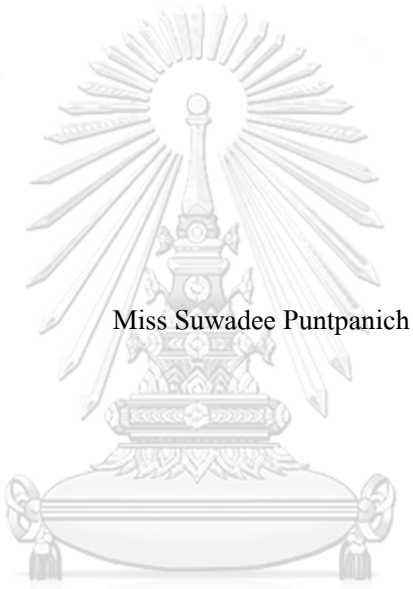
EFFECT OF CHICKEN LOF (LOW FAT IN 90 DAYS): M-HEALTH APPLICATION ON LIPID PROFILE AND BODY COMPOSITION AMONG DYSLIPEDEMIA HEALTHCARE WORKERS: A RANDOMIZED CONTROLLED TRIAL

Miss Suwadee Puntpanich



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ประสิทธิผลของแอปพลิเคชันด้านสุขภาพ ชิคเก้น ลอฟ (ลดไขมันใน 90 วัน) ในโทรศัพท์เคลื่อนที่ที่มีผลต่อระดับไขมันในเส้นเลือดและสัดส่วนของร่างกายในกลุ่มเจ้าหน้าที่สายงานสุขภาพที่มีระดับไขมันในเส้นเลือดผิดปกติ: การทดลองแบบสุ่มและมีกลุ่มควบคุม

น.ส.สุวดี พันธุ์พานิช

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาสาธารณสุขศาสตรดุษฎีบัณฑิต
สาขาวิชาสาธารณสุขศาสตร์ ไม่สังกัดภาควิชา/เทียบเท่า
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สุวดี พันธุ์พานิช : ประสิทธิผลของแอปพลิเคชันด้านสุขภาพ ชิคเก้น ลอฟ (ลดไขมันใน 90 วัน) ในโทรศัพท์เคลื่อนที่ที่มีผลต่อระดับไขมันในเส้นเลือดและสัดส่วนของร่างกายในกลุ่มเจ้าหน้าที่สายงานสุขภาพที่มีระดับไขมันในเส้นเลือดผิดปกติ: การทดลองแบบสุ่มและมีกลุ่มควบคุม. (EFFECT OF CHICKEN LOF (LOW FAT IN 90 DAYS): M-HEALTH APPLICATION ON LIPID PROFILE AND BODY COMPOSITION AMONG DYSLIPEDEMIA HEALTHCARE WORKERS: A RANDOMIZED CONTROLLED TRIAL) อ.ที่ปรึกษาหลัก : ศ. นพ.สุรศักดิ์ ฐานีพานิชสกุล

ความเป็นมา : โรคไม่ติดต่อ (NCD) เป็นปัญหาด้านสาธารณสุขที่มีความเกี่ยวข้องกับวิถีชีวิต และสภาพแวดล้อมที่ไม่ดีต่อสุขภาพ การศึกษาครั้งนี้มีวัตถุประสงค์เพื่อศึกษาประสิทธิผลของชิคเก้น ลอฟ (ลดไขมันใน 90 วัน) ที่มีผลต่อระดับไขมันในเส้นเลือดและสัดส่วนในกลุ่มเจ้าหน้าที่สายงานสุขภาพที่มีระดับไขมันในเส้นเลือดผิดปกติ

วิธีการวิจัย : การศึกษาครั้งนี้เป็นการศึกษาแบบสุ่มและมีกลุ่มควบคุมดำเนินการในกลุ่มเจ้าหน้าที่สุขภาพภาวะไขมันในเลือด ซึ่งปฏิบัติหน้าที่เต็มเวลา โรงพยาบาลองค์การบริหารส่วนจังหวัดภูเก็ต จำนวน 80 คน โดยได้รับการสุ่ม เป็นกลุ่มทดลองหรือกลุ่มควบคุม โดยกลุ่มทดลองได้รับแอปพลิเคชันด้านสุขภาพ ชิคเก้น ลอฟ และการดูแลตามปกติ กลุ่มควบคุมได้รับการดูแลตามปกติจากโรงพยาบาลโดยมีการวัดผลในวันเริ่มต้น วันที่ 30, 60 และ 90

ผลการศึกษา : ผู้เข้าร่วมการวิจัยกลุ่มทดลอง จำนวน 40 คน (ชาย 11/หญิง 29) มีอายุเฉลี่ย 33.9 ปี กลุ่มควบคุม จำนวน 40 คน (ชาย 7/หญิง 23) มีอายุเฉลี่ย 33.2 ปี ในการเก็บข้อมูลครั้งแรกทั้งสองกลุ่มไม่มีความแตกต่างกัน โดยพบว่ามีกลุ่มทดลองมีการเปลี่ยนแปลงที่มีระดับนัยยะสำคัญเมื่อเทียบกับกลุ่มควบคุมในการเปลี่ยนแปลงความรู้โดยรวม (p value<0.001) ทัศนคติโดยรวม (p value<0.001) การปรับเปลี่ยนพฤติกรรมโดยรวม (p value<0.001) HDL-C (p value=0.002) น้ำหนักตัว (p value<0.001), BMI (p value=0.001), ระดับร้อยละของไขมันในร่างกาย (p value=0.029), มวลกระดูก (p value=0.030), BMR (p value=0.032) และระดับน้ำในร่างกาย (p value=0.027) ทั้งนี้เมื่อเทียบการเปลี่ยนแปลงในตนเองของกลุ่มทดลองในวันที่ 30 60 และ 90 เทียบกันวันแรก พบว่า มีการพัฒนาอย่างมีนัยสำคัญทางสถิติ ในการเปลี่ยนแปลงความรู้ ทัศนคติ และพฤติกรรม ขณะที่กลุ่มควบคุมไม่มีการเปลี่ยนแปลง

ข้อสรุปและข้อเสนอแนะ : วิถีชีวิตและสุขภาวะที่ดีส่งผลต่อสุขภาพและการเปลี่ยนแปลงของร่างกายโดยตรง ทุกคนจึงจำเป็นต้องตระหนักและฝึกฝนการดำเนินชีวิตที่มีสุขภาพดี ผลการศึกษาครั้งนี้สรุปวัตถุประสงค์ของการศึกษาว่าแอปพลิเคชันด้านสุขภาพ ชิคเก้น ลอฟ (ลดไขมันใน 90 วัน) ที่พัฒนาขึ้นจากทฤษฎีการสื่อสารสำหรับการสร้างแรงจูงใจในการเปลี่ยนแปลงได้แก่ ทฤษฎีความคาดหวังทฤษฎีการเปลี่ยนพฤติกรรมการสื่อสารและทฤษฎีการโน้มน้าวใจและการเสริมแรง มีผลต่อความรู้ทัศนคติ และพฤติกรรม เกี่ยวกับการดูแลตนเองเพื่อสุขภาพไขมันที่ดีขึ้น รวมถึงส่งผลต่อการพัฒนาของระดับไขมันในเส้นเลือดและสัดส่วนของร่างกาย การใช้เทคโนโลยีในการส่งเสริมสุขภาพและการศึกษาโดยเฉพาะอย่างยิ่งการใช้แอพพลิเคชันเพื่อสุขภาพจะสร้างแรงจูงใจผู้ใช้งานและปรับเปลี่ยนพฤติกรรมการดูแลตัวเองเพื่อให้มีสุขภาพที่ดี

สาขาวิชา	สาธารณสุขศาสตร์	ลายมือชื่อนิสิต .....
ปีการศึกษา	2562	ลายมือชื่อ อ.ที่ปรึกษาหลัก .....

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Suwadee Puntpanich : EFFECT OF CHICKEN LOF (LOW FAT IN 90 DAYS): M-HEALTH APPLICATION ON LIPID PROFILE AND BODY COMPOSITION AMONG DYSLIPEDEMIA HEALTHCARE WORKERS: A RANDOMIZED CONTROLLED TRIAL. Advisor: Prof. SURASAK TANEEPANICHSKUL, M.D.

Background/ Objectives: Non-communicable disease has become public health concern and is associated with an unhealthy lifestyle and ageing. This present study was conducted to explore the effectiveness of “CHICKEN LOF”: M-health application on lipid profile and body composition among dyslipidemia healthcare workers of Phuket City Hospital, Thailand. Subjects/ Methods: This study was a randomized controlled trail with 4 serial measurements and it was conducted among full time dyslipidemia healthcare workers from “Phuket Care Project”, a 10, 000 bed hospital via home visitation in Phuket City Hospital, Thailand. A total of 80 participants participated and they were randomly assigned by a computer generator into either an intervention group or control group. The intervention group received “CHICKEN LOF”: M-Health Application and usual care, and the control group received only usual care. Outcomes were measured on day 30, 60 and 90 compared to baseline. Results: There were 40 participants (M11/F29) with the mean age of 33.9 years in the intervention group and 40 participants (M7/F33) with the mean age of 33.2 years in control group. All of the baseline characteristics were not statistically of significant difference. Significant changes were observed in intervention group on total knowledge (p=0.000), total attitude (p=0.001), total practice (p=0.000), HDL-C (p=0.002), weight (p=0.000), BMI (p=0.001), body fat percentage (p=0.029), bone mass (p=0.030), BMR (p=0.032) and total body water (p=0.027). In pairwise comparison, significant increase of knowledge, attitude and practice was found from the baseline to at day 30, 60 and 90 respectively. Conclusion: As healthy lifestyle has become important issue for personal health which can result many changes in daily life of every person, it is needed to aware and practice the healthy lifestyle measures. The findings of this present study concluded the objectives of the study that M-Health intervention: CHICKEN LOF created by combination of 3 communication theories for motivation change: expectancy theory, behavior change communication theory and Persuasion and reinforcement theory is effective on improving knowledge, attitude and practice on lipid profile and body composition modifying score including improving in blood lipid profile and body composition. Being the use of technology in conducting health promotion and education especially using mobile phone, board game application like this CHICKEN LOF will be attractive to users not only the awareness but also the change of self-management and self-monitoring for their daily healthy lifestyle.

Field of Study:	Public Health	Student's Signature .....
Academic Year:	2019	Advisor's Signature .....

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LIST OF ABBREVIATIONS

AACE	-	American Association of Clinical Endocrinologists
AHA	-	American Heart Association
BCC	-	Behavior Change Communication
BMI	-	Body Mass Index
BMR	-	Basal Metabolic Rate
BP	-	Blood Pressure
CHD	-	Coronary Heart Disease
CRC	-	Colorectal Cancer Screening
CVD	-	Cardiovascular Disease
DBP	-	Diastolic Blood Pressure
DM	-	Diabetes Mellitus
FBG	-	Fasting Blood Glucose
HDL-C	-	High-Density Lipoprotein
HT	-	Hypertension
KAP	-	Knowledge, Attitude, Practice
LDL-C	-	Low-Density Lipoprotein
LOF	-	Low Fat
NCD	-	Noncommunicable Disease
RCT	-	Randomized Controlled Trial
SBP	-	Systolic Blood Pressure
TC	-	Total Cholesterol
TG	-	Triglyceride
TLC	-	Therapeutic Lifestyle Change
WHO	-	World Health Organization

CHAPTER I

INTRODUCTION

1.1 Background and Rationale

Healthcare workers definite from WHO that “all people engaged in actions whose primary intent is to enhance health.” It appears that they are personal important to contribute in health system (World Health Organziation [WHO], 2006). They are one who delivers care and services to the sick and ailing either directly as doctors and nurses or indirectly as aides, helpers, laboratory technicians, or even medical waste handlers. There are approximately 59 million healthcare workers worldwide. Recognizing the vital role played by health care workers as “the most valuable resource for health” WHO had declared the years 2006 to 2015 as the “The decade of the human resources for health.” Several studies have found that healthcare workers fare no better than the general population. A new study in 2010 reports that 740,000 hospital workers are less healthy than the general workforce and cost more in health care spending compared them with 25 million general workforce employees and dependents. They found hospital employees are more likely to be diagnosed with chronic conditions like asthma, obesity and depression, and were 5% more likely hospitalized. These workers spent 9% more in healthcare costs than the general workforce. They continue to smoke, consume alcohol, eat junk food, sleep erratically, and remain obese with little physical exercise despite knowing the health risks that they pose (Regional Office for South-East Asia, 2016). This present study examined lipid profile and body composition of healthcare workers because duties of work should be best role model to enhance or improve other people. Some study intended dyslipidemia and obesity. Around hundred healthcare workers showed prevalence 40.5% of triglycerides and 30.1% of hypercholesterolemia. Values of low HDL-C was 69.3% and including high LDL-C in 55.2%. Dyslipidemia, overweight, obesity and obesity abdominal were higher in female ($p=0.038$). Age growing affected to increase LDL-C ($p=0.015$) (Gómez-Avellaneda & Tarqui-Mamani, 2017).

In generally, people can expose all their lives to all kind of risks to their health in everywhere, whether in the form of communicable diseases (CDs) or non-communicable diseases (NCDs), accidents, consumer products, violence or natural disaster. However, world population trend to get more non-communicable diseases than communicable diseases. These altering patterns of consumption and of living, added with world aging population are linked with an increase in prominence of diseases such as cancers, heart disease, stroke, mental illness, and diabetes and other conditions linked to obesity (WHO, 2002a). An important point is that sign or biochemical parameter to warn health problems. General main parameter linked with circulatory system is dyslipidemia or lipid profile. Dyslipidemia is a main sign associated with cardiovascular diseases (CVDs). It is a group of disorders of lipoprotein metabolism regarded as primary risk factor. The general components of dyslipidemia include elevated low-density lipoprotein cholesterol (LDL) cholesterol, elevated triglycerides, and/or low in high-density lipoprotein cholesterol (HDL) (protective) cholesterol. These status represent may occur often in CVDs patients or the risk group for CVDs (Gerber, 2006). Consequently, dyslipidemia has become a primary target of intervention in strategies for the prevention of cardiovascular events (Lewis, 2011).

Moreover, lipid metabolism can be bothered in different ways, prominent to changes in plasma lipoprotein function and/or levels. Dyslipidemia cover a broad spectrum of lipid abnormalities, some of which are of great importance in CVD prevention. Dyslipidemia may be associate to other diseases (secondary dyslipidemia) or to the interaction between genetic predisposition and environmental factors (Reiner et al., 2011). CVDs were the leading cause of NCDs deaths. There are a group of disorders of the heart and blood vessels included many types of disease as coronary heart disease, cerebrovascular disease, peripheral arterial disease, rheumatic heart disease, congenital heart disease and deep vein thrombosis and pulmonary embolism. The severe of disease associated with heart attacks and strokes and the cause of death are becoming by a blockage blood from flowing to the heart or brain (blood clots). Risks of disease are highlighted by main behavior or lifestyle changing such as tobacco use, unhealthy diet and obesity, physical inactivity and harmful use of alcohol, hypertension, diabetes and hyperlipidemia (WHO, 2013).

Approximately 17.9 million deaths are caused by CVDs over the world in 2016 or 31% of all global deaths. All most death or 85% are due to heart attack and stroke (WHO, 2012). In America, it is the number one cause of death in the United States (Wharton, Johnston, Cunningham, & Sterner, 2014). There were 18 million of the estimated 81 million adults in the US with CVDs had coronary heart disease (CHD). One in every six deaths in the US is cause by CHD. Recently, number of CVDs related with mortality rate have been decline due to CHD risk factors because it can be modified (e.g. smoking, hypertension, obesity, onset of type 2 diabetes, and dyslipidemia). Cardiovascular risk can be reduced by timely and right interventions, such as stop smoking, diet and lifestyle alterations, and lipid-modifying therapy (Lewis, 2011). Actually, death cases are top cause in low- and middle-income countries. In 2015, 17 million premature deaths (under the age of 70) are the cause from NCDs, 82% are in low- and middle-income countries, and 37% are caused by CVDs (WHO, 2016). As the same of South East Asia, many types of CVDs reported a quarter of all deaths annually. The trending of disease affect younger age-groups compared with western countries (WHO, 2008). Example, NCDs in Thailand are estimated to account for 74% of all deaths. Proportional mortality of CVDs are around 23% from 399,100 people (WHO, 2018).

In additional, dyslipidemia may be associate to other diseases (secondary dyslipidemia) or to the interaction between genetic predisposition and environmental factors (Reiner et al., 2011). American Association of Clinical Endocrinologists (AACE) recommends a comprehensive strategy to control lipid levels and to address associated metabolic abnormalities and modifiable risk factors such as hypertension, diabetes, obesity, and cigarette smoking. The first-line approach to primary prevention in patients with lipid disorders involves the implementation of lifestyle changes, including physical activity and medical nutrition therapy. Treatment may also involve pharmacotherapy, as well as patient education programs, to promote further risk reduction through smoking cessation and weight loss (Jellinger et al., 2012).

Besides, another sign is body composition. It’s relevant to direct health status of individual. Including of body composition measurements are such as waist circumference and waist–hip ratio that strongly related to dyslipidemia and body mass

index (BMI) (Ramírez-Vélez et al., 2018). In summary, body composition assessment is often used in clinical practice. Several condition used this parameter that included nutritional evaluation and monitoring (obesity and malnutrition, weight loss), following bariatric surgery, sarcopenia in aging, osteopenia and osteoporosis. Moreover, the most significant of body composition was associated with metabolism system and in this content linked with dyslipidemia. Measurement tools of this indicator has a several tools including anthropometry, dual energy X-ray absorptiometry (DXA) and bioelectrical impedance analysis (BIA). Concurrent, the most national method compared between BIA and DXA methods (Achamrah et al., 2018).

From health report in 2013 showed that Thai people had less exercise, consume more sweet, oily, and salty food but few vegetables and fruits. Moreover, some also had mental problem, smoking, and drinking alcohol. This lifestyle induced them to get Cardiovascular Diseases (CVDs)/ Diabetes Miletus (DM). Abnormally factor of NCDs linked the top of dyslipidemia (Thai Health Promotion Foundation, 2013). CHD is expected to become one of the major health problems in developing countries such as Thailand, where prevalence data are scarce (Yamwong, Assantachai, & Amornrat, 2000). Thailand in 2004 had the highest (78%) percentage of unawareness of hypercholesterolemia, with markedly low percentages of treatment and control. Recent studies suggest that low HDL-C and high triglycerides also confer residual risk for CVDs. However, there is no Thai data on the prevalence of other lipid parameters—for example, high-density lipoprotein cholesterol (HDL-C), non-HDL-C, LDL-C, and triglycerides—in the general population, with and without CVDs risk factors. Since the previous decade, the Ministry of Public Health has spent a great deal of effort in an attempt to increase the coverage in screening for diabetes and hypertension, due to the higher burden of hypertension and diabetes compared lipid profile in the Thai population. However, for dyslipidemia, more resources are needed for investment in rural health care services. A study reported that Thailand had invested less efficiently (Aekplakorn et al., 2014).

CVDs is the leading cause of deaths nearly sixty-thousands people in 2014. Moreover, the prevalence of dyslipidemia in women are higher than men, 40.2 and 30.1 respectively. The studied of Rajavithi hospital showed the result of staff health check-

up program in year 2008, 2009, and 2010 about prevalence of dyslipidemia in the hospital staffs were 66.5%, 60.3%, and 63.4% respectively. Additionally, in 2011, the number of hospital staffs who get dyslipidemia still high, 61.5% (Chanpol & Tanavikrankoon, 2015). Healthcare workers are the key person to affect health people. It's well known that a lot dyslipidemia knowledge and information of healthcare workers are a good responsibility. In contrast, the association between health behavior and knowledge is not the same. It is not surprising that dyslipidemia situation in healthcare workers. However, they should be role model of healthy to inspire potential of health in patients and general people.

There are 7.3 billion people over the world, 3.4 billion are using internet. Especially for social network, 2.3 billion people. Addition, 3.7 billion are using smartphone (Kemp, 2016). As the same in Thailand, Electronic Transactions Development Agency (ETDA) has shown the result of "Thailand Internet User Profile 2016", there are approximately 45.0 hours per week or 6.4 hours per day of using internet from both computer and smartphone. The "Gen Y" are the most generation that use internet, about 53.2 hours per week. Smartphone is the most device for using internet, 85.5% and about 6.2 hours per day. In addition, the number of people who use smartphone and internet is increasing from last year, 82.1% and 5.7 hours per day respectively (Electronic Transactions Development Agency, 2016).

Recent advances in information technology (IT) have in turn led to advances in the management of patients, and especially elderly patients with chronic illnesses (Seo et al., 2015). Mobile information technology may offer new solutions to better meet these needs. With more than 1 billion users having access to mobile broadband Internet and the mobile app market growing rapidly, the stakeholders involved have high hopes that this technology may improve health care (Mertens et al., 2016). There were some data have shown the effectiveness of these technologies especially mobile health (m-health) interventions such as smartphone, mobile phone, short message service (SMS) and mobile application on health to educate people about modifying lipid profile, however the effectiveness in improving lipid profile and body composition are not fully clarified which might be explained by the difference of the study's methodology.

M-health has also been adopted for the management of stroke, and software applications (apps) for mobile devices (especially smartphones) have proven efficacious in the detection of neurological symptoms and in the diagnosis of stroke. The recent studied has been conducted a clinical trial to test the feasibility of using a smartphone application (app) for the management of vascular risk factors, which has rarely been studied in patients with stroke which can help a lot (Seo et al., 2015). However, adherence to self-management and medication remains a challenge, particularly in the management of hypertension and in elderly patients with high comorbidity and reduced awareness of their medical condition. Complexities of daily life, shifting priorities, and frequent polypharmacy are likely to contribute to patients' inability to deal adequately with their medical conditions. A mobile application can support the therapy management, will be accepted by elderly patients with chronic conditions and would improve their therapy adherence (Mertens et al., 2016).

The Impact of M-Health Interventions: Systematic Review of Systematic Reviews. Positive impact has been demonstrated with moderate-quality evidence that text messaging interventions showed greater improvements in the pooled symptom score. Cardiac Rehabilitation exercise capacity in cardiac rehabilitation improved a 6-minute walk test from 524-637 meters in monitored exercise training assisted by a mobile phone app. Congestive Heart Failure, mobile technology counseling led to fewer symptom complaints in congestive heart failure subjects. here was relative risk reduction (20%) of death or hospitalization and better quality of life with nurse telephone intervention and cardiologist support. Diabetes educational group sessions for diabetic women via SMS showed positive effects on sleep, positive actions, and coping (Marcolino et al., 2018).

M-health to improve behavior change for better physical activity on body composition. There are several studies have proved about it. A study in Taiwan found the effect of M-health application named Mobile Physical Activity Promotion Tool in Subjects With Overweight/Metabolic Abnormality-RCT that can improve physical activity, body composition, physiological parameters and quality of life by using MT (mobile physical activity promotion tool) and lifestyle counseling in diet control, increased physical activity, less smoking and drinking, deal with pressure, and regular

health examination was conducted for 3 months in intervention periods (Yang, 2015). There was a study found the impact of a mobile phone game ("Mobile Kids Monster Manor") as a tool to promote voluntary physical activity among 54 children in North America. In the game group, greater physical activity was demonstrated in children with higher BMI z-score. It was confirmed that the M-Health game design promotes physical activity (Garde et al., 2015).

Other Behavior Change from M-Health & Fitness Applications has been studied to support physical activity promotion. It found that First, the consulted experts reveal what kind of intervention strategies are suitable in order to promote physical activity. Second, the study brings forth how the application features carry out support for behavior change. According to the user's motivational stage and the user's psychological characteristics, application features are assigned to different user types to support and increase physical activity. Intervention strategies, also traditional human-to-human mediated ones rely on the long-term participation of the user. Sustainable behavior change is achieved by providing influence measures in form of sessions, discussions, guided activities etc. for numerous times. The more intense the traditional coaching is, the higher are the expected results. Consequently, the amount of persuasive messages increases with the intensity of the interventions. For computer-to-human persuasion, the same correlation is assumed. This means that the behavior change effect is positively associated with the use of the persuasive application (Hamper, Wendt, Zagel, & Bodendorf, 2016).

M-Health also has evidences on effectiveness on improving lipid profile. A study of systematic review and meta-analysis of randomized controlled trials (RCTs) found that 16 clinical trials have reported the effects of M-Health interventions on triglycerides, seventeen on total-cholesterol, 16 on LDL-cholesterol, and 16 on HDL-cholesterol levels. These clinical trials were published between 1998 and 2017. The total number of patients included was 2863) range from 51 to 710 individuals in each trial), with 1520) with range: 25–352 (assigned to m-health interventions and 1338)with range: 26–358 (to control groups. 10 clinical trials were used Smartphone and/or app as M-Health technology type to control lipid profiles, in 10 trials were SMS, and

phone call used in 2 clinical trials as m-health solutions (Azhdari, Karandish, & Mansoori, 2019).

A qualitative systematic review and meta-ethnography of mobile health in promoting physical activity found that personal factors and features of the device influenced the experience of using M-health to support physical activity. The two mechanisms through which mobile health use facilitated physical activity were strengthening of motivation and changes in self-awareness and strategizing (Carter, Robinson, Forbes, & Hayes, 2018).

Most of tasks on exploring existing literatures are carried out online, there are no finding a single study that is specifically conducted around M-Health application on lipid profile and body composition on healthcare workers with dyslipidemia in Thailand or other countries. However, some relevant papers on the issue that were conducted in countries in other regions of the world, which were specifically focused on prevalence and the association factors. As mentioned earlier, there are high percentage of hospital staffs had abnormal lipid profiles. If healthcare worker who knows how to take care themselves can't improve their health, how can the patient trust or believe the way healthcare personnel teach them. On the other hand, good health behavior will not get the NCDs and CVDs risk. They will be a high potential healthcare worker to help others people. Therefore, M-Health applications are a communication way to communicate with patients about the knowledge of self-care.

A study assessed the use of a popular smartphone app name "Lose it!" for dietary self-monitoring and weight loss by comparing it with traditional diet counseling and entry methods for 8-week weight loss trial with 19 intervention group and 15 control group. It found that Smartphone apps could represent a novel and feasible dietary self-monitoring method for individuals. There was a significant reduction in body weight across groups at the end of the 8-week trial (effect size 0.042)., however, mean weight loss did not differ between groups at the end of the trial (effect size0.073). Similarly, BMI values were reduced at the end of the 8-week trial across groups (effect size 0.122) but there were no group differences (effect size 0.046) (Wharton et al., 2014).

A qualitative study of casual mobile games to help adults learn how to live healthfully with 12 adults found that “they improved their understanding of how to eat healthfully and engaged in nutrition-related analytical thinking, reevaluated the healthiness of their real life habits, formed helping relationships by discussing nutrition with others and started replacing unhealthy meals with more nutritious foods” (Parker, Kantroo, & Grinter, 2010).

Another study about diet game M-Health application provides a personalized diet profile and promotes knowledge about nutrition using a diet game with 19 intervention group and 17 control group shown that “in a questionnaire survey at the end of the study, the majority of the participants responded that the system was useful for obtaining information and managing the diet process. The SmartDiet mobile weight management application appears to contribute to weight loss in obese adults” (Lee, Chae, Kim, Ho, & Choi, 2010).

The CHICKEN LOF Application is created by researcher to apply core data from ministry of public health on dietary for lipid profile modifying and self-care. The application is designed as a quest game. A chicken cartoon character represents the user. There are 7 statuses to reflex 6 digital vitamins or activities the chicken does daily which aimed to educate users to improve their KAP on dyslipidemia care applied from Therapeutic Lifestyle Change (TLC) program created by National Institutes of Health and was revised in 2013 which focuses on saturated fats and cholesterol, dietary options to enhance LDL cholesterol lowering, weight control, and physical activity (Eckel et al., 2013).

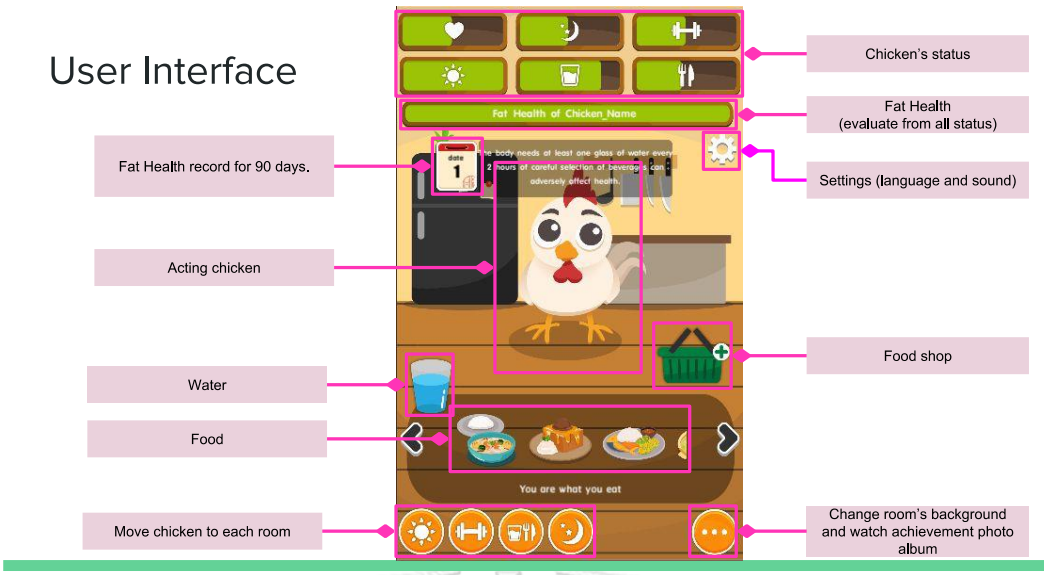


Figure 1 User Interface of CHICKEN LOF

The M-Health has designed to have 6 digital vitamins which are A: a walk to the sun (the sun status will increase while sunbathing in the garden) B: be happy (mood status will increase when the user touches the chicken) C: clam and sleep (sleeping status will increase when the chicken 7 hours). D: drink more water (water status will increase when chicken drinks water). E: exercise daily (exercise status will increase when increase while the chicken exercising) and F: food control (food status will increase when the user bring food to chicken).

There is an advice on each vitamin the user choose. And each vitamin it takes, reflex to its fat health (the status can both increase or decrease such as bringing unhealthy food or drinks to the chicken). There is health record calendar of the chicken which user can see how the chicken improve its health within 90 days.

The M-Health application provide information of lipid profile modifying with motivating strategy for user to continue learning the connecting of the 6 activities to fat heath. The propose of the M-health application is to change Knowledge Attitude and Practice of dyslipidemia in healthcare workers within 90 days. This research focussed on the effect of M-Health application to improve their KAP as a primary outcome and lower lipid profile and modify body composition as a secondary outcome since there

were mentioned that change in lipid profile and body composition effected differently in each participant and time.

1.2 Research Question

1.2.1 Primary Research Question

1) Does CHICKEN LOF group at 90 days has better change of Knowledge, Attitude, and Practice ("KAP") on lipid profile and body composition modifying than their baseline, 30 and 60 days?
2) Does CHICKEN LOF group at 30 and 60 days and 90 days has better change of KAP on lipid profile and body composition modifying than control group?

1.2.2 Secondary Research Question

1) Does CHICKEN LOF group at 90 days has better change of lipid profile than their baseline, 30 and 60 days?
2) Does CHICKEN LOF group at 30 and 60 days and 90 days has better change of lipid profile than control group?
3) Does CHICKEN LOF group at 90 days has better change of body composition than their baseline, 30 and 60 days?
4) Does CHICKEN LOF group at 30 and 60 days and 90 days has better change of body composition than control group?

1.3 Research Objectives

1.3.1 General objective

To explore the effect of CHICKEN LOF M-health application on lipid profile and body composition among dyslipidemia healthcare workers as a communication channel to improve their KAP of lipid profile and body composition modifying.

1.3.2 Specific Objectives

Primary Research specific objectives

1) To compare the change of KAP on lipid profile and body composition modifying score within intervention and control groups (baseline, 30, 60 and 90 days)

2) To compare the change of KAP on lipid profile and body composition modifying between intervention and control groups at baseline, 30, 60 and 90 days.

Secondary Research specific objectives

1) To compare the change of lipid profile within intervention and control groups (baseline, 30, 60 and 90 days)
2) To compare the change of lipid profile between intervention and control groups at baseline, 30, 60 and 90 days.
3) To compare the change of body composition within intervention and control groups (baseline, 30, 60 and 90 days)
4) To compare the change of body composition between intervention and control groups at baseline, 30, 60 and 90 days.

1.4 Research Hypothesis

1.4.1 Primary hypothesis

1) There is significant different change KAP of lipid profile and body composition modifying in intervention group.
2) There is significant different change of KAP of lipid profile and body composition modifying between intervention and control groups

1.4.2 Secondary hypothesis

1) There is significant different change of lipid profile in intervention group
2) There is significant different change of lipid profile between intervention and control groups
3) There is significant different change of body composition in intervention group
4) There is significant different change of body composition between intervention and control groups

1.5 Conceptual Framework

This study is randomized controlled trial to assess the effect of CHICKEN LOF (LOw Fat in 90 Days) M-Health application among dyslipidemia healthcare workers at Phuket City Hospital, Thailand. The conceptual framework of this study is shown in Figure 1.

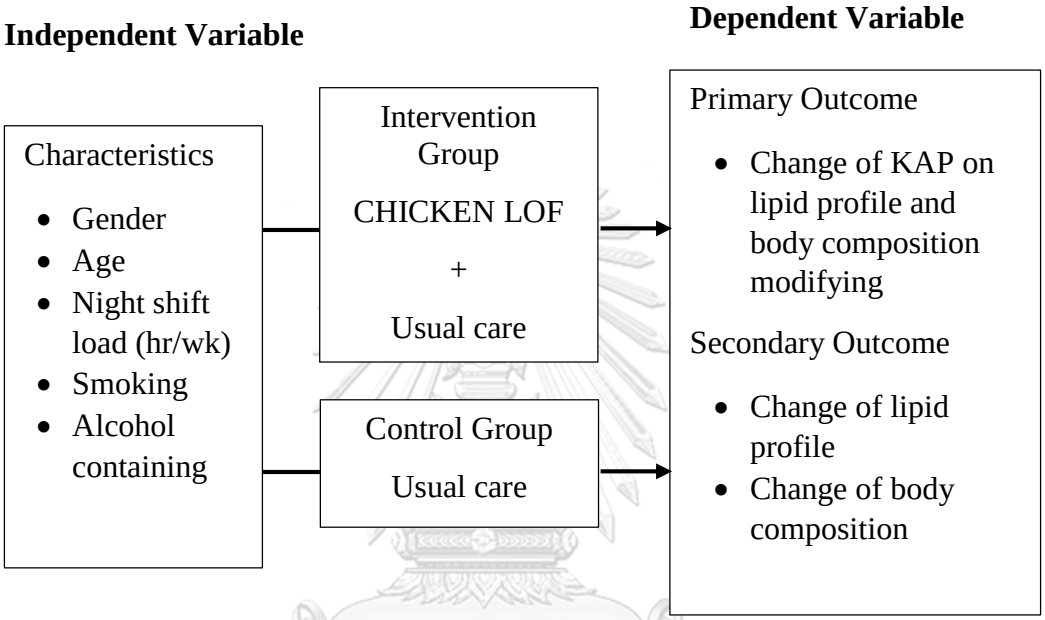


Figure 2 Conceptual framework of study

1.6 Operational Definition

Effect: This effect of mobile application measures the change of two effect after study. Primary effect is a "KAP of lipid profile and body composition modifying" and secondary is the change of "lipid profile and body composition".

KAP: It refers to Knowledge, Attitude and Practice (KAP) on lipid profile and body composition modifying.

Lipid profile: Level of Total Cholesterol (TC) elevated Triglyceride (TG), elevated low-density lipoprotein cholesterol (LDL-C) and high-density lipoprotein cholesterol (HDL-C) tested by hospital blood testing department.

Body Composition: It refers to measurement of Waist(cm), Hip (cm), BMI (kg/m^2), Body fat mass (kg), Body fat percentage (%), Fat free mass (kg), Skeletal muscle mass (kg), Visceral fat level, Waist-Hip ratio, Basal metabolic rate (kcal) by using body composition measurement machine.

Dyslipidemia Healthcare workers: Medical and supporting fulltime staffs who work in a hospital at least 1 year and have a kind of abnormal lipid profile. Total Cholesterol over than 200 mg/dL., LDL Cholesterol more than 100 mg/dL., HDL Cholesterol Level less than 60. Or Triglyceride Level over than 150 mg/dL.

M-Health application: It has been known as an application on mobile contained information of health.

Chicken LOF (Low Fat in 90 days): It is a M-Health Application contained information of Lipid profile and body composition modifying. It is in a form of board game base on the relationship of heathy and unhealthy treatment. User has to take care of a cartoon chicken with 6 modes to improve the cartoon chicken's health. There are 7 status shown on the game; 6 are status of each treatment the chicken has received, other is total fat health status.

Digital Vitamins: The Chicken LOF application has 6 modes to modify the cartoon chicken's health on Lipid profile and body composition called digital vitamins. Each treatment has health information and explanation. The digital vitamins are

Digital Vitamin A: **A walk to the sun:** It refers to the user appoints the cartoon chicken to get Vitamin D by walking to the sunlight daytime without sun protection. Vitamin D is associated with depression situation and help fat burn. The level of status of vitamin D and fat health will increase or decrease by the time of care.

Digital Vitamin B: **Be happy:** It refers to the user makes the cartoon chicken laugh or in the mood of happy but touching the chicken gently. Less Stress or depress and feeling good associated with lipid profile and fat burn. The level of status of happy and fat health will increase or decrease by the time of care.

Digital Vitamin C: **Clam and sleep:** It refers to the user appoint the cartoon chicken to sleep. 7 hours sleeping continuing associated to body composition and fat burn. The level of status of Clam and sleep and fat health will increase or decrease by the time of care.

Digital Vitamin D: **Drink more water:** It refers to the user gives the cartoon chicken a glass of water. Drinking eight glasses or 1 liter of water a day associated to body composition and lipid lowering. The level of status of water and fat health will increase or decrease by the time of care.

Digital Vitamin E: **Exercise daily:** It refers to the to the user takes the cartoon chicken to do exercise. There are 3 kind of exercises to choose; stressing, cardio and muscle weight training. The level of status of exercise and fat health will increase or decrease by the time of care.

Digital Vitamin F: **Food control:** It refers to the to the user choose foods and bring foods to the cartoon chicken. Detail of cholesterol and calories of each food are informed. Eating lean and proper calories and cholesterol of foods will increase or decrease the level of status of food and fat health by the time of care.

Body Mass Index (BMI): Calculation of body fat was measured on divides participant's weight in kilograms by their height in meters squared.

Smoking: This refers to healthcare workers in Phuket City Hospital smoking behavior, the quantity and the frequency of smoking.

Night Shift: It refers to measure night shift of work among healthcare workers in Phuket City Hospital (hour per week).

Lipid-lowering drugs taking: The history of participants taking the drug of lipid reducing.

Disorder of lipid profile: The laboratory results of participants report the abnormal or disorder of lipid values.

Overweight: It refers to the BMI of participant which is more than *25 kilograms* calculated from weight and height *(25 kg/m^2).*

Usual care: It refers to a general consultation by physician in the hospital for dietary and exercise after lipid profile testing.

CHAPTER II

LITERATURE REVIEW

This literature part of this study included the following topics:

2.1 Lipid profile

2.2 Body composition

2.3 Lipid profile and body composition among healthcare workers

2.4 Risk and individual factors of lipid profile and body composition

2.5 Lipid profile and body composition with Therapeutic Lifestyle Change (TLC)

2.6 Healthcare digital intervention

2.7 Expectancy theory

2.8 Persuasion and reinforcement theory

2.9 Behavior change communication theory

2.1 Lipid Profile

In this study, lipid profile includes total cholesterol, HDL-cholesterol, triglyceride, and LDL-cholesterol levels. The abnormal situation of lipid refers to dyslipidemia disorder. It is a group of disorders of lipoprotein metabolism including elevated low-density lipoprotein cholesterol (LDL) cholesterol, elevated triglycerides, and/or low in high-density lipoprotein cholesterol (HDL) (protective) cholesterol. These statuses represent may occur often in CVDs patients or the risk group for CVDs (Gerber, 2006). In 2018, the study of dyslipidemia prevalence founded 66.5% overall; high LDL-C 29.6%; high TG 38.6%; low HDL-C 47.1% in Thailand profile. The study showed NCDs and CVDs prevalence increasingly (Alshamiri et al., 2018).

In Thailand, the reference guideline of CVDs and dyslipidemia uses 2016 RCPT Clinical Practice Guideline on Pharmacologic Therapy of Dyslipidemia for Atherosclerotic Cardiovascular Disease Prevention. Criteria for CVDs risk was

calculated by Thai CV Risk Score. Furthermore, the main association of risk links with lipid profile and dyslipidemia so primary prevention points of this normal range in lipid profile. The normal range parameter of lipid should be follow as table below:

Table 1 Lipid profile guideline

Lipid parameters	**Categories**	**Principle measurement**
Cholesterol (TC)	Desirable: < 200 mg/dL Borderline: 200 – 239 mg/dL High: ≥ 240 mg/dL	Colorimetric reflectance spectrophotometric method
HDL Cholesterol (HDL-C)	Low (representing risk): < 40 mg/dL High (heart protective) ≥ 60 mg/dL	Colorimetric reflectance spectrophotometry after samples are treated with phosphitungstic acid/ magnesium chloride to precipitate HDLs and non-HDLs.
LDL Cholesterol (LDL-C)	Optimal: < 100 mg/dL Near optimal/above optimal: 100–129 mg/dL Borderline high: 130–159 mg/dL High: 160–189 mg/dL Very high: ≥ 190 mg/dL	Calculated from; Total Cholesterol – [HDL + (Triglycerides/5)].
Triglyceride (TG)	Normal: <150 mg/dL Borderline high: 150-199 mg/dL High: 200–499 mg/dL Very high: ≥ 500 mg/d	Colorimetric reflectance spectrophotometry

Source: Adapted from "Managing Your Cholesterol", A Harvard Medical School Special Health Report

Why lipid values are a problem concern? Also their problem isn't having lipid in bloodstream but it's having more than normal criteria, especially not good types of

lipid. It affected to accumulate in the walls of blood vessels. LDL elements are a pure cholesterol or known as “bad” cholesterol. The LDL affecting distributes cholesterol to tissues and builds artery-clogging plaque. The process of LDL creation is directed from their triglyceride (fatty acid) —packing of protein and cholesterol. Part of HDL elements are known as “good” cholesterol. It can remove cholesterol from circulation and from artery walls. This status is an excretion of liver. Others, triglyceride is a molecule consists of three fatty acid chains linked to a backbone called glycerol. In our daily life, triglycerides in the bloodstream can rise and fall. It depended on our meal or food. After a meal, there can be involving in the bloodstream that they form a milky tint in blood. Within a few hours, they’re mostly cleared out so, the top factor association of lipid are food and nutritional. However, triglycerides are one considered a risk factor for CVDs, especially including with high triglycerides and low HDL.

Although this study highlight on lipid profile because it is the risk factor for health diseases. On the others hand, it influences to affect with other NCDs diseases or risks such as high blood pressure, diabetes, and obesity. Blood pressure and hypertension, lipid profile, dyslipidemia, glucose, and diabetes mellitus linked to CVDs factors study in sample comprised 12,654 participants in China (representing 404 million people) and 2607 participants in the United States (representing 105 million people), aged 45 to 75 years (Liu et al., 2018). Hypertension (HT) is associated with dyslipidemia and CVDs or the top risk factor of CVDs included with HT situation — e.g. the low risk CVDs in the dipper HT (Chuemongkon & Thura, 2016; Dai, Huang, Zou, & Liu, 2019).

Risk factors of heart diseases divided into two types—uncontrolled and controlled. The first of beyond our control, it is mention on aging status, genetic, and some of hormone such as a postmenopausal woman. Then, risks can treat or control consists of blood pressure, lipid level in bloodstream, metabolic syndrome, overweight and obesity, and lifestyle factors such as smoking, physical inactivity, a diet high in saturated and trans fats and highly processed carbohydrates, chronic stress, and social isolation, depression, or anxiety. Mentioned by benefit of factors control, it can predict a person’s odds of illness or death. Besides, the cutting chances of developing CVDs

or having a heart attack linked with lipid and body composition situation. For examples of healthy heart are as following (Corliss, 2014);

1. Lowering cholesterol by 10% can decrease heart attack risk by 20% to 30%.

2. Walking at least two hours a week can cut chances of dying early from CVDs by up to 53%.

3. Quitting smoke can reduce risk for a heart attack by half within a year.

4. Maintaining a healthy body weight reduces risk for heart disease by 45%.

5. Eating less sodium in about 1,200 mg per day can reduce blood pressure. It can also decrease deaths from stroke by 22% and those from heart disease by 16%.

The cohort study of BMI, dyslipidemia, hyperglycemia, and hypertension among 60,000 Swedish and Austrian, they founded the important factor in after 10 years' study. The main affecting factors were age and BMI. The abnormal metabolic system increased when the oldest. Moreover, BMI factor were strongest one significant affected to others. Examples, BMI increasing can be elevated blood pressure at increased 0.12 (95%CI: 0.11–0.14) and included triglycerides levels (Van Hemelrijck et al., 2018). Mass participant among 14,744 were diagnosed with dyslipidemia (37.61%) in the Henan rural, China from the all 39,207 participants aged 18–79 years old. Founding the factors linked the dyslipidemia including aging, women, smoking, drinking alcohol, positive family history of dyslipidemia, and lack of physical activity. The level of biomedical parameter (BMI, FBG, SBP, DBP, TC, TG and LDL-C) were significantly compared with the non-dyslipidemia participants. Overall, the age-adjusted of mean levels of TC, TG, HDL-C, and LDL-C showed significant higher in women than in men. It increased in the age range between 60 and 69 years. Summary, women had a higher prevalence of dyslipidemia than men above the age of 60. The others independent risk factor of dyslipidemia included age, men, cigarette smoking, adequate vegetable and fruit intake, inadequate physical activity, positive family history of dyslipidemia, abnormal weight, T2DM and HTN. Part of BMI, associated with awareness and treatment but unrelated to dyslipidemia control (Liu et al., 2018).

Moreover, the effect of dyslipidemia is important to change health. Many study intended the longitudinal effect. Occurring the study of 23.4 years of longitudinal follow-up on 2,893 children in American, Dyslipidemia in youth is significantly to obesity. Besides, high LDL in children is a risk for atherosclerosis and including the main effected to hypertension too. Despite other factor of dyslipidemia that familial hypercholesterolemia are associated with dyslipidemia value of childhood (Turer, Brady, & De Ferranti, 2018). In additional, higher BMI was an independent risk factor for dyslipidemia. For one compared between Japanese and American hypertension, diabetes, dyslipidemia, and hyperuricemia associated with BMI. This results highlighted the increasing BMI in Japan that associated with a higher odds of cardio-metabolic risk factors than in the U.S. and showed a lower risk of dyslipidemia in U.S. than Japan (OR: 0.404, 95% CI, 0.286–0.570). However, neither race nor ethnicity related between BMI and cardio metabolic risk factors in the U.S. (Kuwabara et al., 2018).

2.2 Body Composition

Body composition relevant to direct health status of individual. Including of body composition measurements are such as waist circumference and waist–hip ratio that strongly related to dyslipidemia and body mass index (BMI) (Ramírez-Vélez et al., 2017). In summary, body composition assessment is often used in clinical practice. Several condition used this parameter that included nutritional evaluation and monitoring (obesity and malnutrition, weight loss), following bariatric surgery, sarcopenia in aging, osteopenia and osteoporosis. Moreover, the most significant of body composition was associated with metabolism system and in this content linked with dyslipidemia. Measurement tools of this indicator has a several tools including anthropometry, dual energy X-ray absorptiometry (DXA) and bioelectrical impedance analysis (BIA). Concurrent, the most national method compared between BIA and DXA methods (Achamrah et al., 2018).

Many study used body composition is the outcome that be linked to other factors. Examples, the study of body composition and metabolic disease risk are association together. Founding of results were body composition changing such as high

body fat, high waist circumference that it could be affected to insulin sensitive tissue, fat in skeletal muscle, and dysfunction of liver. Thus, there is direct effect to metabolic diseases such as hypertension, dyslipidemia, and a pro-coagulant state (Pi-Sunyer, 2019).

An association between food or nutritional intake and body composition changes was key factor of several study. The study of Muros and others in 2018, body composition of nine males in International Cyclist Union (UCI) World Tour professional cyclist can change after 3 weeks when controlled and set a quality nutritional. They were set the nutritional intake as follows: carbohydrate, 12.5 ± 1.8 g/kg/day of body weight (BW) (65.0 ± 5.9%); fat, 1.5 ± 0.5 g/kg/day BW (17.9 ± 5.6%); and protein, 3.3 ± 0.3 g/kg/day BW (17.1 ± 1.6%). Micronutrients references from Recommended Dietary Allowances (RDA). In final results, nine cyclists could be changed body composition such as fat mass and upper arm fat mass. Decreased was significantly ($p < .05$). In additional, nutrition intervention in 50 young adults measured the outcome of body composition and nutritional biomarkers. During the 12 weeks long nutrition intervention founded the nutritional biomarkers changing ($p < 0.05$) HDL-cholesterol, blood sugar, cholesterol) and body composition improving ($p < 0.05$), BMI, body fat, fat-free mass index, fat-free mass and total body water) at the end of the intervention. Truly, nutrition is an important to change blood components and improve body composition (Kiss, Dóra, Katona, & Fritz, 2018).

2.3 Lipid Profile and Body Composition among healthcare workers

Health care workers definite from WHO that “all people engaged in actions whose primary intent is to enhance health”. It appears that they are personal important to contribute in health system (WHO, 2006). In this study, lipid profile and body composition of healthcare worker were assessed because duties of work should be best role model to enhance or improve other people. Some study intended dyslipidemia and obesity. Around hundred healthcare workers showed prevalence 40.5% of triglycerides and 30.1% of hypercholesterolemia. Values of low HDL-C was 69.3% and including high LDL-C in 55.2%. Dyslipidemia, overweight, obesity and obesity abdominal were

higher in female (p=0.038). Age growing affected to increase LDL-C (p=0.015) (Gómez-Avellaneda & Tarqui-Mamani, 2017).

Sefwi-Wiawso Municipal Hospital, Ghana conducted 112 healthcare workers to study cardiometabolic risk factors. The markers of study linked with dyslipidemia, hypertension, overweight, obesity, and glycemic levels. In summary, a significant was associated between dyslipidemia and overweight and obesity. Furthermore, glycaemia levels showed a significant trend across increasing in overweight and obesity too. In general, oldest samples was significant increasing in the makers including dyslipidemia, hypertension, and glycemic levels (Osei-Yeboah et al., 2018). One study, a cross sectional was study among female nursing staffs in college of medicine and JNM Hospital, Kalyani, a government medical college hospital in eastern India. In correlation of different biochemical parameters with BMI, a significant founding was age and blood pressure, age and cholesterol level, blood sugar and cholesterol level, blood sugar and triglyceride level (Ghosh & Kumar, 2018). One study female Mexican health workers interested body fat mass, dietary intake, leisure time activity and depression. They used model prediction in each factor. Results of this study showed depression score effected on calorie intake and physical activity such as association (p = 0.098) between depression and body fat (Quezada, Macías-Waldman, Salmerón, Swigart, & Gallegos-Carrillo, 2017).

2.4 Risk and Individual factors of dyslipidemia and body composition

Any factors of risk and individual related with lipid value in bloodstream and body composition parameters will explain more detail as a following;

2.4.1 Job Stress

In fact**,** the growing evidence of stress was related CDs especially CVDs. Almost them explained the one factor of stress becomes from job or occupational. Some study intended an associated job stress with lipid profiles such as regarding cholesterol (LDL & HDL) and triglyceride levels. The study of Catalina-Romero and all in 2013 presented job stress 8.7% (95% CI, 8.5–8.8%) of 91,593 workers in part of the Ibermutuamur Cardiovascular Risk Assessment (ICARIA) study. The top tree job

included 1. Craftsmen/women and skilled workers in manufacturing, construction, and mining, 2. Support technicians and professionals, and 3. Unskilled workers. A study showed an association between job stress and dyslipidemia. In detailed, it was related with high LDL-C levels (OR 1.14, 95% CI, 1.05–1.23), low HDL-C levels (OR 1.08, 95% CI, 1.01–1.15), high TC/HDL-C ratio (OR 1.13, 95% CI, 1.05–1.23) and high LDL-C/HDL-C ratio (OR 1.11, 95% CI, 1.04–1.19) in a model of any factors included age, sex, smoking, alcohol consumption, obesity, occupational level, exercise practice, and lipid-lowering therapy after adjusting (Catalina-Romero et al., 2013).

Part of body composition and job stress have been study in relation. If body physical is dysfunctional or weakness, it can relate to do job and that is reason of job stress become. One study of RCT among worker of several high-tech industries in the Southern Taiwan Science Park. They were full-time workers (40 h/week) and working for at least 1 year with aged equal or more than 20 years old. Body composition criteria included BMI ≥ 24 or waist. This study was taken by physical activity (PA) intervention. After that, the results measured the outcome of physical fitness, overweight and metabolic syndrome, blood lipid profile (cholesterol, triglycerides, HDL-C and LDL-C), and final included occupational stress and job satisfaction. PA is related to change lipid profile. Participant will be added exercise (such as running, jogging, biking, swimming) at a moderate intensity for 60 min/session, 1 session/day, 3 sessions/week for 12 weeks (36 sessions in total) and combined with dietary consults. The result between physical activity and occupational stress, job satisfaction were significantly improved the level of work-related stress and job satisfaction (+5.6%) in the intervention group ($p < 0.05$) (Fang, Huang, & Hsu, 2019).

2.4.2 Vitamin D

The recommended adequate intakes for vitamin D are inadequate, and, in the absence of exposure to sunlight, a minimum of 1000 IU vitamin D/d is required to maintain a healthy concentration of 25(OH)D in the blood (Vitamin D: importance in the prevention of cancers, type 1 diabetes, heart disease, and osteoporosis) in a study of sunlight and vitamin D (Holick, 2004). Association between body composition and vitamin D founded from a total of 126 subjects aged more than 61 years in Germany.

Results analyzing used examine associations of anthropometric [body mass, BMI, waist circumference (WC)] and body composition [fat mass (FM), fat-free mass (FFM)] parameters with vitamin D (25(OH)). This study is longitudinal study when 2004 and 2014. The result of first year study presented association between body composition and vitamin D. However, the results in 2014 differenced from first. It did not correlate (Jungert & Neuhäuser-Berthold, 2018). In additional, study of vitamin D deficiency that be associated with metabolic syndrome in postmenopausal women. This cross-sectional study included women seen at the Climacteric and Menopause Outpatient Clinic of the Botucatu Medical School, Sao Paulo State University (UNESP). The 463 postmenopausal women showed results of high cholesterol, triglycerides in women with hypovitaminosis D ($p < 0.05$) (Schmitt et al., 2018). Another study, changed from postmenopausal women to adolescents and young adults that showed the same result between vitamin D and lipid values. A group of obese patients, vitamin D deficiency associated with more prevalent in morbidly especially metabolic syndrome. For example, 46 of the 73 obese patients (63%) had the metabolic syndrome and vitamin D deficiency showed HDL-C lower and triglycerides levels higher than non-vitamin D deficient group (Botella-Carretero et al., 2007).

2.4.3 Sleep hours

Compared with those who slept 7 hours, the individuals who slept equal or less than 5 hours at night were more likely to experience weight gain and to become obese. No significant difference between slept more than 8 hours and those sleeping 7 hours (Kobayashi, Takahashi, Deshpande, Shimbo, & Fukui, 2011). The study of habitually sleep duration and sleep duration variation associated with BMI, all 748 participants were 50.6% females and 85.4% European-Americans with average age: 49.7 years old. Both factors of sleep duration and variation were significantly correlated with BMI. It is a higher than average values when hours of sleep shorter and higher than standard sleep hour (Xu et al., 2017). The same as one study between waist circumference with sleep duration that were associated with take 8.58 hours of sleep duration in a day. There are a group of 1,912 women, aged more than 20 years in Korea. Waist circumference could be reduced (Ryu et al., 2018).

2.4.4 Exercise

Truly, exercise factor is the main study of general behavior. Most people are lack of exercise and physical activities that leaded to CVDs. Moreover, this factor was associated with weight and body composition. If function of physical is quality and normal, it will protect others risk of disease. In example, BMI and weight maintenance were effected to lipid level in bloodstream. HDL-C improved, LDL-C and triglyceride decreased when the balancing of body and physical were appearing (Swift et al., 2018). Significances of change in the total serum cholesterol levels before and after exercise were determined, and in all subjects' total serum cholesterol levels were significantly reduced. In additional, the study of regular exercise program in 12 months, founded 143 participants included from the Institute of Physical Activity and Sport Sciences of the Cruzeiro do Sul University. They were divided group by BMI including Normal Weight Group (NWG, BMI < 25 kg/ m^2), Overweight Group (OVG, BMI ≥ 25 kg/m^2 and < 30 25 kg/m^2) and Obese Group (OBG, BMI ≥ 35 kg/m^2). From biomedical marker, they were 46% dyslipidemia. Factor correlation reported positively between age and others body composition as % of fat mass ($r = 0.19$, $p = 0.021$); waist ($r = 0.19$, $p = 0.021$); waist hip rate ($r = 0.24$, $p = 0.003$) and leptin levels ($r = 0.19$, $p = 0.034$). In contrast, it was not significantly in the anthropometric parameters (BMI, waist, waist/hip ratio, waist/height ration) and body composition (total body mass, fat mass, lean mass) after exercise program in 6 and 12 months. Part of lipid levels, compared with baseline showed levels remained unchanged. The discussion of result referenced limitation of low prevalence in participants. For example, the high total cholesterol (> 240 mg/dl) is 8%; 19% had low HDL-cholesterol (< 40 mg/dl) and 16% reported taking dyslipidemia medication only (Gondim et al., 2015).

2.4.5 Food Control

Dietary is component of life so the factor of eating and food control are important to diary life. It linked with lifestyle factor. A healthy diet is the one necessary that correlated with NCDs and CVDs. Generally, nutritional recommendations focus on low fat or cholesterol. It is necessarily in heart function or heart-healthy. There was a significant correlation between dietary added sugars and blood lipid levels. Increased

carbohydrate consumption has been associated with lower HDL-C levels, higher triglyceride levels, and higher LDL-C level. Furthermore, consuming 500 ml water prior to each main meal leads to greater weight loss than a hypocaloric diet alone in middle-aged and older adults (Dennis et al., 2011). In summary, food control would be set to lifestyle changing intervention program and it connected to Therapeutic Lifestyle Change (TLC).

2.5 Lipid profile and Body composition with Therapeutic lifestyle change

The TLC Program is a step to control cholesterol—lipid of heart disease risk. First of program will follow healthy diet and physically active. Another setting, it concerns in behaviors risk such as smoking and high blood pressure. Patients or people will change behavior for keeping first goal. Throughout the program, they can get the advice from health coordinators of program or health professors (U.S. Department of Health and Human Services, 2005). From, Research to practice series, No. 7 of U.S. National center for chronic disease prevention and health promotion that used TLC to reduce weight and the risk for chronic diseases.

Lifestyle changing includes two main components of a healthier diet and exercising more. This strategy could be improved lipids and their long effects could be prevented CVDs. Generally, nutritional recommendations focus on low fat or cholesterol. It is necessarily in heart function or heart-healthy. Energy of fat guideline should get 20% to 35% of your daily calories from fat. For good fat, it fines from fish and plant sources, such as avocados, nuts, and vegetable oils. As long as it's mostly lower total and LDL cholesterol. In additional, other type of fat from animal products that affects cholesterol levels is saturated fat. Examples, this fat founds in meats, whole-fat dairy products, and eggs, but also in a few vegetable oils, such as palm oil, coconut oil, and cocoa butter. More taking can increase LDL cholesterol. The one recommendation of fat that replaces saturated fat is polyunsaturated fat or monounsaturated fat in the form of olive oil, nuts, and probably other plant oils because several evidence from heart disease studies showed risk will be reduced. American Heart Association (AHA) limited saturated fat to under 7% of total calories each day (approximately 16 grams of saturated fat if someone who usually takes in 2,000 calories

a day). There are many kinds of good fat for example using olive oil instead of butter or margarine, using monounsaturated fat (olive, peanut, sesame, and canola oils) or polyunsaturated fats (soybean, corn, safflower, sunflower, and fish oils). One study used TLC diet program for metabolism examining. This diet program was highlight in high-fish diet measured after 6 and followed by 24 weeks. Founding results of high-fish diet with TLC were associated with LDL cholesterol reducing. In contract, HDL of this study was associated with decreases (Ooi et al., 2012).

Fruits, vegetables, and grains are generally food for recommendation in daily life. The body processing changes food intake to break in vitamins, minerals, and other nutrients and including removes fiber. Part of carbohydrate, it processed from fiber breaking down. It components two types that are insoluble and soluble fiber. The difference between insoluble and soluble fiber is a dissolve in water. Insoluble fiber cannot dissolve in water and most founded in whole grains, wheat cereals, and vegetables such as carrots, celery, and tomatoes. Another, fiber could be dissolved in water and created a gooey paste. Soluble fibers are mostly founding in barley, oatmeal, beans, nuts, flaxseed, and fruits such as apples, berries, citrus fruits, and pears. Besides, it is a preventive factor to protect heart health. The fiber guideline should be taken 38 grams per day but mostly people intake under half of the recommended.

Nowadays, many evidences presented an association between the amount of added sugar and cholesterol—specifically, low levels of HDL. The National Health and Nutrition Examination Survey in U.S.A. founded 10% of total calories from added sugar and linked with levels of HDL reducing. In fact, a high-sugar diet stimulates the liver to dump more triglycerides into the bloodstream. The sugar added should be consumed less than 100 calories of added sugar per day (the equivalent of about 6 teaspoons). Moreover, others important food of a lot sugar includes cookies, cakes, pastries, and similar treats; fruit drinks; ice cream, frozen yogurt, and the like; candy; and ready-to-eat cereals.

Furthermore, exercise and physically active are the main of TLC program to change lipid and body composition. Generally, a connection of healthy links with physical fitness improvement. This is one protective factor of hearth diseases and other chronic diseases (Swift et al., 2018). The Physical Activity Guidelines for Americans

evidenced activities at least 150 minutes (2 hours and 30 minutes) a week of moderate-intensity physical activity, or 75 minutes (1 hour and 15 minutes) a week of vigorous-intensity activity. Moreover, activity can be combination between moderate and vigorous exercise. For example: activities (showed in table 2) that could be burn 150 calories per types. Frequency of doing should be practiced two of these activities every day of the week. It can burn a little over 2,000 calories per week.

Table 2 Activities to burn 150 calories

Activities	**Time (minutes)**
Biking (9 km/h)	38
Biking (19 km/h)	22
Jogging, (9 km/h)	12
Running (16 km/h)	7
Walking (3 km/h)	38
Walking (5 km/h)	28
Walking (7 km/h)	20
Tennis, singles	23
Gardening	30–45
Washing windows or floor	60
Swimming (22.86 m/minute)	33
Swimming (45.72 m/minute)	18
Raking leaves	35
Shooting baskets	35

Source: Adapted from "Managing Your Cholesterol", A Harvard Medical School Special Health Report

However, somebody who has health conditional or any congenital disorder should be received suggestion from health professional to do proper exercises and physical activities.

2.6 Healthcare Digital Intervention

There are 7.3 billion people over the world, 3.4 billion are using internet. Especially for social network, 2.3 billion people. Addition, 3.7 billion are using smartphone (Kemp, 2016).

Figure 3 Global Digital Snapshot

In Thailand, Electronic Transactions Development Agency (ETDA) has shown the result of "Thailand Internet User Profile 2016", there are approximately 45.0 hours per week or 6.4 hours per day of using internet from both computer and smartphone. Gen Y are the most generation that use internet, about 53.2 hours per week. Smartphone is the most device for using internet, 85.5% and about 6.2 hours per day. In addition, the number of people who use smartphone and internet is increasing from last year, 82.1% and 5.7 hours per day respectively (Electronic Transactions Development Agency, 2016).

Generally, changing of the digitalization of medical information can distribute and exchange of medical information through Internet connection. Mobile health (mHealth) is growing in health market. It could be provided information through

telecommunications, which use cellphones or cellular network technology. Type of mHealth applications classifies by service type, for examples the connection with medical institutions type used in medical connects measurement results to them. Type of personal exercise management set application that helps with fitness, exercise, etc. Included self-assessment and health management, application provides management services for chronic diseases and personal health management. At last of life habit improvement, beneficial of application would be provided services to improve sleeping patterns, eating habits, etc (Jung, Kim, Chung, & Park, 2014). From RCT study of mPATH-CRC Program 8.6-minute decision aid about Colorectal Cancer Screening (CRC)) send automated follow-up electronic messages to support patients. Compared with usual care, mPATH-CRC users "self-ordered" a test via the program (Miller et al., 2018). In some studies, they highlighted in patient especially DM.

M-health application provided information of disease and health management to connect with treatment. After that, the outcome would be compared changing health care provider, risk behavioral, and biomedical marker of disease in between intervention group and control group (Jung et al., 2014; Quinn et al., 2008). Several outcomes from app. used in DM founded a glucose diary and an insulin calculator following. One hundred and eighty-nine patients at Hospital Diabetes Clinic and Diabetes Health Professionals in New Zealand were responded 54% used the app daily. Results of frequently used app. affected to manage blood glucose diaries (87%) and insulin dose calculator (54.6%) (Boyle, Grainger, Hall, & Krebs, 2017). In summary, the studies review in systematic summarized the effectiveness of M-Health application. for DM. They classified apps featured and methodology of study. The results association of app. for type DM were statistically insignificant difference in HbA1c between the apps and control group. However, type 2 DM reported HbA1c changing in participants using an app (Hou, Carter, Hewitt, Francisa, & Mayor, 2016).

As for hypertension management, it is easy to follow efficacy of blood pressure lowering in present. The old one strategies HP management expressed low patient adherence to treatment, physicians' inertia and unsuccessful communication between patients and health care personnel. Interested in now studies were used M-Health application to manage and improve the efficiency of blood pressure controlling. Good

improving of disease condition studied towards ICT-based health care management solutions and systematically applied in real-life patients' care. The important for application used was patient participation in their problem or like a potential game-changer compared with life-changer (Parati, Torlasco, Omboni, & Pellegrini, 2017).

Part of lipid control program, one study interested men with abdominal obesity and dyslipidemia. From One hundred and thirteen experiment group of a 1-yr lifestyle intervention program received a healthy eating and physical activity/exercise program. They were significantly changed 41% HDL cholesterol levels in intervention group and higher after program compared with baseline levels. Most cases had decreased triglyceride but low responders' cases were high and no change in values. To sum up of this program is beneficial for dyslipidemia (Boyer et al., 2018). Recent advances of technology would be interested mobile application in term of medical parameters such as lipid level, physical composition, and other parameters or factors related with health status. For example, Calci-app (self-monitoring of calcium intake) in Australia used web-based and remote data collection methods. However, this study of the mobile self-monitoring had limited and barrier to records. Although the result did not achieve it is interesting to develop and accept in future program (Tay, Garland, Gorelik, & Wark, 2017). Moved to heart diseases and risk factors education through M-Health application., one program of HeartKeeper was used by activities feature (disease guide and overall opinion). The effect of application to educate was significantly and that its utility and friendly used (De Garibay, Fernández, Torre-Díez, & López-Coronado, 2016).

From systematic review of mobile applications for cardiovascular disease self-management founded the most study outcome included hospital readmissions, quality of life, psychosocial well-being, Total cholesterol, LDL-C, BP, BMI and/or weight, and others behavioral factor such as smoking, exercise capacity, physical activity, and medication adherence (Coorey, Neubeck, Mulley, & Redfern, 2018). Several outcome of body composition liked with exercise program and obesity situation. One RCT in obese or overweight among 422 Korean were used a SmartCare app to measure outcome of weight, BMI, body composition. After 24 weeks, the average weight loss (mean change 3.18 (SD 0.29) kg.) effected in the participation group but it was no

statistically significant difference between the control group and intervention group. However, there was a statistically significant difference in body weight, BMI, body fat percentage, and waist circumference at the end of program (Oh et al., 2018).

Finally, technology world is growing in life that mean the main factor in diary life. In the future, the effectiveness of M-Health application would be useful and easy to access. This study is interested in developing friendly application in health education.

2.7 Expectancy Theory

The history of expectancy theory begins from Victor Vroom during the 1960's. He founded the gab of industrial psychologists and practical models of workplace motivation (in 1964). Explanation of motivation force (MF) is becoming from a product of expectancy, instrumentality, and valence as: Motivation = Expectancy x Instrumentality x Valence. Moreover, the study of Vroom's theory includes all social movement and social context too. The model of study would be used workplace motivation and behavior prediction (Robert & Daniel, 2018).

Part of health, expectancy motivation would be used in the most of behavior changing program. For example, study of Valle and all in 2018 set the tobacco module through messages receiving so message is the one media to communicate and understand to do it. The results founded messages linked with motivation for self-efficacy. Participants who received messages (mean 3.31, SE 0.060) effected to their self-efficacy to quit tobacco higher than those who did not receive (mean 3.14, SE 0.057). Moreover, they included other good behavior such as eating habits, and weight-related behaviors.

2.8 Persuasion and reinforcement theory

This persuasion refers to "any influence on beliefs, attitudes, or actions". Occurring persuasion outcome define something to bring attitude and behavior change such as traditional entertainment-education programs. A study of a pro-environmental behavior program used entertainment-education programs to change recycle behavior such as a character recycles a plastic bottle. The comedy of program could influence audience members' knowledge, beliefs, or attitudes regarding that behavior. For

reinforcing effects, it linked with accessibility of attitudes. It can be predictive of behavior. For example, the influence of message would be send via television programs (Rhodes, Toole, & Arpan, 2016). For practice or action through knowledge and attitude (KAP) is the main thing linked to many studies of behavior. For example, the 759 postgraduate primary care trainees in Malaysia was assessed KAP of lipid management. Results of this study confirmed the high awareness and good knowledge (70.2%) of physician in primary care. Moreover, two factors are positive significant association (Said & Chia, 2017).

In additional, reinforcement is a positive situation that changed behaviors by adding rewards and incentives instead of eliminating benefits. Rewards classified into two types including intrinsic and extrinsic. The first, intrinsic rewards are something intangible such as praise and acknowledgement. Then, extrinsic rewards refer to salary, promotion, freedom in office and job security. It can be applied in staffs at the workplace (Wei & Yazdanifard, 2014).

2.9 Behavior Change Communication (BCC) theory

Behavior change communication (BCC) is “an interactive process with communities (as integrated with an overall program) to develop tailored messages and approaches using a variety of communication channels to develop positive behaviors; promote and sustain individual, community and societal behavior change; and maintain appropriate behaviors”. This is introduction from BCC for HIV/AIDs, U.S.A. study in 2002. The role of BCC for their study planned to increase knowledge, stimulate community dialogue, promote essential attitude change, reduce stigma and discrimination, create a demand for information and services, advocate, promote services for prevention, care and support, and Improve skills and sense of self-efficacy. The important thing in this theory is channels such as mass media, community networks and traditional media, and Interpersonal/ group communication. The process of behavior change would be started with unaware→ aware→ concerned→ knowledgeable→ motivated to change→ practicing trial behavior change and to the end of practicing sustained behavior change.

Linked with dyslipidemia, few study used BCC. The study based on motivation and behavior change counseling to set intervention. At month 2, 4, 8 and 12, the results would be measured from blood analysis (total cholesterol, LDL and HDL cholesterol, and triglycerides), cardiovascular risk, anthropometric data (weight, height and BMI), overweight/obesity (waist circumference), diet, and physical activity (Pérula et al., 2011).

CHAPTER III

RESEARCH METHODOLOGY

The purpose of this research was to assess the effect of CHICKEN LOF (Low Fat in 90 Days) M-health application on lipid profile and body composition. This study was a 90-days, randomized controlled trial with 4 serial measurements (baseline, 30, 60, 90 days).

3.1 Research Design

This study used a randomized controlled trial design. Fulltime dyslipidemia healthcare workers in Phuket City Hospital were selected randomly assign by computer generator into intervention and control groups. The investigator assessing outcome was blinded to treatment allocation. The intervention group received CHICKEN LOF mobile application plus usual care and the control group received only usual care. Both groups were homogeneity tested to confirm the similarity of 2 groups. The participants were blinded (no one know who received intervention). Four serial measurements were done at baseline, 30, 60 and 90 days of intervention. This research is using intention to treat analysis.

3.2 Study area

This study was conducted in Phuket City Hospital, Thailand from Phuket Care Project.

3.3 Study population and Sample

Dyslipidemia Healthcare workers in Phuket City Hospital participated in this study. It is the first administrative organization hospital and owned by Phuket administrative organization, who launched a Project “Phuket care – 10,000 beds hospital by home visiting”. In 2018, 58.60% healthcare workers in Phuket City Hospital have a kind of abnormal lipid level. There were 328 fulltime staffs (physicians were not included)

3.4 Research Criteria

3.4.1 Inclusion criteria

The selection criteria are as follows:

- Fulltime healthcare worker (age 20-55 years old) who has least 1 year working experience in Phuket City Hospital in any job position and education.
- Both Male or Female without portion for each gender.
- Having company lipid profile test recorded in 2018.
- Having at least one of abnormal lipid profile from the 2018 record.

  The abnormal is

  - total Cholesterol over than 200 mg/dL. and/or
  - LDL Cholesterol more than 100 mg/dL. and/or
  - HDL Cholesterol Level less than 60 mg/dL. and/or
  - Triglyceride Level over than 150 mg/dL.
- No pregnancy or plan to pregnant in next 3 months.
- No clinical symptoms and significant change of body weight during the last 12 months.
- Having smart phone with internet.

3.4.2 Exclusion criteria

Participants with any of the following conditions were ineligible for the study as follows:

- Not get used to using mobile application.
- Refuse to join the program.
- Incomplete the written consent informs.
- Pregnancy
- Receive new medicines for lipid profile lowering after starting program.
- Intention to quit during the research.

3.5 Sample size

This study used G*power 3.1.5 program to calculate the sample size as follows:

- Selected F test – ANOVA: Repeated measures, between factors.
- Selected type of power analysis: A priori – required sample size.
- Required to achieve power = 95% and alpha = 0.05 with Effect size f=0.542. (Wharton, Christopher M. et al. 2014)
- A total sample size was 30.
- Estimate 10% for drop-out (37.03) from the intervention and control group (Arun Jirawatkul, 2016) and increase sample size for consideration about type II error.
- Therefore, each group was 40 and the total sample size was 80.

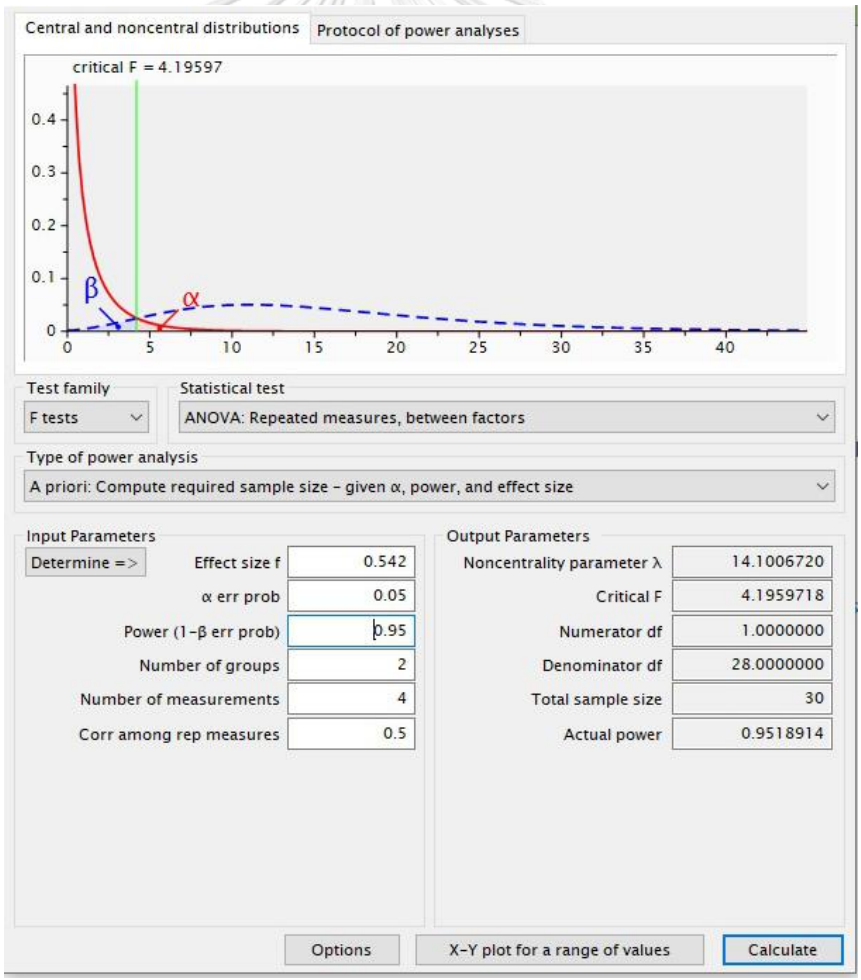


Figure 4 G Power 3.1.5 program

After calculate the number of participants there were 97 persons met criteria. Used computer to random to 80 persons. As shown in below table 3.

Table 3 The number of healthcare worker and abnormal lipid level in Phuket City Hospital, year reported 2018

Characteristics	**Total number**
Fulltime staffs (physicians are not included)	328
At least 1 year experience	250
Lipid test (health checkup 2018)	220
Abnormal Lipid profile (health checkup 2018)	129
Met criteria	97
Participants	80

The flow of sampling technique was shown in figure 5.

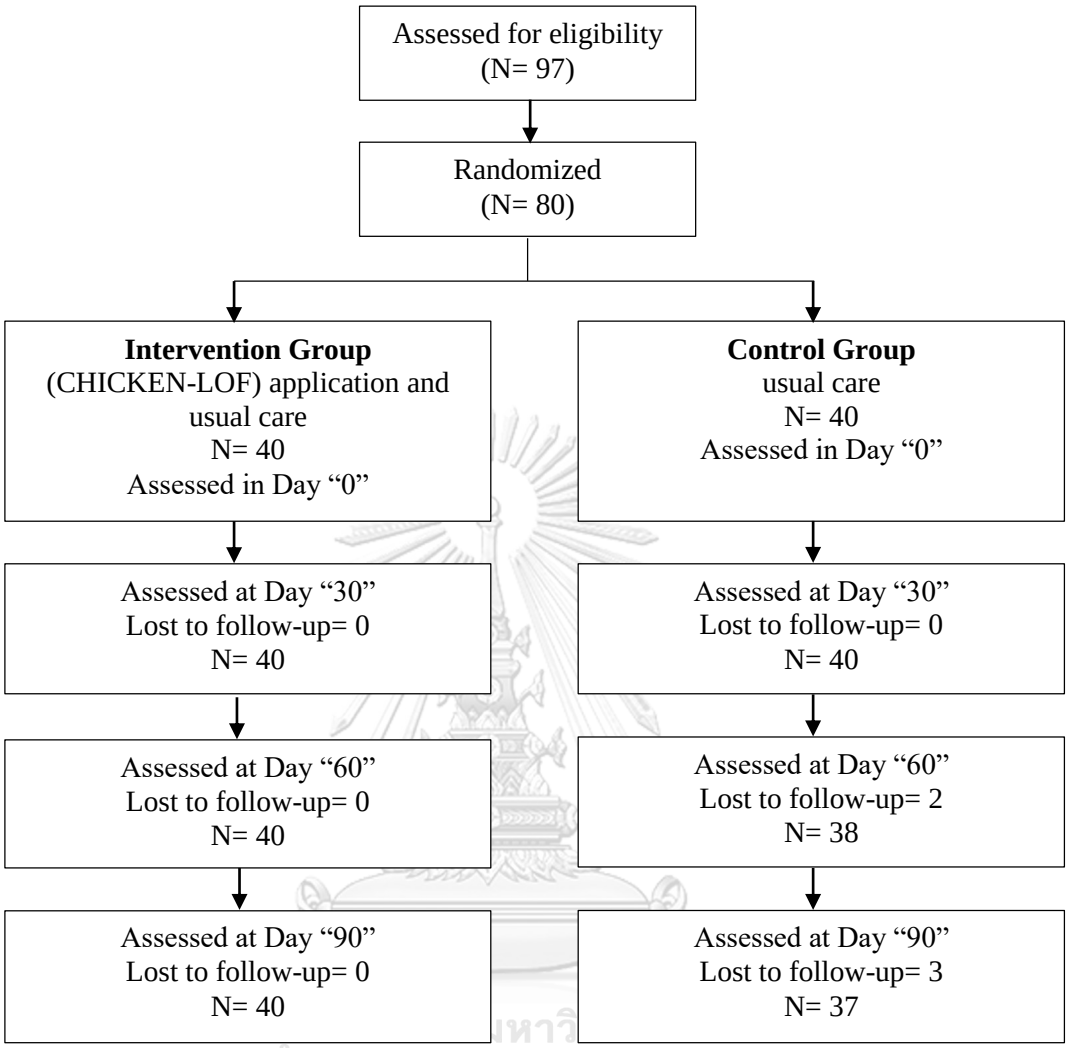


Figure 5 The flow chart of sampling technique

At day 60 of control group there were 2 participants resigned from hospital and 1 more at day 90. As this study was intention to treat analysis, the data of previous measurements of the participants were repeated to analyze.

3.6 Research Instruments

1. Characteristics and life style on health Questionnaire

Self - administered questionnaire was used to collect the data from the participants via face-to-face interview. The detailed questionnaire was described in "**Appendix A no. I"** which included Gender, Age, Night shift

(hours/week), smoking, alcohol containing, vitamin D, job stress, sleeping hours, food control, exercise and consume clean water.

2. The KAP questionnaire on Lipid profile and body composition modifying **(described in *Appendix A* No. II)**

KAP questionnaire was developed from the assessment of knowledge and healthcare behavior of parents with dyslipidemia in Chiva-Som International Health Resort Co., Ltd., Thailand which has been validated by experts and reliability test result showed Cronbach's Alpha Coefficient on knowledge as 0.738, behavior as 0.856 (Nantika Sonyaem, 2017). The KAP scoring designed refers to a further study "Knowledge, Attitudes, and Practices on Lifestyle and Cardiovascular Risk Factors Among Metabolic Syndrome Patients in an Urban Tertiary Care Institute in Sri Lanka study" (Amarasekara, P., de Silva, A., Swarnamali et al., 2015).

a) Knowledge

There are 19 knowledge statements and scored "1" point for "True", and "0" point for "False", "Do not know" and "Incorrect" answers. The total score varied from 0 to 19 scores. Then, the total score was divided by total number of participants and number of questions in each time of measurement.

True answer	1 point
False answer	0 point
Do not know answer	0 point
Incorrect answer	0 point

The questions have 6 sub categories. Knowledge on getting Vitamin D from Sunlight 3 questions. Knowledge on decrease job stress 4 questions. Knowledge on sleeping 7 hours a day 2 questions. Knowledge on drinking at least 8 glasses of clean water a day 2 questions. Knowledge on exercise daily 2 questions. Knowledge on food control 6 questions. The sub categories score was

divided by total number of participants and number of questions in each time of measurement.

b) Attitude

A total of 16 statements were included in attitude part and used Likert scale: “5” points for “Strongly Disagree (SD)”, “4” points for “Disagree (D)”, “3” points for “Neutral (N)”, “2” points for “Agree (A)” and “1” point for “Strongly Agree (SA)” for all “Negative” statements and reverse scoring for all 1 point to 5 points for all “Positive” statements. The total score varied from 16 to 80 scores. Then, the total score was divided by total number of participants in each time of measurement.

	Negative statement	**Positive statement**
Strongly disagree (SD)	5 points	1 point
Disagree (D)	4 points	2 points
Neutral (N)	3 points	3 points
Agree (A)	2 points	4 points
Strongly agree (SA)	1 point	5 points

The questions have 6 sub categories. Attitude on getting Vitamin D from Sunlight 2 questions. Attitude on decrease job stress 3 questions. Attitude on sleeping 7 hours a day 2 questions. Attitude on drinking at least 8 glasses of clean water a day 2 questions. Attitude on exercise daily 2 questions. Attitude on food control 5 questions. The sub categories score was divided by total number of participants and number of questions in each time of measurement.

c) Practice

A total of 20 statements was used and scored “1” point for “Always”, “2” points for “Sometimes” and “3” points for “Never” for all “Negative” statements and reverse scoring for all “Positive” statements. The total score varied from 20 to 60 scores. Then, the total score was divided by total number of participants in each time of measurement.

	Negative statement	Positive statement
Always	1 point	3 points
Sometime	2 points	2 points
Never	3 points	1 point

The questions have 6 sub categories. Practice on getting Vitamin D from Sunlight 2 questions. Practice on decrease job stress 3 questions. Practice on sleeping 7 hours a day 3 questions. Practice on drinking at least 8 glasses of clean water a day 3 questions. Practice on exercise daily 2 questions. Practice on food control 7 questions. The sub categories score was divided by total number of participants and number of questions in each time of measurement.

3. Lipid profile and Body Composition Record list

Lipid profile Record included the following parameters: TC (mg/dL), HDL-C (mg/dL), TG (mg/dL), LDL-C (mg/dL). This measurement tests were analyzed by the hospital blood department for both of Intervention and control group. Using 5ml. blood per person per time. The researcher paid all expenses as necessary. The results were reported to the researcher and assistants by 7 days after testing.

Body composition Record list included the following parameters: Waist(cm), Hip (cm), BMI (kg/m^2), Body fat mass (kg), Body fat percentage (%), Fat free mass (kg), Skeletal muscle mass (kg), Visceral fat level, Waist-Hip ratio, Basal metabolic rate (kcal). Tool of assessment for body composition used "TANITA model BC-731: Body Composition Monitor" which exists in the hospital. The researcher and assistants can see the value of each measurement from the screen after each participant stepping down from standing on the machine.

3.7 Validity and Reliability test

The KAP questionnaire is performed the content validity by three health check-up physicians with Item Objective Congruence rate over than 0.50 (Rovinelli and Hambleton,1977). Two experts were from Thonburi Bamrungmuang Hospital and

another one was from Thonburi Hospital. Reliability test was performed through pilot test with 30 respondents in Pattaya City Hospital, Bangkok. The respondents were similar to Phuket Provincial City Hospital. The internal consistency of the rating scales was performed by Cronbach's alpha coefficient for an analysis of attitude and practice. The Cronbach's alpha coefficient was 0.866.

3.8 Description of CHICKEN LOF application

3.8.1 Intervention Description

The application was developed based on three theories: expectancy, behavior change communication and persuasion and reinforcement.

Intervention group downloaded application in their mobile phone. Chicken represent to owner mobile. It can set the name and others features. Function of this application created from board game that players are participant or representative in themselves. Main items concluded 6 modes that are a walk to the sun, be happy, clam and sleep, drink more water, exercise daily, and food control **(See Appendix B; Application Manual for more details)**.

All participants in the intervention group received application training before using. The application was directly installed in personal mobile phone only for the intervention group by the research assistants. The application can't be downloaded online. The control group could not install the application.

The researcher received the report of daily application usages from the application developer.

3.8.2 Development of CHICKEN LOF application

1) **Application developing**

Motivation of change is the key of the application developing. The researcher designed the application by 3 communication theories for the better change. And engaged the user by self-monitoring and sense of fun then worked together with a company programmer to create the application. The application was developed in both IOS and Android operating with Thai and English languages.

2) Implemented Theories in the application

a) Expectancy theory mentioned that the motivation force is from the expectancy, valence and instrumentality. The application is developed to show the fat health of the chicken and the 90days records as the target to improve lipid profile and body composition. The status of 6 modes are the outcome of good performance after using instrumentality of care.

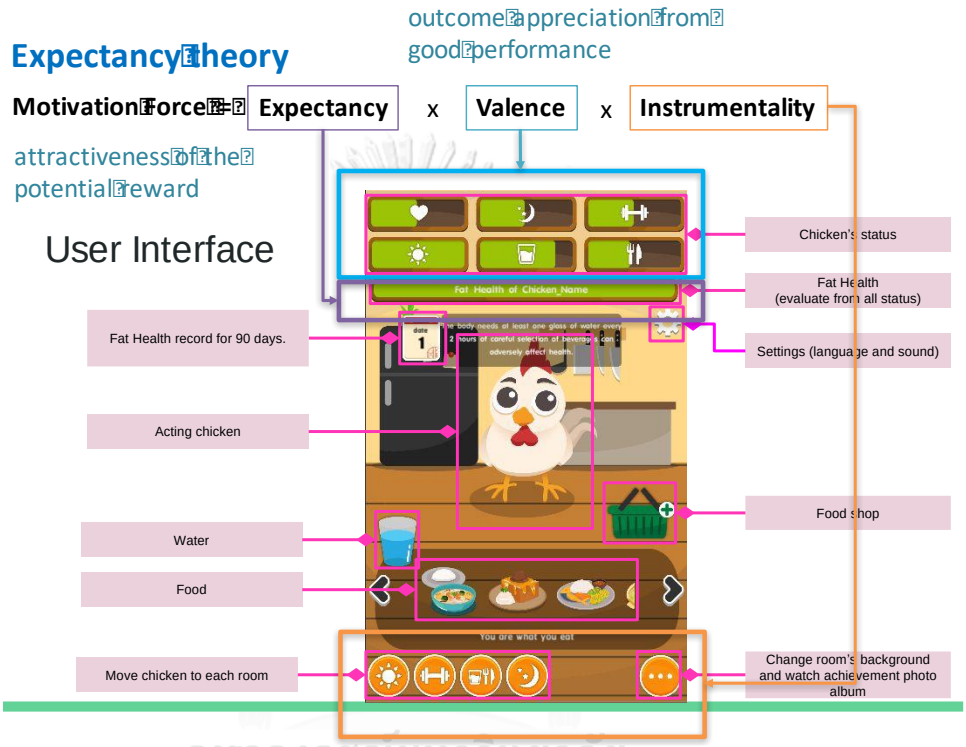


Figure 6 CHICKEN LOF application with expectancy theory

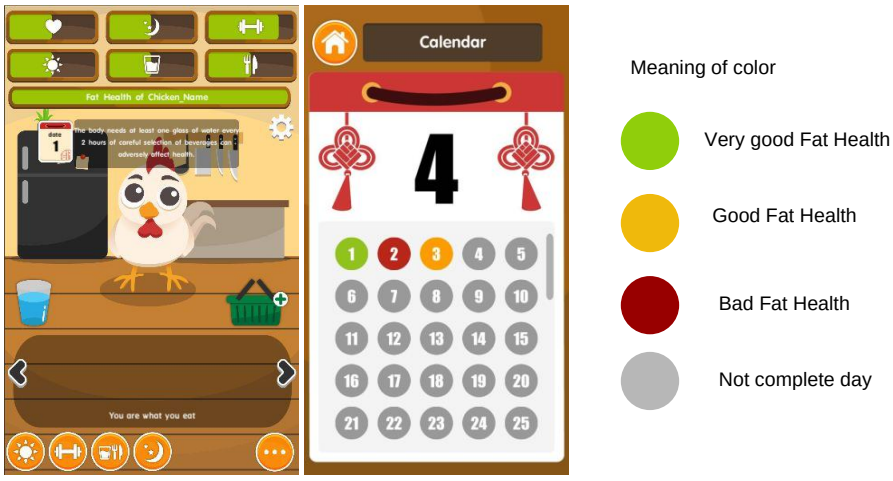


Figure 7 CHICKEN LOF application

b) Behavior change communication theory

Behavior change stages are from unaware, aware, concerned, knowledgeable, motivation to change. The status modes reflected to every activity the user treated the chicken with information learn. The bad and good reflections with reasons are the methods of change motivation.

Figure 8 CHICKEN LOF application of behavior change communication theory

c) Persuasion and reinforcement theory.

There were 2 methods provides cognitive persuasion and supporting for one's pre-existing attitudes and beliefs; rewards and punishment. The application crated photo backgrounds changed and photo albums as the rewards when the user were able to complete the daily, weekly and monthly quests such as getting all modes green, getting perfect fat health 3 days in roll. When the user treated the chicken unwell (all modes turned red), the user was unable to contact the chicken for 6 hours. It was set as punishment.

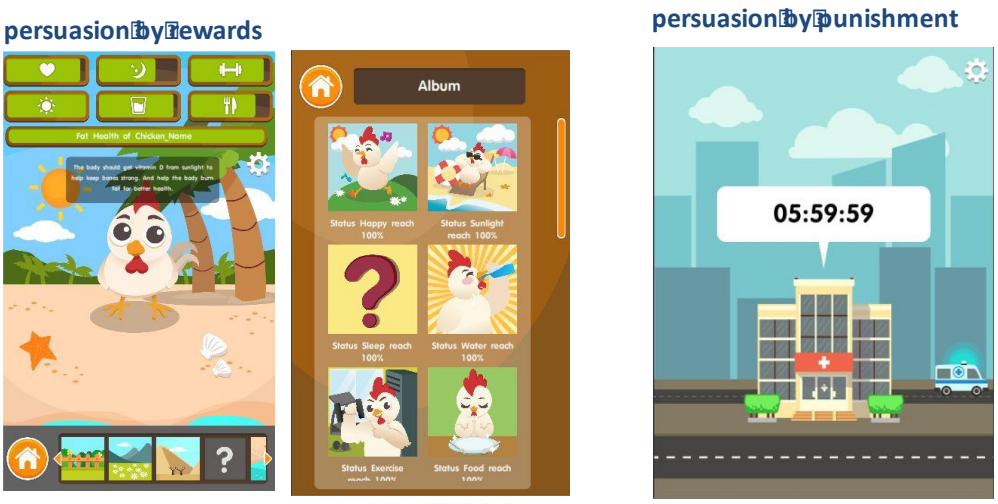
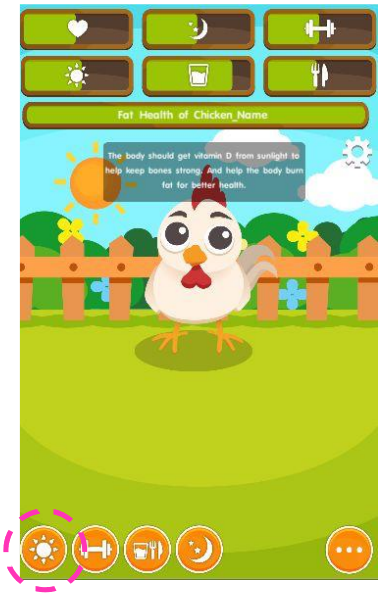
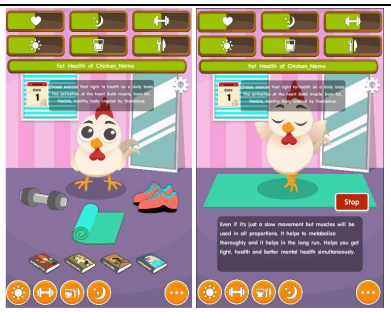


Figure 9 CHICKEN LOF application with Persuasion and Reinforcement theory

3) Content and activities

It was created from Therapeutic Lifestyle Change Program, handbook of cholesterol control, Ministry of health and further studies. 6 modes of self-care were a walk to the sun, be happy, calm and sleep, drink more water, exercise daily and food control.

Modes	**Content**	**Activities**	
Vitamin D from sunlight	Vitamin d from sunlight helps to get stronger bone and improve metabolism	Click the sun icon to bring the chicken to get sunlight	
Decrease stress	Be happy, better fat health	Touch the chicken to make it happy.	

Modes	**Content**	**Activities**	
Sleep	Sleeping well 7 hours bring better ability to burn fat than less 7 hours	Turn off the lamp in bedroom to sleep and never open the application for 7 hours.	
Drink more water	Body needs 1 glass of clean water every 2 hours or at least 8 glasses a day. Careful of beverage section reflects on health	Drag glass of water to the chicken or select beverage from food store.	
Exercise	There are 3 kinds of exercise for stronger health; cardio, stretching, and weigh training for muscle.	Drag sport instruments to the chicken.	

Modes	Content	Activities	
			
Food control	Every kind of food affect fat health differently. Careful of selection. There are details of cholesterol and calories of each dish.	Select food from basket. Difference day, difference kind of food were available to select, then drag food to the chicken.	  

The participants in this study worked closely to the researcher's assistants (HR staffs). They got warning to use the application daily.

3.8.3 Usual Care Description

Both control group and intervention group received usual care equally. They also received general consults from physician in the hospital especially good dietary and how to exercise after lipid testing.

3.9 Data collection

In this study, there were 3 research assistants who worked at the hospital in the Human Recourse Department. They were trained for the research data collecting process, body composition measurement recording and call the participants for the lipid

test. There was a physician from the hospital who is the research consultant. To complete the data collection, the researcher had done the following;

1. Characteristics and life style on health Questionnaire was collected from both of intervention and control groups by self-assessment at day 0 (baseline). It took about 4 minutes in average.
2. The KAP on lipid profile and body composition was collected from both of intervention and control groups by self-assessment at day 0 (baseline), 30, 60 and 90. It took about 10- 15 minutes.
3. Body composition measurement was conducted from both of intervention and control groups by three research assistants at day 0 (baseline), 30, 60 and 90. It took about 10 minutes. The TANITA Model. BC-731 Body Composition Monitor was used.
4. Lipid profile was collected from both of intervention and control groups by the hospital laboratory technicians at day 0 (baseline), 30, 60 and 90. The result was given after 5-7 days and the blood was destroyed according to hospital's standard procedure after data collection.

3.10 Data analysis

This data was analyzed by using the Statistical Package for Social Science (SPSS) Software version 22 licensed for Chulalongkorn University. The homogeneity of baseline characteristics was analyzed by using Independent t-test for nominal data and Chi-square test for categorical data. In inferential statistics, One-Way ANOVA Repeated Measurement was used for comparison of mean changes for all time points within intervention and control groups. The pairwise comparison of One-Way ANOVA Repeated Measurement was used for intervention group at different times of measurement. The Independent t-test was used to compare the change between intervention group and control group for all time points. The level of significance was set at p value < 0.05 for all statistical analyses.

Objectives	Table name	Statistics
Homogeneity test of Baseline characteristics	Baseline characteristics	the Independent t-test for nominal data (Age, night shift load)
		the Independent chi-square test for Categorical data (sex, smoking, Alcohol containing, sleeping hours, Vitamin D from Sun light, Job stress, Food control, Exercise)
Primary Research specific objectives		
1) To compare the change of KAP of lipid profile and body composition modifying score within groups at day 30, 60, 90 and baseline.	Comparison of knowledge of lipid profile and body composition modifying score at day 30, 60 and 90 and baseline within groups.	One-Way ANOVA Repeated Measurement
	Pairwise Comparison of the different measurement of knowledge of lipid profile and body composition modifying score of intervention group at different times of measurement	Pairwise Comparison of One-Way ANOVA Repeated Measurement
	Comparison of attitude of lipid profile and body composition modifying score at day 30, 60 and 90 and baseline within groups.	One-Way ANOVA Repeated Measurement

Objectives	Table name	Statistics
	Pairwise Comparison of the different measurement of attitude of lipid profile and body composition modifying score of intervention group at different times of measurement	Pairwise Comparison of One-Way ANOVA Repeated Measurement
	Comparison of practice of lipid profile and body composition modifying score at day 30, 60 and 90 and baseline within groups.	One-Way ANOVA Repeated Measurement
	Pairwise Comparison of the different measurement of attitude of lipid profile and body composition modifying score of intervention group at different times of measurement.	Pairwise Comparison of One-Way ANOVA Repeated Measurement
2) To compare the change of KAP of lipid profile and body composition modifying between intervention group and control group at day30, 60,90 and baseline	Comparison of knowledge, attitude and practice of lipid profile and body composition modifying score at baseline between intervention and control group	the Independent t-test
	Comparison of knowledge, attitude and practice of lipid profile and body composition modifying score at day 30 between intervention and control group	the Independent t-test
	Comparison of knowledge, attitude and practice of lipid profile and body composition modifying score at day 60 between intervention and control group.	the Independent t-test

Objectives	Table name	Statistics
	Comparison of knowledge, attitude and practice of lipid profile and body composition modifying score at day 90 between intervention and control group.	the Independent t-test
Secondary Research specific objectives		
1) To compare the change of lipid profile within groups at day 30, 60, 90 and baseline	Comparison of Lipid profile at baseline within group.	One-Way ANOVA Repeated Measurement
	Pairwise Comparison of the different measurement of lipid profile of intervention group at different times of measurement	Pairwise Comparison of One-Way ANOVA Repeated Measurement
2) To compare the change of lipid profile between intervention group and control group at day 30, 60, 90 and baseline.	Comparison of lipid profile at baseline between intervention and control group	the Independent t-test
	Comparison of lipid profile at day 30 between intervention and control group	the Independent t-test
	Comparison of lipid profile at baseline between intervention and control group	the Independent t-test
	Comparison of lipid profile at baseline between intervention and control group	the Independent t-test
3) To compare the change of body composition within groups at day 30, 60, 90 and baseline.	Comparison of body composition at day 30, 60, 90 within group.	One-Way ANOVA Repeated Measurement
	Pairwise Comparison of the different measurement of body composition of intervention group at different times of measurement.	Pairwise Comparison of One-Way ANOVA Repeated Measurement

Objectives	Table name	Statistics
4) To compare the change of body composition between intervention group and control group at day30, 60,90 and baseline.	Comparison of lipid profile at baseline between intervention and control group	the Independent t-test
	Comparison of body composition at day 30 between intervention and control group	the Independent t-test
	Comparison of body composition at day 60 between intervention and control group	the Independent t-test
	Comparison of body composition at day 90 between intervention and control group	the Independent t-test

3.11 Ethical considerations

The ethical approval was taken and approved by the Research Ethics Review Committee for Research Involving Human Participants, Health Sciences Group, Chulalongkorn University (COA no. 249/2019). Participants were explained the benefits of this study and their participation. The written informed consent was taken and it included free participation, confidentiality, freedom to withdraw, assured anonymity and no use of data for any other purpose not related to this research. They were allowed to ask for any information which they would like to know regarding research and their participation. Then, they were asked for decision whether to participate in this study or not. Participants were allowed to interrupt their participation in this study without any question and no participants interrupted and provided their full participation. The database could be able to assess by the primary researcher and designated staff.

CHAPTER IV

RESULTS

This study was a 90-day, randomized controlled trail with 4 serial measurements (0,30,60,90 days of intervention) which aimed to examine the effect of CHICKEN LOF M-health application on lipid profile and body composition among dyslipidemia healthcare workers as a communication channel to improve their knowledge attitude and practice of lipid profile and body composition modifying. The intervention group received both usual care and CHICKEN LOF M-health application, while the control group received only usual care or the government hospital standard services. There were 80 participants who are healthcare workers at Phuket provincial hospital in Phuket province. Half of them is allocated to be intervention group by computer generator. The study's findings are presented as followed:

4.1 Baseline characteristics of participants

Table 4 shows the baseline characteristics of the intervention group and control group. The Intervention group, there were 40 participants 29 are female, their mean age was about 34 years old. They had about 10 hours' night shift load a week, almost of them were non-smokers and didn't drink alcohol.

The control group, there were 40 participants, their mean age was about 33 years old. They had about 10.5 hours' night shift load a week, almost of them were non-smokers and didn't drink alcohol.

The statistic showed that participants of both group had not significant difference or it could be assumed that they had similar characteristics at baseline (day 0).

Table 4 Baseline characteristics of participants

Variable	Intervention (n = 40)	Control (n = 40)	P value
Sex	(M 11 / F 29)	(M 7 / F 33)	.284 [d]
Age (years)	33.95 ± 7.72 [a/b]	33.23 ± 8.35 [a/b]	.688 [c]
Night shift load (hours/week)	10.13 ± 15.39 [a/b]	10.55 ± 13.32 [a/b]	.895 [c]
Smoking	(Y 4 / N 36)	(Y 5 / N 35)	1.000 [d]
Alcohol containing	(Y 6 / N 34)	(Y 5 / N 35)	.745 [d]

( ) : Shows the number of people answering the question, Y = yes, N= no.
a : Value are mean ± SD.
b : P-value resulted from the Independent t-test.
c : t-test, d: Chi-square

4.2 Comparison of knowledge, attitude and practice of lipid profile and body composition modifying at day 30, 60, 90 and baseline within groups

4.2.1 Knowledge of lipid profile and body composition modifying within groups

Table 5 compares the change of knowledge of lipid profile and body composition modifying between day 30, 60, 90 and baseline of intervention and control group. It shows that the intervention group had statistics significant changed of total knowledge score, knowledge of getting vitamin D from Sun light, consume at least 8 glasses of clean water, exercise and food control.

There was no significant overtime change of the knowledge in control group. Both group had not significant changed of knowledge of releasing job stress and sleeping 7 hours.

Table 5 Comparison of knowledge of lipid profile and body composition modifying between day 30, 60 and 90 and baseline within groups.

Knowledge	Group	Source	Sum of Squares	df	Mean Squares	F	P value
Get vitamin D from sunlight	Intervention	Time (Baseline, Day30, Day60, Day90)	.402	3	.134	2.733	.047*
		Error (Time)	5.737	117	.049		
	Control	Time (Baseline, Day30, Day60, Day90)	.044	3	.015	.335	.800
		Error (Time)	4.761	108	044		
Release job	Intervention	Time (Baseline, Day30, Day60, Day90)	.183	3	.061	2.129	.100

Knowledge	Group	Source	Sum of Squares	df	Mean Squares	F	P value
stress		Error (Time)	3.348	117	.029		
	Control	Time (Baseline, Day30, Day60, Day90)	.022	3	.007	.273	.845
		Error (Time)	2.838	108	.026		
Sleep 7 hours	Intervention	Time (Baseline, Day30, Day60, Day90)	.355	3	.118	1.855	.141
		Error (Time)	7.458	117	.064		
	Control	Time (Baseline, Day30, Day60, Day90)	.142	3	.047	.532	.662
		Error (Time)	9.608	108	.089		
Consume at least 8 glasses of clean water	Intervention	Time (Baseline, Day30, Day60, Day90)	.467	3	.156	3.185	.026*
		Error (Time)	5.720	117	.049		
	Control	Time (Baseline, Day30, Day60, Day90)	.176	3	.059	.796	.499
		Error (Time)	7.949	108	.074		
Exercise	Intervention	Time (Baseline, Day30, Day60, Day90)	.642	3	.214	3.725	.013*
		Error (Time)	6.670	117	.057		
	Control	Time (Baseline, Day30, Day60, Day90)	.162	3	.054	.824	.484
		Error (Time)	7.088	108	.066		
Food control	Intervention	Time (Baseline, Day30, Day60, Day90)	2.293	3	.764	20.003	<.001*
		Error (Time)	4.471	117	.038		
	Control	Time (Baseline, Day30, Day60, Day90)	.110	3	.037	.850	.469
		Error (Time)	4.640	108	.043		
Total	Intervention	Time (Baseline, Day30, Day60, Day90)	.377	3	.126	7.573	<.001*
		Error (Time)	1.942	117	.017		
	Control	Time (Baseline, Day30, Day60, Day90)	.015	3	.005	.221	.882
		Error (Time)	2.406	108	.022		

*significant at .05, intervention group =40 participants and control group =40 participants

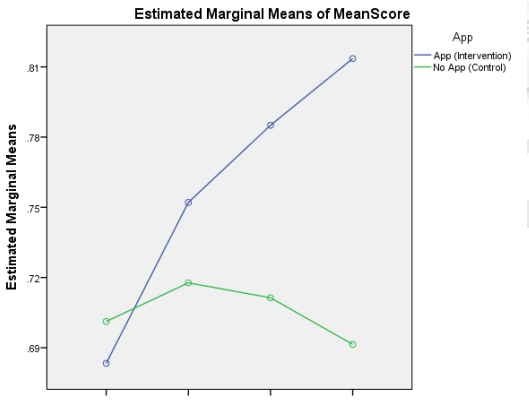


Figure 10 Changes in Total Knowledge over time within groups

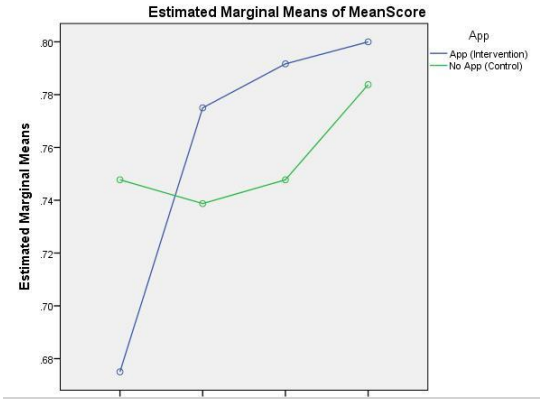


Figure 11 Changes in Knowledge on Getting Vitamin D from sunlight over time within groups

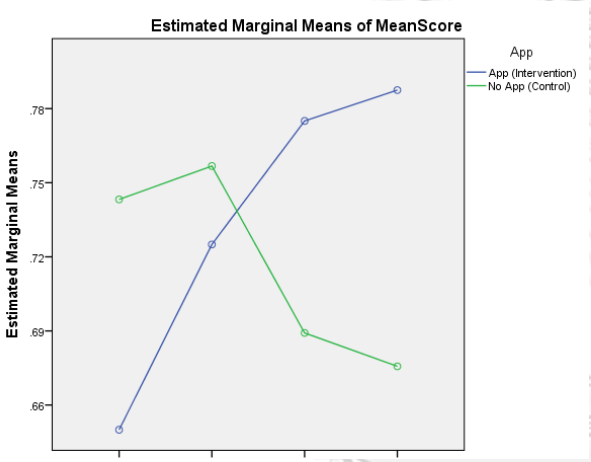


Figure 12 Changes in Knowledge on Consume 8 glasses of clean water over time within groups

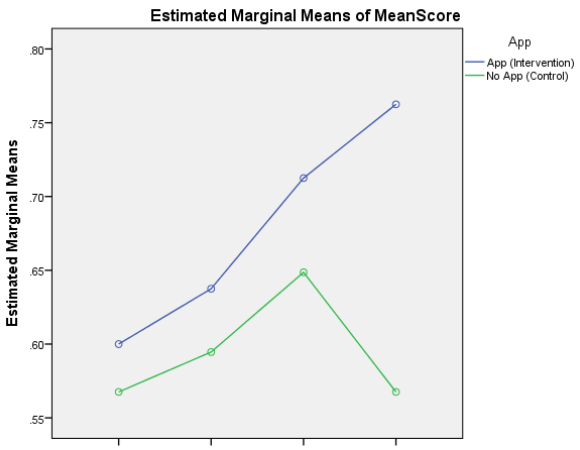


Figure 13 Changes in Knowledge on exercise over time within groups

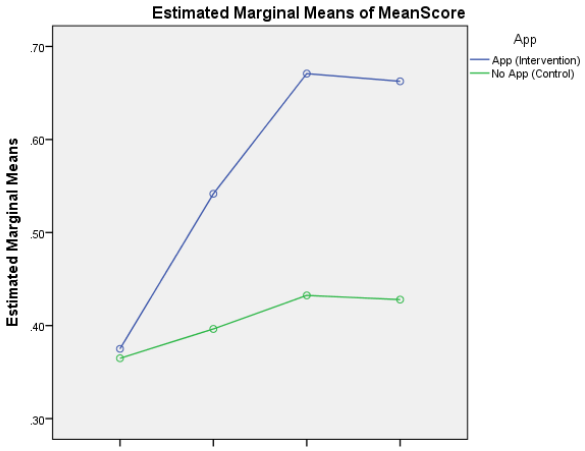


Figure 14 Changes in Knowledge on food control over time within groups

Table 6 shows the time of the table 4-2-1-1 significant changes. There had significant changes of the knowledge in the intervention group on getting vitamin D from sun light, consume at least 8 glasses of clean water, exercise, food control and total knowledge score at day 60 and 90 when compared to baseline.

The knowledge on exercise also significant changed at day 90 when compare to day 30. Knowledge on food control was almost significant changed at all time comparisons except day 90 compared to day 60. The total scores of knowledge were almost significant changed at all time comparisons except day 30 compared to day 60 and day 60 compared to day 90.

There were not significant changes of knowledge of getting vitamin D from sunlight, consume at least 8 glasses of clean water and exercise at day 30 when compared to baseline, at day 60 compared to day 30 and at day 90 compared to day 60.

Table 6 Pairwise Comparison of the different measurement of knowledge of lipid profile and body composition modifying score of intervention group at different times of measurement.

Knowledge	Group	Time	Mean difference	Std.Error	P value	95% Confidence interval for difference	
						Lower bound	Upper bound
Get vitamin D from sunlight	Intervention	Baseline-Day30	-0.100	.055	.076	-0.211	.011
		Baseline-Day60	-0.117	.049	.021*	-0.215	-0.018
		Baseline-Day90	-0.125	.057	.034*	-0.240	-0.010
		Day30-Day60	-0.017	.048	.728	-0.113	.080
		Day30-Day90	-0.025	.045	.584	-0.117	.067
		Day60-Day90	-0.008	.042	.844	-0.094	.077
Consume at least 8 glasses of clean water	Intervention	Baseline-Day30	-0.075	.046	.110	-0.168	.018
		Baseline-Day60	-0.125	.050	.016*	-0.226	-0.024
		Baseline-Day90	-0.137	.051	.010*	-0.240	-0.035
		Day30-Day60	-0.050	.050	.323	-0.151	.051
		Day30-Day90	-0.063	.048	.200	-0.160	.035
		Day60-Day90	-0.012	.052	.812	-0.118	.093
Exercise	Intervention	Baseline-Day30	-0.037	.052	.474	-0.142	.067
		Baseline-Day60	-0.113	.052	.037*	-0.218	-0.007
		Baseline-Day90	-0.162	.066	.018*	-0.295	-0.030
		Day30-Day60	-0.075	.046	.110	-0.168	.018
		Day30-Day90	-0.125	.056	.031*	-0.238	-0.012
		Day60-Day90	-0.050	.047	.291	-0.144	.044
Food control	Intervention	Baseline-Day30	-0.167	.047	.001*	-0.262	-0.071
		Baseline-Day60	-0.296	.046	<.001*	-0.388	-0.204
		Baseline-Day90	-0.287	.051	<.001*	-0.391	-0.184
		Day30-Day60	-0.129	.036	.001*	-0.202	-0.056
		Day30-Day90	-0.121	.044	.009*	-0.210	-0.031
		Day60-Day90	.008	.035	.815	-0.063	.080
Total	Intervention	Baseline-Day30	-0.069	.022	.003*	-0.113	-0.025
		Baseline-Day60	-0.102	.031	.002*	-0.164	-0.040
		Baseline-Day90	-0.130	.040	.002*	-0.210	-0.050
		Day30-Day60	-0.033	.023	.167	-0.080	.014
		Day30-Day90	-0.061	.029	.041*	-0.120	-0.003
		Day60-Day90	.028	.024	.251	-0.078	.021

* significant at .05 intervention group =40 participants

4.2.2 Attitude of lipid profile and body composition modifying within groups

Table 7 compares the changes of attitude of lipid profile and body composition modifying between day 30, 60, 90 and baseline of intervention and control group. It

shows that the intervention group had statistics significant changes of total attitude score, attitude of getting vitamin D from Sun light, sleeping 7 hours, and food control while there was no significant overtime change of the attitude in control group.

Table 7 Comparison of attitude of lipid profile and body composition modifying score between day 30, 60 and 90 and baseline within groups.

Attitude	Group	Source	Sum of Squares	df	Mean Squares	F	P value
Get vitamin D from Sun light	Intervention	Time (Baseline, Day30, Day60, Day90)	6.138	3	2.046	4.024	.009*
		Error (Time)	59.488	117	.508		
	Control	Time (Baseline, Day30, Day60, Day90)	3.073	3	1.024	1.848	.143
		Error (Time)	59.8865	108	.554		
Release job stress	Intervention	Time (Baseline, Day30, Day60, Day90)	1.685	3	.562	2.319	.079
		Error (Time)	28.342	117	.242		
	Control	Time (Baseline, Day30, Day60, Day90)	.393	3	.131	.584	.627
		Error (Time)	24.191	108	.224		
Sleep 7 hours	Intervention	Time (Baseline, Day30, Day60, Day90)	10.681	3	3.560	7.758	<.001*
		Error (Time)	53.694	117	.459		
	Control	Time (Baseline, Day30, Day60, Day90)	.505	3	.168	.425	.736
		Error (Time)	42.807	108	.396		
Consume at least 8 glasses of clean water	Intervention	Time (Baseline, Day30, Day60, Day90)	2.381	3	.794	1.881	.137
		Error (Time)	49.369	117	.422		
	Control	Time (Baseline, Day30, Day60, Day90)	.465	3	.155	.394	.758
		Error (Time)	42.473	108	.393		
Exercise	Intervention	Time (Baseline, Day30, Day60, Day90)	1.700	3	.567	1.826	.146
		Error (Time)	36.300	117	.310		
	Control	Time (Baseline, Day30, Day60, Day90)	.370	3	.123	.269	.847
		Error (Time)	49.443	108	.458		
Food control	Intervention	Time (Baseline, Day30, Day60, Day90)	1.742	3	.581	4.252	.007*
		Error (Time)	15.978	117	.137		
	Control	Time (Baseline, Day30, Day60, Day90)	.112	3	.037	.278	.841
		Error (Time)	14.568	108	.135		
Total	Intervention	Time (Baseline, Day30, Day60, Day90)	2.459	3	.820	6.306	.001*
		Error (Time)	15.206	117	.130		
	Control	Time (Baseline, Day30, Day60, Day90)	.113	3	.038	.242	.867
		Error (Time)	16.827	108	.156		

*significant at .05 intervention group =40 participants and control group =40 participants

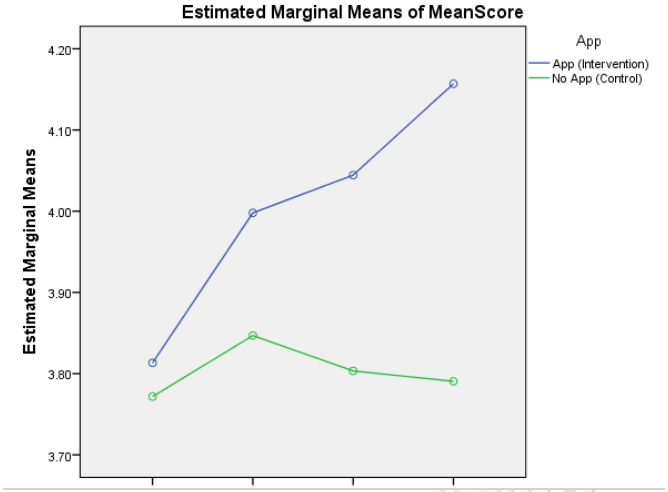


Figure 15 Changes in total Attitude over time within groups

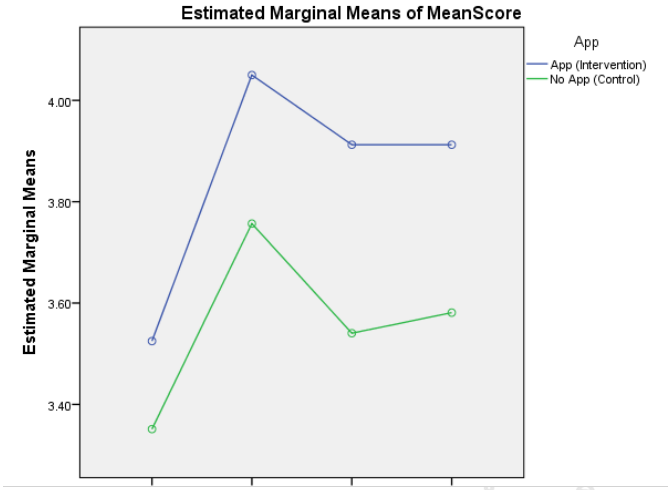


Figure 16 Changes in Attitude on get Vitamin D from sunlight over time within groups

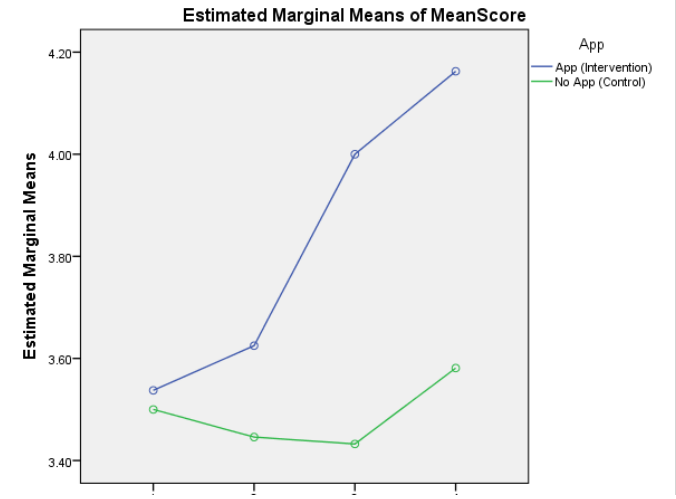


Figure 17 Changes in Attitude on sleep 7 hours over time within groups

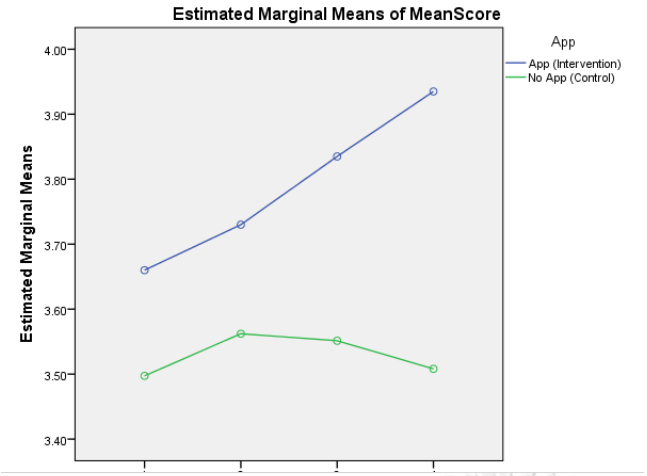


Figure 18 Changes in Attitude on food control over time within groups

Table 8 shows Pairwise Comparison of the different measurement of attitude of lipid profile and body composition modifying score of intervention group at different times of measurement. It shows that there were significant changes of the attitude in the intervention group on getting vitamin D from sunlight between day30, 60, 90 compared to baseline. The attitude on sleeping 7 hours almost significant changed at all time comparisons except day 30 compare to baseline and day 60 compared to day 90. Attitude on food control was almost significant changed at day 90 compared to day30 and baseline.

The total score of attitude almost significant changed at all time except day30 compare to day 60 and day 60 compared to day 90. The total attitude scores of intervention group had almost significant changes at all-time comparison except day90 compared to day 60 and day 60 compare to day 30.

Table 8 Pairwise Comparison of the different measurement of attitude of lipid profile and body composition modifying score of intervention group at different times of measurement.

Attitude	Group	Time	Mean difference	Std.Error	P value	95% Confidence interval for difference	
						Lower bound	Upper bound
Get vitamin D from Sun light	Intervention	Baseline-Day30	-0.525	.137	<.001*	-0.803	-0.247
		Baseline-Day60	-0.388	.179	.036*	-0.749	-0.026
		Baseline-Day90	-0.388	.175	.033*	-0.741	-0.034
		Day30-Day60	.137	.156	.384	-0.178	.453
		Day30-Day90	.137	.140	.331	-0.145	.420
		Day60-Day90	.000	.165	1.000	-0.334	.334
Sleep 7 hours	Intervention	Baseline-Day30	-0.087	.179	.628	-0.449	.274
		Baseline-Day60	-0.462	.165	.008*	-0.797	-0.128
		Baseline-Day90	-0.625	.174	.001*	-0.977	-0.273
		Day30-Day60	-0.375	.131	.007*	-0.640	-0.110
		Day30-Day90	-0.537	.134	<.001*	-0.809	-0.266
		Day60-Day90	-0.162	.112	.156	-0.390	.065
Food control	Intervention	Baseline-Day30	-0.070	.087	.427	-0.247	.107
		Baseline-Day60	-0.175	.089	.055	-0.354	.004
		Baseline-Day90	-0.275	.081	.002*	-0.439	-0.111
		Day30-Day60	-0.105	.078	.187	-0.263	.053
		Day30-Day90	-0.205	.078	.012*	-0.362	-0.048
		Day60-Day90	-0.100	.083	.233	-0.267	.067
Total	Intervention	Baseline-Day30	-0.185	.086	.039*	-0.359	-0.10
		Baseline-Day60	-0.231	.100	.026*	-0.433	-0.030
		Baseline-Day90	-0.344	.097	.001*	-0.541	-0.147
		Day30-Day60	-0.047	.060	.442	-0.168	.075
		Day30-Day90	-0.159	.063	.016*	-0.286	-0.032
		Day60-Day90	-0.112	.068	.104	-0.249	.024

* significant at .05 intervention group =40

4.2.3 Practice of lipid profile and body composition modifying within groups

Table 9 compares the change of practice of lipid profile and body composition modifying score between day 30, 60, 90 and baseline of intervention and control group. It shows that the intervention group had statistics significant change of total practice score, attitude of exercise and food control while there was no significant overtime change of the practice in control group.

There were not significant changes of practice on getting vitamin D from sunlight, releasing stress, sleeping 7 hours and consuming at least 8 glasses clean water in both groups from baseline to day 90.

Table 9 Comparison of practice of lipid profile and body composition modifying score at day 30, 60 and 90 and baseline within groups

Practice	Group	Source	Sum of Squares	df	Mean Squares	F	P value
Get vitamin D from Sunlight	Intervention	Time (Baseline, Day30, Day60, Day90)	.505	3	.168	1.800	.151
		Error (Time)	10.933	117	.093		
	Control	Time (Baseline, Day30, Day60, Day90)	.289	3	.096	.704	.552
		Error (Time)	14.774	108	.137		
Release stress	Intervention	Time (Baseline, Day30, Day60, Day90)	.217	3	.072	.749	.525
		Error (Time)	11.283	117	.096		
	Control	Time (Baseline, Day30, Day60, Day90)	.102	3	.034	.398	.755
		Error (Time)	9.231	108	.085		
Sleep 7 hours	Intervention	Time (Baseline, Day30, Day60, Day90)	.485	3	.162	1.249	.295
		Error (Time)	15.153	117	.130		
	Control	Time (Baseline, Day30, Day60, Day90)	.009	3	.003	.030	.993
		Error (Time)	10.824	108	.100		
Consume at least 8 glasses of clean water	Intervention	Time (Baseline, Day30, Day60, Day90)	.397	3	.132	2.275	.084
		Error (Time)	6.798	117	.058		
	Control	Time (Baseline, Day30, Day60, Day90)	.002	3	.001	.011	.998
		Error (Time)	7.248	108	.067		
Exercise	Intervention	Time (Baseline, Day30, Day60, Day90)	2.142	3	.714	5.127	.002*
		Error (Time)	16.295	117	.139		
	Control	Time (Baseline, Day30, Day60, Day90)	.302	3	.101	.725	.539
		Error (Time)	15.010	108	.139		
Food control	Intervention	Time (Baseline, Day30, Day60, Day90)	1.384	3	.461	10.008	<.001*
		Error (Time)	5.392	117	.046		
	Control	Time (Baseline, Day30, Day60, Day90)	.006	3	.002	.051	.985
		Error (Time)	4.173	108	.039		
Total	Intervention	Time (Baseline, Day30, Day60, Day90)	.610	3	.203	7.339	<.001*
		Error (Time)	3.244	117	.028		
	Control	Time (Baseline, Day30, Day60, Day90)	.040	3	.013	.410	.746
		Error (Time)	3.543	108	.033		

*significant at .05 intervention group =40 participants and control group =40 participants

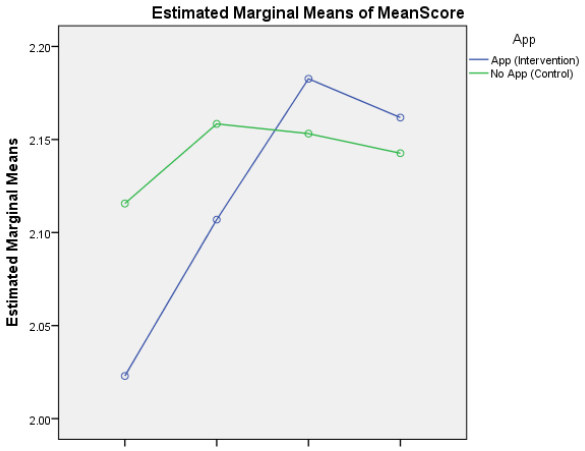


Figure 19 Changes in total Practice over time within groups

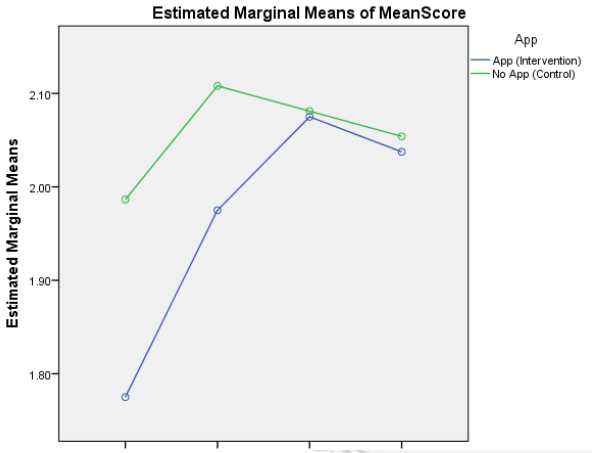


Figure 20 Changes in Practice on exercise over time within groups

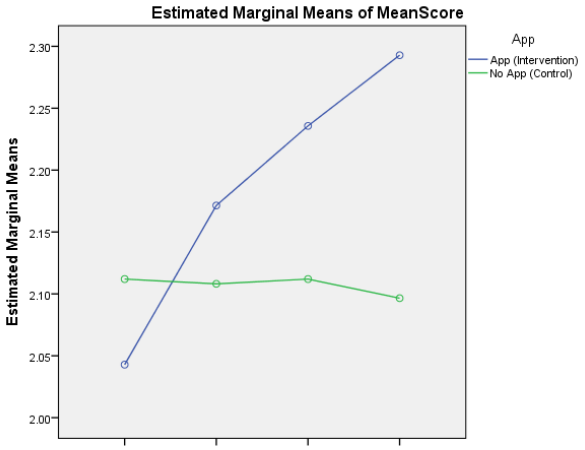


Figure 21 Changes in Practice on Food control over time within groups

Table 10 compares of the different measurement of practice of lipid profile and body composition modifying score of intervention group at different times of measurement. It describes that there were significant changes of the practice in the intervention group on total practice score, exercise and food control had significant change in every time difference compared to baseline.

Practice on food control was almost significant changed every time measurements except day 60 compared 30 and day 90 compared to day 60.

The practice of exercise and total practice scores were not significant at day 90 compared to day 60, day 90 compared to day 30 and day 60 compared to day 30 while the attitude of food controlling were not significant at day 90 compared to day 60 and day 60 compared to day 30.

Table 10 Pairwise Comparison of the different measurement of practice of lipid profile and body composition modifying score of intervention group at different times of measurement

Practice	Group	Time	Mean difference	Std.Error	P value	95% Confidence interval for difference	
						Lower bound	Upper bound
Exercise	Intervention	Baseline-Day30	-0.200	.082	.019*	-0.365	-0.035
		Baseline-Day60	-0.300	.080	.001*	-0.461	-0.139
		Baseline-Day90	-0.263	.089	.006*	-0.444	-0.081
		Day30-Day60	-0.100	.084	.243	-0.271	.071
		Day30-Day90	-0.063	.078	.430	-0.221	.096
		Day60-Day90	.038	.087	.667	-0.138	.213
Food control	Intervention	Baseline-Day30	-0.129	.036	.001*	-0.202	-0.055
		Baseline-Day60	-0.193	.053	.001*	-0.300	-0.086
		Baseline-Day90	-0.250	.052	<.001*	-0.356	-0.144
		Day30-Day60	-0.064	.049	.195	-0.163	.034
		Day30-Day90	-0.121	.055	.033*	-0.233	-0.010
		Day60-Day90	-0.057	.039	.153	-0.136	.022

Practice	Group	Time	Mean difference	Std.Error	P value	95% Confidence interval for difference	
						Lower bound	Upper bound
Total	Intervention	Baseline-Day30	-0.084	.035	.020*	-0.154	-0.014
		Baseline-Day60	-0.160	.041	<.001*	-0.242	-0.078
		Baseline-Day90	-0.139	.036	<.001*	-0.212	-0.066
		Day30-Day60	-0.076	.040	.068	-0.157	.006
		Day30-Day90	-0.055	.034	.116	-0.124	.014
		Day60-Day90	.021	.037	.579	-0.054	.096

*significant at .05 intervention group =40 participants

4.3 Comparison of knowledge, attitude and practice of lipid profile and body composition modifying score at day 30, 60, 90 and baseline between intervention and control groups

4.3.1 Knowledge, attitude and practice at baseline between groups

Table 11 compares knowledge, attitude and practice of lipid profile and body composition modifying at baseline between intervention and control group. It shows that there was not significant different between both groups or they were similar on knowledge, attitude and practice at baseline.

Table 11 Comparison of knowledge, attitude and practice of lipid profile and body composition modifying at baseline between intervention and control groups

Variable of KAP	Baseline		
	Intervention (n = 40)	Control (n = 40)	P value
Knowledge (1 point)			
Get vitamin D from Sun light	.67 ± .35	.75 ± .26	.264
Release Stress	.81 ± .25	.84 ± .19	.529
Sleep 7 hours	.76 ± .34	.71 ± .36	.522
Consume at least 8 glasses of clean Water	.65 ± .23	.71 ± .30	.298
Exercise	.60 ± .30	.58 ± .27	.697
Food control	.38 ± .23	.37 ± .23	.936
Total	.68 ± .17	.69 ± .16	.757
Attitude (5 points)			
Get vitamin D from Sun light	3.53 ± .91	3.38 ± .82	.481
Release Stress	3.45 ± .61	3.56 ± .58	.452
Sleep 7 hours	3.54 ± 1.02	3.54 ± .69	1.000
Consume at least 8 glasses of clean Water	3.78 ± .96	3.93 ± .62	.408
Exercise	4.29 ± .96	4.15 ± .80	.489
Food control	3.66 ± .52	3.52 ± .50	.224

Variable of KAP	Baseline		
	Intervention (n = 40)	Control (n = 40)	P value
Total	3.81 ± .59	3.79 ± .46	.819
Practice (4 points)			
Get vitamin D from Sun light	1.89 ± .43	1.90 ± .48	.903
Release Stress	2.32 ± .39	2.35 ± .39	.681
Sleep 7 hours	2.10 ± .45	2.18 ± .36	.363
Consume at least 8 glasses of clean Water	2.28 ± .26	2.24 ± .33	.530
Exercise	1.78 ± .48	1.95 ± .45	.096
Food control	2.04 ± .28	2.10 ± .26	.319
Total	2.02 ± .23	2.10 ± .21	.145

Value are mean average ± SD, , p-value from the Independent t-test, *significant at .05

4.3.2 Knowledge, attitude and practice at day 30 between groups

Table 12 compares knowledge, attitude and practice of lipid profile and body composition modifying at day 30 between intervention and control group. It shows that the intervention group has better change significantly of knowledge on sleeping 7 hours and food control than control group at day 30.

There were not significant changes of total knowledge and knowledge on getting vitamin D from sunlight, releasing stress, consume at least 8 glasses of clean water and exercise.

There were not significant changes of attitude and practice in intervention and control group at day 30.

Table 12 Comparison of knowledge, attitude and practice of lipid profile and body composition modifying score at day 30 between intervention and control groups

Variable of KAP	Day 30		
	Intervention (n = 40)	Control (n = 40)	P value
Knowledge (1 point)			
Get vitamin D from sunlight	.78 ± .21	.74 ± .19	.456
Release Stress	.85 ± .19	.84 ± .22	.786
Sleep 7 hours	.89 ± .21	.74 ± .38	.031*
Consume at least 8 glasses of clean water	.73 ± .25	.74 ± .28	.833
Exercise	.63 ± .25	.59 ± .25	.377
Food control	.54 ± .20	.40 ± .21	.002*
Total	.75 ± .12	.70 ± .16	.138
Attitude (5 points)			
Get vitamin D from Sun light	4.05 ± .78	3.69 ± .95	.066
Release Stress	3.70 ± .59	3.58 ± .44	.320
Sleep 7 hours	3.62 ± .56	3.44 ± .80	.230
Consume at least 8 glasses of clean Water	4.04 ± .60	3.80 ± .72	.115
Exercise	4.29 ± .60	4.24 ± .68	.728
Food control	3.73 ± .54	3.54 ± .51	.101
Total	4.00 ± .36	3.83 ± .41	.054

Variable of KAP	Day 30		
	Intervention (n = 40)	Control (n = 40)	P value
Practice (4 points)			
Get vitamin D from Sun light	2.03 ± .43	1.96 ± .46	.528
Release Stress	2.28 ± .37	2.31 ± .30	.657
Sleep 7 hours	2.18 ± .43	2.23 ± .39	.527
Consume at least 8 glasses of clean Water	2.22 ± .33	2.25 ± .34	.653
Exercise	1.98 ± .34	2.11 ± .47	.140
Food control	2.18 ± .25	2.11 ± .24	.312
Total	2.11 ± .17	2.16 ± .23	.222

Value are mean average ± SD, , p-value from the Independent t-test, *significant at .05

4.3.3 Knowledge, attitude and practice at day 60 between groups

Table 13 compares knowledge, attitude and practice of lipid profile and body composition modifying score at day 60 between intervention and control group. It shows that when compared to the control group at day 60, the intervention group had better change of total knowledge and total attitude scores, knowledge and attitude on sleeping 7 hours and food control. The intervention group also had better change of practice on food control.

There were not significant changes of knowledge, attitude and practice on getting vitamin d from sunlight, releasing stress, consume 8 glasses clean water and exercise between intervention group and control group at day 60.

Table 13 Comparison of knowledge, attitude and practice of lipid profile and body composition modifying score at day 60 between intervention and control groups

Variable of KAP	Day 60		
	Intervention (n = 40)	Control (n = 40)	P value
Knowledge (1 point)			
Get vitamin D from sunlight	.79 ± .25	.75 ± .20	.468
Release Stress	.87 ± .22	.83 ± .23	.432
Sleep 7 hours	.85 ± .28	.68 ± .34	.022*
Consume at least 8 glasses of clean water	.78 ± .28	.68 ± .24	.129
Exercise	.71 ± .25	.64 ± .26	.242
Food control	.68 ± .18	.43 ± .20	<.001*
Total	.79 ± .16	.71 ± .13	.022*
Attitude (5 points)			
Get vitamin D from Sun light	3.91 ± .89	3.53 ± .88	.059
Release Stress	3.72 ± .69	3.47 ± .55	.090
Sleep 7 hours	4.00 ± .63	3.42 ± .71	<.001*
Consume at least 8 glasses of clean Water	3.96 ± .69	3.89 ± .58	.642
Exercise	4.34 ± .57	4.22 ± .67	.423
Food control	3.84 ± .59	3.55 ± .37	.013*
Total	4.04 ± .44	3.79 ± .39	.009*

Variable of KAP	Day 60		
	Intervention (n = 40)	Control (n = 40)	P value
Practice (4 points)			
Get vitamin D from Sun light	2.01 ± .33	1.99 ± .43	.767
Release Stress	2.38 ± .39	2.29 ± .33	.298
Sleep 7 hours	2.23 ± .37	2.21 ± .30	.852
Consume at least 8 glasses of clean Water	2.33 ± .29	2.25 ± .30	.246
Exercise	2.08 ± .47	2.08 ± .38	.968
Food control	2.24 ± .18	2.11 ± .19	.005*
Total	2.18 ± .22	2.15 ± .23	.519

Value are mean average ± SD, , p-value from the Independent t-test, *significant at .05

4.3.4 Knowledge, attitude and practice at day 90 between groups

Table 14 compares knowledge, attitude and practice of lipid profile and body composition modifying at day 90 between intervention and control group. It shows that when compared to the control group at day 90, the intervention group had better change of total knowledge, knowledge on sleeping 7 hours, exercise and food control. The intervention group had better change of total attitude, attitude on sleeping 7 hours, exercise at least 8 glasses of clean Water and food control. The intervention group had better change of practice on food control.

There were not significant changes of knowledge, attitude and practice on get vitamin D from sunlight and releasing stress between intervention and control group at day 90.

Table 14 Comparison of knowledge, attitude and practice of lipid profile and body composition modifying score at day 90 between intervention and control groups

Variable of KAP	Day 90		
	Intervention (n = 40)	Control (n = 40)	P value
Knowledge (1 point)			
Get vitamin D from sunlight	.80 ± .26	.78 ± .21	.765
Release Stress	.91 ± .19	.86 ± .18	.338
Sleep 7 hours	.86 ± .25	.69 ± .34	.014*
Consume at least 8 glasses of clean water	.79 ± .25	.68 ± .36	.120
Exercise	.76 ± .28	.57 ± .34	.007*
Food control	.66 ± .22	.43 ± .22	<.001*
Total	.81 ± .15	.69 ± .20	.003*
Attitude (5 points)			
Get vitamin D from Sun light	3.91 ± .93	3.58 ± .98	.130
Release Stress	3.69 ± .60	3.59 ± .54	.457
Sleep 7 hours	4.16 ± .62	3.58 ± .77	<.001*
Consume at least 8 glasses of clean Water	4.10 ± .64	3.77 ± .75	.041*
Exercise	4.54 ± .65	4.11 ± .86	.015*
Food control	3.94 ± .56	3.51 ± .54	.001*
Total	4.16 ± .44	3.79 ± .50	.001*

Variable of KAP	Day 90		
	Intervention (n = 40)	Control (n = 40)	P value
Practice (4 points)			
Get vitamin D from Sun light	2.01 ± .33	2.00 ± .33	.869
Release Stress	2.30 ± .34	2.30 ± .26	.969
Sleep 7 hours	2.24 ± .48	2.20 ± .36	.656
Consume at least 8 glasses of clean Water	2.34 ± .26	2.25 ± .35	.205
Exercise	2.04 ± .44	2.05 ± .35	.857
Food control	2.29 ± .24	2.10 ± .22	<.001*
Total	2.16 ± .18	2.14 ± .17	.633

Value are mean average ± SD, , p-value from the Independent t-test, *significant at .05

4.4 Comparison of lipid profile at day 30, 60, 90 and baseline within groups

Table 15 compared lipid profile at day 30,60,90 and baseline within groups. It shows that there was significantly changed of HDL-C in the intervention group. There had not significantly changes of lipid profile in control group.

Table 15 Comparison of Lipid profile at day 30, 60, 90 within groups

Variable of Lipid profile	Group	Source	Sum of Squares	df	Mean Squares	F	P value
TC (mg/dL)	Intervention	Time (Baseline, Day30, Day60, Day90)	2363.619	3	787.873	1.650	.182
		Error (Time)	55871.131	117	477.531		
	Control	Time (Baseline, Day30, Day60, Day90)	657.378	3	219.126	.560	.643
		Error (Time)	42297.122	108	391.640		
TG (mg/dL)	Intervention	Time (Baseline, Day30, Day60, Day90)	1729.350	3	576.450	.380	.768
		Error (Time)	177443.150	117	1516.608		
	Control	Time (Baseline, Day30, Day60, Day90)	1589.750	3	529.917	.120	.948
		Error (Time)	478205.500	108	4427.829		
HDL-C (mg/dL)	Intervention	Time (Baseline, Day30, Day60, Day90)	498.669	3	166.223	5.201	.002*
		Error (Time)	3739.581	117	31.962		
	Control	Time (Baseline, Day30, Day60, Day90)	194.831	3	64.944	2.258	.086
		Error (Time)	3105.919	108	28.759		
LDL-C (mg/dL)	Intervention	Time (Baseline, Day30, Day60, Day90)	374.075	3	124.692	.143	.934
		Error (Time)	102368.925	117	874.948		
	Control	Time (Baseline, Day30, Day60, Day90)	5519.101	3	1839.700	.870	.459
		Error (Time)	228315.149	108	2114.029		

*Significant at .05 intervention group =40 participants and control group =40 participants

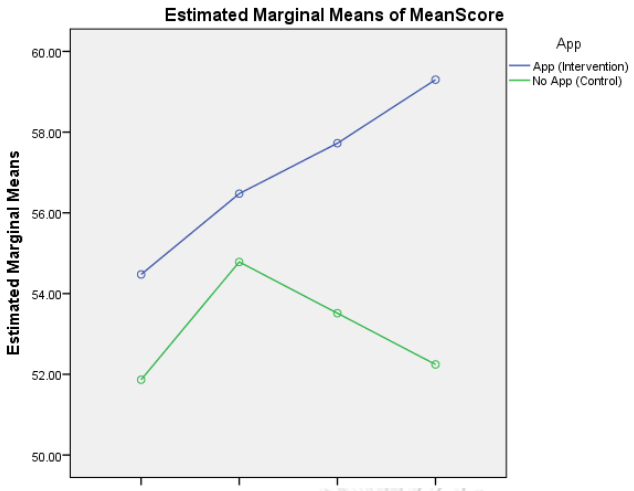


Figure 22 Changes in lipid profile of HDL-C (mg/dl) over time within groups

Table 16 shows the different measurement of lipid profile of intervention group at different times of measurement. It describes that the HDL-C of intervention group had significantly changed at day 60 and 90 compared to baseline.

It was also significantly changed at day 90 when compared to day 30. At the day 60 and 90 their HDL-C were almost not changed.

Table 16 Pairwise Comparison of the different measurement of lipid profile of intervention group at different times of measurement.

Variable of Lipid profile	Group	Time	Mean difference	Std.Error	P value	95% Confidence interval for difference	
						Lower bound	Upper bound
HDL-C (mg/dL)	Intervention	Baseline-Day30	-2.000	1.210	.106	-4.447	.447
		Baseline-Day60	3.250	1.591	.048*	-6.468	-0.032
		Baseline-Day90	-4.825	1.189	<.001*	-7.229	-2.421
		Day30-Day60	-1.250	1.028	.231	-3.330	.830
		Day30-Day90	-2.825	1.251	.030*	-5.356	-0.294
		Day60-Day90	-1.575	1.248	.214	-4.099	.949

*Significant at .05 intervention group =40 participants

4.5 Comparison of lipid profile at day 30, 60, 90 and baseline between intervention and control groups

4.5.1 Lipid profile at baseline between groups

The table 17 shows that there was not significant difference of lipid profile between intervention and control group at baseline.

Table 17 Comparison of lipid profile at baseline between intervention and control group

Variable of Lipid profile	Baseline		
	Intervention (n = 40)	Control (n = 40)	P value
TC (mg/dL)	214.98 ± 35.58	220.00 ± 34.04	.521
TG (mg/dL)	134.55 ± 74.38	145.93 ± 82.37	.519
HDL-C (mg/dL)	54.48 ± 19.46	52.98 ± 15.93	.521
LDL-C (mg/dL)	134.00 ± 33.82	146.43 ± 52.08	.209

Value are mean ± SD. , p-value from the Independent t-test. , *significant at .05

4.5.2 Lipid profile at day 30 between groups

The table 18 shows that there was no significant difference of lipid profile between intervention and control group at day 30.

Table 18 Comparison of lipid profile at day 30 between intervention and control groups

Variable of Lipid profile	Day 30		
	Intervention (n = 40)	Control (n = 40)	P value
TC (mg/dL)	211.35 ± 30.36	217.98 ± 31.50	.341
TG (mg/dL)	139.20 ± 87.95	139.63 ± 79.97	.982
HDL-C (mg/dL)	56.48 ± 19.26	56.03 ± 15.25	.908
LDL-C (mg/dL)	136.00 ± 50.58	134.53 ± 32.38	.877

Value are mean ± SD. , p-value from the Independent t-test. , *significant at .05

4.5.3 Lipid profile at day 60 between groups

The table 19 shows that there was no significant difference of lipid profile between intervention and control group at day 60.

Table 19 Comparison of lipid profile at day 60 between intervention and control groups

Variable of Lipid profile	Day 60		
	Intervention (n = 40)	Control (n = 40)	P value
TC (mg/dL)	219.88 ± 31.14	217.11 ± 33.04	.704
TG (mg/dL)	131.73 ± 80.52	145.50 ± 126.48	.566
HDL-C (mg/dL)	57.73 ± 21.79	53.95 ± 11.93	.343
LDL-C (mg/dL)	135.75 ± 22.84	147.42 ± 66.15	.296

Value are mean ± SD. , p-value from the Independent t-test. , *significant at .05

4.5.4 Lipid profile at day 90 between groups

The table 20 shows there was significant differences of HDL-C and LDL-C between intervention and control group at day 90.

Table 20 Comparison of lipid profile at day 90 between intervention and control groups

Variable of Lipid profile	Day 90		
	Intervention (n = 40)	Control (n = 40)	P value
TC (mg/dL)	220.88 ± 25.90	221.70 ± 33.13	.932
TG (mg/dL)	130.73 ± 72.19	145.03 ± 98.72	.468
HDL-C (mg/dL)	59.30 ± 20.03	52.24 ± 10.86	.049*
LDL-C (mg/dL)	132.20 ± 18.73	149.57 ± 48.87	.048*

Value are mean ± SD. p-value from the Independent t-test. *significant at .05

4.6 Comparison of body composition at day 30, 60, 90 and baseline within groups

Table 21 compares body composition modifying at day 30, 60, 90 and baseline within groups. It shows that there was significantly changed of weight, BMI, body fat percentage, bone mass, BMR and total body water in the intervention group.

Table 21 Comparison of body composition at day 30, 60, 90 and baseline within groups

Body composition	Group	Source	Sum of Squares	df	Mean Squares	F	P value
Weight (Kg.)	Intervention	Time (Baseline, Day30, Day60, Day90)	54.321	3	18.107	8.007	<.001*
		Error (Time)	264.599	117	2.262		
	Control	Time (Baseline, Day30, Day60, Day90)	3.753	3	1.251	.524	.666
		Error (Time)	257.620	108	2.385		
BMI (kg/m^2)	Intervention	Time (Baseline, Day30, Day60, Day90)	16.090	3	5.363	5.713	.001*
		Error (Time)	109.847	117	.939		
	Control	Time (Baseline, Day30, Day60, Day90)	3.417	3	1.139	.783	.506
		Error (Time)	157.168	108	1.455		
Body fat percentage (%)	Intervention	Time (Baseline, Day30, Day60, Day90)	208.221	3	69.407	3.123	.029*
		Error (Time)	2600.246	117	22.224		
	Control	Time (Baseline, Day30, Day60, Day90)	21.290	3	7.097	1.051	.373
		Error (Time)	729.298	108	6.753		
Visceral Fat Level	Intervention	Time (Baseline, Day30, Day60, Day90)	.389	3	.130	.331	.803
		Error (Time)	45.856	117	.392		
	Control	Time (Baseline, Day30, Day60, Day90)	.056	3	.019	.025	.995
		Error (Time)	80.487	108	.745		
Muscle Mass (kg)	Intervention	Time (Baseline, Day30, Day60, Day90)	8.926	3	2.975	1.799	.151
		Error (Time)	193.457	117	1.653		
	Control	Time (Baseline, Day30, Day60, Day90)	10.925	3	3.642	.885	.451
		Error (Time)	444.172	108	4.113		
Physique Rating	Intervention	Time (Baseline, Day30, Day60, Day90)	1.092	3	.364	1.030	.382
		Error (Time)	41.345	117	.353		

Body composition	Group	Source	Sum of Squares	df	Mean Squares	F	P value
	Control	Time (Baseline, Day30, Day60, Day90)	.541	3	.180	.314	.815
		Error (Time)	61.959	108	.574		
Bone Mass	Intervention	Time (Baseline, Day30, Day60, Day90)	.217	3	.072	3.089	.030*
		Error (Time)	2.743	117	.023		
	Control	Time (Baseline, Day30, Day60, Day90)	.029	3	.010	1.050	.374
		Error (Time)	1.008	108	.009		
BMR	Intervention	Time (Baseline, Day30, Day60, Day90)	22141.925	3	7380.642	3.037	.032*
		Error (Time)	284355.075	117	2430.385		
	Control	Time (Baseline, Day30, Day60, Day90)	11687.486	3	3895.829	1.364	.258
		Error (Time)	308572.514	108	2857.153		
Metabolic Age	Intervention	Time (Baseline, Day30, Day60, Day90)	29.300	3	9.767	1.215	.307
		Error (Time)	940.200	117	8.036		
	Control	Time (Baseline, Day30, Day60, Day90)	141.243	3	47.081	1.445	.234
		Error (Time)	3518.257	108	32.576		
Total Body Water (%)	Intervention	Time (Baseline, Day30, Day60, Day90)	15.109	3	5.036	3.172	.027*
		Error (Time)	185.756	117	1.588		
	Control	Time (Baseline, Day30, Day60, Day90)	.052	3	.017	.007	.999
		Error (Time)	256.580	108	2.376		
Waist-Hip Ratio	Intervention	Time (Baseline, Day30, Day60, Day90)	.014	3	.005	1.834	.145
		Error (Time)	.295	117	.003		
	Control	Time (Baseline, Day30, Day60, Day90)	.004	3	.001	.832	.479
		Error (Time)	.179	108	.002		

*significant at .05 intervention group =40 participants and control group =40 participants

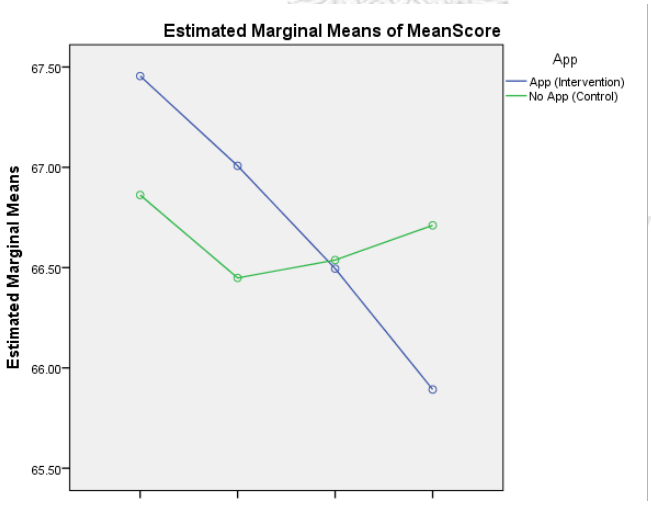


Figure 23 Changes in body composition of weight (kg) over time within groups

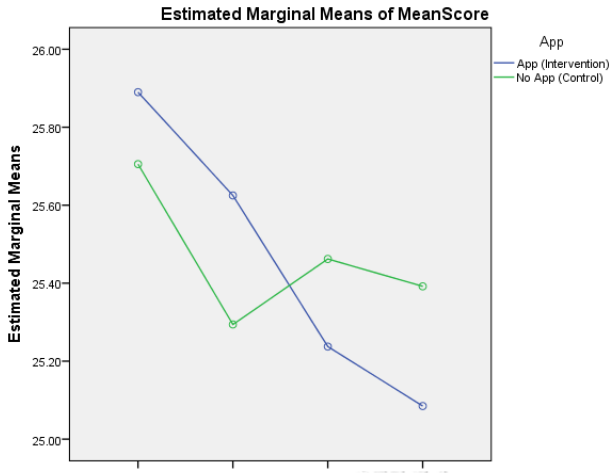


Figure 24 Changes in body composition of BMI (kg/m^2) over time within groups

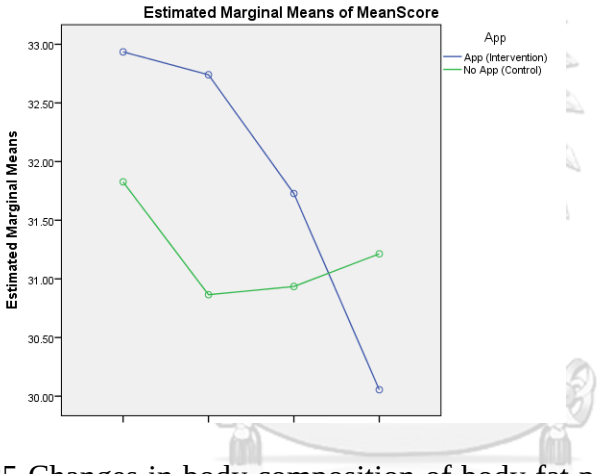


Figure 25 Changes in body composition of body fat percentage (%) over time within groups

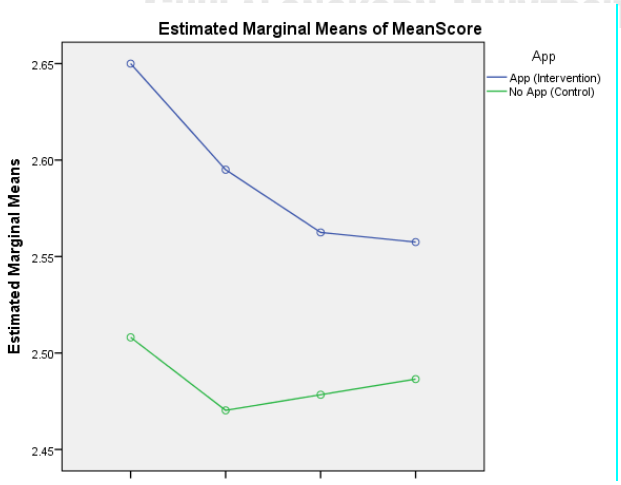


Figure 26 Changes in body composition of bone mass over time within groups

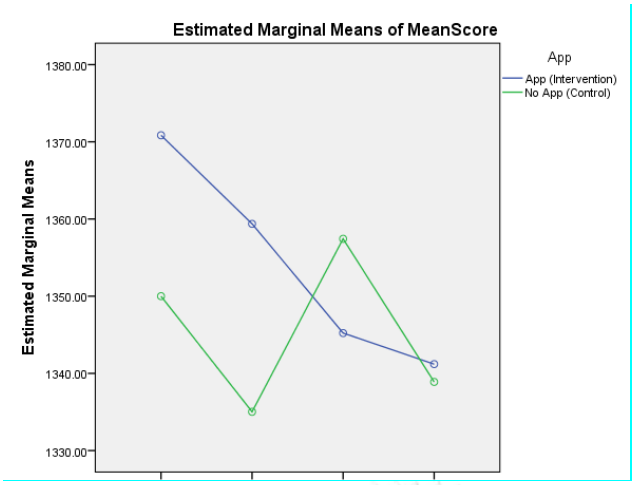


Figure 27 Changes in body composition of BMR over time within groups

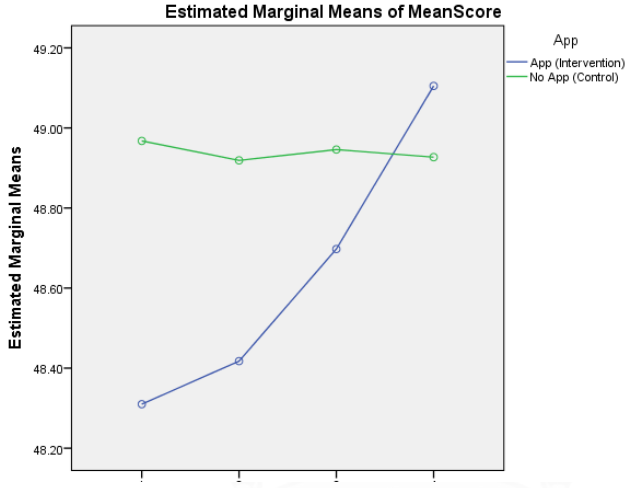


Figure 28 Changes in body composition of total body water over time within groups

The table 22 shows comparison of the different measurement of body composition of intervention group at different times of measurement. It shows that the intervention group was better changed in weight at day 60 and 90 compared to baseline and at day 90 compared to day 30. The BMI was better changed almost at all-time except day 60 compared to day 30 and day 90 compare to day 60.

The body fat percentage was better changed at day 90 compared to day 30, 60 and baseline. Bone mass was better changed at day 90 compared to baseline, BMR was better changed at day 90 and 30 compared to baseline and total body water was better changed at day 90 when compared to day 60 and baseline.

There was no significant difference change of weight body fat, body fat percentage, bone mass and total body water when compared to day 30 to baseline.

Table 22 Pairwise Comparison of the different measurement of body composition of intervention group at different times of measurement

Variable of Body composition	Group	Time	Mean difference	Std.Error	P value	95% Confidence interval for difference	
						Lower bound	Upper bound
Weight (Kg.)	Intervention	Baseline-Day30	.448	.233	.063	-0.025	.920
		Baseline-Day60	.960	.396	.020*	.159	1.761
		Baseline-Day90	1.563	.398	<.001*	.758	2.367
		Day30-Day60	.512	.288	.083	-0.070	1.095
		Day30-Day90	1.115	.371	.005*	.364	1.866
		Day60-Day90	.602	.297	.049*	.002	1.203
BMI (kg/m^2)	Intervention	Baseline-Day30	.265	.129	.047*	.004	.526
		Baseline-Day60	.653	.269	.020*	.109	1.196
		Baseline-Day90	.805	.262	.004*	.276	1.334
		Day30-Day60	.387	.231	.102	-0.080	.855
		Day30-Day90	.540	.242	.031*	.051	1.029
		Day60-Day90	.152	.112	.181	-0.074	.379
Body fat percentage (%)	Intervention	Baseline-Day30	.195	1.406	.890	-2.650	3.040
		Baseline-Day60	1.208	.698	.092	-0.205	2.620
		Baseline-Day90	2.880	.880	.002*	1.101	4.659
		Day30-Day60	1.012	1.249	.422	-1.513	3.538
		Day30-Day90	2.685	1.264	.040*	.128	5.242
		Day60-Day90	1.672	.520	.003*	.622	2.723
Bone Mass	Intervention	Baseline-Day30	.055	.036	.131	-0.017	.127
		Baseline-Day60	.088	.043	.051	.000	.175
		Baseline-Day90	.093	.042	.035*	.007	.178
		Day30-Day60	.032	.030	.286	-0.028	.093
		Day30-Day90	.037	.031	.227	-0.024	.099
		Day60-Day90	.005	.016	.750	-0.027	.037
BMR	Intervention	Baseline-Day30	11.475	4.356	.012*	2.664	20.286
		Baseline-Day60	25.625	13.039	.057	-0.749	51.999
		Baseline-Day90	29.650	13.017	.028*	3.320	55.980
		Day30-Day60	14.150	12.729	.273	-11.596	39.896
		Day30-Day90	18.175	13.160	.175	-8.443	44.793
		Day60-Day90	4.025	5.955	.503	-8.021	16.071
Total Body Water (%)	Intervention	Baseline-Day30	-0.107	.168	.527	-0.448	.233
		Baseline-Day60	-0.387	.294	.195	-0.981	.206
		Baseline-Day90	-0.795	.368	.037*	-1.539	-0.051
		Day30-Day60	-0.280	.225	.221	-0.735	.175
		Day30-Day90	-0.688	.315	.035*	-1.325	-0.050
		Day60-Day90	-0.408	.277	.149	-0.967	.152

* significant at .05 intervention group =40 participants

4.7 Comparison body composition modifying at day 30, 60, 90 and baseline between intervention and control groups

4.7.1 Body composition modifying at baseline between groups

Table 23 shows that there was no difference of body composition between intervention and control groups at baseline.

Table 23 Comparison of body composition at baseline between intervention and control groups

Variable of Body composition	Baseline		
	Intervention (n = 40)	Control (n = 40)	P value
Weight (Kg.)	67.46 ± 15.29	66.55 ± 18.68	.813
BMI (kg/m^2)	25.89 ± 5.14	25.56 ± 5.38	.780
Body fat percentage (%)	32.94 ± 8.82	31.49 ± 7.26	.424
Visceral Fat Level	7.26 ± 3.87	7.30 ± 4.57	.971
Muscle Mass (kg)	42.48 ± 8.66	42.62 ± 11.66	.951
Physique Rating	3.79 ± 1.19	3.93 ± 1.40	.638
Bone Mass	2.65 ± .45	2.51 ± .60	.236
BMR	1370.85 ± 248.27	1348.93 ± 344.04	.745
Metabolic Age	38.23 ± 9.88	39.35 ± 12.88	.662
Total Body Water %	48.31 ± 4.42	49.12 ± 3.68	.377
Waist-Hip Ratio (Waist/Hip=Ratio)	.83 ± .10	.82 ± .10	.633

Value are mean ± SD. , p-value from the Independent t-test. , *significant at .05

4.7.2 Body composition modifying at day 30 between groups

Table 24 shows that there was no difference of body composition between intervention and control groups at day 30.

Table 24 Comparison of body composition at day 30 between intervention and control groups

Variable of Body composition	Day30		
	Intervention (n = 40)	Control (n = 40)	P value
Weight (Kg.)	67.01 ± 15.24	66.26 ± 18.79	.845
BMI (kg/m^2)	25.63 ± 5.09	25.22 ± 5.42	.729
Body fat percentage (%)	32.74 ± 10.35	30.62 ± 5.92	.264
Visceral Fat Level	7.19 ± 3.86	7.29 ± 4.81	.919
Muscle Mass (kg)	42.34 ± 8.63	42.36 ± 12.02	.992
Physique Rating	3.70 ± 1.22	3.78 ± 1.05	.769
Bone Mass	2.60 ± .44	2.48 ± .61	.325
BMR	1359.38 ± 242.12	1336.85 ± 348.78	.738
Metabolic Age	38.88 ± 10.68	39.00 ± 12.87	.962
Total Body Water %	48.42 ± 4.57	49.08 ± 3.53	.470
Waist-Hip Ratio (Waist/Hip=Ratio)	.82 ± .09	.83 ± .10	.936

Value are mean ± SD. , p-value from the Independent t-test. , *significant at .05

4.7.3 Body composition modifying at day 60 between groups

Table 25 shows that there was no difference of body composition between intervention and control groups at day 60.

Table 25 Comparison of body composition at day 60 between intervention and control groups

Variable of Body composition	Day 60		
	Intervention (n = 40)	Control (n = 40)	P value
Weight (Kg.)	66.50 ± 15.13	66.36 ± 18.71	.974
BMI (kg/m^2)	25.24 ± 5.13	25.37 ± 5.45	.910
Body fat percentage (%)	31.73 ± 7.81	30.90 ± 6.65	.617
Visceral Fat Level	7.16 ± 3.83	7.25 ± 4.42	.926
Muscle Mass (kg)	42.55 ± 8.64	42.04 ± 11.18	.825
Physique Rating	3.85 ± 1.10	3.82 ± 1.16	.894
Bone Mass	2.56 ± .46	2.48 ± .60	.489
BMR	1345.23 ± 257.11	1355.00 ± 370.29	.893
Metabolic Age	37.98 ± 9.51	37.89 ± 10.69	.972
Total Body Water %	48.70 ± 4.41	48.93 ± 3.65	.797
Waist-Hip Ratio (Waist/Hip=Ratio)	.83 ± .08	.83 ± .08	.726

Value are mean ± SD. , p-value from the Independent t-test. , *significant at .05

4.7.4 Body composition modifying at day 90 between groups

Table 26 shows that there was no difference of body composition between intervention and control groups at day 90.

Table 26 Comparison of body composition at day 90 between intervention and control groups

Variable of Body composition	Day 90		
	Intervention (n = 40)	Control (n = 40)	P value
Weight (Kg.)	65.89 ± 14.63	66.71 ± 19.95	.835
BMI (kg/m^2)	25.09 ± 5.14	25.39 ± 5.54	.802
Body fat percentage (%)	30.06 ± 6.62	31.21 ± 6.32	.435
Visceral Fat Level	7.13 ± 3.82	7.38 ± 4.73	.796
Muscle Mass (kg)	42.97 ± 8.29	41.84 ± 11.04	.617
Physique Rating	3.93 ± 1.33	3.83 ± .96	.744
Bone Mass	2.56 ± .46	2.49 ± .62	.568
BMR	1341.20 ± 255.06	1338.89 ± 353.06	.974
Metabolic Age	37.73 ± 9.59	37.76 ± 10.86	.989
Total Body Water %	49.11 ± 4.23	48.93 ± 3.60	.844
Waist-Hip Ratio (Waist/Hip=Ratio)	.85 ± .07	.84 ± .07	.593

Value are mean ± SD. , p-value from the Independent t-test. , *significant at .05

CHAPTER V

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

This study was a randomized controlled trial study conducted among dyslipidemia healthcare workers in Phuket City hospital, Thailand. The objective of this study was to explore and evaluate the effectiveness of M-Health intervention: CHICKEN LOF on lipid profile and body composition among dyslipidemia healthcare workers as a communication channel to improve their knowledge, attitude and practice regarding lipid profile and body composition. Participants were selected randomly through computer generator and assigned in an intervention group and control group. A total of 80 participants were selected and it was divided into 40 participants for intervention group and 40 participants for control group. Participants in the intervention group received CHICKEN LOF mobile application and usual care while participants from the control group received only usual care. The CHICKEN LOF mobile application included 6 modes as main items which are walk to the sun, be happy, calm and sleep, drink more water, exercise daily, and food control. The chicken in this application represented the player (each participant in the intervention group) and players have to follow and play with these 6 main items for control of lipid profile and body composition. The usual care included general consultation by physician in the hospital for dietary and exercise after blood testing. The intervention period was 90 days and a total of 4 serial measurements (0, 30, 60 and 90 days) were done.

5.1 Baseline characteristics

The baseline characteristics of the participants were not difference. More than 70% of the participants in both groups were female (29 participants in intervention group and 33 participants in control group). In this Phuket city hospital, there are female healthcare workers than male healthcare workers. In a cross-sectional study on prevalence of dyslipidemia among primary health care centers in Saudi Arabia that there are more female healthcare workers than males in the study although gender was not the significant risk factor for dyslipidemia but females are 3.3 times more likely to have dyslipidemia (Basheikh et al., 2016). The result of this present study is consistent

with the Thai National Health Examination Survey in 2009 and another study in Chinese adult population that there was high prevalence of dyslipidemia in females than males (Aekplakorn et al., 2014; Wang et al., 2011). But the result in the study on young adult Indian population in 2008 was contrary that high prevalence was found in males (Sawant, Shetty, Mankeshwar, & Ashavaid, 2008). The mean age of participants in both group were 33 years and this result is supported by the study in India on dyslipidemia on adult age group that more prevalence of dyslipidemia was found in the adult age group of 31 to 40 years compared to less than 30 years old (Puranik, Shashank, & Srivastav, 2016). This present study result was contrary with the study in Bangladesh that adult age group of 20 to 35 years was higher prevalence than 36 to 45 year group (Rabeya et al., 2019). The difference between two studies can be due to different population (healthcare worker versus general patients). All participants of both groups had average 10 hours of night shift load and this result is consistent with the study of dyslipidemia healthcare workers in Netherlands that night-shift can be one of the risk factors for dyslipidemia (Loef et al., 2019). This result is also supported by another study in Korea that both of male night shift workers and female night shift workers (while collar positions) have high prevalence of dyslipidemia (Joo, Lee, Choi, & Park, 2019). This can be due to suffering of psycho-emotional stress among night shift healthcare worker at work place as it is one of the important source for dyslipidemia and it can lead to CVDs (Eller et al., 2009). In both of intervention and control group, about 75% of participants did not control their food eating and about 90% of participants have no exercise activity. It is important to control the diet which is one of the important risk factors for dyslipidemia (Kim, Joung, & Shin, 2019).

5.2 Comparison of changes in knowledge, attitude and practice within groups

5.2.1 Comparison of changes in knowledge on lipid profile and body composition modifying score on day 30, 60, 90 and baseline within groups

Participants in the control group did not show statistically significant difference in knowledge within the group. The total knowledge score on lipid profile and body composition modifying score within the intervention group had statistically significant difference ($p<0.001$) and it also showed positively increases and statistically significant

mean differences between baseline and day 30, between baseline and day 60, between baseline and day 90, and between day 30 and day 90 (p=0.003, p=0.002, p=0.002 and p=0.041 respectively). In the study of using "WeChat" mobile application in health education program in China, there was increase in knowledge of the participants regarding weight loss in the intervention group (He et al., 2017). It can also be said that M-Health application: CHICKEN LOF application had positive effect in improving knowledge on lipid profile and body composition modifying score.

It can be said that M-Health application: CHICKEN LOF application had positive effect in knowledge on lipid profile and body composition modifying score. This result is supported by a systematic review that mobile application with entertainment elements (such as quizzes and games) based health promotion programs have intervention efficacy compared to usual text messaging and health education program (Lee et al., 2018). It can also enhance people for self-monitoring and self-management of their health lifestyle.

Knowledge on "getting vitamin D from sunlight" have shown statistically significant difference within the intervention group with p value of p= 0.047. This result is supported by the study on association of lipid profile, body composition and vitamin D status in Spain that vitamin D is positively associated with lipid and body composition (Souza et al., 2017). In pairwise comparison within the intervention group, knowledge on "getting vitamin D from sunlight" showed increase mean difference in all measurements. Among these, statistically significant differences were found between baseline and day 60 (p=0.021), and between baseline and day 90 (p=0.034). As this present study showed changes in knowledge regarding getting vitamin D from sun light, it is strongly pointed out that vitamin D deficiency among healthcare worker is important to be aware. This is supported by a systematic review study on vitamin D deficiency with different occupations that vitamin D deficiency was very high in healthcare workers (Sowah, Fan, Dennett, Hagtvedt, & Straube, 2017).

Knowledge on "consume at least 8 glasses of clean water" also showed statistically significant difference within the intervention group (p=0.026) and there were also increase mean differences at all measurements. The statistically significant differences were found between baseline and day 60 and baseline and day 90 with p

value of p=0.016 and p=0.010 respectively. The study on relationship between lipid profile and body composition and consumption of water among adult and healthcare workers is limited. In the study of cardiometabolic factors among children, the consumption of water benefits health, especially in prevention of obesity and metabolic syndrome (Milla-Tobarra et al., 2016). It might be said that daily adequate water consumption may play a role in lipid profile and body composition among healthcare workers and this present study had shown the effectiveness on knowledge with positive mean differences.

Knowledge on "exercise and food control" within the intervention group showed statistically significant difference with p value of p= 0.013 and p<0.001 respectively. Although only three measurements: between baseline and 60 days, between baseline and 90 days, and between day 30 and day 90 in exercise showed statistically significant differences (p=0.037, p=0.018 and p=0.031 respectively), all of the measurements (baseline-day 30, baseline-day 60, baseline-day 60, day 30-day 60, day 30-day 90, and day 60-day 90) were statistically significant different in food (p=0.001, p<0.001, p<0.001, p=0.001 and p=0.009 respectively) for the pairwise comparison within the intervention group. In this present study, CHICKEN LOF mobile application had features on food control and daily exercise, and it can be said as the effectiveness of the application. It is important not only to have healthy diet but also to do regular exercises to draw out the complementary effects on lipid profiles, thus combined therapy of diet and exercise has positive effect on dyslipidemia (Varady & Jones, 2005).

5.2.2 Comparison of changes in attitude on lipid profile and body composition modifying score on day 30, 60, 90 and baseline within groups

Participants in the control group did not show statistically significant difference in attitude within the group. The total attitude score on lipid profile and body composition modifying score within the intervention group had statistically significant difference (p=0.001) and it also showed positively increases and statistically significant mean differences in pairwise comparison within the intervention group between baseline and day 30, between baseline and day 60, between baseline and day 90, and

between day 30 and day 90 (p=0.039, p=0.026, p=0.001 and p=0.016 respectively). It is supported by a study on fitness mobile application and attitudes toward physical activities that a daily use of physical activity mobile application makes the users in increase awareness and it leads to positive attitude towards health lifestyle behaviors (Gabbiadini & Greitemeyer, 2018). This present study was supported by a population based study in China which used "WeChat" application for health education in weight loss program that there was an improvement in attitude of the participants in the intervention group (He et al., 2017). It can also be said that M-Health application: CHICKEN LOF application had positive effect in changing attitude on lipid profile and body composition modifying score.

In attitude, "get vitamin D from sun light", "sleep 7 hours" and "food control" showed statistically significant mean differences within the intervention group (p= 0.009, p< 0.001, and p=0.007 respectively). In pairwise comparison within the intervention group, positive change and statistically significant differences were found between baseline and day 30, between baseline and day 60 and between baseline and day 90 (p<0.001, p=0.036, and p=0.033 respectively) in "get vitamin D from sun light"; between baseline and day 60, between baseline and 90, between day 30 and day 60, and between day 30 and day 90 (p=0.008, p=0.001, p=0.007 and p<0.001 respectively) in "sleep 7 hours". Regarding "food", only two measurements between baseline and day 90 and between day 30 and day 90 were found positively increases and statistically significant mean differences (p=0.002 and p=0.012 respectively). According to these findings, CHICKEN LOF mobile application had less effect on food compare to other variables in attitude. But in overall, it can be said that M-Health application can trigger the users for positive behavior change especially in healthy eating (Smahel et al., 2018). This is also supported by another study on using mobile phones and choosing healthy lifestyle that positive attitudes and self-efficacy were found through mobile phone applications (Kroes & Shahid, 2013).

5.2.3 Comparison of changes in practice on lipid profile and body composition modifying score on day 30, 60, 90 and baseline within groups

There was no statistically significant difference within the control group for practice on lipid profile and body composition modifying score. The total practice score within the intervention group had statistically significant difference ($p<0.001$) and it also showed positively increases and statistically significant mean differences in pairwise comparison within the intervention group between baseline and day 30, between baseline and day 60, between baseline and day 90 ($p=0.020$, $p<0.001$ and $p<0.001$ respectively). In a population based study in China, using "WeChat" application for health education for weight loss program showed increase in practice of the participants (He et al., 2017). This present study also observed that using M-Health application: CHICKEN LOF is favorable to be used in practice of healthy behavior. It might be due to significant interest of the participants in the intervention group. In term of practice, only "exercise" and "Food control" had statistically significant mean differences within the intervention group ($p= 0.002$ and $p<0.001$). In pairwise comparison within the intervention group, positive increases and statistically significant mean differences were found between baseline and day 30, between baseline and day 60, between baseline and day 90 in "exercise" ($p=0.019$, $p=0.001$ and $p= 0.006$ respectively) and between baseline and day 30, between baseline and day 60, between baseline and day 90 and between day 30 and day 60 in "food control" ($p=0.001$, $p=0.001$, $p<0.001$ and $p=0.033$ respectively). This result is supported by a systematic review and meta-analysis that mobile application interventions are effective in healthy nutrition behaviors. Using mobile phone application can be essential for changes in metabolic parameters of the patients (Villinger, Wahl, Boeing, Schupp, & Renner, 2019).

5.3 Comparison of changes in knowledge, attitude and practice between intervention and control groups

There were no statistically significant differences in knowledge, attitude and practice between intervention and control group at baseline. At day 30, 60 and 90 between intervention and control groups, "food control" showed statistically significant

mean differences in knowledge, attitude and practice. It can be due to features of CHICKEN LOF that more content related to “food control” than other contents. This result is supported by a literature review study on smart phone applications that participants preferred on those applications related to food control and weight management (Coughlin et al., 2015). “Exercise” also showed statistically significant mean differences in almost all of the variables which can be the same reason as above “food control”. Doing exercise among healthcare workers had shown improved vitality and pain control which can also be one of the reasons that “Exercise” showed more statistically significant mean differences than others (Jakobsen, Sundstrup, Brandt, & Andersen, 2017). The reason of not much statistically significant mean differences between intervention and control can be due to participants’ existing knowledge related to lipid profile and body composition as they are healthcare workers. Based on the findings of this present study, there should be a future studies with more contents besides “Food control” and “Exercise” to measures the effectiveness on others, and to study with patients who have less health education compared to healthcare workers for the effectiveness of CHICKEN LOF to be applied in general population.

5.4 Comparison of changes in lipid profile and body composition within and between groups

There were no statistically significant mean differences in lipid profile and body composition of participants within the control group. In the intervention group among lipid profile, only HDL-C (mg/dl) showed statistically significant mean difference with p value of p=0.002. In pairwise comparison, there was negative change of mean difference between baseline and day 60 (p=0.048), and there were positive changes and statistically significant mean differences between baseline and day 90, and between day 30 and day 90 ($p<0.001$ and p=0.030). This present study observed that CHICKEN LOF application have positive effect on lipid profile especially HDL-C (mg/dl) but it needs longer time from baseline to Day 90 and from day 30 to day 60. It pointed out that changes in metabolic parameters needs longer time duration to observe the effectiveness which is compared to other interventions which are spa therapy and balneotherapy (Fioravanti et al., 2014; Kamioka et al., 2009). The statistically significant mean differences were observed between intervention and control group

only at day 90 in HDL-C (mg/dl) and LDL-C (mg/dl) (p=0.049 and p=0.048). It can be said that it is needed at least 3 months for mean changes of lipid profile and body composition through mobile phone intervention which is contrast with a study in Iran that 3-month mobile phone intervention in type II diabetes patients on lipid profile show significant improvement in LDL-C (Goodarzi, Ebrahimzadeh, Rabi, Saedipoor, & Jafarabadi, 2012). The result of significant of KAP on food control may relate to the change of HDL and LDL since the control group leaned about the quality of food.

Among the body composition within the intervention group, weight (kg), BMI (kg/m^2), body fat percentage, bone mass and total body water (%) showed statistically significant mean differences ($p<0.001$, $p=0.001$, $p=0.029$, $p=0.030$, $p=0.032$ and $p=0.027$ respectively). In pairwise comparison among intervention group, all body compositions showed positive mean changes in all variables and showed statistically significant in some of the comparison of time points. This result is supported by a review study on management of obesity and overweight by mobile interventions that mobile phone applications play a major role in maintaining healthy body composition (Alnuaima, Rawaf, Hassounah, & Chehab, 2019). It is also supported by another study of systematic review and meta-analysis that there was a moderate short-term effect on BMI and body weight by mobile phone application but is it needed at least 9 months of intervention (Park, Hwang, & Choi, 2019). Although there was a short-term (<6 months) mobile phone intervention had shown significant weight lost, more reduction of weight with a longer term duration (> 6 months) was observed in a meta-analysis of randomized controlled trial (Liu et al., 2015). In a systematic review of long term weight loss on lipid outcomes, lifestyle change interventions are effective in improving lipid profile and weight loss by longer term (Aucott, Gray, Rothnie, Thapa, & Waweru, 2011).

5.5 Limitations of the study

- There are more contents and activities with “food control” among 6 modes and effects on other modes were less observed. More contents may have more effect than other modes.

- All of the participants were dyslipidemia healthcare workers in any job position and education. Although there were significant mean changes as increase in knowledge, attitude and practice, it might be difficult to refer the result to general population or healthcare workers in specific job position such as nurses, pharmacists or physicians.
- Only few risk factors for dyslipidemia and metabolic disorders (night shift, job stress, alcohol consuming and smoking) were assessed at baseline, there might be effect of other factors on effectiveness of this CHICKEN LOF mobile application on lipid profile and body composition.
- As this study was conducted only for 90 days (3 months), longer and sustained effect of CHICKEN LOF mobile application on lipid profile and body composition cannot be assessed.

5.6 Strengths of the study

- Although there are many intervention programs to improve knowledge, attitude, practice of lipid profile and body composition modifying score, this CHICKEN LOF mobile application intervention is the first study in Thailand using M-health technology.
- Unlike other mobile phone applications, this CHICKEN LOF is board game and participants/user can play and learn the related health education information on lipid profile and body compositions so that they can do self-monitoring and self-management for their healthy lifestyle behavior by themselves.
- A total of 6 modes with variety of features provides updated information regarding walk to the sun, be happy, calm and sleep, drink more water, exercise daily, and food control so that participants can follow easily and enjoy the application.

5.7 Benefit of the study

The findings of this study can be applied in policy of using mobile phone applications in implementing non-communicable diseases especially on lipid profile and body composition in both of institution based and community based programs. In addition, this application can be used as a self-monitoring and self-management tool

for healthy lifestyle behavior to reduce the risks of metabolic disorders and cardiovascular diseases.

5.8 Recommendation

(A) For Policy and Program intervention

- This CHICKEN LOF application should be reported to policy makers and longer term of implementation needs to be done with modification of modes and contents to be applicable for general population especially on lipid control and body composition. Once longer term implementation shows the effectiveness, using CHICKEN LOF application (board game) should be included in the policy of non-communicable diseases. Then, field implementation should be done by both of government authority and non-government organizations.
- A coordinated health action with different sectors within and outside of the health system is needed for controlling non-communicable disease such as taxation, food and drug control, etc. Government needs to enforce the coordinated and collaborative action for non-communicable diseases. Using mobile phone application can be a part of action plan.

(B) For Future Research

- To apply the behavior change model and to include the assessment of participants' motivation in improving lipid profile and body composition.
- To develop more cartoon characters to attract difference users.
- To add KAP self-assessment for users to monitor and evaluate themselves. It may motivate and engage the user to the real life.
- To study the sustain effect of this CHICKEN-LOF application, further research with longer period is needed.
- To converse the KAP, Lipid profile and body composition to categorical such as high, normal and low and analyze to see the change in category.
- To analyze mean change in each group would be more information of the effect of this program.

- To assess and study other related factors with dyslipidemia and body composition to observe the effect of the intervention.
- Follow up of the participants on user friendly issues of the application should be designed and conducted.
- To conduct the qualitative study among healthcare workers to assess about the risk factors of metabolic disorders and cardiovascular disease especially on lipid profile and body composition.

(C) Other recommendations

- As this CHICKEN LOF application have more contents related to “food” and “exercise”, there should be modification by adding more contents which can be applicable contributable to improve lipid profile and body composition.
- It should be considered the “Global action plan for the prevention and control of non-communicable diseases” and context of Thailand when developing the content of the applications.
- The updated clinical practice guideline for non-communicable diseases should be integrated in the application especially prevention and control of risk factors for metabolic disorders and cardiovascular diseases.
- According to finding of this present study, combined therapy or intervention of “food and physical activity” have positive effect in improving lipid profile and body composition, future interventions should be designed and implemented as combined intervention.

5.9 Conclusion

As healthy lifestyle has become important issue for personal health which can result many changes in daily life of every person, it is needed to aware and practice the healthy lifestyle measures. The findings of this present study concluded the objectives of the study that M-Health intervention: CHICKEN LOF created by combination of 3 communication theories for motivation change: expectancy theory, behavior change communication theory and Persuasion and reinforcement theory is effective on improving knowledge, attitude and practice on lipid profile and body composition modifying score including improving in blood lipid profile and body composition.

Being the use of technology in conducting health promotion and education especially using mobile phone, board game application like this CHICKEN LOF will be attractive to users not only the awareness but also the change of self-management and self-monitoring for their daily healthy lifestyle.

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APPENDIX A

Questionnaires

Date of interview……

Code of interviewee □□□

I

Questionnaire for Research

EFFECT OF CHICKEN LOF (LOW FAT IN 90 DAYS) M-HEALTH APPLICATION ON LIPID PROFILE AND BODY COMPOSITION AMONG DYSLIPIDEMIA HEALTHCARE WORKERS: A RANDOMIZED CONTROLLED TRIAL

In order to participate in this study, you are required to complete the questionnaire. Please follow the instructions of each part.

Characteristics and life style on health

Instructions: *Please fill in the blank or check ✔ in the* ( )

No	*Items*	*fill in the blank or check ✔ in the* ( )	*Research team only*
101	*Age*		
102	*Gender*	( ) Male ( ) Female	
103	*Night shift load*	hours/week	
104	*Smoking*	( ) Yes ( ) No	
105	*Alcohol containing*	( ) Yes ( ) No	

Date of interview……

Code of interviewee □□□

II

Questionnaire for Research

EFFECT OF CHICKEN LOF (LOW FAT IN 90 DAYS) M-HEALTH APPLICATION ON LIPID PROFILE AND BODY COMPOSITION AMONG DYSLIPIDEMIA HEALTHCARE WORKERS: A RANDOMIZED CONTROLLED TRIAL

In order to participate in this study, you are required to complete the questionnaire which is separated into 3 parts (Knowledge, Attitude and Practice). Please follow the instructions of each part.

Part I Knowledge

Instructions: *Please check* ✓

No	***Items***	***True***	***False***	***I don't know***	***Research team only (point)***
201	*we can synthesize vitamin D from sunlight*	1			
202	*Synthesize vitamin D from sunlight 15 minutes a day makes a stronger health*	1			
203	*The body can synthesize vitamin D from food*		1		
204	*Job stress effects on health*	1			
205	*Job stress doesn't effect on metabolism and fat*		1		
206	*Job stress is a factor of NCD such as hypertension, diabetes, CVD and obesity*	1			
207	*Job stress can be decreased by meditation, singing, talk to family and friends*	1			
208	*Sleeping at least 7 hours effects on metabolism and fat*	1			
209	*One who sleeps less than 7 hours has lighter weight than one who sleeps 7 hours*		1		

No	*Items*	*True*	*False*	*I don't know*	*Research team only (point)*
210	*We need clean water at least 8 glasses a day*	1			
211	*One who drinks water before meal get lighter weight than one who doesn't*	1			
212	*Exercise daily make better body composition*	1			
213	*We must chose only a type of exercises (Cardio or stretching or weigh training)*		1		
214	*One who wants to lowering lipid profile and modifying body composition, needs to control food intake by calculating calories and cholesterol*	1			
215	*Pork Suki with soup has higher cholesterol than Tom-Yum Kong clear soup*		1		
216	*Tuna sandwich has high cholesterol as Chicken congee with egg but lower calories*	1			
217	*Fruits have no cholesterol*	1			
218	*Stir fried flat noodle and pork has much higher calories and cholesterol than Stir fried pork with basil, star egg and rice*		1		
219	*Milk tea with jelly bubble has lower calories than beer*	*1*			

Part II Attitude

Instructions: *Please check* ✓

No	*Items*	*Strongly disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly agree*	*Research team only (point)*
301	*We don't need to get vitamin D from sunlight, we can take it from food instead*	*5*					

No	*Items*	*Strongly disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly agree*	*Research team only (point)*
302	*synthesize vitamin D from sunlight doesn't worth to melisma, darker skin and skin cancer risk*	*5*					
303	*Job stress is general problem which can't be solved*	*5*					
304	*Entertainment activities can help to decrease job stress*					*5*	
305	*Sweets intake help to decrease job stress*	*5*					
306	*Short sleep but has 7 hours sleeping in total is enough resting*	*5*					
307	*With deep sleeping, we doesn't want to have 7 hours sleeping for healthy*	*5*					
308	*Drinking less water makes we feel skinny.*	*5*					

No	*Items*	*Strongly disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly agree*	*Research team only (point)*
309	*Drinking water before meal make us faster full and take less food portion.*					*5*	
310	*Skinny one doesn't need to do exercise*	*5*					
311	*Exercise is like a medicine to prevent and treat deceases*					*5*	
312	*Even strong one need to control food by calculate calories and cholesterol*					*5*	
313	*Healthy foods are expensive*						
314	*Taking some Alcohol drinks don't effect on lipid and body composition.*						
315	*Dietary is not about not eating but controlling*					*5*	
316	*Dyslipidemia patients should not be serious on food controlling*	*5*					

Part III Practice

Instructions: *Please check* ✓

No	***Items***	Sometimes	Always	Never	***Research team only (point)***
401	*Walk to the sunlight for synthesizing vitamin D*		3		
402	*Use umbellar or jacket when faces sunlight*			3	
403	*Do some entertainment activities to decrease job stress such as meditation, making merit, talk to people, singing or watching TV*		3		
404	*Stay alone and collect job stress*			3	
405	*Consume sweets to decrease job stress*			3	
406	*7 hours sleeping*		3		
407	*Deep sleeping*		3		
408	*Insomnia*			3	
409	*Drinking water at least 8 glasses a day*		3		
410	*Sweet drinks, color-soda, milk tea or coffee with sugar*			3	
411	*Drinking alcohol*			3	
412	*Exercise for health*		3		
413	*Do 3 types of exercise: Cardio or stretching or weigh training*		3		
414	*Calculate calories and cholesterol before meal*		3		
415	*Chose food with low calories and cholesterol*		3		
416	*Late dinner*			3	
417	*Consume sweet and high fat foods*			3	
418	*Consume sweets between meal*			3	
419	*Use supplements to lose weight*			3	
420	*Refuse to eat to lose weight*			3	

Staff Only

Code of participants □□□

III

Lipid profile and Body Composition Record list

For the research of

EFFECT OF CHICKEN LOF (LOW FAT IN 90 DAYS) M-HEALTH APPLICATION ON LIPID PROFILE AND BODY COMPOSITION AMONG DYSLIPIDEMIA HEALTHCARE WORKERS: A RANDOMIZED CONTROLLED TRIAL

No	***Lipid profile***	***Day 0***	***Day 30***	***Day60***	***Day 90***
501	*TC (mg/dL)*				
502	*TG (mg/dL)*				
503	*HDL-C (mg/dL)*				
504	*LDL-C (mg/dL)*				
No	***BODY COMPOSITION***	***Day 0***	***Day 30***	***Day60***	***Day 90***
505	*Waist (cm)*				
506	*Hip (cm)*				
507	*BMI (kg/m^2)*				
508	*Body fat mass* (kg)				
509	*Body fat percentage* (%)				
510	*Fat free mass* (kg)				
511	*Skeletal muscle mass* (kg)				
512	*Visceral fat level*				
513	*Waist-Hip ratio*				
514	*Basal metabolic rate* (kcal)				

Code of interviewee ☐☐☐

II

แบบสอบถาม สำหรับการวิจัย

เรื่อง ประสิทธิผลของแอปพลิเคชันด้านสุขภาพ ชิคเก้น ลอฟ (วัน 90 ลดไขมันใน)ในโทรศัพท์เคลื่อนที่ที่มีผลต่อระดับไขมันในเส้นเลือดและสัดส่วนของร่างกายในกลุ่มเจ้าหน้าที่สายงานสุขภาพที่มีระดับไขมันในเส้นเลือดผิดปกติ: การทดลองแบบสุ่มและมีกลุ่มควบคุม

ข้อมูลส่วนบุคคล และไลฟ์สไตล์ด้านสุขภาพ

คำอธิบาย **: ผู้ตอบแบบสอบถามมีหน้าที่ตอบคำถามทุกข้อโดยสมบูรณ์ โปรดเติมคำตอบในช่องว่าง หรือทำเครื่องหมาย ✔ *ในวงเล็บ* ( )**

ที่	*คำถาม*	เติมคำตอบในช่องว่างหรือทำเครื่องหมาย ✔ *ในวงเล็บ*	*สำหรับผู้วิจัย*
101	*อายุ*		
102	*เพศ*	( ) ชาย ( ) หญิง	
103	*ชั่วโมงการทำงาน*	ชั่วโมง ต่อสัปดาห์	
104	*ชั่วโมงการทำงานเวรดึก*	ชั่วโมง ต่อสัปดาห์	
105	*การสูบบุหรี่*	( ) สู ( ) ไม่สูบ	
106	*การดื่มแอลกอฮอล์*	( ) ดื่ม ( ) ไม่ดื่ม	
108	*ได้รับวิตามินดีจากแสงแดดประจำ*	( ) ใช่ ( ) ไม่ใช่	
109	*มีความเครียดจากการทำงาน*	( ) ใช่ ( ) ไม่ใช่	
110	*ชั่วโมงการนอน*	( ) ต่ำกว่า 7 ชั่วโมง ( ) 7 ชั่วโมง ( ) มากกว่า 7 ชั่วโมง	
111	*การควบคุมปริมาณแคลอรี่และคอเลสเตอรอลในอาหาร*	( ) ควบคุม ( ) ไม่ควบคุม	

ที่	คำถาม	เติมคำตอบในช่องว่างหรือทำเครื่องหมาย ✔ ในวงเล็บ	สำหรับผู้วิจัย
112	ออกกำลังกายทุกวัน	( ) ใช่ ( ) ไม่ใช่	
113	ดื่มน้ำอย่างน้อยวันละ 8 แก้ว	( ) ใช่ ( ) ไม่ใช่	

Date of interview……

Code of interviewee ☐☐☐

II

แบบสอบถาม สำหรับการวิจัย

เรื่อง ประสิทธิผลของแอปพลิเคชันด้านสุขภาพ ชิคเก้น ลอฟ (วัน 90 ลดไขมันใน)ในโทรศัพท์เคลื่อนที่ที่มีผลต่อระดับไขมันในเส้นเลือดและสัดส่วนของร่างกายในกลุ่มเจ้าหน้าที่สายงานสุขภาพที่มีระดับไขมันในเส้นเลือดผิดปกติ: การทดลองแบบสุ่มและมีกลุ่มควบคุม

ผู้ตอบแบบสอบถามมีหน้าที่ตอบคำถามทุกข้อโดยสมบูรณ์ ซึ่งแบบสอบถามนี้ได้แบ่งออกเป็น 3 ส่วน ได้แก่ ส่วนความรู้ ส่วนทัศนคติ และส่วนพฤติกรรม โปรดอ่านคำอธิบายในแต่ละส่วน

ส่วนที่ 1 ความรู้

คำอธิบาย: โปรดทำเครื่องหมาย ✔ ในช่องตัวเลือก ในแต่ละข้อท่านสามารถเลือกคำตอบได้เพียงคำตอบเดียว

ที่	คำถาม	ถูก	ผิด	ไม่ทราบ	สำหรับผู้วิจัย
201	*ร่างกายสามารถสังเคราะห์วิตามินดี ได้จากแสงแดด*	1			
202	*การได้รับวิตามินดีจากแสงแดดวันละ 15 นาที ทำให้ร่างกายแข็งแรง*	1			
203	*ร่างกายไม่สามารถสังเคราะห์วิตามินดีได้จากอาหาร*		1		
204	*ความเครียดจากการทำงานส่งผลต่อสุขภาพร่ายกายโดยรวม*	1			
205	*ความเครียดจากการทำงานไม่ส่งผลต่อระบบการเผาผลาญพลังงานและไขมัน*		1		
206	*ความเครียดเป็นปัจจัยเกี่ยวข้องกับการเกิดโรคไม่ติดต่อ เช่น ความดัน เบาหวาน โรคหัวใจและหลอดเลือด และโรคอ้วน เป็นต้น*	1			
207	*ความเครียดลดลงได้จากการทำสมาธิ ร้องเพลง หรือพูดคุยกับคนในครอบครัวและคนรอบข้าว*	1			
208	*การนอนอย่างน้อย 7 ชั่วโมงส่งผลดีต่อระบบการเผาผลาญพลังงานและไขมัน*	1			

ที่	คำถาม	ถูก	ผิด	ไม่ทราบ	สำหรับผู้วิจัย
209	คนนอนน้อยกว่า 7 ชั่วโมงมีโอกาสผอมกว่าคนนอน 7 ชั่วโมง		1		
210	ร่ายกายต้องการการดื่มน้ำสะอาดอย่างน้อยวันละ 8 แก้ว	1			
211	การดื่มน้ำก่อนอาหารทำให้น้ำหนักตัวจะน้อยกว่าคนที่ไม่ดื่ม	1			
212	การออกกำลังกายทุกวันช่วยให้รูปร่างดีขึ้น	1			
213	การออกกำลังกายต้องเลือกประเภทของการออกกำลังกายอย่างใดอย่างหนึ่ง ต่อไปนี้ การกระตุ้นจังหวะการเต้นของหัวใจ หรือ การยืดหยุ่นร่างกาย หรือ การเสริมสร้างกล้ามเนื้อ		1		
214	ผู้ที่ต้องการปรับปรุงรูปร่างและปริมาณไขมันในเส้นเลือดต้องควบคุมอาหารด้วยการคำนวณแคลอรีและคอเลสเตอรอล	1			
215	สุกี้น้ำหมูมีคอเลสเตอรอลสูงกว่าต้มยำกุ้งน้ำใส		1		
216	แซนวิชทูน่ามีคอเลสเตอรอลสูงใกล้เคียงกับโจ๊กไก่ใส่ไข่แต่แคลอรีน้อยกว่า	1			
217	ผลไม้เป็นอาหารที่ไม่มีคอเลสเตอรอล	1			
218	ผัดซีอิ้วหมูเส้นใหญ่มีแคลอรีและคอเลสเตอรอลสูงกว่าข้าวกะเพราหมูไข่ดาวมาก		1		
219	ชานมไข่มุก มีแคลอรีน้อยกว่าเบียร์	1			

ส่วนที่ ***2*** *ทัศนคติ*

คำอธิบาย ***:*** *โปรดทำเครื่องหมาย* ✔ **ในช่องตัวเลือก ในแต่ละข้อท่านสามารถเลือกคำตอบได้เพียงคำตอบเดียว**

ที่	*คำถาม*	*ไม่เห็นด้วยอย่างยิ่ง*	*ไม่เห็นด้วย*	*เฉย ๆ*	*เห็นด้วย*	*เห็นด้วยอย่างยิ่ง*	*สำหรับผู้วิจัย*
301	ไม่จำเป็นต้องรับวิตามินดีจากแสงแดด สามารถทานอาหารทดแทนได้	5					

ที่	คำถาม	ไม่เห็นด้วยอย่างยิ่ง	ไม่เห็นด้วย	เฉย ๆ	เห็นด้วย	เห็นด้วยอย่างยิ่ง	สำหรับผู้วิจัย
302	การรับวิตามินดีจากแสงแดดไม่คุ้มค่าต่อความเสี่ยงในการเป็นฝ้า ผิวคล้ำ หรือมะเร็งผิวหนัง	5					
303	ความเครียดจากการทำงานเป็นเรื่องปกติ ไม่มีทางแก้ไข	5					
304	การทำกิจกรรมสันทนาการช่วยให้ลืมความเครียดจากการทำงาน					5	
305	การรับประทานของหวานทำให้หายเครียดจากการทำงาน	5					
306	นอนสั้น ๆ แต่บ่อย ๆ รวมแล้วไม่น้อยกว่า 7 ชั่วโมง เป็นการนอนหลับที่เพียงพอ	5					
307	การนอนหลับลึกไม่จำเป็นต้องนอนถึง 7 ชั่วโมงก็ส่งผลดีต่อสุขภาพ	5					
308	การดื่มน้ำน้อยทำให้ร่างกายดูผอมน้ำหนักเบา	5					
309	การดื่มน้ำก่อนอาหารทำให้ร่างกายอิ่มเร็วขึ้น รับประทานอาหารได้น้อยลง					5	
310	คนผอมไม่จำเป็นต้องออกกำลังกาย	5					
311	การออกกำลังกายเป็นเหมือนยาป้องกันและรักษาโรค					5	
312	แม้ร่างกายจะแข็งแรงดีก็ควรเลือกรับประทานอาหารโดยคำนึงถึงแคลอรีและคอเลสเตอรอล					5	
313	อาหารเพื่อสุขภาพมีราคาแพง						
314	การดื่มแอลกอฮอล์เล็กน้อยไม่ส่งผลต่อสุขภาพไขมัน และรูปร่าง						

ที่	คำถาม	ไม่เห็นด้วยอย่างยิ่ง	ไม่เห็นด้วย	เฉย ๆ	เห็นด้วย	เห็นด้วยอย่างยิ่ง	สำหรับผู้วิจัย
315	การลดน้ำหนักไม่ใช่การอดอาหาร แต่เป็นการควบคุมอาหาร					5	
316	ในผู้ที่เป็นโรคไขมันในหลอดเลือด ไม่ควรเคร่งเครียดกับการรับประทานอาหารมากเกินไป	5					

ส่วนที่ 3 พฤติกรรม

คำอธิบาย: โปรดทำเครื่องหมาย ✓ ในช่องตัวเลือก ในแต่ละข้อท่านสามารถเลือกคำตอบได้เพียงคำตอบเดียว

ที่	คำถาม	บางครั้ง	สม่ำเสมอ	ไม่เคย	สำหรับผู้วิจัย
401	รับวิตามินดีจากแสงแดดเพื่อสุขภาพ		3		
402	ใช้ร่ม หรือเสื้อคลุมเมื่อเจอแสงแดด			3	
403	ทำกิจกรรมลดความเครียดจากการทำงาน อาทิ นั่งสมาธิ ทำบุญ เล่นเกม พูดคุยกับคนรอบข้าง ฟังเพลง ดูละคร		3		
404	เก็บตัวเงียบ สะสมความเครียดจากการทำงาน			3	
405	กินของหวาน/ขนมลดความเครียดจากการทำงาน			3	
406	นอนครบ 7 ชั่วโมงต่อเนื่อง		3		
407	นอนหลับสนิท		3		
408	นอนไม่หลับ			3	
409	ดื่มน้ำอย่างน้อยวันละ 8 แก้ว		3		
410	ดื่มน้ำหวาน น้ำอัดลม ชา กาแฟใส่น้ำตาล			3	
411	ดื่มแอลกอฮอล์			3	
412	ออกกำลังกายเพื่อสุขภาพ		3		
413	ออกกำลังกายครบทั้ง 3 ประเภท ได้แก่ การกระตุ้นจังหวะการเต้นของหัวใจ หรือ การยืดหยุ่นร่างกาย หรือ การเสริมสร้างกล้ามเนื้อ		3		
414	คำนวณแคลอรีและคอเลสเตอรอลในอาหาร		3		

415	*เลือกรับประทานอาหารที่มีแคลอรีและคอเลสเตอรอลต่ำ*		3		
416	*ทานอาหารคืก*			3	
417	*ทานอาหารที่มีรสหวาน ไขมันสูง*			3	
418	*ทานขนมระหว่างมื้ออาหาร*			3	
419	*ทานอาหารเสริมลดน้ำหนัก*			3	
420	*อดอาหารลดน้ำหนัก*			3	

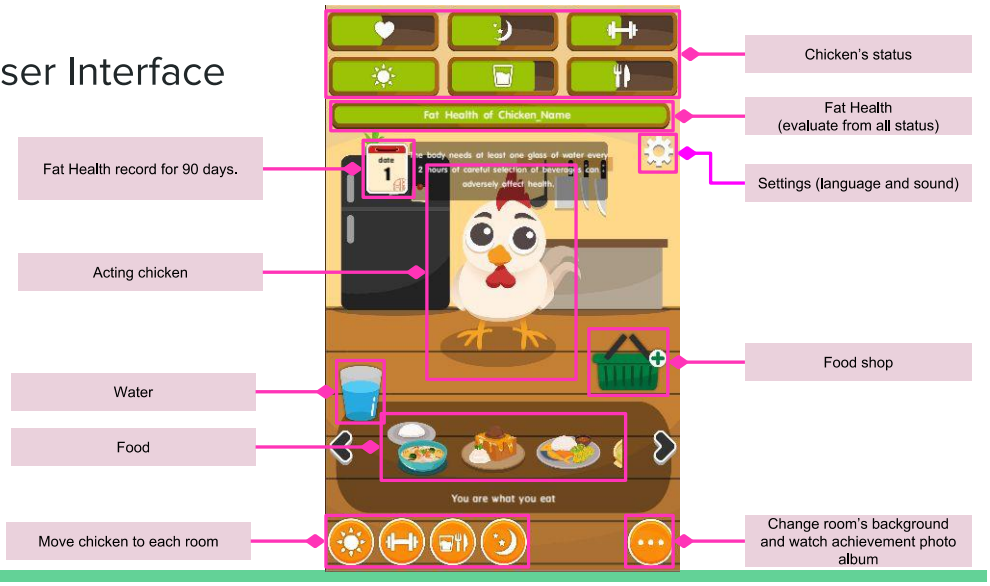
APPENDIX B

CHICKEN LOF Manual

Chicken LOF Game

How to play Chicken LOF Game

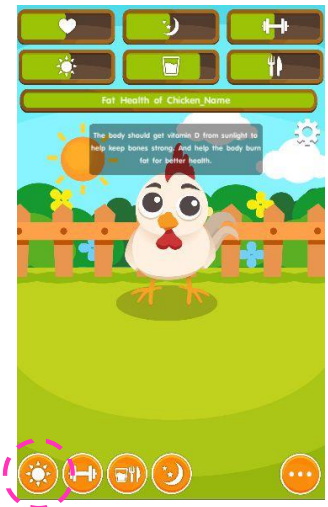
User Interface



Chicken’s status

There are 6 statuses to be evaluated as Fat Health. Each status decreases continuously until the player gives Digital Vitamin to the chicken.

A. A walk to the sun : increase while sunbathing in the garden.
B. Be happy : increase when the player touches the chicken.
C. Calm and sleep : increase while sleeping.
D. Drink more water : increase when chicken drinks water. (including beverage from the shop)
E. Exercise daily : increase while exercising.
F. Food control : increase when the chicken eats any food.



Sunbathing in the garden

Drag a glass to chicken to give him some water

Drag any food to the chicken to feed him

Drag available food to the basket to buy it from the shop (which sells different kinds of food everyday). The player will see food information when he taps on a dish. And, the player can buy only 1dish per type of food per day.

Amount of Calories and Cholesterol have 5 levels : highest - lowest.
Calories make chicken full but Cholesterol affects Fat Health (high cholesterol is bad for chicken's health.)

Eat enough food to avoid starving. The player will be notified if the chicken eats too much

Turn off the lamp to go to sleep

Touching the chicken make him happy

Drag any instrument to the chicken to start exercising. He will exercise continuously until you tap STOP or change to another room. While exercising, the information will show below.

Meaning of color

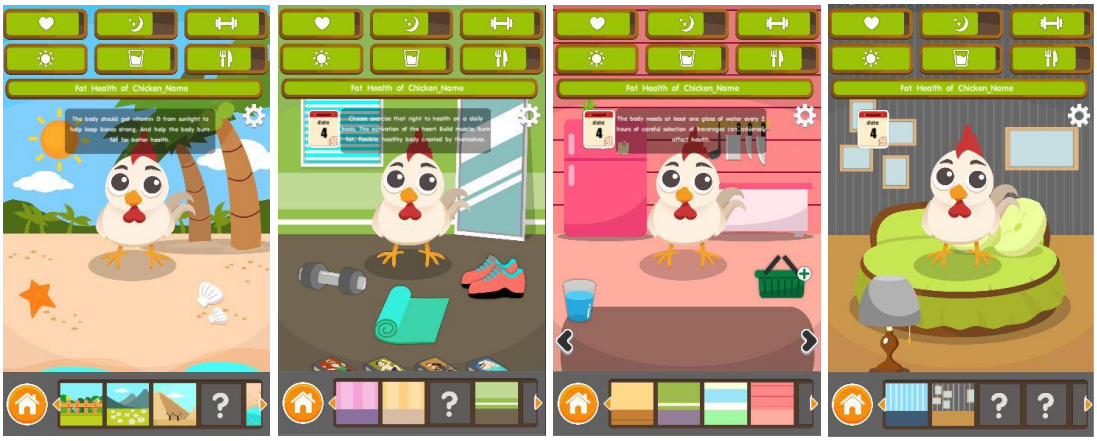
Very good Fat Health

Good Fat Health

Bad Fat Health

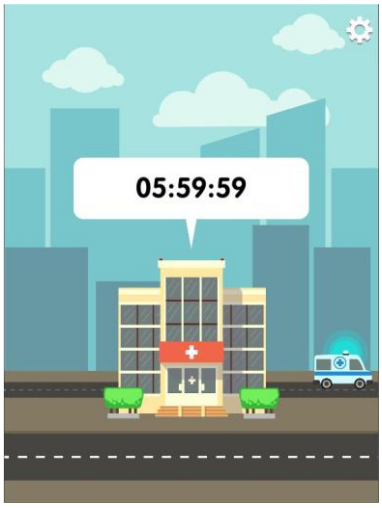
Not complete day

Calendar will show your Fat Health record in 90 days. Color of each day depend on Fat Health.



If the chicken is kept healthy, new background will be unlocked.

In addition, you can see the photo album as achievement.



If the player doesn't take a good care of the chicken, he will be sick and go to hospital. After that, all of the chicken's statuses will be reset.

How to calculate Chicken's Fat Health

Fat Health calculate from Chicken's status that contain

1. Happy
2. Sunlight
3. Sleep
4. Water
5. Exercise
6. Food

Status 1 - 5 depend on real time but status 6 depends on high fat or high cholesterol food.

Max Fat Health = 60 points that will be increased or decreased from summation of all status. If Fat Health below than 12 points, means Chicken's health is very bad. If it's bad around 12 hrs, he will sick and will be sent to the hospital.

How to calculate Chicken's status

1.Max happy = 60 points

Increase	Increase 5 points/times when touch Chicken
Decrease	Decrease 40 points/day or 0.000463 points/sec

% of Happy level effect to Fat Health level

Happy 0% - 20%	Fat Health decrease 0.2 points/sec
Happy 20% - 40%	Fat Health decrease 0.1 points/sec
Happy 40% - 100%	Fat Health increase 0.1 points/sec

How to calculate Chicken's status

2. Max sunlight = 60 points

Increase	Increase 1 point/sec when sunbath on a garden
Decrease	Decrease 40 points/day or 0.000463 points/sec

% of Sunli effect to Fat Health level

Sunlight 0% - 20%	Fat Health decrease 0.2 points/sec
Sunlight 20% - 40%	Fat Health decrease 0.1 points/sec
Sunlight 40% - 100%	Fat Health increase 0.1 points/sec

How to calculate Chicken's status

3. Max sleep = 60 points

Increase	Increase 60 points / 6 hours or 0.0028 points / sec when sleep on bed
Decrease	Decrease 60 points / 14 hours or 0.00119 points / sec

% of Sleep level effect to Fat Health level

Sleep 0% - 20%	Fat Health decrease 0.2 points / sec
Sleep 20% - 40%	Fat Health decrease 0.1 points / sec
Sleep 40% - 100%	Fat Health increase 0.1 points / sec

How to calculate Chicken's status

4. Max water = 60 points

Increase	Increase 20 points/glass when drink water
Decrease	Decrease 160 points/day or 0.00185 points/sec

% of Water level effect to Fat Health level

Water 0% - 20%	Decrease Fat Health 0.2 points / sec
Water 20% - 40%	Decrease Fat Health 0.1 points / sec
Water 40% - 100%	Increase Fat Health 0.1 points / sec

Note
- System calculate from drinking water 8 glasses/day
- If water > 50 points, Chicken will ignore drinking

How to calculate Chicken's status

5. Max exercise = 60 points

Increase	Increase 6 points / 10 sec or 0.6 points / sec when exercise
Decrease	Decrease 160 points / day or 0.000463 points / sec

% of Exercise level effect to Fat Health level

Exercise 0% - 20%	Decrease Fat Health 0.2 points / sec
Exercise 20% - 40%	Decrease Fat Health 0.1 points / sec
Exercise 40% - 100%	Increase Fat Health 0.1 points / sec

Note
If Exercise level > 50 points, Chicken will ignore exercising because too much exercise can be harmful to health.

How to calculate Chicken's status

6. Food

Increase	When you feed the Chicken and it will depends on amount of food.
Decrease	1. Day time: Increase 10 points / hours or 0.00278 points / sec 2. Night time (8:00 p.m. till 4:00 a.m.), Food level will not decrease

% of Food level effect to Fat Health level

1. If Food level > 60 points, it will decrease Fat Health level because of overeating.
2. All food has different Cholesterol levels. (Too high or too low will cause Fat Health level to decrease)
3. When Food level < 12 points, Chicken will get hungry status. If he's hungry more than 12 hours, he will be sick and go to hospital.

Food Table

Food's cholesterol levels and calories

Cholesterol levels

Required cholesterol per day is 300 mg, which is 100 mg per meal.	
0 - 25	Too low
26 - 50	Low
51 - 100	Average
101 - 200	High
More than 201	Too high

Calories

Required calories per day is 1200 kcal, which is 400 kcal per meal.	
0 - 100	Too low
101 - 200	Low
201 - 400	Average
401 - 600	High
More than 601	Too high

Tom Yum Goong with rice

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Shrimp	20 g	35
Squid	20 g	76.8
		111.8

Cholesterol = High

Calories Table

Food	Quantity	Calories (kcal)
Tom Yum Goong	1 bowl	65
Rice	2 scoops	138
		203

Calories = Average

Chicken rice

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Chicken drumstick	50 g	50
Chicken meat	50 g	30
Chicken skin	10 g	9.3
		89.3

Cholesterol = Average

Calories Table

Food	Quantity	Calories (kcal)
Chicken rice	1 dish	596
		596

Calories = High

Fried chicken rice

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Chicken drumstick	50 g	50
Chicken meat	50 g	30
Chicken skin	10 g	9.3
		89.3

Cholesterol = Average

Calories Table

Food	Quantity	Calories (kcal)
Fried chicken rice	1 dish	693
		693

Calories = Highest

Fried noodle with pork

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Pork	30 g	26.7
Egg	10.7 g	214
		240.7

Cholesterol = Highest

Calories Table

Food	Quantity	Calories (kcal)
Fried noodle with pork	1 dish	679
		679

Calories = Highest

Pepperoni Pizza

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Mozzarella cheese	100 g	54
Pepperoni	100 g	105
Egg	10.7 g	214
Butter	20 g	20
		393 (98.25 each)
		196.5

Cholesterol = High

Calories Table

Food	Quantity	Calories (kcal)
Pepperoni Pizza	2 pieces	679
		679

Calories = Highest

Beef burger set

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Butter	10 g	10
Beef	100 g	60
Cheddar cheese	20 g	21
		91

Cholesterol = Average

Calories Table

Food	Quantity	Calories (kcal)
Beef burger	1 piece (113g)	290
French fries	Medium size (111g)	340
Coke	Medium size (495 ml)	220
	Mc donald	850

Calories = Highest

Fried chicken set

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Spicy chicken drumstick	1 piece	60
Spicy chicken meat	1 piece	80
	KFC	140

Cholesterol = High

Calories Table

Food	Quantity	Calories (kcal)
Spicy chicken meat	1 piece	340
Spicy chicken drumstick	1 piece	170
French fries	Medium size (111g)	340
Coke	Medium size (495 ml)	220
	Mc donald and KFC	1070

Calories = Highest

Pork steak set

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Butter	20 g	20
Pork ribs	200 g	98
Salad cream	20 g	40
		158

Cholesterol = High

Calories Table

Food	Quantity	Calories (kcal)
Pork steak and Salad	1 dish	505
Spicy chicken drumstick	1 piece (100g)	93
		598

Calories = High

Crispy pork rice

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Pork(with fat)	100 g	126
Egg	5.35 g	107
		233

Cholesterol = Highest

Calories Table

Food	Quantity	Calories (kcal)
Crispy pork	1 dish	560
Rice	2 scoops	138
Boiled egg	5.35 g	36.5
		734.5

Calories = Highest

Grilled pork with sticky rice

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Pork	150 g	189
		189

Cholesterol = High

Calories Table

Food	Quantity	Calories (kcal)
Grilled pork	2 sticks	250
Sticky rice	1 scoop	160
		410

Calories = Highest

Instant noodles

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
-	-	-
		-

Cholesterol = Lowest

Calories Table

Food	Quantity	Calories (kcal)
Instant noodles (Thai)	1 package(big)	250
Instant noodles (Korean)	1 package	160
		410

Calories = High

Omelette rice

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Egg	21.4 g	428
		428

Cholesterol = Highest

Calories Table

Food	Quantity	Calories (kcal)
Omelette rice (2 eggs)	1 dish	445
		445

Calories = High

Spicy fried pork with basil leaves and fried egg

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Minced pork	100 g	100
Egg	10.7 g	214
		314

Cholesterol = Highest

Calories Table

Food	Quantity	Calories (kcal)
Spicy fried pork with basil leaves	1 dish	580
Fried egg	1 egg	215
		795

Calories = Highest

Green Curry Chicken with Rice Noodles

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Chicken	100 g	60
		60

Cholesterol = Average

Calories Table

Food	Quantity	Calories (kcal)
Green Curry Chicken with Rice Noodles	1 dish	594
		594

Calories = High

Chinese Steamed Dumpling

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Pork	100 g	89
		89

Cholesterol = Average

Calories Table

Food	Quantity	Calories (kcal)
Chinese Steamed Dumpling	8 pieces	256
		256

Calories = Average

Honey toast

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Ice-cream	100 g	40
		40

Cholesterol = Low

Calories Table

Food	Quantity	Calories (kcal)
Honey toast	1 dish	1,300
		1,300

Calories = Highest

Vegetable gourd soup with minced pork and tofu (with rice)

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Minced pork	50 g	50
		50

Cholesterol = Low

Calories Table

Food	Quantity	Calories (kcal)
Vegetable gourd soup with minced pork	1 bowl	90
Egg tofu	0.5 pack	35
Rice	2 scoops	138
		263

Calories = Average

Bingsu

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Fresh Milk	400 g	96
Sweetened Condensed Milk	385 g	23.1
Ice-cream	100 g	40
		159.1

Cholesterol = High

Calories Table

Food	Quantity	Calories (kcal)
Bingsu	1 bowl	750
		750

Calories = Highest

Pork clear noodle soup

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Minced pork	20 g	20
		20

Cholesterol = Lowest

Calories Table

Food	Quantity	Calories (kcal)
Pork clear noodle soup	1 bowl	192
		192

Calories = Low

Thicken noodle Soup

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Minced pork	20 g	20
Pork liver	20 g	80
Pork intestine	10 g	14
		114

Cholesterol = High

Calories Table

Food	Quantity	Calories (kcal)
Thicken noodle Soup	1 bowl	180
		180

Calories = Low

Sukiyaki

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Ground pork	50 g	40
		40

Cholesterol = Low

Calories Table

Food	Quantity	Calories (kcal)
Sukiyaki (without glass noodle)	1 bowl	200
Glass noodle (raw)	40 g	150
		350

Calories = Average

Scipy vermicelli salad

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Ground pork	20 g	20
		20

Cholesterol = Lowest

Calories Table

Food	Quantity	Calories (kcal)
Scipy vermicelli salad	1 dish	120
		120

Calories = Low

Fresh spring roll

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Ground pork	20 g	20
		20

Cholesterol = Lowest

Calories Table

Food	Quantity	Calories (kcal)
Fresh spring roll	1 dish	118
		118

Calories = Low

Papaya salad

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
-	-	-
		-

Cholesterol = Lowest

Calories Table

Food	Quantity	Calories (kcal)
Papaya salad (no peanut)	1 dish	55
		55

Calories = Lowest

Tuna salad

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Tuna	125 g	232.5
		232.5

Cholesterol = Highest

Calories Table

Food	Quantity	Calories (kcal)
Tuna salad	1 dish	142
		142

Calories = Low

Tuna sandwich

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Tuna	125 g	232.5
		232.5

Cholesterol = Highest

Calories Table

Food	Quantity	Calories (kcal)
Sandwich	1 pair	180
		180

Calories = Low

Fried Mackerel With Shrimp Paste Sauce

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Mackerel	300 g	228
		228

Cholesterol = Highest

Calories Table

Food	Quantity	Calories (kcal)
Shrimp Paste Sauce	2 Tablespoons	56
Mackerel	1 (medium size)	280
Rice	2 scoops	138
		474

Calories = High

Chicken porridge with egg

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Chicken	50 g	30
Egg	10.7 g	214
		244

Cholesterol = Highest

Calories Table

Food	Quantity	Calories (kcal)
Chicken porridge with egg	1 bowl	250
		250

Calories = Average

Tomato juice

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
-	-	-
		-

Cholesterol = Lowest

Calories Table

Food	Quantity	Calories (kcal)
Tomato juice	1 glass	48
		48

Calories = Lowest

Mixed fruit

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
-	-	-
		-

Cholesterol = Lowest

Calories Table

Food	Quantity	Calories (kcal)
Kiwi	100 g	61
Blueberry	50 g	28.4
Apple	1	95
		184.4

Calories = Low

Thai barbecue

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Pork	300 g	267
Shimp	60 g	105
		372

Cholesterol = Highest

Calories Table

Food	Quantity	Calories (kcal)
Pork	200 g	594
Shimp	60 g	55
		649

Calories = Highest

Cold crepe

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Ice cream	66 g	29
Whip cream	100 g	300
		329

Cholesterol = Highest

Calories Table

Food	Quantity	Calories (kcal)
Cold crepe	1	200
Ice cream	1 scoop	300
		500

Calories = High

Iced pink milk

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Evaporated milk	100 g	19
		19

Cholesterol = Lowest

Calories Table

Food	Quantity	Calories (kcal)
Iced pink milk	1 glass	425
		425

Calories = High

Soft drink

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Soft drink	495 g	0
		0

Cholesterol = Lowest

Calories Table

Food	Quantity	Calories (kcal)
Soft drink	Medium (495 ml)	220
		220

Calories = Average

Bubble milk tea

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Sweetened Condensed Milk	30 g	2
Fresh milk	60 g	14
		16

Cholesterol = Lowest

Calories Table

Food	Quantity	Calories (kcal)
Bubble milk tea	1 glass	300
		300

Calories = Average

Beer

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Beer	300 g	0
		0

Cholesterol = Lowest

Calories Table

Food	Quantity	Calories (kcal)
Beer	300 ml	129
		129

Calories = Low

Whiskey

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Whiskey	300 g	0
		0

Cholesterol = Lowest

Calories Table

Food	Quantity	Calories (kcal)
Whiskey	300 ml	750
		750

Calories = Highest

Black coffee no sugar

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Coffee	20 g	0
		0

Cholesterol = Lowest

Calories Table

Food	Quantity	Calories (kcal)
Black coffee no sugar	1 glass	7
		7

Calories = Lowest

Black tea no sugar

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Tea	10 g	0
		0

Cholesterol = Lowest

Calories Table

Food	Quantity	Calories (kcal)
Black tea no sugar	1 glass	5
		5

Calories = Lowest

Black coffee

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Coffee	20 g	0
Sugar	10 g	0
		0

Cholesterol = Lowest

Calories Table

Food	Quantity	Calories (kcal)
Coffee	1 glass	45
		45

Calories = Lowest

Black tea

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Tea	10 g	0
Sugar	10 g	0
		0

Cholesterol = Lowest

Calories Table

Food	Quantity	Calories (kcal)
Black tea	1 glass	43
		43

Calories = Lowest

Iced latte

Cholesterol Table

Ingredient	Weight	Cholesterol (mg)
Coffee	20 g	0
Fresh milk	100 g	24
		24

Cholesterol = Lowest

Calories Table

Food	Quantity	Calories (kcal)
Iced latte	1 glass	230
		230

Calories = Average

In case, player closed the game.

- If the player doesn’t take a good care of the chicken during the game close, when the game is open the chicken will be sick and go to hospital. It will takes 6 hours in real-time to finish the treatment, which is start counting the time from the last opened.

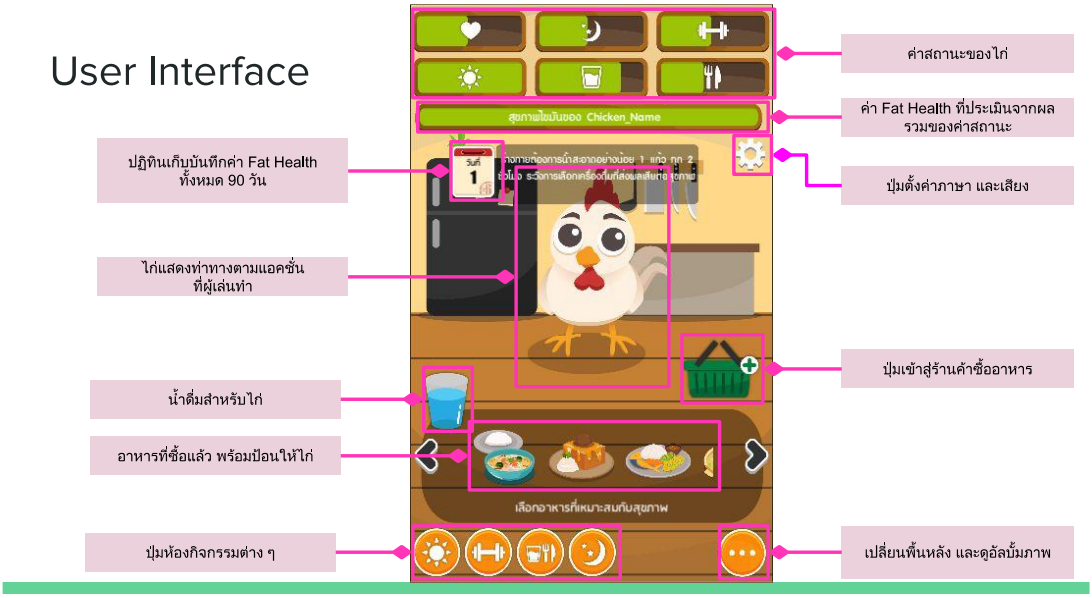
- After that, all of the chicken’s statuses will be reset.

CHICKEN LOF Manual in Thai Language

เกม Chicken LOF

คู่มือแนะนำวิธีการเล่น ฉบับเบื้องต้น

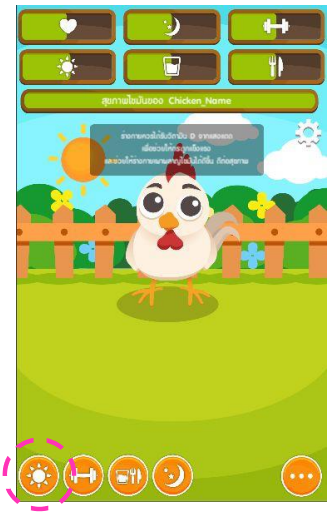
User Interface



ค่าสถานะ

มีทั้งหมด 6 สถานะ ซึ่งทุกสถานะ จะนำมาประมวลผลเป็นค่า Fat Health แต่ละสถานะนั้น จะลดลงตามเวลา และเพิ่มด้วยเงื่อนไขต่าง ๆ ประกอบด้วย Digital Vitamin ทั้งหมด 6 สิ่ง

A. A walk to the sun : เพิ่มขึ้นก็ต่อเมื่อไก่ได้รับแสงอาทิตย์ในสวนหลังบ้าน
B. Be happy : เพิ่มขึ้นก็ต่อเมื่อผู้เล่น เล่นกับไก่ โดยการแตะตัวไก่
C. Calm and sleep : เพิ่มขึ้นก็ต่อเมื่อไก่ได้นอนหลับพักผ่อน
D. Drink more water : ไก่ต้องได้รับน้ำอย่างเพียงพอ โดยการดื่มน้ำ
E. Exercise daily : เพิ่มขึ้นก็ต่อเมื่อไก่ออกกำลังกายด้วยอุปกรณ์ใด ๆ
F. Food control : เพิ่มขึ้นก็ต่อเมื่อไก่ได้รับอาหาร

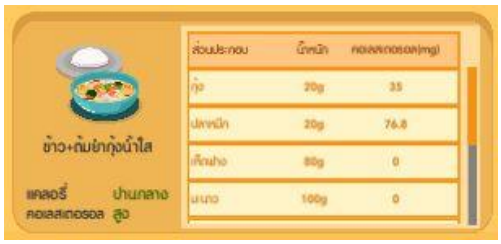


สวนหลังบ้าน : อาบแดดเพิ่มวิตามิน D

ดมืนจ้ให้เพยีงพอ โดยการแตะลากแก้วนจ้ไปยงัตวัไก่

ห้องครวั : ให้อาหารโดยการลากอาหารไปยงัตวัไก่

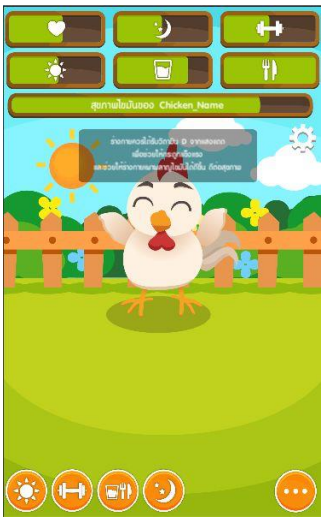
เลอีกซอีอาหารจากร้านค้า โดยแต่ละวนัจะส่มุเมนขูายอาหารไม่เหมอืนกนั ผู้เล่นเลอีกซอีได้ประเภทละ 1จาน/วนั และนอกจากนยีงัสามารถดข้อมลูโภชนาการของอาหารได้ตลอดเวลาอกีด้วย



Calories และ Cholesterol จะแบ่งเกณฑ์ เป็น 5 ระดบั ตงั้แต่ ตจ่ำสดุ-สงูสดุ Calories จะส่งผลต่อความอมิของไก่ Cholesterol จะส่งผลต่อ Fat Health ถ้ามี Cholesterol สงู จะส่งผลลบต่อค่า Fat Health

ทานอาหารให้ได้รับปริมาณที่พอดีพอต่อความต้องการ ถ้ามากเกินไปจะมีข้อความแจ้งเตือน

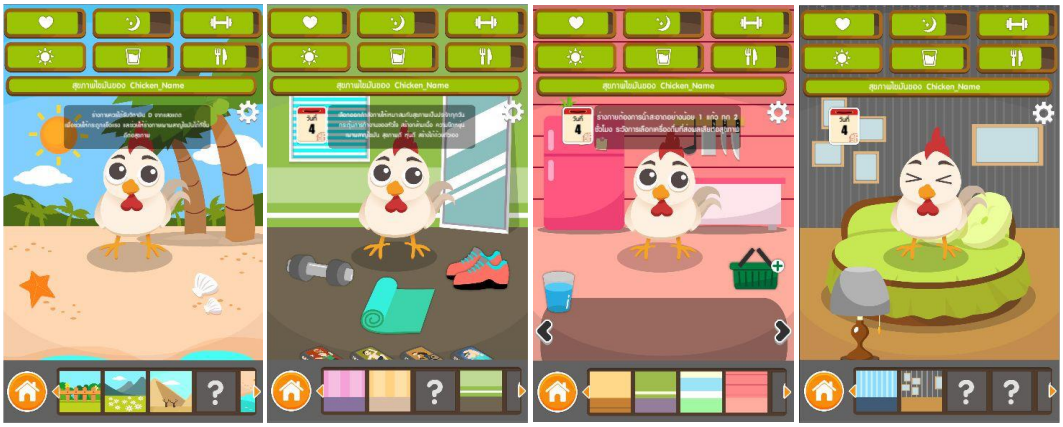
ห้องนอน : กดเปิดโคมไฟ เพื่อเข้านอน



เล่นกบัไก่ โดยการแตะทตีวัไก่ เสมอืนการลบูตวัไก่ เพอืให้มคีวามสขุ สนกุสนาน

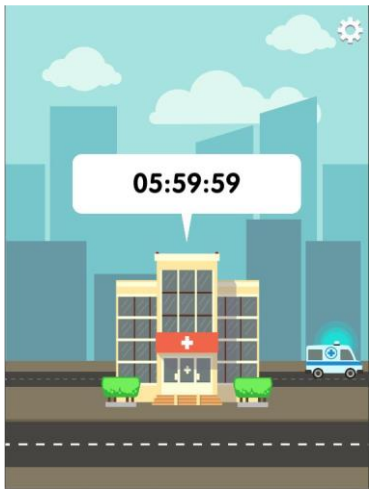
ห้องออกกาลงักาย : เลอืกลากอปุกรณ์ใด ๆ ไปยงัตวัไก่ ไก่จะหาท่าทางออกกาลงักายไปเรอืย ๆ จนกว่าผู้เล่นจะกดหยดุ หรอืเปลยีนไปห้องอนื ระหว่างออกกาลงักายจะมขีอความให้ความรู้สรมิไปด้วย

หน้าปฏิทินจะมีการเก็บบันทึกทั้งหมด 90 วัน โดยสามารถดูสถานะของ Fat Health ได้จากสีของแต่ละวัน



เมื่อบรรลุเงื่อนไข Achievement ผู้เล่นจะได้รับพื้นหลังห้องอันใหม่

และนอกจากนี้ยังมีสับม้เกบ็สะสมภาพพเศิษอกีด้วย



หากไก่ไม่ได้รับการดูแลสขุภาพไขมน้อย่างสมำ่เสมอ ไก่จะป่วย และถ้าหากละเลย ปล่อยให้ไก่ป่วยเป็นระยะเวลานาน ไก่จะถูกส่งไปยงัโรงพยาบาลอตัโนมตัิเพอืรับการรกัษาเป็นเวลา 6 ชจั่โมง

การคำนวนสุขภาพไก่ (Fat Health)

ประกอบไปด้วย Status ต่างๆดังนี้

1. Happy
2. Sun Light
3. Sleep
4. Water
5. Exercise
6. Food

ค่า status ข้อ 1-5 จะมีผลขึ้นลงตลอดเวลาโดยนับเป็นต่อวินาทีตามเวลาจริง
ค่า status ข้อ 6 Food จะมีผลทันทีต่อการเลือกทานอาหารมาก,น้อย หรือเลือกอาหารประเภทที่มีไขมันสูง

โดยค่า Fat Health มีค่าเต็มที่ 60 หน่วย เพิ่ม-ลด ตามผลรวม Effect จาก status อื่นๆ ทุกๆ status
ถ้าสุขภาพไขมันอยู่ในระดับที่ต่ำกว่า 12 จะเข้าสู่สถานะสุขภาพไขมันแย่ ถ้าไก่อยู่ในสถานะนี้ครบ 12 ชั่วโมง ไก่จะป่วยจนต้องเข้าโรงพยาบาล

วิธีคำนวนค่า status

1.Happy ค่าเต็ม 60 หน่วย

Increase	แตะที่ตัวละคร เพิ่มครั้งละ 5 หน่วย/แตะ
Decrease	ค่อยๆลดลงที่ 40 หน่วย/วัน หรือ 0.000463/วินาที

Effect to Fat Health : วัดเกณฑ์การเพิ่ม Fat Health จาก%ของสถานะ อยู่ในช่วง

0%-20% Fat Health	ลด 0.2 ต่อวินาที
20%-40% Fat Health	ลด 0.1/วินาที
40%-100% Fat Health	เพิ่ม 0.1/วินาที

วิธีคำนวนค่า status

2. Sun Light ค่าเต็ม 60 หน่วย

Increase	หากอยู่ในสถานะตากแดด(อยู่ในห้องตากแดดดในเวลาที่มีพระอาทิตย์) เพิ่มค่า Sun ในอัตรา 1/วินาที
Decrease	ค่อยๆลดลงที่ 40 หน่วย/วัน หรือ 0.000463/วินาที

Effect to Fat Health : วัดเกณฑ์การเพิ่ม Fat Health จาก%ของสถานะ อยู่ในช่วง

0%-20% Fat Health	ลด 0.2 ต่อวินาที
20%-40% Fat Health	ลด 0.1/วินาที
40%-100% Fat Health	เพิ่ม 0.1/วินาที

วิธีคำนวนค่า status

3. Sleep ค่าเต็ม 60 หน่วย

Increase	จะเพิ่ม 60หน่วย/6ชั่วโมง หรือ 0.0028หน่วย/วินาที
Decrease	จะลด 60หน่วย/14ชั่วโมง หรือ 0.00119หน่วย/วินาที

Effect to Fat Health : วัดเกณฑ์การเพิ่ม Fat Health จาก%ของสถานะ อยู่ในช่วง

0%-20% Fat Health	ลด 0.2 ต่อวินาที
20%-40% Fat Health	ลด 0.1/วินาที
40%-100% Fat Health	เพิ่ม 0.1/วินาที

วิธีการคำนวณค่า Status

4. Water ค่าเต็ม 60 หน่วย

เพิ่มขึ้น	ไก่ดื่มน้ำ เพิ่มค่า 20 หน่วย / แก้ว
ลดลง	ค่อย ๆ ลดลงอัตรา 160 หน่วย / วัน หรือ 0.00185 หน่วย / วินาที

ระดับค่า % Water จะส่งผลต่อการเพิ่มหรือลดของค่า Fat Health ดังนี้

Water 0% - 20%	Fat Health ลด 0.2 หน่วย / วินาที
Water 20% - 40%	Fat Health ลด 0.1 หน่วย / วินาที
Water 40% - 100%	Fat Health เพิ่ม 0.1 หน่วย / วินาที

หมายเหตุ
- ระบบคำนวณการดื่มน้ำ 8 แก้วต่อวัน
- หากค่า Water มากกว่า 50 หน่วย ไก่จะปฏิเสธน้ำดื่ม

วิธีการคำนวณค่า Status

5. Exercise ค่าเต็ม 60 หน่วย

เพิ่มขึ้น	ขณะออกกำลังกาย เพิ่มอัตรา 6 หน่วย / 10 วินาที หรือ 0.6 หน่วย / วินาที
ลดลง	ค่อย ๆ ลดลงอัตรา 40 หน่วย / วัน หรือ 0.000463 หน่วย / วินาที

ระดับค่า % Exercise จะส่งผลต่อการเพิ่มหรือลดของค่า Fat Health ดังนี้

Exercise 0% - 20%	Fat Health ลด 0.2 หน่วย / วินาที
Exercise 20% - 40%	Fat Health ลด 0.1 หน่วย / วินาที
Exercise 40% - 100%	Fat Health เพิ่ม 0.1 หน่วย / วินาที

หมายเหตุ
หากค่า Exercise มากกว่า 50 หน่วย ไก่จะปฏิเสธการออกกำลังกาย เพราะการออกกำลังกายมากเกินไป จะส่งผลเสียต่อสุขภาพ

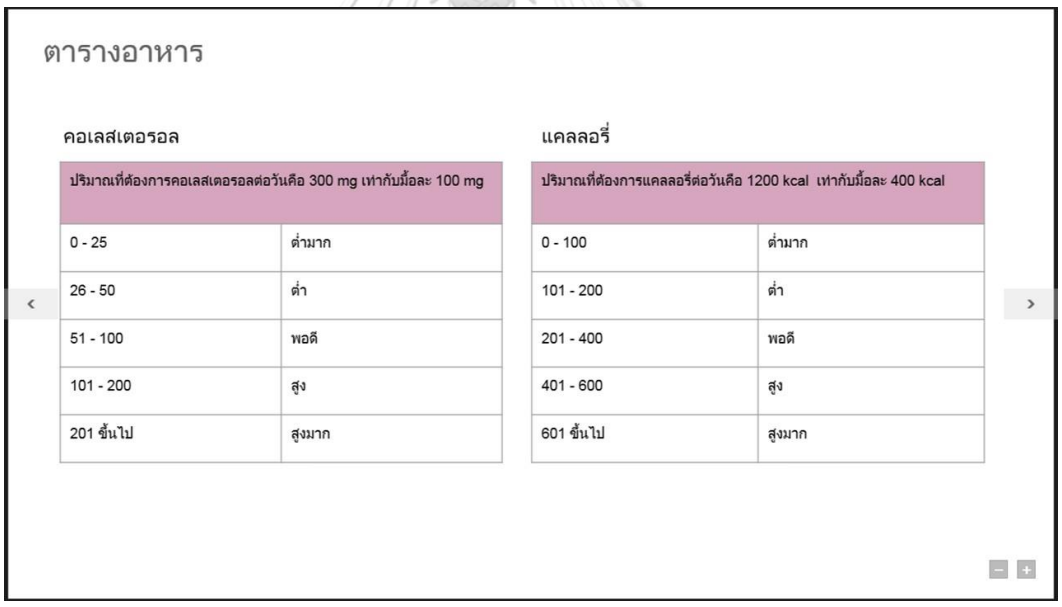
วิธีการคำนวณค่า Status

6. Food

เพิ่มขึ้น	เมื่อลากอาหารป้อนให้ไก่ โดยค่า Food เพิ่มมากน้อยตามอาหารที่กินเข้าไป
ลดลง	1.ลดลงระหว่างวัน อัตรา 10 หน่วย / ชั่วโมง หรือ 0.00278 หน่วย / วินาที 2.ช่วงเวลากลางคืน ตั้งแต่ 20:00 จนถึง 4:00 ค่า status food จะไม่ลดลง

ระดับค่า % Food จะส่งผลต่อการเพิ่มหรือลดของค่า Fat Health ดังนี้

1. ถ้ากินอาหารจนค่า Food เกิน 60 หน่วย จะทำให้ส่งผลลบต่อค่า Fat Health เพราะถือว่าเป็นการกินมากเกินความจำเป็น
2. อาหารมีค่า Cholesterol มากน้อยต่างกัน ถ้าน้อยหรือมากเกินไป จะทำให้ค่า Fat Health ลดลง
3. เมื่อค่า Food ต่ำกว่า 12 จะเข้าสู่สถานะหิวจัด ถ้าหิวจัด 12 ชั่วโมง ไก่จะป่วยจนเข้าโรงพยาบาล



ตารางอาหาร

คอเลสเตอรอล

ปริมาณที่ต้องการคอเลสเตอรอลต่อวันคือ 300 mg เท่ากับมื้อละ 100 mg	
0 - 25	ต่ำมาก
26 - 50	ต่ำ
51 - 100	พอดี
101 - 200	สูง
201 ขึ้นไป	สูงมาก

แคลลอรี่

ปริมาณที่ต้องการแคลลอรี่ต่อวันคือ 1200 kcal เท่ากับมื้อละ 400 kcal	
0 - 100	ต่ำมาก
101 - 200	ต่ำ
201 - 400	พอดี
401 - 600	สูง
601 ขึ้นไป	สูงมาก

ข้าว + ต้มยำกุ้ง

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
กุ้ง	20 g	35
ปลาหมึก	20 g	76.8
		111.8

ปริมาณคอเรสเตอรอล = สูง

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
ต้มยำกุ้งน้ำใส	1 ถ้วย	65
ข้าวสวย	2 ทัพพี	138
		203

ปริมาณแคลอรี่ = พอดี

ข้าวมันไก่ต้ม

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
น่องไก่	50 g	50
เนื้อไก่ล้วน	50 g	30
หนังไก่	10 g	9.3
		89.3

ปริมาณคอเรสเตอรอล = พอดี

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
ข้าวมันไก่ต้ม	1 จาน	596
		596

ปริมาณแคลอรี่ = สูง

ข้าวมันไก่ทอด

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
น่องไก่	50 g	50
เนื้อไก่ล้วน	50 g	30
หนังไก่	10 g	9.3
		89.3

ปริมาณคอเรสเตอรอล = พอดี

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
ข้าวมันไก่ทอด	1 จาน	693
		693

ปริมาณแคลอรี่ = สูงมาก

ข้าวมันผัดซีอิ๊วหมูเส้นใหญ่

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
หมูเนื้อแดง	30 g	26.7
ไข่ไก่	1 ฟอง	214
		240.7

ปริมาณคอเรสเตอรอล = สูงมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
ผัดซีอิ๊วหมูเส้นใหญ่	1 จาน	679
		679

ปริมาณแคลอรี่ = สูงมาก

พิซซ่าเปปเปอร์โรนี่

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
ชีสมอสเซอเรลลา	100 g	54
เปปเปอร์โรนี่	100 g	105
ไข่ไก่	1 ฟอง	214
เนย	20 g	20
		393 (ชิ้นละ 98.25)
		196.5

ปริมาณคอเรสเตอรอล = สูง

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
พิซซ่าเปปเปอร์โรนี่	2 ชิ้น	679
		679

ปริมาณแคลอรี่ = สูงมาก

ชุดเบอร์เกอร์เนื้อ, เฟรนช์ฟรายส์, น้ำอัดลม

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
เนย	10 g	10
เนื้อ	100 g	60
ชีสเชดดาร์	20 g	21
		91

ปริมาณคอเรสเตอรอล = พอดี

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
เบอร์เกอร์เนื้อ	1 ชิ้น (113g)	290
เฟรนช์ฟรายส์	กลาง (111g)	340
โค้ก	กลาง (495 ml)	220
	Mc donald	850

ปริมาณแคลอรี่ = สูงมาก

ไก่ทอด, เฟรนช์ฟรายส์, น้ำอัดลม

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
น่องไก่กรอบสไปซี่	1 ชิ้น	60
อกไก่กรอบสไปซี่	1 ชิ้น	80
	KFC	140

ปริมาณคอเรสเตอรอล = สูง

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
อกไก่กรอบสไปซี่	1 ชิ้น	340
น่องไก่กรอบสไปซี่	1 ชิ้น	170
เฟรนช์ฟรายส์	กลาง (111g)	340
โค้ก	กลาง (495 ml)	220
	Mc donald และ KFC	1070

ปริมาณแคลอรี่ = สูงมาก

สเต็กหมู, มันอบ, สลัด

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
เนย	20 g	20
หมูสันใน	200 g	98
น้ำสลัดครีม	20 g	40
		158

ปริมาณคอเรสเตอรอล = สูง

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
สเต็กหมู + ผักสลัด	1 จาน	505
น่องไก่กรอบสไปซี่	1 ชิ้น (100g)	93
		598

ปริมาณแคลอรี่ = สูง

ข้าวหมูแดง

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
หมูเนื้อแดง	100 g	89
ไข่	0.5 ฟอง	107
		196

ปริมาณคอเรสเตอรอล = สูง

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
ข้าวหมูแดง	1 จาน	541
		541

ปริมาณแคลอรี่ = สูง

ข้าวหมูกรอบ

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
หมูปนมัน	100 g	126
ไข่	0.5 ฟอง	107
		233

ปริมาณคอเรสเตอรอล = สูงมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
หมูกรอบ	1 จาน	560
ข้าวสวย	2 ทัพพี	138
ไข่ต้ม	0.5 ฟอง	36.5
		734.5

ปริมาณแคลอรี่ = สูงมาก

ข้าวเหนียวหมูปิ้ง

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
หมู	150 g	189
		189

ปริมาณคอเรสเตอรอล = สูง

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
หมูปิ้ง	2 ไม้	250
ข้าวเหนียว	1 ทัพพี	160
		410

ปริมาณแคลอรี่ = สูงมาก

บะหมี่กึ่งสำเร็จรูป

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
-	-	-
		-

ปริมาณคอเรสเตอรอล = ต่ำมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
บะหมี่กึ่งสำเร็จรูป (ไทย)	1 ห่อใหญ่	250
บ่าหมี่กึ่งสำเร็จรูป (เกาหลี)	1 ห่อ	160
		410

ปริมาณแคลอรี่ = สูง

ข้าวไข่เจียว

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
ไข่	2 ฟอง	428
		428

ปริมาณคอเรสเตอรอล = สูงมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
ข้าวไข่เจียว 2 ฟอง	1 จาน	445
		445

ปริมาณแคลอรี่ = สูง

ข้าวกระเพราหมูไข่ดาว

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
หมูสับ	100 g	100
ไข่	1 ฟอง	214
		314

ปริมาณคอเรสเตอรอล = สูงมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
ข้าวผัดกระเพราหมู	1 จาน	580
ไข่ดาว	1 ฟอง	215
		795

ปริมาณแคลอรี่ = สูงมาก

ขนมจีนแกงเขียวหวานไก่

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
เนื้อไก่ล้วน	100 g	60
		60

ปริมาณคอเรสเตอรอล = พอดี

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
ขนมจีนแกงเขียวหวานไก่	1 จาน	594
		594

ปริมาณแคลอรี่ = สูง

ขนมจีบหมู

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
เนื้อหมู	100 g	89
		89

ปริมาณคอเรสเตอรอล = พอดี

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
ขนมจีบหมู	8 ชิ้น	256
		256

ปริมาณแคลอรี่ = พอดี

ฮันนี่โทสต์

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
ไอศกรีม	100 g	40
		40

ปริมาณคอเรสเตอรอล = ต่ำ

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
ฮันนี่โทสต์	1 จาน	1,300
		1,300

ปริมาณแคลอรี่ = สูงมาก

บิงซู

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
นมสด	400 g	96
นมข้นหวาน	385 g	23.1
ไอศกรีม	100 g	40
		159.1

ปริมาณคอเรสเตอรอล = สูง

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
บิงซู	1 ถ้วย	750
		750

ปริมาณแคลอรี่ = สูงมาก

ข้าว แกงจืดตำลึงหมูสับเต้าหู้ไข่

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
หมูสับ	50 g	50
		50

ปริมาณคอเรสเตอรอล = ต่ำ

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
แกงจืดตำลึงหมูสับ	1 ถ้วย	90
เต้าหู้ไข่	0.5 หลอด	35
ข้าวสวย	2 ทัพพี	138
		263

ปริมาณแคลอรี่ = พอดี

ก๋วยเตี๋ยวหมูน้ำใส

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
หมูสับ	20 g	20
		20

ปริมาณคอเรสเตอรอล = ต่ำมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
ก๋วยเตี๋ยวหมูน้ำใส	1 ชาม	192
		192

ปริมาณแคลอรี่ = ต่ำ

ก๋วยเตี๋ยวเรือน้ำตก

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
หมูสับ	20 g	20
ตับหมู	20 g	80
ไส้ตันหมู	10 g	14
		114

ปริมาณคอเรสเตอรอล = สูง

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
ก๋วยเตี๋ยวเรือน้ำตก	1 ชาม	180
		180

ปริมาณแคลอรี่ = ต่ำ

สุกี้น้ำหมู

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
หมูสันนอก	50 g	40
		40

ปริมาณคอเรสเตอรอล = ต่ำ

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
สุกี้น้ำหมู ไม่ใส่วุ้นเส้น	1 ชาม	200
วุ้นเส้น (ดิบ)	40 g	150
		350

ปริมาณแคลอรี่ = พอดี

ยำวุ้นเส้นหมูสับ

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
หมูสับ	20 g	20
		20

ปริมาณคอเรสเตอรอล = ต่ำมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
ยำวุ้นเส้น	1 ชาม	120
		120

ปริมาณแคลอรี่ = ต่ำ

ก๋วยเตี๋ยวลุยสวน

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
หมูสับ	20 g	20
		20

ปริมาณคอเรสเตอรอล = ต่ำมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
ก๋วยเตี๋ยวลุยสวน	1 ชาม	118
		118

ปริมาณแคลอรี่ = ต่ำ

ส้มตำไทย

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
-	-	-
		-

ปริมาณคอเรสเตอรอล = ต่ำมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
ส้มตำไทยไม่ใส่ถั่ว	1 ชาม	55
		55

ปริมาณแคลอรี่ = ต่ำมาก

สลัดทูน่าน้ำใส

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
ทูน่า	125 g	232.5
		232.5

ปริมาณคอเรสเตอรอล = สูงมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
สลัดทูน่าน้ำใส	1 จาน	142
		142

ปริมาณแคลอรี่ = ต่ำ

แซนด์วิชทูน่า

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
ทูน่า	125 g	232.5
		232.5

ปริมาณคอเรสเตอรอล = สูงมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
แซนด์วิช	1 คู่	180
		180

ปริมาณแคลอรี่ = ต่ำ

ข้าวน้ำพริกกะปิ ปลาทู

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
ปลาทู	300 g	228
		228

ปริมาณคอเรสเตอรอล = สูงมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
น้ำพริกกะปิผักสด	2 ช้อนโต๊ะ	56
ปลาทู	1 ตัวกลาง	280
ข้าวสวย	2 ทัพพี	138
		474

ปริมาณแคลอรี่ = สูง

โจ๊กไก่ใส่ไข่

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
ไก่	50 g	30
ไข่ไก่	1 ฟอง	214
		244

ปริมาณคอเรสเตอรอล = สูงมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
โจ๊กใส่ไข่	1 ถ้วย	250
		250

ปริมาณแคลอรี่ = พอดี

น้ำมะเขือเทศ

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
-	-	-
		-

ปริมาณคอเรสเตอรอล = ต่ำมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
น้ำมะเขือเทศ	1 แก้ว	48
		48

ปริมาณแคลอรี่ = ต่ำมาก

ผลไม้รวม

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
-	-	-
		-

ปริมาณคอเรสเตอรอล = ต่ำมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
กีวี่	100 g	61
บลูเบอรี่	50 g	28.4
แอปเปิ้ล	1 ลูก	95
		184.4

ปริมาณแคลอรี่ = ต่ำ

หมูกระทะ

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
หมูเนื้อแดง	300 g	267
กุ้ง	60 g	105
		372

ปริมาณคอเรสเตอรอล = สูงมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
หมูเนื้อแดง	200 g	594
กุ้ง	60 g	55
		649

ปริมาณแคลอรี่ = สูงมาก

เครปเย็น

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
ไอศครีม	66 g	29
วิปครีม	100 g	300
		329

ปริมาณคอเรสเตอรอล = สูงมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
เครปเย็น	1 ชิ้น	200
ไอศครีม	1 ลูก	300
		500

ปริมาณแคลอรี่ = สูง

นมเย็น

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
นมข้นจืด	100 g	19
		19

ปริมาณคอเรสเตอรอล = ต่ำมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
นมเย็น	1 แก้ว	425
		425

ปริมาณแคลอรี่ = สูง

น้ำอัดลม

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
น้ำอัดลม	495 g	0
		0

ปริมาณคอเรสเตอรอล = ต่ำมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
น้ำอัดลม	กลาง (495 ml)	220
		220

ปริมาณแคลอรี่ = พอดี

ชานมไข่มุก

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
นมข้นหวาน	30 g	2
นมสด	60 g	14
		16

ปริมาณคอเรสเตอรอล = ต่ำมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
ชานมไข่มุก	1 แก้ว	300
		300

ปริมาณแคลอรี่ = พอดี

เบียร์

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
เบียร์	300 g	0
		0

ปริมาณคอเรสเตอรอล = ต่ำมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
เบียร์	300 ml	129
		129

ปริมาณแคลอรี่ = ต่ำ

เหล้า

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
เหล้า	300 g	0
		0

ปริมาณคอเรสเตอรอล = ต่ำมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
เหล้า	300 ml	750
		750

ปริมาณแคลอรี่ = สูงมาก

กาแฟดำ ไม่ใส่น้ำตาล

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
กาแฟ	20 g	0
		0

ปริมาณคอเรสเตอรอล = ต่ำมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
กาแฟดำ ไม่ใส่น้ำตาล	1 แก้ว	7
		7

ปริมาณแคลอรี่ = ต่ำมาก

ชาดำ ไม่ใส่น้ำตาล

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
ชา	10 g	0
		0

ปริมาณคอเรสเตอรอล = ต่ำมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
ชาดำ ไม่ใส่น้ำตาล	1 แก้ว	5
		5

ปริมาณแคลอรี่ = ต่ำมาก

กาแฟดำ ใส่น้ำตาล

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
กาแฟ	20 g	0
น้ำตาล	10 g	0
		0

ปริมาณคอเรสเตอรอล = ต่ำมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
กาแฟดำ ใส่น้ำตาล	1 แก้ว	45
		45

ปริมาณแคลอรี่ = ต่ำมาก

ชาดำ ใส่น้ำตาล

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
ชา	10 g	0
น้ำตาล	10 g	0
		0

ปริมาณคอเรสเตอรอล = ต่ำมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
ชาดำ ใส่น้ำตาล	1 แก้ว	43
		43

ปริมาณแคลอรี่ = ต่ำมาก

ลาเต้เย็น

ตารางปริมาณคอเรสเตอรอล

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม (mg)
กาแฟ	20 g	0
นมสด	100 g	24
		24

ปริมาณคอเรสเตอรอล = ต่ำมาก

ตารางปริมาณแคลอรี่

อาหาร	ปริมาณ	แคลอรี่ (kcal)
ลาเต้เย็น	1 แก้ว	230
		230

ปริมาณแคลอรี่ = พอดี

กรณีผู้เล่นปิดเกม หรือพักจอ

- หากในระหว่างที่ปิดเกมไป ผู้เล่นเลี้ยงดูไก่ไม่ดีจนสุขภาพย่ำแย่ เมื่อเปิดเกม จะพบว่า ไก่ถูกส่งเข้าโรงพยาบาลแล้ว โดยเริ่มนับเวลารักษาตัว 6 ชั่วโมงตามเวลาจริง จากเปิดเกมครั้งล่าสุดนี้
- เมื่อรักษาตัวครบเวลาแล้ว ค่า Status ทุกอย่างจะถูกรีเซ็ตเป็นระดับกลาง ๆ ทั้งหมด

APENDIX C

แผ่นพับประกอบการให้ความรู้

การวิจัยเรื่อง : เรื่อง ประสิทธิผลของแอปพลิเคชันด้านสุขภาพ ชิคเก้น ลอฟ)

(วัน 90 ลดไขมันในในโทรศัพท์เคลื่อนที่ที่มีผลต่อระดับไขมันในเส้นเลือดและสัดส่วนของร่างกายในก

ลุ่มเจ้าหน้าที่สายงานสุขภาพที่มีระดับไขมันในเส้นเลือดผิดปกติ: การทดลองแบบสุ่มและมีกลุ่มควบคุม

<u>การพัฒนาระดับไขมันในเส้นเลือดและสัดส่วนของร่างกาย</u>

การวิจัยหลายเรื่องได้แสดงให้เห็นถึงแนวปฏิบัติสำหรับผู้ที่ประสงค์ที่จะพัฒนาระดับไขมันในเส้นเลือดและสัดส่วนของร่างกาย โดยสามารถสรุปได้จำนวนหนึ่ง ดังนี้

1. **สุขภาพดีจากแสงแดด** : ร่างกายต้องการวิตามินดีเพื่อเสริมสร้างความแข็งแรงของกระดูก และมีส่วนช่วยให้ร่างกายดูดซึมสารอาหาร เสริมการทำงานของกล้ามเนื้อ หัวใจ ปอด และสมอง รวมถึงสามารถช่วยการเผาผลาญอาหารได้ดีขึ้น โดยร่างกายสามารถสังเคราะห์วิตามินดีได้จากแสงแดดภายนอกบ้าน/อาคาร โดยควรให้ร่างกายสัมผัสแสงแดดธรรมชาติอย่างน้อย 15 นาทีต่อวัน ทั้งนี้ ร่างกายสามารถสังเคราะห์วิตามินดีจากการรับประทานอาหาร/พืชบางชนิด อาทิ ปลาที่มีไขมันมาก ปลาแซลมอน ปลาทู) เนื้อวัว ชีส ไข่แดง และเห็ด เป็นต้น (น่า และปลาทู
2. **เครียดน้อยเผาผลาญดีกว่า** : ความเครียดส่งผลโดยตรงกับระบบการทำงานของร่างกาย เป็นปัจจัยเกี่ยวข้องกับการเกิดโรคไม่ติดต่อ เช่น ความดัน เบาหวาน โรคหัวใจและหลอดเลือด และโรคอ้วน เป็นต้น รวมถึงส่งผลต่อระบบการเผาผลาญพลังงานและไขมัน เมื่อท่านประสบกับสถานการณ์ที่ก่อให้เกิดความเครียดทั้งที่บ้าน หรือที่ทำงาน ควรปรับอารมณ์ ด้วยการทำจิตใจให้สงบ ร้องเพลง ฟังเพลง ทำสมาธิ หรือพูดคุยกับคนในครอบครัวและคนรอบข้าง
3. **นอนให้อิ่ม :** การนอนอย่างน้อย 7 ชั่วโมงส่งผลดีต่อระบบสุขภาพโดยรวม โดยเฉาะการเผาผลาญพลังงานและไขมัน คนนอนน้อยกว่า 7 ชั่วโมง ทำให้ร่างกายเผาผลาญได้ไม่เต็มที่ส่งผลให้มีโอกาสน้ำหนักลดลงน้อยกว่า
4. **ดื่มน้ำให้เพียงพอ :** ร่างกายน้ำต้องการน้ำสะอาดอย่างน้อยวันละ 8 แก้ว การดื่มน้ำก่อนมื้ออาหารมีส่วนช่วยให้น้ำหนักตัวลดลงมากกว่าคนที่ไม่ดื่ม
5. **ออกกำลังกายทุกวัน ลดไขมัน กระชับรูปร่าง :** การออกกำลังกายทุกวันช่วยให้รูปร่างดีขึ้น โดยควรออกกำลังกายให้ครบทั้ง 3 ประเภท ได้แก่ 1) การกระตุ้นจังหวะการเต้นของหัวใจ เช่น การวิ่ง การเล่นแบดมินตัน การเล่นบาส การปั่นจักรยาน 2) การยืดหยุ่นร่างกาย เช่น โยคะ ยิมนาสติก 3) การเสริมสร้างกล้ามเนื้อ เช่น การยกเวท บอดี้เวท การว่ายน้ำ เป็นต้น
6. ***คุมอาหารด้วยการเลือก*** : ผู้ที่ต้องการปรับปรุงรูปร่างและระดับไขมันในเส้นเลือดต้องควบคุมอาหารด้วยการเลือกอาหารที่มีแคลอรีและคอเลสเตอรอลต่ำ และละเว้น อาหารที่มีแคลอรีและคอเลสเตอรอลสูง โดยมี ตัวอย่างการคำนวณปริมาณ แคลอรี และคอเลสเตอรอลในอาหาร และเครื่องดื่ม ข้อมูลจาก สำนักโภชนาการ)กรมอนามัย กระทรวงสาธารณสุข, 2557 ดังนี้ (

x	ข้าว+ต้มยำกุ้งน้ำใส		TomYu
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
กุ้ง	20g	35	
ปลาหมึก	20g	76.8	
		111.8	สูง

อาหาร	ปริมาณ	แคลอรี่(kcal)	
ต้มยำกุ้งน้ำใส	1 ถ้วย	65	
ข้าวสวย	2 ทัพพี	138	
		203	พอดี

ChickenRice	ข้าวมันไก่ต้ม		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
น่องไก่	50g	50	
เนื้อไก่ล้วน	50g	30	
หนังไก่	10g	9.3	
		89.3	พอดี

อาหาร	ปริมาณ	แคลอรี่(kcal)	
ข้าวมันไก่ต้ม	1 จาน	596	
		596	สูง

FriedChickenRice	ข้าวมันไก่ทอด		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
น่องไก่	50g	50	
เนื้อไก่ล้วน	50g	30	
หนังไก่	10g	9.3	
		89.3	พอดี

อาหาร	ปริมาณ	แคลอรี่(kcal)	
ข้าวมันไก่ทอด	1 จาน	693	
		693	สูงมาก

StirFriedRibbonNoodleWith	ผัดซีอิ๊วหมูเส้นใหญ่		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
หมูเนื้อแดง	30g	26.7	
ไขไก่	1 ฟอง	214	10.7g
		240.7	สูงมาก

อาหาร	ปริมาณ	แคลอรี่(kcal)	
ผัดซีอิ๊วหมูเส้นใหญ่	1 จาน	679	
		679	สูงมาก

PepperoniPizza	พิซซ่าเปปเปอร์โรนี่		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
ชีสมอสเซอเรลลา	100g	54	
เปปเปอร์โรนี่	100g	105	
ไขไก่	1 ฟอง	214	10.7g
เนย	20g	20	
		393(ชิ้นละ 98.25)	
		196.5	สูง

อาหาร	ปริมาณ	แคลอรี่(kcal)	
พิซซ่าเปปเปอร์โรนี่	2 ชิ้น	760	
		760	สูงมาก

ถ้ากิน 2 ชิ้น	760 kcal
	196.5 คอเรสเตอรอล

BeefBurgerSet	ชุดเบอร์เกอร์เนื้อ+เฟรนช์ฟรายส์+น้ำอัดลม		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
เนย	10g	10	
เนื้อ	100g	60	
ชีสเชดดาร์	20g	21	
		91	พอดี

อาหาร	ปริมาณ	แคลอรี่(kcal)	
เบอร์เกอร์เนื้อ	1 ชิ้น (113g)	290	
เฟรนช์ฟรายส์	กลาง (111g)	340	
โค้ก	กลาง(495ml)	220	
	(mc donald)	850	สูงมาก

	ไก่ทอด+เฟรนช์ฟรายส์+น้ำอัดลม		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
KFC			
น่องไก่กรอบสไปซี่	1 ชิ้น	60	
อกไก่กรอบสไปซี่	1 ชิ้น	80	
		140	สูง

อาหาร	ปริมาณ	แคลอรี่(kcal)	
อกไก่กรอบสไปซี่	1 ชิ้น	340	ข้อมูลของ KFC
น่องไก่กรอบสไปซี่	1 ชิ้น	170	ข้อมูลของ KFC
เฟรนช์ฟรายส์	กลาง (111g)	340	ข้อมูลของ mc
โค้ก	กลาง(495ml)	220	ข้อมูลของ mc
		1070	สูงมาก

	สเต็กหมู+มันอบ+สลัด		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
เนย	20g	20	
หมูสันใน	200g	98	
น้ำสลัดครีม	20g	40	
		158	สูง

ThaiRoastRedPorkWithRice	ข้าวหมูแดง		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
หมูเนื้อแดง	100g	89	
ไข่	0.5 ฟอง	107	
		196	สูง

	ข้าวหมูกรอบ		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
หมูปนมัน	100g	126	
ไข่	0.5 ฟอง	107	
		233	สูงมาก

	ข้าวเหนียวหมูปิ้ง		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
หมู	150g	189	
		189	สูง

InstantNoodles	บะหมี่กึ่งสำเร็จรูป		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
-	-	-	
		0	ต่ำมาก

	ข้าวไข่เจียว		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
ไข่	2 ฟอง	428	
		428	สูงมาก

SpicyThaiBasilPorkFriedEg	ข้าวกะเพราหมู+ไข่ดาว		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
หมูสับ	100g	100	
ไข่	1 ฟอง	214	
		314	สูงมาก

	ขนมจีนแกงเขียวหวานไก่		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
เนื้อไก่ล้วน	100g	60	
		60	พอดี

	ขนมจีนหมู		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
หมู	100g	89	
		89	พอดี

อาหาร	ปริมาณ	แคลอรี่(kcal)	
สเต็กหมู+ผักสลัด	1 จาน	505	
มันอบ	1 ชิ้น (100g)	93	
		598	สูง

อาหาร	ปริมาณ	แคลอรี่(kcal)	
ข้าวหมูแดง	1 จาน	541	
		541	สูง

อาหาร	ปริมาณ	แคลอรี่(kcal)	
หมูกรอบ	1 จาน	560	
ข้าวสวย	2 ทัพพี	138	
ไข่ต้ม	0.5 ฟอง	36.5	
		734.5	สูงมาก

อาหาร	ปริมาณ	แคลอรี่(kcal)	
หมูปิ้ง	2 ไม้	250	
ข้าวเหนียว	1 ทัพพี	160	
		410	สูง

อาหาร	ปริมาณ	แคลอรี่(kcal)	
บะหมี่กึ่งสำเร็จรูป(ไทย)	1 ห่อใหญ่	310	
บะหมี่กึ่งสำเร็จรูป(เกาหลี	1 ห่อ	540	สูง

อาหาร	ปริมาณ	แคลอรี่(kcal)	
ข้าวไข่เจียว 2 ฟอง	1 จาน	445	
		445	สูง

อาหาร	ปริมาณ	แคลอรี่(kcal)	
ข้าวผัดกระเพราหมู	1 จาน	580	
ไข่ดาว	1 ฟอง	215	
		795	สูงมาก

อาหาร	ปริมาณ	แคลอรี่(kcal)	
ขนมจีนแกงเขียวหวานไ	1 จาน	594	
		594	สูง

อาหาร	ปริมาณ	แคลอรี่(kcal)	
ขนมจีบหมู	8 ชิ้น	256	
		256	พอดี

HoneyToast	ฮันนี่โทสต์		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
ไอศกรีม	100g	40	
		40	ต่ำ

	บิงซู		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
นมสด	400g	96	
นมข้นหวาน	385g	23.1	
ไอศกรีม	100g	40	
		159.1	สูง

	ข้าว+ผัดบรอคโคลี่กุ้ง		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
กุ้ง	20g	35	
		35	ต่ำ

	ข้าว+แกงจืดตำลึงหมูสับเต้าหู้ไข่		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
หมูสับ	50g	50	
		50	ต่ำ

PorkNoodleClearSoup	ก๋วยเตี๋ยวหมูน้ำใส		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
หมูสับ	20g	20	
		20	ต่ำมาก

	ก๋วยเตี๋ยวเรือน้ำตก		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
หมูสับ	20g	20	
ตับหมู	20g	80	
ไส้ตันหมู	10g	14	
		114	สูง

ThaiSukiyakiSoup	สุกี้น้ำหมู		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
หมูสันนอก	50g	40	
		40	ต่ำ

ThaiGlassNoodleSaladPor	ยำวุ้นเส้นหมูสับ		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
หมูสับ	20g	20	
		20	ต่ำมาก

FreshNoodleSpringRoll	ก๋วยเตี๋ยวลุยสวน		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
หมูสับ	20g	20	
		20	ต่ำมาก

PapayaSalad	ส้มตำไทย		

อาหาร	ปริมาณ	แคลอรี่(kcal)	
ฮันนี่โทสต์	1 จาน	1300	
		1300	สูงมาก

อาหาร	ปริมาณ	แคลอรี่(kcal)	
บิงซู	1 ถ้วย	750	
		750	สูงมาก

อาหาร	ปริมาณ	แคลอรี่(kcal)	
ผัดบรอคโคลี่กุ้ง	1 จาน	210	
ข้าวสวย	2 ทัพพี	138	
		348	พอดี

อาหาร	ปริมาณ	แคลอรี่(kcal)	
แกงจืดตำลึงหมูสับ	1 ถ้วย	90	
เต้าหู้ไข่	0.5 หลอด	35	
ข้าวสวย	2 ทัพพี	138	
		263	พอดี

อาหาร	ปริมาณ	แคลอรี่(kcal)	
ก๋วยเตี๋ยวหมูน้ำใส	1 ชาม	192	
		192	ต่ำ

อาหาร	ปริมาณ	แคลอรี่(kcal)	
ก๋วยเตี๋ยวเรือน้ำตก	1 ชาม	180	
		180	ต่ำ

อาหาร	ปริมาณ	แคลอรี่(kcal)	
สุกี้น้ำหมู ไม่ใส่วุ้นเส้น	1 ชาม	200	
วุ้นเส้น(ดิบ)	40g	150	
		350	พอดี

อาหาร	ปริมาณ	แคลอรี่(kcal)	
ยำวุ้นเส้น	1 ชาม	120	
		120	ต่ำ

อาหาร	ปริมาณ	แคลอรี่(kcal)	
ก๋วยเตี๋ยวลุยสวน	1 จาน	118	
		118	ต่ำ

อาหาร	ปริมาณ	แคลอรี่(kcal)

ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
-	-	-	
		-	ต่ำมาก

	สลัดทูน่าน้ำใส		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
ทูน่า	125g	232.5	
		232.5	สูงมาก

TunaFishSandwich	แซนด์วิชทูน่า		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
ทูน่า	125g	232.5	
		232.5	สูงมาก

FriedMackerelWithShrimpP	ข้าว+น้ำพริกกะปิ+ปลาทู		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
ปลาทู	300g	228	
		228	สูงมาก

CongeeWithChickenAndEg	โจ๊กไก่ไส่ไข่		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
ไก่	50g	30	
ไข่ไก่	1 ฟอง	214	
		244	สูงมาก

TomatoJuice	น้ำมะเขือเทศ		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
-	-	-	
		-	ต่ำมาก

MixedFruitJuice	ผลไม้รวม		
ส่วนประกอบ	น้ำหนัก	คอเรสเตอรอลรวม(mg)	
-	-	-	
		-	ต่ำมาก

อาหาร	ปริมาณ	แคลอรี่(kcal)	
ส้มตำไทยไม่ใส่ถั่ว	1 จาน	55	
		55	ต่ำมาก

อาหาร	ปริมาณ	แคลอรี่(kcal)	
สลัดทูน่าน้ำใส	1 จาน	142	
		142	ต่ำ

อาหาร	ปริมาณ	แคลอรี่(kcal)	
แซนด์วิช	1 คู่	180	
		180	ต่ำ

อาหาร	ปริมาณ	แคลอรี่(kcal)	
น้ำพริกกะปิดผักสด	2 ช้อนโต๊ะ	56	
ปลาทู	1 ตัวกลาง	280	
ข้าวสวย	2 ทัพพี	138	
		474	สูง

อาหาร	ปริมาณ	แคลอรี่(kcal)	
โจ๊กไส่ไข่	1 ถ้วย	250	
		250	พอดี

อาหาร	ปริมาณ	แคลอรี่(kcal)	
น้ำมะเขือเทศ	1 แก้ว	48	
		48	ต่ำมาก

อาหาร	ปริมาณ	แคลอรี่(kcal)	
กีวี	100g	61	
บลูเบอร์รี่	50g	28.4	
แอปเปิ้ล	1 ลูก	95	
		184.4	ต่ำ

APPENDIX D

Timeframe

Project Procedure	**Time Frame (Month) October 2018 – Jan 2020**								
	Oct	**Dec 25**	**Jan JUN**	**Jun20**	**July SEP**	**OCT**	**Nov**	**Dec**	**Jan**
1. Submission for proposal exam	/								
2. Proposal exam		/							
3. Field preparation			/						
3. Ethical Review				/	/	/			
5. Data collection						/	/	/	
6. Data analysis							/	/	
7. Thesis and article writing						/	/	/	/
8. Final thesis exam									/
9. Submission of thesis									/

Budget

No.	Description	Total Amount (Baht)
1	M-health Application	200,000.00
2	Tickets and hotel for researcher (5times) and application developers (1 time)	70,000.00
3	Center phone *2 for android and IOS	30,000.00
4	1 IT/ 3 assistants in 3 months	100,000.00
5	Remuneration for the attendees (80 persons)	64,000.00
6	Lipid check fee (case of later having normal lipid)	20,000.00
7	Document copies and postal	10,000.00
8	Body composition measurement to replace the existing one at the hospital after finishing research	8,000.00
Total		**502,000.00**

VITA

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