IMPACT OF MOBILE APPS DEVELOPMENT ON SELF-MANAGEMENT OF WEIGHT LOSS, CASE OF LPM MOBILE APP.

by

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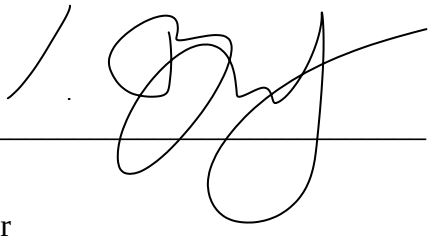

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Abstract

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When excess calories are not burned through physical activity and are instead deposited as fat in the body, the condition is known as obesity. Consuming foods high in fat and sugar, which have a lot of calories, might cause it. Sustaining a healthy BMI and controlling body weight are mostly dependent on diet. Consuming a lot of fast food or processed foods might cause the body to gain excess fat. It could also be brought on by inadequate levels of physical activity, excessive amounts of stress, or shifting surroundings. The purpose of the dissertation is to highlight how mobile app development affects weight loss self-management. The study demonstrated the increasing contributing factors to obesity and overweight conditions, particularly in youngsters and growing adults, using data from the LPM mobile app. To comprehend the link between the impact of weight loss management mobile applications on the self-management of weight loss among obese people, an investigation of the LPM mobile app has been conducted. For obese people, following a disciplined and methodical weight loss plan is crucial to getting the most effective outcomes. Additionally, the study described the prevalence of obesity worldwide in

various nations. A questionnaire approach was utilised to get relevant data from people who are attempting to lose weight by utilizing the LPM mobile application to accomplish the study goals. The study findings suggested that when it comes to assisting people in losing weight, mobile applications are often more successful than small intervention groups and can be on par with or even more successful than traditional paper-and-pencil weight loss therapy. Numerous behaviours, including peer support, educational resources, and monitoring of a person's weight, activity level, and diet, are promoted by apps for smartphones. Because app types differ greatly, it can be difficult to identify the components that are most crucial to the program's accomplishment. The effectiveness of the program is based on how much the patients use the application on their mobile devices. Smartphone apps can help people lose weight and are a useful, cost-effective alternative to intense in-person weight loss programs. More research is necessary to ensure their long-term viability, especially for hard-to-reach groups.

Keywords: Mobile Apps Development, self-management, weight loss, LPM Mobile apps, Obesity, Overweight

Table of Content

List of Tables

CHAPTER 1

INTRODUCTION

The thesis intends to draw attention towards the impact of mobile app development on the self-management of weight loss. By taking evidence from LPM mobile app, the study will show the growing causes of obesity and overweight conditions, especially among children and growing adults. The main headings covered in the introduction chapter are research background, key factors related to obesity & overweight, impact of age on obesity, mobile applications for weight management, self-management of weight loss, brief highlight of the LPM mobile application and significance of the study in the theoretical and practical fields.This section will also include research purpose and questions.

According to Who (2023), the worldwide obesity rate has tripled since 1975 and more than 1.9 billion adults have been the sufferrers of overweight. In 2016, about 650 million individuals were termed as obese. Among the children, 39 million under the age of 5 are either overweight or obese as reported in 2020. Abnormal or excessive fat accumulation leads to this condition, which may significantly impair health conditions of individuals. (Who 2023). A common index used to segregate normal individuals from overweight or obese individuals is body mass index (BMI), which shows the proportion of height and weight either in kg/sq.m or kg/inches.

Age groups being the maximum sufferers of overweight and obesity range from 5 years or below to 20 years. In recent decades, obesity has become a global public health issue and has been termed as a national epidemic in the US. The alarming increase of childhood obesity may cause chronic diseases like insulin resistance, metabolic syndrome, hyperlipidemia, hypertension, coronary artery diseases and type 2 diabetes. Governments across many countries have failed to create

awareness among the people regarding obesity control measures due to many challenges like weight bias, discrimination, educational set up and poor healthcare facilities.

1.1 Research Background

Obesity is the condition when extra calories are stored in the body as fat and are not burnt through physical activities. It can occur due to intake of high fat and high sugar food, which contain high calories. Diet plays a vital role in regulating body weight and maintaining a healthy BMI. Eating large amounts of processed or fast food may result in the development of extra fat in the body. It may also occur due to changing environments, high stress levels or lack of physical activity. Genes may also alter people's lifestyle choices or may affect metabolism rates that are strongly connected with obesity.

A review of latest evidences have shown the use of mobile applications among the teenagers for the purpose of weight management. In the last decade, mobile technology has been very useful in facilitating weight management and controlling obesity rates. A large segment of people have already integrated these apps with their weight management regime in order to derive the best results (Tiwari and Balasundaram 2021). Especially for low-intensity approaches these mobile applications can be useful. However, further research is required to understand the extent to which these applications are useful. Among all the applications, LPM mobile app is versatile, which covers important aspects of lifestyle related to weight management through a user-friendly approach.

1.1.1 Key factors pertaining to obesity and overweight

Obesity and overweight can develop due to consumption of more calories than used. This condition leads to energy imbalance, when the input is greater than the output. The nutrients required by the body constitute carbohydrates, sugars and proteins or fats. The energy imbalance leads to high storage of fat content in the body, which might be risky in the present and in the future. Overweight conditions are also developed by the type of food or drinks consumed in a day, level of exercise and quality of sleep. Risks of overweight and obesity may also increase due to personal factors like knowledge, skills and behaviors.Environmental factors also affect obesity, such as, schools, offices and neightbourhood that shape the lifestyle of a person.

Indirect factors can be food industry practices, marketing activities, social and cultural norms or values that affect the level of obesity in a person (NHS 2023). It is difficult to change all the risk factors, but it is important to be aware of the region of risk so that necessary steps are taken and a healthy weight is reached. When a healthy weight is reached, the person can avoid many health-related issues, such as heart diseases. Lack of physical activity is a common problem among the teenagers of the digital era. They are mostly fond of online games, which lead to fatigue and unwillingness for exercise.

Unhealthy eating behavior increases the chances of being overweight and obesity. The number of calores taken by a person generally varies according to his age, sex and capacity of doing physical exercise on a regular basis. Calorie count should be in line with the daily calorie needs or goals. Parents can follow tips given in the online portal to understand the calorie needs of their children. Amount of saturated fat in the diet should be approximately 10% of the total calories (NHS 2023). For a 2000 calorie diet, the total amount of saturated fat should be 22 grams.

Another factor leading to obesity and overweight issues is bad-quality sleep. A link has been made between poor sleep, inadequate sleep and inadequate good-quality sleep. All the three variables are linked with the BMI rates of individuals. If an individual gets less than 7 hours of sleep per night, the urge for hunger may be affected. As a result, the person tends to overeat and it damages the metabolic rate, leading to deposition of extra fat in the body. This is called sleepy deprivation or deficiency, which might arise due to high amounts of stress, either long-term or short-term.

Other factors can be poor health conditions due to other illnesses, genetics and medicines. In females. Polycystic overy syndrome can increase the chances of gaining weight. These medical conditions are treated when a person comes closer to reaching a normal body weight. Obesity may also occur due to genetics, when people are predisposed to be heavier than the others. Studies have shown that people with genetic high risk for obesity must make sustainable changes to their lifestyle in order to lower the risk. Sometimes, medicines for other diseases may cause side effects and make the person obese. Examples include antidepressants, antipsychotics and beta blockers.

These medicines disrupt the neurons that send signals of hunger to the brain. Medicines like birth control, glucocorticoids and insulin can cause weight gain as they are used to treat autoimmune diseases and blood sugar levels. Another factor pertaining to overweight and obesity can be environment, which might compel the person to start unhealthy eating habits or decrease the rate of physical activity. Environment includes all the parts where a person stays and works, such as, home, buildings, shops, streets and open spaces. The choice of restaurants and the amount of green space available to a person can affect his weight.

In places where there are sidewalks and green spaces, people tend to be more active physically and eat healthier food options (Ghelani et al. 2020). People living in neightbourhoods that have

multiple fast food restaurants may indulge in unhealthy food options. All these factors may make obesity a complex disease, which may change the sleep routines or lifestyle patterns of individuals. These conditions of learning, working and playing are referred to as social determinants of health (SDOH), which might lead to chronic disease outcomes and risks. These habits vary according to geographical regions and physical abilities of people. To tackle the issue, many follow the route of genetics and medications.

1.1.2 Impact of age on obesity

In modern times, obesity has become a life-threatening problem, occurring globally across all regions. Increase in life expectancy has increased the levels of obesity among the older age groups. Age is related with susceptibility to chronic ill health conditions, which is proliferated through obesity. Both ageing and obesity affects a person simultaneously and may cause serious health issues, sometimes being the reason for death. With ageing, people tend to accumulate fat in their abdominal areas, which is a major contributor to insulin resistance and other metabolic problems. Improvement in public healthcare services can extend the life expectancy of the individuals and increase the average living age, that is, 65. However, elderly people may be exposed to age-related diseases like stroke and heart attacks.

Authors have studied over 9000 US citizens within the age range of 20-30 years in order to understand the effect of obesity on their life expectancy. It is observed that severely obese men belonging to this age range have 10 years less life expectancy than others. People exceeding the normal body weight 20% have the probability of suffering from obesity-related disorders. Balanced amounts of adipose tissue may cause metabolic homeostasis (NHLBI 2023). Fat must

be deposited at the local area so that chances of having a disease is lessened. Due to ageing the metabolic rate of a person declines and insulin resistance becomes very common.

Evidence also proves that obesity is a risk factor among middle-aged people, which may decrease life expectancy by about 7 years. This is comparable with the combined effects of all cardiovascular diseases and life-threatening disorders like cancer. It is argued that individuals before reaching middle age tend to suffer from obesity and after they cross middle age, they tend to lose the fat content. Impairments in hypothalamic function can be a cause for increased obesity with age. The current trends of life expectancy and obesity-related diseases show that there will be high prevalence of diseases in the future years and the life expectancy in the developed countries will continue to decrease.

The relationship between age and obesity is very significant as obesity decreases life span, whereas caloric restrictions increase life span (CDC 2023). Obesity is a driver of age-correlated diseases and such a condition has increased dramatically in the past decade in the US across all age groups. Studies have shown that middle-aged people hitting the age of 40 can have a reduced life span of 6 to 7 years if they have a BMI greater than 30. Overweight people with BMIs between 26 and 29.9 can have lifetime diseases like diabetes, hypertension and coronary heart diseases.

Few authors have shown an agewise and genderwise comparison of obesity across developing countries like India. It is revealed that India contributes a significant amount of obese or overweight people. A study conducted in 2015 has revealed a shocking number of 135 million Indians suffering from obesity. Poor nutrition has led to reduction in the metabolic capacities of vital organs like pancreas, liver and kidney. Other factors driving this situation can be

carbohydrate-rich diet, decreased physical activity and dense calorie food. All these factors can slow down the metabolic rates of individuals and their BMIs become higher.

Age and gender both can be important determinants of fat accumulation. With increasing age, body and fat mass increases and it may continue till early and middle adulthood. Fat mass can be directly correlated with age and lean body mass along with fat-free mass can be indirectly correlated with adults of age more than 50 years (Jura and Kozak 2016). In younger people, fat-free mass increases with age. Other issues that increase with age are waist circumference (WC), which shows the level of abdominal adiposity. Gender also plays a vital role in this context along with age. Among the two genders, the WC increases higher in women as compared to men.

Age-dependent progression of obesity is evident across many countries according to the results of the surveys and experiments. The correlation between these variables have also been proved through Anthropometric parameters. BMI has positive correlation with Waist Circumference (WC) and fat deposition percentage, which indicates positive movement of BMI as a result of high fat storage. Age is found to have strong correlation with all the anthropometric measures, such as, fat mass and fat deposition. Due to age, there is increase in body fat and decrease in lean mass, which succinctly reduces resting energy expenditure (REE).

1.1.3 Mobile applications for healthy weight loss

In the modern era, a large chunk of the population is dependent on weight management applications for a healthy weight loss. These weight management applications can track the calories, conduct workout sessions, give reminders for regular water intake and provide motivation to lose weight (Mizuno et al. 2004). These applications can be very useful in guiding the

individuals throughout their weightloss journey and helping them analyze the data points, such as, connectability, user ratings and tracking features.

The common challenge faced by the modern generation in this aspect is choosing the best weight loss app according to their needs. The weight-loss apps and calorie counting apps must be selected according to multiple factors, such as, monthly costs, free versions and their features, app user reviews, device compatibility, water intake reminders, and barcode scanners. These applications help individuals account for their daily lifestyle choices and track important parameters like exercise, sleep and water intake. These apps also can provide meal reminders and import interesting and delicious personalized recipes from the web. Before picking the most suitable weight loss app, the users must set personal goals.

Every person should take extreme caution while selecting a weight loss app as few applications may support excessive calories restriction, stringent diets and unattainable workouts. Before selecting an app, the person should try to align the guidance or tools provided by the app with the nutritional needs (Sarvottam et al. 2020). The plan should be sustainable in the long term and must store data of the user, such as, his food chart or micronutrients so that it can be used again in the future. The nutritional information of the food chart must be verified so that it does not misguide the person.

My fitnesspal is currently recognised as one of the leading weight management applications of the current times. The database of this application has over 19 million food recipes and the users can easily track their preferred food or meal preparation through barcodes or meal scanners.

Next in lost is MyNetDiary which has a monthly cost of about $8.99. The free version of the application is also available to the customers as a demo. The application supports food, water and

exercise tracking features for the users. The application also includes “gentle” meals and weigh-in reminders for the users along with shopping lists and nutrition blogs. The application also has “daily feedback and advice” column, where “premium” diets have been created and curated by registered dietitians. Additional benefits of the application include a range of diet-friendly recipes and information on carb, keto, vegetarian and vegan diets.

The third application in the series is Fitbit, which has a monthly cost of $9.99 and a 90-day free trial version. The users do not need a wearable fitbit to use this application. People who are interested in this application can download its free trial version and follow guidance on steps, distance, calories, food and water intakes. A large catalog of audio and video showing all the possible workouts is also available. Other intriguing features include meditation and calming sounds or videos for people who suffer from high stress levels. They can listen or watch these sounds or videos to relieve their stress.

Another important application used for weight management is fatsecret, which has a monthly cost of $6.99. Free versions of the app are available on iOS and Android. The application has an image recognition feature, which helps users take photos of meals and products and get an overview of their nutritional components (Forbes 2023). The application also contains an exercise diary, where the users can record the number of calories burnt, a weight tracker, daily weigh-ins and journal entries. Users paying for a subscription can enjoy additional features like dietitian-prescribed meal plans and special diet charts like Keto, Mediterranean and High protein/low carb diets.

The last application in this list, used for weight management is WeightWatchers, which is a complete paid application. After purchase, the first month is free to use. On both iOS and Android, the application has high user ratings. WeightWatchers app is slightly different than the other

applications as it notices nutritional and behavioral changes and does not encourage quick fixing of calories. The customized nutrition plan provided by this app contains social networking among the members, coaching chats and other helpful tips related to ordering at restaurants. Along with water, fitness and sleep trackers, the diabetes patients can track their blood sugar levels.

1.1.4 Self-management of weight loss through mobile apps

Health practitioners across the world have investigated mobile application platforms, which can facilitate self-management of obesity using artificial intelligence techniques. Various dietary regulatory initiatives have been taken to provide authentic information to users regarding calories contents in the meals. An artificial intelligence (AI) based application is generally driven by genetic algorithm (GA), which can track the energy balance of the user and predict his possible calorie intake. This is highly essential in managing overweight and obesity. The algorithm takes input from the users and extract records on cholesterol level, physical activity level and diabetes status (Sefa-Yeboah et al. 2021). The macro and micronutrients contained in the food are used by this application for the computation and prediction of probable food recipes for the customers that can sufficiently meet their daily calorie needs.

Using a sample of 30 volunteers from the University of Ghana, the functionality and performance of the model are tested. The model predicted both gycemic and non-glycemic food based on the present state of the user and his macro or micronutrient requirements. At the same time, the system also tested the progress of the person over the predefined period and the trend of weight loss linked with the particular person. The system can be a useful resource for individuals, dietitians and other health management personnel to train their clients on obesity, dietetics and consumer science.

Authors have studied a multitude of technology-based health management applications, which can target and control obesity across a wide range of customer groups. These tools come in the form of both web-based and mobile-based solutions. The users can get basic information on food items that should or should not be consumed so that they can arrange for the substitutes in order to meet their daily calorie needs. A mobile-based health monitoring application has also been launched in the market, that mainly concerns the weight management of children using IoT technology (Dounavi and Tsoumani 2019). Remote tracking and monitoring are also enabled by this application.

Another dynamic healthcare solution has also been introduced in the market, which enables self-regulation of weight. The users can self-monitor vital parameters like body weight, physical activity, and daily taken meals. The data collected through self-regulation is then transmitted in real-time to secure web server. Another smart mobile application has been developed that uses clinical-guideline-based obesity management system. Taking knowledge from clinical practice guidelines and expert consultation, the application designs the perfect algorithm for obesity management. The overall proficiency and efficiency scores for the algorithm have been 88.0% and 69.1% respectively. This app also requires self-regulation of obesity by users.

Another integrated health management system has been very prominent in the market, which monitors both weight loss journey and maintenance behaviors of the users. In this digital platform, the dietitians can directly connect with the patients and these patients can receive face-to-face consultation services from the doctors. A relationship is built between the patients and the dietitians and they take regular updates from the users regarding weight management. The doctors also look for a sustained behavioral change within the patients and if there is any deviation, they

are notified at early stages. These remedial measures can therefore be very effective in obesity management.

Another very important mobile application used for self-regulation of weight management issues is the food prediction model (NCBI 2023). The model analyses information, makes decisions on possible eating habits and also suggests meals to the users for meeting their daily calories needs. The system ensures that the person does not cross the boundary of daily calorie intake or does not have micronutrient deficiency, so that the health is compromised. Bad choice of food or eating habits may degrade the health status of users and may lead to increase in sugar and cholesterol levels. Information related to these parameters are obtained from the registration data provided by the users.

Thus, it is evident that the knowledge arising from behavioral science must be combined with information technology in order to devise the best weight management solutions for the obese people. Mobile health or mHealth interventions are defined as medical and public health practices that support patient-monitoring devices, PDA and othe wireless devices. By the end of 2022, the global smartphone subscriptions have increased to 1 billion, which also boosted the growth of mHealth market. As per records of 2017, about 325,000 health apps are available in major app stores. These apps track physical activities, diets and adherence to medication for all the patients.

1.1.5 Brief highlight of LPM mobile app

To select the right kind of food and workout technique, it is very important to consider both quality and quantity. Majority of mobile applications only guide users about the quantity of food, but do not provide any information about its quality. These mobile applications are unable to integrate

quality & quantity within the dietary regime of the users. As a result, these apps are not considered accurate or effective. It is observed that a person cannot manage weight by focussing only on calorie count. To improve health status, the person should concentrate on both quantity and quality of food taken. Such a gap is filled by the LPM mobile app. This newly launched app covers all aspects of lifestyle through a user-friendly approach and makes it very easy for the people to practice weight management.

LPM mobile app provides an accurate and wider number of inputs which can show weight management results very precisely and accurately. This has a direct positive influence on the health condition of the person. LPM mobile app shows a graph based on the daily intake of food by mnerging together quality and quantity. It also denotes the period or the intervals in which this food will be taken. Simultaneously, the type of exercise to be selected along with the given food recipe is also suggested by the app. After a long-term research involving 40000 clients, LPM Mobile app has been developed.

Ample evidences have proven that self-monitoring diet, physical activity and weight management can lead to successful outcomes. Through technology, people can be exposed to accessible and cost-effecive weight management interventions and they can sustain their healthy lifestyle practices. Working in a digital space, these mobile apps can reach a wide number of audience all across the world and show them the right direction to obesity management. More than 6.37 billion people are smartphone users, while 0.5 billion people use these apps from dietary routines, physical activities and weight management.

Weight loss and maintenance strategies are also included in the weight management program of LPM app. The main aim of a weight management program should be prevention of unwanted body

fat and maitenance of the healthy BMI for the long term. The individual should get an environment where he is able to maintain a healthy body weight and composition. The app also tempts the users to fill in a complex set of factors related to their genetic make-up, behavior and environment. By examining these factors, the LPM app shows the difficulty levels to be crossed by the users as they venture into their weight loss journey.

LPM also offers diets, potions, strategies and devices to the users, which can help them combat many challenges of weight. The small percentage of people who have been able to lose weight without the use of LPM app and maintain it successfully have been merely 1-3%. The app encourages the users to take small steps towards behavior and lifestyle modification so that they can increase the rate of physical activities, reduce calorie intake, alter eating habits and keep their weight under control. A subcategory of behavioral change is environmental management, which are intrinsically related with each other.

Through proper self-monitoring of diet and physical activity, the individuals can develop accountability of their own weight management regime and keep a daily food diary in hand. Such a diary is provided by the LPM app, where the users not only record their daily food habits, but also write about the time and place of eating along with the context in which the food was consumed. While revising the pages of the diary, the users can understand the point in which they went wrong and the reasons behind such a mistake.

The app also helps in recommending food supplements and other similar items to the users, who have deficiency of essential nutrients. A dietitian or nutrition therapist is also allocated for the users by which they can get personalized benefits. Likewise, the users can make necessary changes to their eating behaviors and move in the direction of weight loss. The app also presents a chart or

a graph showing the future weight loss trend of the person. Accordingly, the person can make himself ready for reaching the future goals. The app also allows for self-monitoring of eating behavior and physical exercises.

1.2 Research Problem

People face a number of challenges when they try to self-monitor their weight loss programs. Even when people think they are making healthy lifestyle choices, still they might not get the desirable results. While self-monitoring weight loss, the individuals may only focus on the scale. The number on the scale is just one measure of weight change and it might be moderated by many factors, such as fluid fluctuations and amount of food residue remaining in the body. Another issue can be related to calorie deficit, when a person burns more calories than that consumed. A decrease in 3,500 calories per day might result in the decrease of 0.45 kg.

Sometimes, people indulge in low fat, diet food, which are processed containing artificial preservatives (Healthline 2023). These products just have the opposite effects as they are loaded with sugar and other fat-based components. Another issue can be related to overestimation of calories that have been burnt during exercise. People with moderate weight and overweight tend to overestimate the calorie burnt during exercise by a large amount, which may alter the overall result to a large extent. About 29% participants of a study reported higher physical activity level than they actually did.

1.3 Significance of the study

In the modern generation, weight loss is a vital area as everyone wants to stay fit and healthy. For many people reaching a healthy weight is a distant goal as they do not know the place and time to start their weight loss journey. They just need support and guidance from the digital platforms to bring about a vast health transformation. Through the weight management plans offered by these mobile platforms, men and women can reach their weight loss goals and enjoy a seamless and integrated process. They can also slowly reduce bad habits and indulge into good habits that can help in massive weight reduction.

There are many reasons that prove the significance of weight management for the present generation. Reasons can be mental, emotional and physical. An unhealthy weight can negatively impact the mental wellbeing of a person, decrease his self-esteem, and severely impact his mental and physical health. Weight loss is not only a vanity, but it also upgrades the quality of life led by an individual. Furthermore, weight loss protects an individual from weight-related diseases like diabetes, cancer, stroke, osteoarthritis and high blood pressure. Reaching a healthy weight can promote the longevity of an individual and make himself more confident in his body.

Taking the help of a mobile app to eat the right food can keep the individual under a guided weight loss treatment plan (Medical Transformation Center 2023). The reliable apps provide the right dietary guidelines and promote physical fitness and mental wellness of the person. The individuals can select the right food and follow the appropriate diet to maintain the weight in the long-term. When a person has the right tool, he can easily devise weight management plans and plan ideas to remove the extra weight. Motivation and empowerment are the two essential factors that can set up an individual for success.

The commitment to losing weight is regarded as the first step to a weight loss journey. A map is needed to get into the destination, which can be obtained through these mobile applications. Platforms like LPM app can increase the built-in accountability of a person during the weight loss journey, so that he is motivated and committed to perform his best during this process. Even after achieving a healthy weight and a perfect BMI, these apps help individuals sustain and maintain the weight for a long term. These apps provide a list of balanced diet recipes to follow in the long term.

At the same time, the weight management mobile applications can provide tailor-made fitness programs to the users according to their body needs and preferences. While self-managing the weightloss journey, the users might not be able to understand the actual needs of the body or appropriate food recipes for them considering their present health condition. They might try to follow others whose diet chart may not be suitable for them. Therefore, they need to take the right nutrients, supplements and do proper exercises according to their age and health condition. All these benefits are provided through the mobile app.

1.4 Research purpose and questions

The purpose of the research is to study the impact of weight loss management mobile applications on the self-management of weight loss among the obese people. Case study of LPM mobile app has been taken to understand this relationship. For obese people, it is highly essential to practice a systematic and structured weight loss journey in order to achieve the best results. The research also provided an account of the global obesity prevailing in countries across the world. The

diseases associated with high BMI and obesity have also been mentioned in the paper. The study also aims to understand the specific utility of LPM weight management app for the obese people.

The research questions for the study are as follows.

a) What is the probable impact of weight loss management apps on the weight management practice of individuals?

b) What kind of challenges are faced by individuals when they try to self-manage their weight loss journey?

c) Why does excess weight lead to critical diseases that can be life threatening?

d) What is the global distribution of obesity and what age groups are mostly affected by higher BMI?

e) Why is LPM app superior than other weight management apps in the market and what are the reasons behind its popularity?

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Weight management is one of the most widely researched topics all across the globe. Since 1975, worldwide obesity has faced an exponential growth and by 2016, about 650 million people were reported to be obese (WHO 2023). Maintenance of a healthy lifestyle can help prevent obesity and manage weight in the most sustainable way. Body Mass Index (BMI) is a simple quantitative metric that shows the proportion of weight with respect to the height of the individual. This is just a rought indicator of overweight and obesity, but does not reflect the degree of fatness in the person's body.

Information technology has played a massive role in guiding individuals towards self-management of weight loss. The mobile applications monitor diet, physical activities and show persistent solutions to the individuals so that they can achieve fruitful outcomes. These weight management applications have a large scope as they can reach more than 6.37 billion people at a time who use smartphones (WHO 2023). It is seen that 0.5 billion people use mobile applications that help reduce obesity (WHO 2023).These mobile applications present customised diet, physical activities

and other weight management techniques to the users. These self weight management interventions are accessible and cost effective.

Self-monitoring is the “centerpiece” of weight management strategy, which shows the behavioral approaches to obesity. During the self-monitoring process, a person observes and records his actions and in-turn adjusts his behavior and lifestyle activities to achieve his goals. Self-monitoring of diet leads to consistent and significant weight loss. With advancement in technology, the researchers have explored divides like portable microcomputers and personal digital assistants to investigate the process of self-monitoring of weight loss. By using mobile applications like Myfitnesspal and Fitter, the users can have access to calorie counters and plan their diet accordingly. These applications are user-friendly and can motivate users to start their weight loss journey.

In the above context, this research is going to focus on the impact of mobile app development on the self-management of weight loss by highlighting the case of LPM mobile app. In this chapter, past literary works will be referred to regarding several aspects of the research topic. The several segments of this chapter include obesity & overweight, application monitoring process for weight management, self-monitoring through mobile applications, changes in lifestyle patterns, techniques adopted for health weight loss management and future impacts of mobile applications on weight loss management. The research summary and research gap will be narrated at the last two sections.

2.2 Theoretical Framework

Three basic theoretical frameworks define the foundation of obesity in the human body, that is, physiological, psychological and environmental theories. Physiological theory states that there is

a belief among obese people that obesity is a problem of a gland that controls metabolism. Psychological theory states that food is an element of pleasure or satisfaction, which might replace the feeling of inadequacy or relieve stress. People start taking food the moment they are nervous about something or there is boredom. Environmental theory assumes that modern society is greatly influenced by obesity and there is a constant bombardment of advertisements that adds to this situation.

2.3 Background of the literature

2.3.1 Obesity and overweight

Aronne (2002) classified obesity and assessed the obesity-related health risks in order to understand the barriers to the treatment of obesity by healthcare service providers. One such barrier has been lack of awareness on obesity and inadequate training on medical management of obesity. According to researchers, evidence-based, practical guidelines are required to train physicians on obesity-related treatment approaches. During these training sessions, obesity is classified according to BMI (Body Mass Index) results. Individuals falling in the range of 25 to 30 BMI were tagged as overweight, whereas those having more than 30 BMI were tagged as obese. Targeted people have high-risk combinations of BMI, high waist circumference and cardiovascular issues. These individuals were also tested for other complicated factors of obesity, such as, sleep apnea, type 2 diabetes and psychosocial factors. This information can help healthcare service providers trim the weight-loss program and align with individual needs or requirements.

Both environmental and genetic factors affect morbidity and mortality. The victims of obesity suffer from social stigmatization and also have increased risk of medical disorders. Other factors contributing to obesity are social, economic and hereditory factors. Increased obesity over the years have been due to lack of time invested in weight management, skepticism related to efficacy and reliability of medicinal diagnosis for obesity and lack of willpower or self-discipline while going through weightloss journey. Physicians need to recognise obesity as a chronic illness, which should be given utmost importance. They must assess the readiness of an individual in losing weight and motivate him further to maintain a sustainable weight throughout his life.

The World Health Organization Obesity Task Force was given the responsibility of classifying obesity in terms of BMI. The expert panel identified, evaluated and then treated the overweight and obese adults if they faced any health complications. Abdominal fat might pose greater health risk than peripheral fat. Epidemioloigcal studies have revealed that a higher waist-to-hip ratio increases the risk of diabetes and coronary heart diseases (CHD). Another indicator of abdominal fat distribution is waist circumference. Increased waist circumference is said to be a hypertrophic form of obesity. The treatment guidelines include designing an algorithm for determining the muscle mass of the body.

The next article by Muller et al. (2016) put forward the conceptual issues surrounding weight management. Body Mass Index (BMI) is a metric for measuring weight status and disease risks. Though it losely defines the present weight status, it does not reflect a suitable phenotype or a biologically sound picture of the health condition of an individual. Credible techniques are used for calculating disease risks, fat mass and fat free mass. Going beyond BMI, the health practitioners have introduced a new concept called functional body composition (FBC), which integrates body

components with the regulatory system. FBC also takes into account masses of body components, tissues and organs.

FBC is also used for defining specific phenotypes of obesity, such as, sarcopenic-obese patients. By understanding these phenotypes, the health practititoners can devise targeted research that is centered around the patient. FBC contributes to a psychological criteria exclusively designed for overweight and obese patients. Modern health practitioners define overweight and obesity through statistical parameters. Normal BMI value was seen among Caucasian, African and Hispanic populations. Lower BMI rates are observed among Asians. Drawing upon the U-shaped and J-shaped relationship between BMI and cardiometabolic risks or mortality, the researchers have used reference points for BMI categorization.

Another idea has been introduced in the study, that is, the true obesity paradox, which is mostly observed in cancer patients. Though obesity is considered a threat for the patients with chronic diseases, it appears to be protective for patients with cancer. The characteristics of obesity are used for genetic studies and for building weight status measurement tools. In 1995, a group of leading obesity experts used a range of phenotypes to analyse metabolism and energy intake of the human body. The genetic studies on obesity are also used as tools for molecular biology, especially across a range of phenotypes.

The next article (Djalalinia et al. 2015) discussed the health impacts of obesity by providing evidence that links overweight/obesity with different dimensions of health. Studies published on PubMed Central since 1990 have been thoroughly studied to find out the relationship between obesity and health related issues.It is found that obesity is the root cause for metabolic disorders and can pose serious health threats to individuals. At least 18 co-morbidities are associated with

increased fat content in the body. Other prominent diseases observed across obese individuals are joint pains and social or psychological impairments. Intervention strategies must be devised to control this growing epidemic.

The prevalence of obesity and overweight has seen a dramatic increase in most countries, which is the cause for 3.4 million deaths globally. Despite the urgency of this issue, significant gaps have been observed in the research work of this subject. This is because obesity is mostly estimated through surveys or population studies that are based on weight measurement instead of body fat. Co-morbidities associated with overweight and obesity are type 2 diabetes, hypertention, coronary artery disease, pulmonary embolism, gallbladder issues and cancers of many forms. All these severe diseases lead to more than 3 million death annually across the globe.

In developed economies, obesity-related cardiovascular diseases are very common and show an increasing trend. These cardiovascular diseases reduce the mortality rates of individuals and also pushes down the insulin supply in these countries. As a result, type 2 diabetes is also highly prevalent in these countries. The mortality rate for people suffer from obesity-related morbidity and disability is also determined by the type of health problems and extent of fatness in the body. Being a major public health problem, obesity can actually pull down life expectancy, especially in the young age groups. Standard protocols say that both waist circumference and waist-to-hip ratio should be closer to 22.5 - 25 kg per sq.m.

The next article (Raj and Kumar 2010) examined the obesity conditions within children and adolescents in prominent countries of the world. Obesity trends, for many years, are threatening the viability and effectiveness of basic healthcare services. In the last two decades, the healthcare costs have also increased tremendously and childhood obesity has been recognised as a global

phenomenon affecting all socio-economic groups. A kind of childhood obesity is aetiopathogenesis, which includes a combination of psychological, environmental, socio-cultural and genetic factors. Treatment of overweight and obesity takes place in multiple phases, such as, dietary management, restrictions on sedentary lifestyle, pharmacotherapy and bariatric surgery.

Childhood obesity can be tackled through a collection of activities, such as, mobilization of communities, establishment of coalitions and networks, empowerment of providers, and reinforcement of individual skills. Obesity has become a colossal epidemic and is particularly visible in low- and middle-income countries. In these countries, the obesity levels of children and adolescents are tested using age and sex specific normograms that show their BMI. Individuals having BMI equal to or more than 85th percentile can be either overweight or obese (Raj and Kumar 2010). When the percentile crosses 95, they are at risk for obesity and associated co-morbidity.

With the period from 1999-2002, about 65.1% were overweight in Africa and Asia, while 30.4% were obese (Raj and Kumar 2010). 31% children having age equal to or more than 6 were overweight, while 16% were obese (Raj and Kumar 2010). From 1985 to 2000, the obesity among boys increased by 25%, while that of girls increased by 17% (Raj and Kumar 2010). The distribution of obesity depended on the socio-economic strata or position of the individuals.

2.3.2 App monitoring process for weight management

The first article by Burke et al. (2012) talked about self-monitoring of weight loss through a systematic review of the literary studies. According to the authors, self-monitoring is at the heart of behavioral weight loss intervention programs, based on three components, that is, diet, exercise and self-weighing. Conventionally, paper diaries were used to self-monitor weight management.

With the advancement in technology, the process was shifted to digital and the individuals measured the number of logins or reported weights to self-monitor their program. Technological tools used in this process are internet, personal digital assistants and electronic digital scales. A study of similar research works showed that the target samples are predominantly white and female, who adhere to self-monitoring measures ardently. The study has referred to self-regulation theory, which states that self-monitoring precedes self-evaluation, whereby a person takes one more step towards his desired goal.

In this process of self-monitoring, a person requires to develop self-regulatory skills in order to change habits smoothly according to his health conditions. The person keenly observes the minute details and pays adequate attention to his actions according to the internal or external conditions. Successful self-regulation requires truthfulness, sustainability and punctuality of self-monitoring with respect to the performance of the target behavior. Research works on self-monitoring conducted experiments across obese people, who were instructed to record exercise, mood, eating habits and water consumption. It was found from these experiments that sincere participants lost more weight than others and discovered a true mental stability of the sincere followers.

The next article (Patel et al. 2019) compared conventional self-monitoring weight loss strategies with that of strategies given through smartphone applications. The study revolves around the principle that self-monitoring of diet charts is a useful component to lose weight quickly and effectively. The study examined a novel behavioral weight loss intervention scheme that attenuates the decline in self-monitoring engagement related to diets. A randomized controlled trial is being performed in this study and participants were randomized to a 12-week stand-alone intervention program. Modern technologies were used for conducting the programme and monitor weight on a daily basis. The application also provided weekly lessons, action plans and feedbacks. All the

groups participating in this program lost an initial weight of 5% within 12 weeks and were given a tailored calorie goal along with automated in-app reminders. Using calibrated scales, weight was collected at the first month and then within the next three months.

The authors concluded that these commercial mobile applications can be helpful in reducing significant weight. This weightloss journey of the participant is clinically significant. As compared to conventional weight loss programs, these applications offer stand-alone digital health treatments for people seeking a lower intensity approach of weight loss. The accuracy of these programs is much higher than that of conventional methods. In an ordinary self-monitoring technique, the overweight/obese people track body weight for a particular period of time and then track diet on a periodic interval. While using innovative approaches to weight control, this time-consuming process is erased and the individuals can get everything in a comprehensive manner.

The final article (Patel et al. 2021) investigated self-monitoring processes via digital health weight loss interventions. Overweight or obese adults have been selected as participants and major reviews have been collected from past studies by authors. Self-monitoring is a part of behavioral obesity treatment and it was previously done manually from end-to-end. However, it is still unknown how digital health is used for self-monitoring purposes. The results obtained from these self-monitoring programs and the engagement rates achieved in these interventions are still not clear. Six databases were searched for randomized controlled trials, that is, PubMed, Scopus, ProQuest, CINAHL, Embase and PsycInfo. About thirty-nine studies conducted within the period of 2009 and 2019 met the inclusion criteria of the authors. Digital self-monitoring engagement rates have been more than 75% of the total days counted.

Self-regulation theories suggest that behavioral change occurs through self-monitoring of health and accordingly the behavioral outcomes are obtained. Progress is compared with either the future or the past performance to measure the accuracy of the outcomes. The process is important as it increases awareness within the individuals regarding their present health status and the ideal state they want to achieve after the completion of the program. The individuals also become aware of the corresponding triggers that affect their self- efficacy and accountability. Self-monitoring helps identify individual eating patterns and the dietary changes related to weight loss regime. Self-monitoring also impacts weight loss positively as it is regulated through goal setting and feedback mechanisms. This is an intrinsic reflection of a person's eating behavior.

The next article (Puig et al. 2019) assessed the efficacy, safety and effectiveness of two important components of the research that is, weight control and obesity management through mobile applications. Using digital innovative approaches, the users can achieve personal goals within a defined time period. Through a systematic review, the study delves into the mHealth interventions related to weight control and attempts to look at the outcomes. Several initiatives have been taken to define the utility of mobile applications for weight management and a number of ways have been found to evaluate these apps with respect to clinical regulations. Medical regulatory bodies across the world have not validated the credibility and safety of these technologies for the users. Medical professionals often struggle to relate these apps with real-world scenarios. mHealth solutions might present unique challenges to the medical world. Operating without a clear direction may lead to additional issues.

To mitigate these challenges, the patients, health care providers, authorities and mHealth developers must sit together to discuss the quality of health apps they prescribe to the customers. RCTs have not been proven very effective in evaluating all the dimensions of mHealth. Therefore,

all the concerned personnel must make use of instruments for evaluating the e-interventions as a whole. These instruments must perform jobs like verification, validation, certification and similar items that constitute a part of mHealth implementation. As defined by WHO, the interventions must follow the protocols of Food and Drug Administration and the European Commission.

2.3.3 Self-monitoring through mobile app

Lee et al. (2017) studied the use of a mobile application for self-monitoring of dietary intake. Two types of tests have been conducted for this purpose, that is, feasibility test and intervention study. In the recent era, people face increasing burdens of chronic diseases and they rely on information and communication technology (ICT) to take care of their health. The feasibility of mobile application is tested using examination of dietary intake of the adolescents. Participants recorded all food and beverages consumed using voice or text modes. Some of these participants were separately taken for the feasibility test and they were given questionnaires to fill during these sessions. They reported answers related to food monitoring, personal data regarding dietary intake and use of application for recording food intake. The dietary self-monitoring application that is, "Diet-A" has been partially useful for them in generating nutrient intakes. This application can provide real-time updates on selected nutrients and short messages on prevention of critical diseases, such as diabetes, hypertension and dyslipidemia.

Mobile applications like "Diet-A" can improve dietary habits of individuals and provide them with real-time feedbacks in order to make the process personalised for them. About 65% participants reported that the application monitored their dietary intake and about 61.9% were satisfied with the the results produced by the application. Adolescents reported that they keened to monitor diet

with the help of this application, however, they did not show any improvement in their diet during pre- and post-intervention stages. Few adolescents showed confidence in using mobile application as an alternative approach to conventional diet measurement techniques.

About 71.4% participants agreed that the application is burdensome and about 85.7% forgot to record their daily dietary intakes. Limited database of new products led to underestimation of some of the figures and brought error in the process. Reporting error was also seen among the adolescents as they follow unstructured eating patterns and they can easily alter food intake to change the overall report. These applications let them alter food habits very easily, which is not the case for conventional methods.

The next article (Azar et al. 2013) narrated the use of mobile applications for weight management. Smartphone applications can assist with weight management. However, some of these applications are not well characterized in terms of behavior and function. Weight management applications recorded in this study can help devise strategies related to health interventions that is, diet tracking, anthropometric tracking, grocery decision making, and healthy cooking. The mean behavioral score was found to be 8.1 (Azar et al. 2013).

In the US, nearly seven of every 10 adults suffer from being overweight to being obese. Weight reduction is promoted across the country through lifestyle intervention methods. These methods include intensive educational and counselling sessions in order to level up the energy intake rates. Due to increased energy expenditure the obesity trajectory showly levelled up to becoming an obesity epidemic. The smartphone makers captured this opportunity to develop new mobile applications that can smoothly intervene with the behavioral aspects of the people while going

through a weightloss journey. About 61% US adults owned smartphones during that period and about 60% searched for “weight loss” topics over the internet (Azar et al. 2013).

In recent times, more than 10,000 apps are available over the internet that assess the effectiveness of the existing weight loss apps (Azar et al. 2013). These apps target dietary factors of the patients and also formulate charts that aid in their weightloss journey. These apps also show the behavioral changes of individuals, which is otherwise a difficult task to achieve. Although mobile applications have the potential to show the current picture of individuals regarding their health status and weight, they fail to incorporate evidence-based content in their platforms. These apps also do not recommend theory-based strategies, which might have negative effects on individuals.

Ghelani et al. (2020) reviewed latest evidence showing use of mobile apps for weight management. In recent years, mobile technology has been a potentially desirable platform for weight management, which limits the spread of this deadly epidemic. Clinicians often talk about the benefits of these applications and the latest developments concerning this field. Studies conducted at all levels showed promising results regarding weight management through mobile-based interfaces. Randomized controlled trials (RCTs) have been used to synthesise latest evidence on the clinical use of mobile platforms for weight reduction and control. These instruments also show the limitations of mobile weight management applications.

Over the last 50 years, overweight and obesity have been the major health issues across the world. There is a need for intervention to reduce the effects and high burden of comorbidities associated with increased fatness. As per data of 2016, about 39% of the population was overweight and about 650 million people were obese (Ghelani et al. 2020). Detected comorbidities have been type 2 diabetes, cardiovascular diseases, musculoskeletal disorders and cancer in various forms. In

response to this situation, the World Health Organization (WHO) has defined electronic health (eHealth) as the availability and use of data required for the digitalization of medical documents or records and dissemination of information between health practitioners.

Electronic health is narrowed down to mobile health (mHealth), which requires the use of mobile devices for improving the health outcomes. It requires the use of wireless mobile technology to monitor the daily habits and dietary charts of the users. The degree of specificity varies with target audience and most of these applications aim to treat complex diseases so that the patients can enjoy a healthy, balanced life. In modern era, there is considerable increase in number and availability of mHealth products as well as consumers. These consumers regularly reflect and monitor their own health behavior through these applications.

The next paper (Islam et al. 2020) put forward the use of mobile phone app interventions for promoting weight loss. Lack of physical activity is one of the major causes for obesity and it may cause life threatening diseases and major risk factors of health. Owing to the demand for cutting-edge technology and efficient interventions, mobile apps can promote weight loss and boost physical activities within children. Large electronic databases, such as, Scopus, EMBASE and Web of Science revealed that mobile phone app intervention can control body weight and assess physical activity outcomes.

Changing lifestyle, behavior and habits is a cumbersome task for many people as they are already in charge of their lives. These people find it very difficult to sustain weight loss. As a result, they quickly jump back to their previous number. Mobile app intervention can motivate people to take the plunge and change their lifestyles, so that they can achieve their goals. They must follow the guidelines provided by this digital platform to set pragmatic goals, maintain weight loss and

increase the rate of physical activities. They can also exchange ideas with their peers through this platform and take help or suggestions from them.

About 75% adults use digital platforms or mobile phones for devising preventive or protective measures for disease prevention, control and management (Islam et al. 2020). These interventions support behavioral change and provide an interactive and timely access to vital information. App-based interventions are cost effective and reduce most of the barriers related to traditional approaches. These mobile applications are controlled by a mobile app intervention delivery system that produces an innovative way to manage weight and enjoy a healthy lifestyle. About 11 randomised control trials have been performed along with 792 experimental participants and 799 controls (Islam et al. 2020).

2.3.4 Changes in lifestyle, mobile app and weight management

Brownell (1999) investigated the central role of lifestyle change in driving long-term weight management. Lifestyle change relates to alteration of eating behavior, exercise pattern and other psychological factors, such as, attitudes, emotions and aspirations. These factors are the lead indicators of weight loss for a person. Primary treatment is carried out using medical interventions, however, behavior of the concerned person plays a great role in this process. If a person has the right behavior, the chances of generating successful outcomes are more than the others. The intake of prescribed medication depends on the thoughts, attitudes and social environment of a person. In order to be a part of a successful treatment procedure, the self-management skills must be developed. These skills enable long-term lifestyle change of the individual so that he is able to

cultivate and nurture the right attitude towards weight management. It can also ease away the process of discarding old habits and acquiring new ones in their place.

The study defines lifestyle management as a set of behavioral and thinking patterns that affect weight and other associated elements. Individuals acquire skills, make relevant decisions and act accordingly, which in turn affect their eating habits and physical activities. In response to the present condition of the person, the practitioners must simply give advice for eating better and exercising harder in order to reach an optimal weight. In almost every program for obesity, lifestyle management, lifestyle management is taught as an important chapter. These programs vary widely in terms of empirical support, intensity, ease of use and underlying principles.

The most common lifestyle change program related to weight management is LEARN. The acronym stands for Lifestyle, Exercise, Attitudes, Relationships and Nutrition. One key area among these is attitude, which shows the patient's willingness to accept reasonable weight-loss goals and think in terms of health benefits. Mostly, the health professionals recommend a 10% weight loss, which might affect the mental wellbeing of a person, leading to frustration or relapse (Brownell 1999). However, if the person is able to accept the goals of a modest weight loss, he can easily achieve the desired body weight goal. Slowly and steadily, the person can embrace the physical transition.

According to Malone et al. (2005) a lifestyle challenge program can be treated as a multidisciplinary approach to weight management. Many weight loss programs are prevalent across a wide range of settings, some of which require pharmacists' involvement. A successful approach to weight management must have selected characteristics, that is, collaborative, comprehensive and multi-disciplinary factors. In this program, adult patients were recruited from

outpatient university-based settings to participate in the weight loss program. The key segments of the program included diet, exercise and behavioral changes. Over a 20-week period, the program included one-hour group sessions, conducted by the eminent faculties.

The US Department of Health and Human Services identified some of the key factors that aided in the longevity and quality of life for the overweight and obese individuals. The document also clearly mentioned that 60-65% of the adults in the US are overweight (Malone et al. 2005). National guidelines recommend balanced diet and exercise as the preliminary steps towards weight loss journey. However, people want short-term results and they opt for pharmacotherapy or surgery, which might have detrimental effects on their health in the long term. On the contrary, people who are inclined towards a healthy diet and exercise are headed towards long-term health benefits.

The different steps taken towards health weight loss are introduction of a lifestyle challenge program, determining the roles and responsibilities of the faculties, selection of the participants, eligibility criteria, baseline screening of participants, health-related quality-of-life assessments, assessment of binge eating severity and depressive symptoms. Participants who failed any of these tests were called up and requested to attend subsequent meetings held by the group facilitator. Participants who missed out 2 consecutive meetings were removed from the group and assumed to have withdrawn from the process. These patients were assigned in "intent-to-treat" (ITT) or "per protocol" (PP) group.

The next article (Vaz et al. 2021) discussed a randomized controlled trial for an innovative, user-friendly and interactive lifestyle intervention for weight loss. Electronic-based lifestyle interventions are generally labor intensive as they require logging onto websites and recording

activities manually. These processes are very time consuming and they require complete attention of the concerned person. Lack of human coaches may add to the inaccuracies and discrepancies within the process. To address these pertaining issues, the present study highlights a comprehensive lifestyle intervention using a friendly, interactive session through a smartphone-based app.

About 28 adults with BMIs within 25-42 were taken for the experiment (Vaz et al. 2021). Other elements used in the experiment are wearable activity trackers, food photography logs, app-based behavioral coaching, peer support and smartscales. To achieve sustained weight loss, realistic interventions must be set up so that the daily energy intake is in tandem with the energy expenditure of a person. Lifestyle interventions can include in-person approaches, however, these processes are difficult to implement and sustain. The optimal weight loss should be around 5 kgs within 6-12 months, which can be achieved through self-monitoring and extensive personalised feedbacks along with comprehensive weight loss interventions.

In the US, the smartphone-based weight loss intervention can be effective as the country has a high smartphone penetration rate, that is, 69.6% as of 2018 (Vaz et al. 2021).This figure has increased tremendously from 2012, when the penetration rate was just 40% (Vaz et al. 2021). Modern smartphones are built in a way that avoids tedious features, such as, manual tracking of weight, physical activities and calorie intake. These applications are mostly meant for a comprehensive lifestyle intervention with limited burden of monitoring in a manual way. It also reduces the abnormal pressure on participants and professional coaches. This intervention included easy access to professional coaching services.

The last article (Siriwoen et al. 2018) shed light into the effectiveness of weight management programs carried out using mobile health technology as a supporting instrument for corpulent women. Applying mobile health (mHealth) technology, the study conducts a quasi-experimental research with thirty overweight and obese women, aged 25 to 52 years. These women are ready to take action regarding weight loss programs and be a participant of a 12-week weight management program. One of the growing public health challenges in Thailand is obesity and more than one-third of the population, that is, 37.5% people suffer from this issue (Siriwoen et al. 2018).

About 32.9% men and 41.8% women are faced with issues of obesity in the country (Siriwoen et al. 2018)The highest rate of obesity is seen among middle-aged women, belonging to the group of 45 to 59 years. Urban residents suffer from this issue more than that of rural residents. The World Health Organization states that the use of mobile devices and wireless connections can potentially change the shape of global health services. These wireless technologies are the supporting tools for abolishing face-to-face contact between health practitioners and patients. Personal Digital Assistants (PDAs) are allocated to the patients so that they can get the maximum benefits from the health plans.

Several studies have shown that the patients have recieved the maximum positive outcomes using the mHealth technology during weight management and control. The length of the weight management interventions ranged between 1 month and 12 months. Among all the devices, the use of smartphones has generated the maximum benefits to the users. In few selected cases, overweight and obese people have failed to apply this program in their daily lives. The most commonly used method is the traditional paper food record, which is a part of traditional self-monitoring process.

2.3.5 Techniques adopted for healthy weight loss management through mobile apps

Set of authors (Cavero-Redondo et al. 2020) shifted their attention towards the effect of behavioral weight management interventions on the mHealth weight loss application. Through systematic review and meta analysis, the authors have studied the interventions related to weight loss and healthy lifestyle. Mobile health (mHealth) is considered highly effective while preventing and treating excess weight in the body. The study also investigates behavioral weight management through mHealth self-monitoring techniques. To find suitable data and information, databases like MEDLINE, EMBASE and the Web of Science are searched. The results of subgroup analyses indicated that smartphones are the most effective mHealth support devices, which are a part of behavioral weight management and self-monitoring of weight loss process. As a responsive measure of weight disorder, mHealth applications can be considered successful. These applications have tremendous effects on the self-efficacy, motivation and adherence to treatment protocols and thereore, yield better results than conventional methods.

In the current times, obesity prevalence rates are much higher than past decades and therefore, interventions are easily scalable. mHealth self-monitoring prevents and treats excess weight and analyzes the effects of behavioral weight management approaches on the lifestyle of individuals. About twenty studies showed the effects of behavioral interventions using mHealth self-monitoring application conducted in six countries. The published reports between 2007 and 2019 showed that the consumer groups for mHealth self-monitoring intervention mainly belonged to the age range of 20.5 to 59.8 years. The baseline weight of these individuals ranged from 62.1 kg to 116.9 kg.

The mHealth interventions were carried out using PDAs, smartphones and web-based approaches. The length of interventions went up to 24 months and the percentage of dropouts from the mHealth ranged between 5 and 54.8%. Subgroup analyses showed that the mHealth interventions produced greater effects when carried out using smartphones. Furthermore, meta-analysis proved that smartphone-led mHealth self-monitoring processes are more pronounced as compared to using care and short term interventions.

mHealth applications are tested using Pilot testing method in order to find out their effects on people with disabilities (Radcliffe et al. 2021) Growing evidence shows that people with disabilities face more challenges while acquiring healthcare and wellness resources. It is the responsibility of the government and health authorities to take special care of these people so that they can easily access the mHealth applications. Using two existing assessment instruments the authors have collected data and tested the top-rated weight management applications under three disability groups, that is, vision, dexterity and cognitive development. The lowest accessibility was found among people with visual impairments.

In the US, mHealth applications are a way to manage chronic health diseases, but when it comes to managing people with disabilities, their needs and accessibility are often overlooked. People with dexterity and visual impairments often face application incompatibility with alternative software and assistive devices. People suffering from visual and cognitive impairments often use special tools, such as, custom contrast, color adjustments and auditory alerts to use smartphone applications. Therefore, they need more attention while using these apps for weight management. Rapid spreading of mHealth apps over the globe may lead to increased health disparities beteween ordinary people and people with disabilities.

The smartphone applications used as innovative approaches provided reliable compatibilities and weight management. These approaches are mainly directed towards goal-setting, which also helps users track nutrients and generate successful weight loss outcomes. The data is captured in distinct subgroups with the desired characteristics in order to reach the targets. The final app is FatSecret, whereby the customer can receive a peer network support to buckle up and reach their weight goals.

The next article (Vlahu-Gjorgievska et al. 2023) discussed the mHealth Apps targeted towards minimising obesity and overweight in young people. Increased calorie intake may lead to serious health problems and medical conditions and at least a quarter of young population suffers from this issue. Mobile health apps come to the rescue at this stage by encouraging positive health behavior and achieving better health outcomes. These applications are unique opportunities for young people to adhere to the health interventions and take necessary steps in order to maintain a healthy weight. User adherence to health interventions is predicted to be low in the long term.

91% young people are the users of a mobile device and they provide useful notifications to the users at particular moments to adopt certain behaviors and make the most out of these digitally-supported obesity interventions (Vlahu-Gjorgievska et al. 2023). mHealth apps are unique opportunities for young people to revolutionalize their health behavior and support change interventions in the workplace. In the long-term, these interventions can pave the way for improved engagement and health benefits. By moderating the behavioral factors, mHealth enhance self-efficacy, positive outcomes and potential for success. The user interface and experience of mHealth apps take the customers to a new level, where they can have their own interpretations and perceptions.

An important element of mHealth apps is user interface design patterns (UDP), which can provide descriptions and best practices within the user interface designs. UDPs have the ability to strongly influence user perceptions and viewpoints and they can also impact the rate of adoption of health applications by the users as well as their continuation of use. They can take up commonly occurring issues and find general reusable solutions to ensure continuous flow of user interfaces. These users are generally satisfied with this technology. They find it very easy and enjoyable. UDPs can also enhance the cognitive load of the users.

The last article (Rivera et al. 2016) depicts a scoping review for the mobile apps used in weight management. These mobile apps are found to be cost-friendly, scalable and effective in improving the health outcomes of adults and adolescents. The commercial market for these apps has expanded at a rapid pace as these tools are believed to be of finest quality. This study referred to 393 apps, among which 35.3% apps used self-monitoring on a large basis (Rivera et al. 2016). About 27.5% provided physical activity support to the users, 7.1% apps recommended motivational strategies, while others provided social support and personalized feedback (Rivera et al. 2016).

Interactive information and communication technology is able to support self-management of chronic diseases even at low-cost scalability. The clinical intervention strategies are converted into digital intervention strategies through mobile apps, which leverage multifunctional capabilities with the widespread use of mobiel devices. Growing research has also revealed that mobile apps show superior performance when compared with standard no-intervention controls. Mobile devices enhance self-efficacy by activating prime behavior of users and reducing the burden of behavior change techniques. These apps transmit personally relevant education as well as resources to the users to find convenient ways for self-monitoring weight loss.

It has also been observed that health care experts are involved in the process of app development and they perform scientific evaluation of the information presented in the app. According to the Ontario Regulated Health Professions Act, a healthcare professional must provide useful insights during the development of a weight management app. The app makers must also consult accessible scientific databases to incorporate accurate information within the app. Credible websites and databases used for this purpose are National Centre for Biotechnology Information and PubMed.

2.3.6 Future impact of mobile apps on weight management

Empirical investigations show the prevalence of multiple factors influencing consumer intention while using artificial intelligence-powered mobile applications. Several interventions have been carried out using mobile health (m-Health) applications, which grabbed the attention of the researchers. The adoption of mHealth apps for weight management is driven partially by the consumers' attitudes towards reaching the desirable weight number. The Information and Communication Technology (ICT) market is driven by consumer expectations and demands and they play a major role during the launch of a new product or service (Huang and Yang 2020). In future, the adoption of a product or service by a customer will depend on the future installed consumer base and its resulting externality. A large chunk of users have responded that they are going to continue using the weight management mobile apps in the future. For most of the users, use of weight loss and health management app has become a daily habit.

Future studies might use survey platforms to select participants for reviewing the weight management apps. Online data shows that the study-focused adults aged more than 21 years have had an abundant experience while using these apps on their smartphones. About 57% of these

consumers hold a master's degree or higher (Huang and Yang 2020). The current study uses a cross-sectional analysis to understand the intention behind using the weight management apps. It is revealed that a large portion of the target population is going to actually use AI-powered weight loss management app for a definite period of time. The behavioral intention (BI) of the candidates might be different from their actual usage behavior as seen from the present data.

Future weight management apps will be able to track participants who are the real-time users of the app and showcase similar behavioral intentions. These apps will also be able to track the behavioral dimensions like attitude and emotions of the consumers so that they can offer personalized diet charts and exercise recommendations to them. Quantitatively, these apps will used metrics like body mass index and health condition for understanding the relationship between behavioral intention and adoption of m-health components. Habit is found to be a pronounced factor in this situation, which will determine user behavior.

Kozak et al. (2017) discussed all the technology-based interventions related to weight management. In this study, a futuristic direction is predicted for the smartphone apps related to weight management. Studies have shown that many individuals are unable to participate in face to face treatments due to limited costs, accessbility or time constraints. Widespread use of the internet, smartphones and self-monitoring tools have introduced the concept of eHealth weight management programs. The future of eHealth weight management will be affected by dissemination and implementation of newer policies by the government all over the globe. Several methodologies will be explored while evaluating existing protocols and designing future treatments.

Past researchers have found out that high levels of adherence to the protocols will result in significantly more weight loss for about 96.8% of participants (Kozak et al. 2017). An example of adherence can be logging into a study website for setting goals. Based on intent-to-treat analysis, a significant link is established between better adherence and more weight loss. These findings indicate that adherence to eHealth interventions can serve as an important factor in the weight loss journey. Future smartphone applications are going to measure and report adherence data in order to find out the intentions and goals of the participants, instead of measuring their level of engagement.

A trend has been noticed in user behavior, that is, more men are enrolled in Internet-based weight loss trials as they rely on app-based weight management treatment than conventional treatments. They can easily access the weight loss videos and enjoy the benefits of an internet-based weight loss program. The app makers can think of designing a new weightloss programs with customized strategies in order to achieve six 100 cal reduction in a day. This approach can be experimented in the future to seek the attention of the customers and help them lose at least 5% of their initial body weight.

Another set of authors (Kelli et al. 2017) researched on the future of mobile health applications and devices in treating cardiovascular diseases. Mobile technologies have particular relevance in enhancing the lifestyle behavior of the individuals, which directly minimises cardiovascular disease risks. Future progress of mHealth technologies will help validate and standardize accelerometer and heart rate data from various devices. Intervention studies like integration of dietary charts with physical activities improve the intermediate outcomes. In the future, data is predicted to be integrated with various devices and fed into the medical record system in order to smoothen the communication between healthcare practitioners and patients.

Technologies like Fitbit have already noted the short-term behavioral changes of patients with the change in medical diagnosis and interventions. Sustained behavioral change is also noted among patients having myocardial infarction. Future days will see the growing use of mobile computing by the patients of cardiovascular diseases in order to prevent weight loss and rapid behavioral fluctuations. Most of these apps will revolve around three major themes, that is, dietary management, physical activity promotion and cessation of addictive smoking behavior. It is highly likely that American Heart Association (AHA) is going to formulate new policies related to blood pressure control, weight control and healthy eating.

It is forecasted that smartphone access and utilization of health apps will be at peak in the next few years. The number of people using mHealth apps on iTunes will rise to more than 1 lakh. More than 62% of the US population will use phones to access health-related information and educate themselves on healthy living and weight loss mechanisms (Kelli et al. 2017). Abiding by the guidelines of AHA, the patients will start exercise and other physical activities on a regular basis. The patients that measure their blood pressure levels and lower them using the prescribed drugs on the digital applications.

The final article (Spruijit-Metz et al. 2015) draws attention to the use of interactive technology for supporting weight management. The various futuristic innovations observed in this field are also narrated in this study. The mHealth efforts towards weight management take advantage of short message system (SMS) to convey any information to the users. In future days, these apps are going to use real-time sensing technologies to develop multiple innovations, such as, just-in-time and adaptive interventions (JITAIs). These techniques are going to sense and intervene three central elements of weight management, that is, diet, physical activity and sleep.

The interactive platforms of mHealth technologies will offer valuable solutions that revolutionize current practice and upgrade obesity research and interventions. mHealth is going to offer new solutions in the segments of dieting, activities, sleep and sedentariness. The users are going to use wearable and deployable sensors linking them to their smartphones, through which their behaviors will be tracked ubiquitously and continuously. Studying the social and environmental surroundings of the users, these behaviors can also be tracked. A combination of sensors will be linked to mobile computers in order to deliver just-in-time, adaptive interventions (JITAI) to the users.

JITAI are ecologically sound instruments as they are meant for serving the daily lives of people. With the changing status and contexts of an individual, these intervention elements will adapt and modify themselves accordingly. JITAI can be delivered remotely in the situation when a person has the maximum need. It is believed that during times of emergencies, the patients will be receptive to JITAI and will take appropriate measures to improve their health status. However, intervention doses and content will be regularly amended according to participant data.

2.4 Summary of the literature

The literature review chapter revolved around the briefings of the present works of researchers related to weight management through mobile apps. Information technology has played a major role in making the weight management process easier and smoother for the users. The key activities performed using these apps are monitoring of diet, physical activities and motivational therapies to sustain the reduced weight for a longer period. Through these apps, the users can self-monitor their weight and understand their behavioural approaches to obesity. These apps enable systematic

tracking and recording of weight for a defined period so that the users can understand the trajectory of their weight loss journey.

BMI (Body Mass Index) is a popularly used indicator of obesity, which shows the proportion of weight with respect to the height of the individual. BMIs ranging between 25 and 30 show overweight, while BMIs with 30 or more show obesity. True obesity paradox has been mentioned in the study, which is a characteristic of cancer patients. Nowadays, digital weight management platforms use the internet, personal digital assistants and electronic digital scales to make the weight loss journey convenient for the users. It has been observed that the accuracy of these apps is much higher than conventional methods.

Mobile applications like “Diet-A” have been thoroughly researched and their use in real-world scenarios has been examined. This application provides real-time feedback to the users so that they can monitor their dietary intake and physical exercises accordingly. Smartphone applications also offer anthropometric tracking, grocery decision making, healthy cooking and restaurant selection. Mobile technology is compatible with a higher degree of specificity and aims to treat complex diseases in order to pull down the death rate of individuals. While going through the weight loss journey, the users undergo changes in their lifestyles and alter their eating behavior, exercise patterns and some of the daily habits.

Suitable data and information is collected from MEDLINE, EMBASE and other databases to investigate behavioral weight management through self-monitoring techniques on a digital platform. In this area, mHealth applications have been very useful as they affect self-efficacy, motivation and adherence to treatment protocol. mHealth apps provide descriptions and best practices to the users through user interface design patterns (UDP). These elements influence user

perceptions and impact the adoption of health applications and their continuation of use. Empirical investigations have shown that these platforms will continue to evolve in future by bringing in innovations like diseases sensors.

2.5 Research Gap

The literary studies covered in this section reflected most of the critical aspects of weight management apps and their contribution towards the weight loss journey. However, past literature has not extensively researched on the advantages and disadvantages of using weight management apps and the challenges faced by individuals while they try to self-monitor their weight loss journey. The studies also did not project the geographic distribution of obesity and the user behavior of weight management mobile app across several regions of the world. Neither did any of the studies talk about any newly implemented app that can make a good market in this field. This research will introduce a new app, that is, LPM weight management app to fill the gaps of past literature.

CHAPTER 3

RESEARCH METHODOLOGY

The selection of various research instruments that are being employed to accomplish the major purpose of the research is covered in this chapter of the thesis. This section of the study presents the methodological choices the researcher used for collecting and analyzing data, along with a thorough explanation of those selections. The rationale will go into great length to explain why a certain approach was chosen and why it makes the most sense in light of the purpose of the study. An overview of the study and a review of earlier studies in this area were given in the earlier sections of the research. The section will begin with an explanation of the many forms of research philosophy, along with accompanied with an explanation for the choice of the specified research philosophy. To help the scholar make informed judgments on study design, this section will provide a general overview of the key research techniques and strategies that are being used for this project. Lastly, a summary of the methods employed for data collecting and analysis that contributed to the research's dependability will be given in this part. The section will end with a review of the ethical considerations for the investigation. For this section, the subsequent subheadings would be applicable.

According to Goundar (2012), research methodology is like a roadmap solving a research problem. It's kind of a science-y way to figure out how to do research stuff. Good quality results in strategic management come from solid research methods being used. Even with advancements in methodology, there are still challenges in the field. Authors, editors, and reviewers need to step up their game in measuring and analyzing data. Research methodology involves the steps scientists use to describe, explain, and predict events. It helps plan out the research work. Igwenagu (2016)

explains that methodology is different from a method. It doesn't solve problems directly but sets the stage for choosing the right methods or best practices for different situations. For proper scientific understanding, we need discipline and a professional approach. Picking the right research method means knowing all the different types out there. It can be tough to pick just one approach that fully addresses the problem you're looking into. To tackle this issue, it's important to use various research techniques. Organizational Research Methods (ORM) could play a crucial role in improving standards in strategic management, as suggested by Ketchen et al. (2008). Dźwigoł and Dźwigoł-Barosz (2018) emphasize that mixing it up with different methods is key.

3.1 Overview of the research problem

The aim of the proposed study and literature review is to find out which better for helping folks lose weight on their own: old-fashioned private therapies or modern mHealth apps, like the LPM Mobile app. The research showed that a mix of exercise, good food, rest, and lifestyle changes is key to managing weight effectively. While some studies doubt the effectiveness of mobile health apps for weight loss, many others prove they work well. This confusion points out the gaps in our knowledge about how these technologies really affect weight management. The study's goal is to see how well people can manage weight loss with the LPM Mobile app. It aims to check how the app influences self-management of weight loss and compare its effects with traditional isolated methods. To determine the characteristics of the app most valued by users. The research questions derived from the objectives are:

1. What is the impact of using mHealth apps like the LPM Mobile app on self-management of weight loss?

2. How does the impact on self-management of weight loss compare between the LPM Mobile app and private practice?

3. What are the characteristics of the app most valued by users?

Research Methodology: The study employs an exploratory research design, specifically an experimental design, to compare the effectiveness of the LPM Mobile app against private practice. Primary data collection through surveys is chosen to gather quantitative data on app characteristics valued by users. Non-probability sampling is utilized to select participants with extreme obesity (BMI > 40 kg/m^2), divided into experimental (app intervention) and control (private practice) groups. 385 participants on board, shooting for a 95% confidence level with a 5% margin of error to keep things precise. Our focus is on those carrying a lot of weight to keep our results consistent. For number crunching, we're turning to MS Excel and SPSS for a down-to-business analysis that lines up with our data-driven approach.

The goal of this study is to bridge the gaps in our knowledge about whether mHealth apps like LPM Mobile can help folks manage their weight better. We're after hard numbers showing how they stack up against the old school methods, aiming to clear up any doubts about their effectiveness. Knowing which app features users value the most could influence future apps and strengthen weight management tools. We intend to test LPM Mobile in weight-loss mode soon, so check back for a second post with results and app-maker feedback. Our study provides a quite substantial effort for mHealth in the weight management area, primarily characterized by hard data and a deep dive into an app world of health interventions.

3.2 Operationalization of theoretical constructs

Consumer behavior theory gives us a good way to understand how people make choices, use, and stick with weight loss plans. Lots of things like psychology, society, money, culture, and who we are as individuals all mix together to shape how consumers act in this area. When we use theories like TPB, HBM, and SCT, we can come up with better strategies to make weight loss programs that work for consumers. Looking at consumer behavior theory in the world of weight loss gives us smart ideas about how people decide things about their health. It a deep dive into the many things like psychology, community life, and cash that affect how consumers choose and stick to weight loss programs. The idea here is to see how people or groups pick, buy, use & get rid of stuff or services to meet their wants and wishes (Solomon et al., 1995). Using this idea in weight loss means getting how people decide on a program and what helps them stay with it & do well.

Factors Affecting Consumer Behavior in Weight Loss Programs

1. Psychological: Our thoughts play a big role in shaping what we do in weight loss programs. What drives someone to start losing weight? Things like self-worth, body image views, and wanting self-growth can be big motivators (Ogden, 2011).

2. Social: Friends & family can also push us towards or away from weight loss programs. Having support & cheerleading might help us stick with it better, while peer pressure could affect what program we go for (Hill, & Peters, 1998).

3. Personal: Our own traits matter too - things like our age or job or health issues change how we see and join in on weight loss programs. For example, younger adults might want high-tech plans with apps while older folks might like face-to-face help (Laudenslage et al, 2021).

4. Our Ways & Where We Live: What our community thinks about food or what workout spots are open near us impact how well weight loss programs work for us too. Cultural values about meals or moves & access to good-for-you foods matter big time (Kumanyika et al., 2018).

5. Monetary: How much it costs to join a program or keep up with it makes a big difference. People have to think if the price is worth the good stuff they'll get out of it when they lose weight & feel healthier (Jeffery et al., 2000).

Using Consumer Behavior Theory Models

1. Theory of Planned Behavior (TPB): This one says what you plan on doing is tied to your attitudes about it, what others near you want you to do (social norms), and if you think you can control your actions well (self-efficacy). With weight loss programs, TPB helps know why people trust a program's power if family & pals back them up on it and if they believe they can keep at it (Ajzen ,1991).

2. Health Belief Model (HBM): This one tells us our picks around health are fixed by if we think bad stuff could happen health-wise soon; if we see those things as big problems; if we reckon making moves will bring good results; and if there are hurdles in our way too . For weight loss plans , HBM shows why people look at chances of getting sick because of extra pounds; positives

from shedding those pounds; limitations due to time or physical issues when picking a program(Stuckart ,1974).

3.Social Cognitive Theory (SCT): This one chats about personal bits mixing with outsides forces and actions . It says thinking you can do something is key when changing behaviors . Thinking about losing extra for this theory shows why self-belief matte rs in sticking with plan alongside help from fam & friends and world out there impacts success (Bandura 1986).

4. The Impact of Sales Talk & Signals: Good marketing talk has a big say in making folks go for a new way of losing weight! Telling stories that hit home for success stories,endorsing by docs,and talking straight benefits helps programs stand out more giving more DJ s (Coutts, Schneider Gruman, 2012)

5. Real Stories & Science: Studies give cool data on using consumer behaviour theory when sorting out weights' plans. Looking at which type works best (online vs Just Being There counseling) along with our tasting could make them great (Flores Mateo et al 2015)

3.3 Research Design

After the researcher has determined the exact issue to be addressed and turned the variables and research question into a clear, quantified hypothesis, it is crucial to choose an acceptable research strategy. A researcher planning a study must select an appropriate research design before selecting study participants and assigning them to groups. As it often happens, the specific research design that is used in a study determines how study participants are selected and assigned to groups (Marczyk et al., 2010). Any research endeavor needs a suitable research design in order to be

completed effectively. "A plan adopted by an investigator before gathering data begins so as to accomplish the research goal in a valid way" is the definition of research design. Translating a research problem into data for analysis in order to provide pertinent answers to research questions at the lowest possible cost is the fundamental component of research design."By organizing the research into a coherent approach and outlining how all the key elements work together to meet the research objectives, a successful research design helps to avoid dissatisfaction. A research project's chances of success are increased by clearly describing its first section and providing a justification and objectives statement. It is simpler to recognize and arrange the sequential actions required for creating a research strategy and carrying out the investigation with success thanks to this clarity. Instead of choosing a study design at random or without a good reason, one should choose one based on the nature of the investigation (Asenahabi, 2019). Omair (2015) emphasized how important it is to select the right epidemiological study designs for a particular research subject.

Positivist research paradigm is chosen to provide objective and statistical data on the impact of the LPM Mobile app. By treating cultural norms, beliefs, and communication behaviors as variables, a positivist paradigm aims to make generalizations from a set of metrics (Hua, 2015). The positivist paradigm holds that actual events may be observed through experimentation and logically explained. A positivist would focus on solving the external manifestations of complex society concerns such as criminality and unemployment before any other consideration. Social science scientific practices were greatly influenced by positivism in the early 20th century. This was

especially true for naturalistic domains, where reliable predictions can be made since laboratory studies can fairly closely mirror real-world scenarios. However, in the social sciences, human will and uncertainty make laboratory trials less reliable (Kaboub, 2008). The most effective ways to collect data are through investigations that use a quantitative approach and grounded in positivist philosophy. Survey questions are used to gauge respondents' preferences, emotions, and performance both individually and in groups (Rahi, 2017).

A scientific technique is necessary for a researcher to do high-caliber research. Empirical studies use scientific methods and a deliberate approach to solve research issues. Every study includes inherent uncertainty, and doing so requires the researcher to exercise extreme caution. For a research endeavor to be accepted, the research problem must be investigated using a systematic approach. The researcher must approach it with a temperamental, skillful, competent, and highly dedicated attitude. The only ways for a scholar to increase the accuracy of his investigation are through the use of scientific methodology and this logical concept (Khalid et al., 2012). Despite being general and abstract, the difference between "qualitative and quantitative research" is frequently disregarded. A scientific technique is required by a researcher in order to achieve Because many of the characteristics of "qualitative and quantitative" techniques significantly overlap, it is frequently difficult to distinguish between them. Research procedures should generally not be conceptualized at the same abstract levels as when employing "qualitative or quantitative approaches." Instead, it is suggested that discussing the benefits and drawbacks of specific research methodologies is more fruitful, especially when done in the context of specific study topics (Allwood, 2012). The following are the primary categories of research approaches.

Quantitative research approach is selected to quantify the impact of the app and private practice on weight loss management. The main idea of quantitative research is to draw big conclusions. To make that happen a smart person has to pick the right study plan, really understand their variables, choose the best way to pick samples, check if the tools are spot-on with "validity and reliability", pick the top method for getting data, and use the best way to analyze data (Khalid et al., 2012). Apuke (2017) talked about the quantitative approach as "a research that deals with measuring and looking at variables to get answers. It means using numerical data and special stats tricks to answer questions like who, how much, what, where, when, how many, and how." This kind of research can be split into "survey research, correlational research, experimental research, and causal-comparative research". Doing quantitative studies needs more than just "collecting data, doing stats, making sure instruments work right, and fitting analysis" for them to be good and right. Qualitative studies need more than just respecting what folks on the sidelines have to say - they must earn trustworthiness by framing unique qualities in solid frameworks guided by key principles (Fisher jr and Stenner, 2011).

The study employs an exploratory research design, specifically an experimental design, to compare the effectiveness of the LPM Mobile app against private practice. Primary data collection through surveys is chosen to gather quantitative data on app characteristics valued by users. Non-probability sampling is utilized to select participants. Exploratory research designs are used to look into and learn more about situations that haven't been the subject of in-depth analyses and investigations in the past. Its goals are to more succinctly characterize an issue and to formulate

actions that contribute to its resolution. Understanding exploratory research design can help define and make sense of research challenges and issues in management research. When conducting exploratory research, management sciences researchers should use a variety of data collection techniques in order to meet their objective of gaining a deeper understanding of a problem (Olawale et al., 2023). Producing innovative findings with exploratory research designs is easier because there are less rigorous methodological constraints. Producing innovative findings with exploratory research designs is easier because there are less rigorous methodological constraints. It is more likely that a significant result will be found if the threshold for what the investigator considers significant is lowered. Additionally, the researcher might wish to look into any possible connections between some of the variables that were measured for the study. Researchers in the management sciences should employ a range of data collection techniques when conducting exploratory studies. To satisfy the investigator's interest and the demand for a better understanding of a phenomenon, as well as to follow the guidelines of exploratory study design, the three data collection methods—interview, observation, and survey—are employed in the interim (Thomas and Lawal, 2020).

The scientific method used to explore correlations between multiple factors is called an experimental study. This approach involves examining independent and dependent variables to determine the type and strength of their relationships. Such evaluations are essential for testing hypotheses and establishing cause-and-effect relationships. Since experimental studies use quantitative data and statistical analysis, their results are highly accurate and valuable. This method is useful in fields like academics, social sciences, psychology, and physical assessment. Time-bound research is typically employed for verification purposes (Voxco, 2021). The outcomes of

this method are often specific and relevant. The data collected allows researchers to assess success, failure, or other precise results, making it easier to advance any idea based on the insights gained from this process. During variable manipulation, results must be brought to their logical conclusion to obtain the necessary data. However, a significant drawback of experimental research is its potential to overlook moral or ethical issues arising from certain factors. Some aspects cannot be safely altered without posing risks to individuals, the environment, or society at large (Zubair, 2023).

3.4 Population and Sample

A group of customers will be chosen, who frequent users of weight management apps are and another group will be the non-users. This process involves selecting the most valued app characteristics by users, followed by collecting numerical information using surveys. Non-probability sampling means selecting just anyone to be in a study without knowing the probability of how likely they are selected, and that has bias on it. This includes different types, namely convenience/purposive sampling, quota sampling, and snowballing.

1. Convenience / Purposive Sampling: The frequently used type of sampling that selects samples at the discretion and solely dependent upon what well serves the investigator's purpose. Commonly used in the clinical research setting -- so they basically get a pool of subjects that meet their specific criteria. Benefits include that it is widely used, inexpensive, and does not require an exhaustive base list of the population. However, the limitations of this design are unmeasurable and uncontrollable variability and bias. Also, results would not be applicable to the sample. Examples include: Patients of OPD in a hospital; School students; Members of a social body.

2. Quota Sampling: This method requires that certain population characteristics be presented as specified by the investigator. An investigator may desire only 40% men, and then will cease recruiting after reaching a capped number of 40 within the sample size of 100. It combines moderate cost with wide use, as well as enabling some stratification without requiring a full list of the population. It has limitations similar to those of convenience sampling. Although stratified and quota sampling both divide the population into categories, in stratified sampling respondents within each stratum are randomly chosen -- possibly requiring callbacks to complete an interview - so a sample frame is needed. Quota sampling is the selection of units within predefined pseudo strata at random, with equal probability. That means just selecting everyone who passes by or is seen doing something unusual (an example). Stratified sampling, unlike quota sampling, allows estimation of the precision (sampling error) of stratified sample-takers.

3. Snowball Sampling: Under this technique, we ask a first set of respondents selected randomly or through non-random means. Additional research subjects are then selected using the recommendations of those first asked. It is valuable for studying populations involved in high-risk behaviors or rare conditions. Benefits include: Inexpensive and ability to target underrepresented populations. Disadvantages include potential problems related to validity. However, the design is subject to non-independent sampling units, and findings are not generalizable outside of the sample.

A sample size of 385 is used for this study at a confidence level of 95% and a margin of error rate of +/-5%. The sample shall comprise individuals defined as class III obesity (body mass index >40 kg/m^2) subjects, which will allow the inclusion of a homogeneous group to assess the effect and effectiveness of the LPM Mobile app for weight loss control in this pertinent patient population. Including members from various obesity categories may distort the results. Participants will be

randomly split into the intervention program, where they receive the LPM Mobile app for weight management and loss (Group A), or continue usual support from a practitioner in private practice (Group B). Weight data will be collected on all participants using standardized procedures at each time point over three months. This will determine the amount of weight loss change resulting from the intervention in comparison to the control group. Subsequently, the subjects placed in the experimental condition will be administered a survey questionnaire to measure quantitative data regarding their experience using different features of the app.

3.5 Instrumentation

Being quantitative research, mostly survey questionnaire will be used for data collection. This questionnaire's main goal is to get relevant data from people who are attempting to lose weight by utilizing the LPM mobile application. The purpose of this questionnaire is to gather data regarding the features of the LPM mobile application that users found most appealing. The LPM smartphone application is used for weight self-management. The study project named "Impact of Mobile Apps Development on Self-management of Weight Loss, Case of LPM Mobile App" has chosen this questionnaire as one of its data collection tools. The participants are requested to read the questions carefully and respond in an attentive manner to the questions that are asked below. The respondents are assured that the information they would provide will be used for research purposes only their identities would be kept confidential.

CHAPTER 4

RESULTS & DISCUSSIONS

Once thought to be a problem exclusive to high-income countries, overweight and obesity have grown more common in low- and middle-income countries, particularly in urban areas. Asia was found to be home to more than half of the globe's overweight or obese youngsters in 2019. Obesity during childhood raises the likelihood of obesity, premature death, and impairment in adulthood. But additionally, to their increased future dangers, obese children additionally experience respiratory problems, a higher risk of high blood pressure, broken bones, early signs of heart disease, insulin resistance, and psychological effects. Arguably the most hazardous and significant nutritional disorder in the globe today is obesity. Individuals typically establish eating habits that

are harmful and result in weight gain and the buildup of fat in their bodies. Experts have proposed a number of explanations for this, one of these is a mismatch between the power that the human body uses and the vitality that is obtained from meals. This disparity may contribute to a spike in excess weight. Dietary regimens, exercise, weight-loss instruction, and the use of wellness initiatives that support nutritious food are some of the main therapies for this grave health concern. Therefore, having a solid system in place to stop and manage obesity rates is essential. It inspired a number of health-related specialists as well as scholars to look into further ways to counteract the growing problem of obesity. The study aims to assess self-management in weight loss by using the mobile app. In alignment with the research aim, the objectives of the study aim to assess the impact of LPM Mobile on self-management of weight loss. It further aims to analyse and compare the impact of the LPM Mobile app self-management of weight loss as compared to the impact of private practice Finally, the study determines the characteristics of the app most valued by the users

The purpose of the thesis is to raise awareness of how mobile app development affects weight loss self-management. The research project will demonstrate the increasing causes of obesity and overweight conditions, particularly in youngsters and growing adults, using data from the LPM mobile app. Regarding the goal of the present research, which is to close the knowledge gap regarding how mobile apps, such as the LPM application, affect weight loss self-management, the present investigation would employ the positivist research paradigm. The investigator selected the approach of positivism in order to provide factual and statistical information related to the influence of the LPM mobile application. A quantitative method of study is employed by the investigator in relation to the methodology which is being applied in the current investigation. The utilisation of a quantitative method of study would facilitate the investigator's ability to evaluate

the effects of the LPM applications and private practice on customer service and losing weight in a measurable way through the application of statistical information. In the present investigation, a design for exploratory research will be used, and a particular implementation of the experimental research design will enable the implementation of the clinical study. This necessitates using the main technique for gathering data.

Additionally, in order to comprehend the aspects of the application that users appreciate the most, the investigation will additionally utilise a survey-based questionnaire approach to gather the information employing a quantitative research strategy. This would necessitate the collection of primary information.

Non-probability sampling might be the sampling strategy employed in this investigation, taking into account the necessity of the present research. The goal of non-probable sampling is to choose individuals from a population in a personal, non-random manner. For this research, a sample size of 4000 could be taken into consideration. The body weights of the participants in both groups could be gathered for 3 months in order to ascertain the differences in weight reduction brought about by the therapy.

Subsequently, a survey form will be sent to the experimental group participants in order to gather quantitative information related to the features of the application that they find most valuable. The information that was gathered from the samples was analysed using statistical software such as SPSS and MS Excel. The investigator has applied a deductive data analysis methodology to the examination of these gathered data. The reasoning strategy was chosen since it is consistent with the research design that the investigator is using for this study. The chapter on Results and discussions highlights the major findings of the research study along with the Discussions of the

results, comparing and contrasting the major findings with those of the findings of the previous research scholars. Finally, an overall conclusion or summary of the main findings is provided.

4.1 Summary of the findings

Many people in the current world rely on weight management apps to help them lose weight in a healthy way. These weight-control apps have the ability to measure calories, lead exercise sessions, remind users to drink water on a regular basis, and offer incentives to reduce weight. These apps can be quite helpful in assisting people in analysing information like feedback from others, connectivity, and monitoring capabilities as well as in advising them throughout their efforts to lose weight. Smartphone applications are a practical, affordable substitute for rigorous in-person weight loss treatments and can aid individuals in losing weight. Their future viability requires further investigation, particularly for communities that are difficult to reach. Selecting the finest weight loss application for their particular requirements is a common problem in the modern age in this regard. A number of criteria need to be taken into consideration when choosing weight-loss and calorie-counting applications, including monthly expenses, the capabilities and free editions of the apps, user reviews, flexibility with different devices, water intake notifications, and barcode readers. These apps assist users in keeping track of vital indicators such as water intake, physical activity, and sleep patterns, as well as in accounting for their everyday lifestyle decisions. These applications may additionally import intriguing and delectable personalised recipes from the internet, as well as serve as meal notifications. Users need to define their own objectives before selecting the best weight loss app. When choosing a weight reduction app, everyone should proceed with the utmost caution because some apps may encourage excessive calorie consumption,

rigid diets, and unachievable exercise regimens. The user should attempt to match the application's tools or recommendations with their nutritional requirements before choosing one (Sarvottam et al. 2020). In order to be utilised repeatedly in the years to come, the strategy needs to be long-term sustainable and save user data, such as his food intake chart or nutrients. To prevent someone from being misled, the food chart's nutritious details require to be confirmed.

Before conducting the analysis, a reliability assessment called Cronbach Alpha is used in SPSS to gauge the internal coherence, or dependability, of the instrument of measurement (questionnaire). It is primarily employed to assess whether or not the rating system is dependable when the survey is created using several Likert scale assertions.

Before conducting any statistical tests, the reliability of the instrument was tested to check the acceptance of the data. The study results depicted that for Part B, the Cronbach alpha value was given by 0.768 which is good and accepted.

- Descriptive Statistics

Concerning the descriptive statistics, the majority of the respondents that is 28.5 per cent belong to the age group of 41-50 years, followed by 26.9 per cent of the respondents belonging to the age group of 31-40 years and finally, 26.9 per cent of the respondents belonging to 18-30 years of age.

Table 1: Age (in Years)

	Frequenc y	Percent	Valid Percent	Cumulative Percent

Valid		800	16.7	16.7	16.7
	18-30	1290	26.9	26.9	43.5
	31-40	1290	26.9	26.9	70.4
	41-50	1370	28.5	28.5	99.0
	51-60	30	.6	.6	99.6
	60 and above	20	.4	.4	100.0
	Total	4800	100.0	100.0	

The majority of the respondents that is 54.6% of the respondents are Male, 43.6% are Females.

Table 2: Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		1	.0	.0	.0
	Female	1744	43.6	43.6	43.6
	Male	2185	54.6	54.6	98.3
	Other	30	.8	.8	99.0
	Prefer not to say	40	1.0	1.0	100.0
	Total	4000	100.0	100.0	

Further, 98.8 per cent of the respondents have no disability, while 0.8 per cent have partial disability and 0.5 per cent have full disability.

Table 3:Disability Status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Full	20	.5	.5	.5
	None	3950	98.8	98.8	99.3
	Partial	30	.8	.8	100.0
	Total	4000	100.0	100.0	

The majority of the respondents that is 33.7 percent have Average physical activity at the workplace, 33.4% have minimum physical activity at the workplace and 32.9% have the most physical activity at the workplace.

Table 4: Physical Activities at the Workplace

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid	Average	1349	33.7	33.7	33.7
	Minimum	1336	33.4	33.4	67.1
	Most Active	1315	32.9	32.9	100.0
	Total	4000	100.0	100.0	

Table 5: Education Qualifications

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid		1	.0	.0	.0
	Doctorate	1007	25.2	25.2	25.2
	Graduate	899	22.5	22.5	47.7
	High School Graduate	1086	27.2	27.2	74.8
	Post Graduate	1007	25.2	25.2	100.0
	Total	4000	100.0	100.0	

The majority of the respondents revealed that 27.2 per cent of the population are high school graduates, 25.2 per cent are doctorate and postgraduate, and 22.5 per cent are Graduates.

Finally, the study found that 26.3 per cent of the population opted for LPM Mobile Application, while 25 per cent opted for both LPM Mobile Application and personal practice.

Table 6 : Weight Management Method Utilized

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Both	1001	25.0	25.0	25.0
	LPM Mobile application	1051	26.3	26.3	51.3
	None of the Listed	1000	25.0	25.0	76.3
	Personal Practice	948	23.7	23.7	100.0
	Total	4000	100.0	100.0	

Additionally, 50.4%of the respondents opted for No concerning that they have never used a mobile app designed to assist with weight loss. While 49.6 per cent of them agreed that that they have never used a mobile app designed to assist with weight loss.

Table 7: Have you ever used a mobile app designed to assist with weight loss

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	2017	50.4	50.4	50.4
	Yes	1983	49.6	49.6	100.0
	Total	4000	100.0	100.0	

Moreover, 50.3%of the respondents disagreed that they have ever tried the LPM mobile application for weight management. On the contrary 49.7 per cent agreed that they tried LPM mobile application for weight management.

Table 8: Have you ever tried the LPM mobile application for weight management

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	2012	50.3	50.3	50.3
	Yes	1988	49.7	49.7	100.0
	Total	4000	100.0	100.0	

- **Correlation Analysis**

The correlations table depicts the magnitude and the directions of the associations between different variables using the Pearson Correlation coefficients. These variables include the different elements of weight management, like private practices and the LPM application. Primarily, the Pearson Correlation Coefficient measures the linear association between different variables. The values here range from -1 to 1 where 1 demonstrates a significant positive correlation, while -1 demonstrates a negative correlation, while 0 shows no association between the variables. Further, significance depicts the probability concerning the observed correlation that happens by chance. Further, the p-value below 0.05 or 0.01 depicts a statistical significance.

Concerning the impact of using weight management mobile apps like of LPM Mobile app oneself-management of weight loss of patients, a Regression analysis was done to test the impact of using weight management mobile apps like of LPM Mobile app oneself-management of weight loss of patients. From the regression analysis, the Null Hypothesis was rejected and it was conclude that there is an impact of using weight management mobile apps like of LPM Mobile app oneself-management of weight loss of patients. Here the statement "It is easy to get information about weight loss exercise and nutrition on the LPM application" has a p value of 0.047 which is less than 0.05, and thus is deemed to be statistically significant. Similarly, Patel et al. (2019) conducted a comparison between traditional self-monitoring weight loss techniques and tactics provided by apps for smartphones. The premise of the research is that self-monitoring diet plans are a helpful tool for efficiently and rapidly losing weight. The research investigation looked at a unique behavioural weight reduction treatment strategy that lessens the drop in diet-related monitoring oneself involvement. In this investigation, a randomised controlled trial was conducted with individuals who were randomised to receive a 12-week independent intervention course. The program was run using contemporary technologies, and daily weight monitoring was done.

Additionally, weekly courses, strategies for action, and comments were delivered by the application itself. Following 12 weeks, all the groups that took advantage of the scheme lost five per cent of their starting weight. They also received customised calorie goals and regular in-app reminders. This depcist that the present study results cincide with those of Patel et al. (2019).

Table 9: Variables Entered/Removed

Model	Variables Entered	Variables Removed	Method
1	Utilizing applicationsapplication for weight management helpshelp in bebeing mindful of my calorie intake, It is easy to get information about weight loss exercise and nutrition on the LPM application, I would recommend the LPM application to friends and family members for weight loss. , I would continue using LPM applications for weight management[b]	.	Enter

a. Dependent Variable: Have you ever used a mobile app designed to assist with weight loss

b. Tolerance = .000 limits reached.

Table 10: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.037[a]	.001	.000	.500

a. Predictors: (Constant), Utilizing applicationsapplication for weight management helpshelp in bebeing mindful of my calorie intake, It is easy to get information about weight loss exercise and nutrition on the LPM application, I would recommend the LPM application to friends and family members for weight loss. , I would continue using LPM applications for weight management

Table 11: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.379	4	.345	1.380	.238[b]
	Residual	998.578	3995	.250		
	Total	999.958	3999			

a. Dependent Variable: Have you ever used a mobile app designed to assist with weight loss

b. Predictors: (Constant), Utilizing applicationsapplication for weight management helpshelp in bebeing mindful of my calorie intake, It is easy to get information about weight loss exercise and nutrition on the LPM application, I would recommend the LPM application to friends and family members for weight loss. , I would continue using LPM applications for weight management

Table 12: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.503	.028		18.144	.000
	It is easy to get information about weight loss exercise and nutrition on the LPM application	-.017	.009	-.037	-1.985	.047
	I would recommend the LPM application to friends and family members for weight loss.	.010	.008	.026	1.333	.183
	I would continue using LPM applications for weight management	.010	.007	.029	1.337	.181
	Utilizing applicationsapplication for weight management helpshelp in bebeing mindful of my calorie intake	-.004	.009	-.011	-.501	.617

a. Dependent Variable: Have you ever used a mobile app designed to assist with weight loss

Moreover, the differences in the impact on self-management of weight loss between LPM Mobile apps compared to the impact of private practice was analysed using Pearson correlation coefficient. The null hypothesis stated "H_0: There is no impact on the difference self-management of weight loss between LPM Mobile apps compared to the impact of private practice." The analysis found that there is no significance among the variables. Hence, it is concluded that there is no relationship among the Impact of Private Practice and LPM Mobile Apps. Identically, the "ENGAGED" weight loss app has been mentioned by Spring et al. (2013) as a resource to help consumers comprehend health and weight tracking through mobile apps. An improved version of the mHealth program with a weight loss focus is included in this application. This software helps diabetic patients by using cutting-edge technology to treat and relieve their symptoms. The introduction of the Diabetes Prevention Program (DPP) aims to lessen the risks associated with obesity. The website has advocated a demanding lifestyle that is the gold benchmark. The researchers have identified several behavioural changes, such as increasing people's understanding of weight control and self-monitoring of food consumption and exercise, through the lens of social cognition theory. Along similar lines, Azar et al. (2013) described the usage of smartphone applications for regulating weight. Applications for smartphones can help with losing weight. Several of these apps, nevertheless, lack clear behavioural and functional descriptions. The weight management tools included in this research can be used to inform the development of methods for health promotion, such as anthropometric monitoring, grocery choices, diet monitoring, and nutritious cooking.

Table 13: Correlations

		The LPM mobile application helped me achieve my weight loss goals	It is easy to get information about weight loss exercise and nutrition on the LPM application	I would recommend the LPM application to friends and family members for weight loss.	I would continue using LPM applications for weight management	Utilizing applicationsapplication for weight management helpshelp in bebeing mindful of my calorie intake	I often engage in private practice (one-on-one sessions with a dietitian, nutritionist, or personal trainer) to manage my weight	I have been engaging in private practice for quite some time	Private practice has been quite effective in helping me achieve my weight loss goals	Personalised guidance and customised meal plans were most beneficial to me	Regular in-person sessions and motivational support were quite effective in private practice
The LPM mobile application helped me achieve my weight loss goals	Pearson Correlation	1	.223**	.569**	.525**	1.000**	.001	.000	.003	.001	.000
	Sig. (2-tailed)		.000	.000	.000	.000	.966	.978	.874	.937	.984
	N	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
It is easy to get information about weight loss exercise and nutrition on the LPM application	Pearson Correlation	.223**	1	.218**	.514**	.223**	-.001	-.001	.000	.000	.000
	Sig. (2-tailed)	.000		.000	.000	.000	.972	.967	.986	.981	1.000
	N	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
I would recommend the LPM application to friends and family members for weight loss.	Pearson Correlation	.569**	.218**	1	.249**	.569**	.001	.001	.002	.002	.000
	Sig. (2-tailed)	.000	.000		.000	.000	.952	.969	.874	.912	.984
	N	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
I would continue using LPM applications for weight management	Pearson Correlation	.525**	.514**	.249**	1	.525**	.000	.000	.002	.001	.000
	Sig. (2-tailed)	.000	.000	.000		.000	.976	.996	.901	.933	.996
	N	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000

Utilizing applicationsappli cation for weight management helpshelp in bebeing mindful of my calorie intake	Pearson Correlation	1.000**	.223**	.569**	.525**	1	.001	.000	.003	.001	.000
	Sig. (2-tailed)	.000	.000	.000	.000		.966	.978	.874	.937	.984
	N	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
I often engage in private practice (one-on-one sessions with a dietitian, nutritionist, or personal trainer) to manage my weight	Pearson Correlation	.001	-.001	.001	.000	.001	1	.242**	.564**	.000	.211**
	Sig. (2-tailed)	.966	.972	.952	.976	.966		.000	.000	.998	.000
	N	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
I have been engaging in private practice for quite some time	Pearson Correlation	.000	-.001	.001	.000	.000	.242**	1	.523**	.591**	.510**
	Sig. (2-tailed)	.978	.967	.969	.996	.978	.000		.000	.000	.000
	N	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
Private practice has been quite effective in helping me achieve my weight loss goals	Pearson Correlation	.003	.000	.002	.002	.003	.564**	.523**	1	.600**	.216**
	Sig. (2-tailed)	.874	.986	.874	.901	.874	.000	.000		.000	.000
	N	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
Personalised guidance and customised meal plans were most beneficial to me	Pearson Correlation	.001	.000	.002	.001	.001	.000	.591**	.600**	1	.540**
	Sig. (2-tailed)	.937	.981	.912	.933	.937	.998	.000	.000		.000
	N	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
Regular in-person sessions and motivational support were quite effective in private practice	Pearson Correlation	.000	.000	.000	.000	.000	.211**	.510**	.216**	.540**	1
	Sig. (2-tailed)	.984	1.000	.984	.996	.984	.000	.000	.000	.000	
	N	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000

**. Correlation is significant at the 0.01 level (2-tailed).

Firstly, the study found that the statement "The LPM Mobile Application Helped Me Achieve My Weight Loss Goals" is strongly correlated with the "Ease of Getting Information About Weight

Loss on LPM" depicting a value of 0.223; providing recommendations of LPM to Friends and Family depicting a value of 0.569; and also strongly correlated with Continued Use of LPM for Weight Management having a value of 0.525. Further, a perfect correlation is observed for the statement "Mindfulness of Calorie Intake Through Applications" having a value of 1.000. Further, Ghelani et al. (2020) suggested that the most recent data demonstrates the utilisation of smartphone applications for weight management. Mobile devices have emerged as a particularly attractive weight-management tool in the past few years, helping to slow the growth of this fatal pandemic. Physicians frequently discuss the advantages of these kinds of apps and the most recent advancements in this sector. Positive findings on the use of mobile-based platforms for weight management were found in studies performed at all levels. Utilising randomised controlled trials (RCTs), the most recent data regarding the clinical application of mobile apps for weight loss and monitoring has been compiled. These tools also highlight the shortcomings of software for managing weight.

Moreover, the "Ease of Getting Information About Weight Loss Exercises and Nutrition on the LPM Application" is moderately correlated with the aspect of "Recommendation of LPM to Friends and Family" with a value of 0.218 and the aspect of "Continued Use of LPM for Weight Management" having a value of 0.514. Therefore, it can be suggested that the easier the accessibility to information, the more the app will be recommended to new users. Puig et al. (2019) revealed that the safety, efficacy, and success of two significant study components, weight control and controlling obesity via mobile applications, were evaluated in the following publication. Individuals can accomplish individual objectives in a set amount of time by using creative digital methods. The research project explores the mHealth strategies linked to weight management and looks at the results via a systematic examination. Numerous steps have been made to determine

the usefulness of smartphone applications for managing weight, and multiple methods have been discovered for assessing these applications in relation to clinical guidelines. Global medical governing organisations have not endorsed these innovations for their reliability or security for users (Puig et al. 2019).

Additionally, the statement, “I Would Recommend the LPM Application to Friends and Family Members for Weight Loss” is again strongly correlated with the statement “LPM Helps in Achieving Weight Loss Goals” having a value of 0.569. Moreover, this statement is further correlated with the aspect that “Continued Use of LPM for Weight Management” has a value of 0.249. This revealed that a positive user experience may lead to more recommendations and continued usage. Concerning this Spruijit-Metz et al. (2015) highlight the application of technological interaction to assist in managing weight. It also tells the story of the different futuristic advances that have been seen in this subject. mHealth initiatives aimed at managing weight employ short messaging services (SMS) to deliver information to users. These applications will eventually leverage real-time sensor technology to create a variety of advances, including adaptable and just-in-time treatments. These methods will detect and address the three main components of weight control: nutrition, exercise, and relaxation. It can be difficult for medical experts to connect these apps to real-world situations. The medical industry may face particular difficulties as a result of mHealth technologies. Functioning in an unclear manner could result in further problems (Spruijit-Metz et al., 2015).

The study further found a correlation between the statements, “I Would Continue Using LPM Applications for Weight Management” and “Ease of Getting Information on LPM” holding a value of 0.514. Also, “I Would Continue Using LPM Applications for Weight Management” was correlated with the “Mindfulness of Calorie Intake” having a value of 0.525. This shows that

continued usage is associated with the ease of acquiring information and deciphering the calorie intake.

Additionally, the statement “Utilizing Applications for Weight Management Helps in Being Mindful of My Calorie Intake” has a perfect correlation with the statement “LPM Helps in Achieving Weight Loss Goals” as it has a value of 1.000. This depicts that the application helps in users becoming mindful of calorie intake which further leads to weight loss. Sefa-Yeboah et al. (2021) in their research study contemplated that Globally, medical professionals have looked into mobile application frameworks that use artificial intelligence to help people regulate their obesity. To give consumers accurate information about the number of calories in meals, a number of dietary regulation measures have been introduced and implemented. Typically, a genetic algorithm (GA) powers an artificial intelligence (AI) system by monitoring the user's nutritional status and forecasting his potential caloric intake. This is crucial for controlling fat and overweight. According to Sefa-Yeboah et al. (2021), the algorithm receives user input and retrieves records pertaining to diabetes status, active lifestyle threshold, and cholesterol concentration.

Additionally, the statement, “Private Practice (One-on-One Sessions with a Dietitian, Nutritionist, or Personal Trainer) for Weight Management” is Strongly correlated with “Effectiveness of Private Practice in Achieving Weight Loss Goals” having a value of 0.564 and “Regular In-Person Sessions and Motivational Support” holding a value 0.211. Furthermore, the “Engagement in Private Practice for Quite Some Time” is Strongly correlated with “Effectiveness of Private Practice in Achieving Weight Loss Goals” having a value of 0.523 and “Personalized Guidance and Customized Meal Plans” holding a value of 0.591. Additionally, the aspect of “Private Practice Has Been Quite Effective in Helping Me Achieve My Weight Loss Goals” is significantly

correlated with the aspect “Personalized Guidance and Customized Meal Plans” holding a value of 0.600 and “Regular In-Person Sessions and Motivational Support” having a value 0.216.

Conclusively, it must be suggested that the LPM application is seen to be useful for educating users and encouraging calorie awareness. There is little correlation between using the app and feeling that it is beneficial. Also, those who find the application useful typically stick to a healthy diet and suggest it. Similarly, Dounavi and Tsoumani (2019) revealed that numerous technologically driven health management apps that can address and manage obesity throughout an extensive spectrum of client groups have been researched by academics. These resources are available as mobile apps as well as web-based ones. Customers may schedule the replacements to satisfy their everyday calorie requirements by getting basic information about food products that should or shouldn't be ingested. Additionally, a mobile-based health-tracking app has been introduced to the marketplace; it focuses primarily on leveraging IoT technology to control the weight of children (Dounavi and Tsoumani 2019). This tool also allows for remote monitoring and surveillance.

Part E of the questionnaire was analysed where the Characteristics of LPM Mobile Application almost liked by users were identified.

Firstly, the study analysed the characteristics of the LPM app most valued by the users. It was found that the majority of the respondents, 19.9 per cent disagreed regarding the fact that the LPM app is easy to use and navigate. This is followed by 16.7 per cent per cent of the respondents who held a neutral perspective that the LPM app is easy to use and navigate. While 16.5 per cent of the respondents strongly disagreed with the same.Identically, Kozak et al. (2017) evaluated every technologically driven weight management therapy. The research predicts that smartphone apps for managing weight will take a futuristic turn. Numerous people are unable to take part in in-

person therapies because of financial limitations, accessibility issues, or schedule conflicts, according to investigations. The idea of eHealth weight control programmes has been made popular by the increasing usage of cell phones, internet access, and self-monitoring technologies. Transmission and global government application of revised regulations will impact eHealth obesity management in the years to come.

Table 14: I like the fact that the LPM app is easy to use and navigate

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	793	16.5	19.8	19.8
	Disagree	953	19.9	23.8	43.7
	Neutral	800	16.7	20.0	63.7
	Agree	720	15.0	18.0	81.7
	Strongly Agree	734	15.3	18.4	100.0
	Total	4000	83.3	100.0	

Furthermore, 24.9 per cent of the respondents disagreed that they were satisfied with the features and functionalities of the LPM application, also 24.9 per cent of the respondents strongly disagreed

that they were satisfied with the features and functionalities of the LPM application. . Nevertheless, on the contrary, Vlahu-Gjorgievska et al. (2023) revealed that user interface design patterns (UDP), which can offer explanations and standards for use throughout the user interface concepts, are a crucial component of mHealth apps. UDPs possess the power to significantly affect user views and impressions. They may additionally impact how quickly users embrace medical applications and how long they continue to utilise them. To maintain a constant supply of user interfaces, they can tackle problems that arise frequently and come up with generic, reusable remedies. In broad terms, these users are satisfied with the advances in technology. They appreciate and consider it extremely simple. UDPs have the potential to increase users' cognitive strain.

Table 15: I am satisfied with the features and functionalities of the LPM application

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1197	24.9	29.9	29.9
	Disagree	1197	24.9	29.9	59.9
	Neutral	807	16.8	20.2	80.0
	Strongly Agree	799	16.6	20.0	100.0
	Total	4000	83.3	100.0	

Out of the total number of respondents, the majority of them approximately 24.9 per cent strongly disagreed that they are able to set personalised and achievable weight loss goals on the LPM app.

While 16.8 per cent of the respondents held a neutral perspective, only 16.6 per cent of the respondents agreed and strongly disagreed that they are able to set personalised and achievable weight loss goals on the LPM app.

Similarly, Sarvottam et al. (2020) revealed that selecting the finest weight loss application for what they require is a common problem in the modern age in this regard. A number of criteria need to be taken into consideration when choosing weight-loss and calorie-counting applications, including monthly expenses, the functions and free editions of the applications, feedback from others, interoperability with different devices, water intake notifications, and scanners for bar codes. These apps assist users in keeping track of vital indicators such as water intake, physical activity, and sleep patterns, as well as in accounting for their everyday lifestyle decisions. These applications are capable of importing intriguing and delightful personalised recipes from the internet, as well as serving as meal reminders. Consumers need to define personal goals before selecting the best weight loss application.

Table 16: I like that I am able to set personalized and achievable weight loss goals on the LPM app

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	798	16.6	20.0	20.0
	Disagree	1197	24.9	29.9	49.9
	Neutral	807	16.8	20.2	70.1
	Agree	798	16.6	20.0	90.0
	Strongly Agree	400	8.3	10.0	100.0
	Total	4000	83.3	100.0	

The study further found that the majority of the respondents that is 24.9 per cent agreed that they like that the LPM app allows them to track their calorie intake and calories burned during exercise. While 24.9 per cent also disagreed regarding the same and 16.8 per cent of the respondents had a neutral perspective that they like that the LPM app allows them to track their calorie intake and calories burned during exercise. Similarly, Vlahu-Gjorgievska et al. (2023) talked about mHealth apps that are designed to reduce youth obesity and overweight. Around a quarter of young people at least experience significant wellness issues and medical illnesses as a result of eating too many calories. At this point, mobile health applications save the day by promoting healthy habits and improving medical results. These apps offer young people special chances to follow through on medical treatments while performing the required actions to keep their weight in check. Continued user compliance with medical treatments is expected to be low.

Table 17: I like that the LPM app allows me to track my calorie intake and calories burned during the exercise

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	399	8.3	10.0	10.0
	Disagree	1197	24.9	29.9	39.9
	Neutral	807	16.8	20.2	60.1
	Agree	1197	24.9	29.9	90.0
	Strongly Agree	400	8.3	10.0	100.0

	Total	4000	83.3	100.0	

Majority of the study participants that is 33.4 per cent held a neutral perspective regarding the statement that they like the database of food items and their nutritional value on the LPM application. While 16.6 per cent agreed and disagreed regarding this statement. In this context, Sarvottam et al. (2020) revealed that when choosing a weight reduction app, everyone should proceed with the utmost caution because some apps may encourage excessively restricting calories, rigid diets, and unachievable exercise regimens. The user should attempt to match the app's tools or recommendations with their nutritional requirements before choosing one. In order to be utilised again in subsequent years, the strategy needs to be long-term feasible and save user data, including his eating chart or supplements. To prevent someone from being misled, the food chart's nutritious information needs to be confirmed (Sarvottam et al. 2020).

Table 18: I like the database of food items and their nutritional value on the LPM application.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	399	8.3	10.0	10.0
	Disagree	798	16.6	20.0	29.9
	Neutral	1605	33.4	40.1	70.1
	Agree	799	16.6	20.0	90.0
	Strongly Agree	399	8.3	10.0	100.0
	Total	4000	83.3	100.0	
Missing	System	800	16.7		
Total		4800	100.0		

4.2 Discussion of the results

The aim of the study is to assess self-management in weight loss by using the mobile app. In alignment with the research aim, the objectives of the study are as follows:

Objective 1: To assess the impact of the LPM Mobile app on self-management of weight loss

Eating the correct foods and using the right exercise methods require careful consideration of quality as well as quantity. A great deal of smartphone applications fail to offer customers any information regarding the quality of the food—they merely advise users on how much to eat. These smartphone applications can't incorporate both quantity and quality into the consumers' diet plans. These applications are therefore seen as inaccurate and ineffective. It has been shown that counting calories alone is not a good way to control weight. The individual should focus on the amount as well as the quality of food consumed in order to enhance their health. The LPM smartphone app bridges this gap. This recently released app makes it incredibly simple for users to practise weight management by covering every part of their lifestyle in an accessible way. The LPM smartphone app bridges this gap. This recently released app provides an incredibly simple for users to practise weight management by covering every part of lifestyle in an accessible way.

The study further found that the majority of the respondents that is 24.9 per cent agreed that they like that the LPM app allows them to track their calorie intake and calories burned during exercise. While 24.9 per cent also disagreed regarding the same and 16.8 per cent of the respondents had a neutral perspective that they like that the LPM app allows them to track their calorie intake and calories burned during exercise.. Identically, Islam et al. (2020) revealed that the application of mobile phone app treatments to promote weight loss. Among the primary causes of obesity and an important risk indicator for serious health risks as well as potentially fatal diseases is an inadequate

amount of vigorous exercise. Due to the need for innovative technology and effective treatments, mobile applications have the potential to encourage youngsters to lose weight and increase their physical activity levels. Big online databases like Web of Science, EMBASE, and Scopus have shown that body weight management and physical activity evaluations are possible using mobile app interventions. Further, the utility of a smartphone app for self-monitoring nutritional intake was investigated by Lee et al. (2017). Individuals in the modern period depend more and more on technologies such as ICT to manage their well-being as the incidence of persistent illnesses grows. The analysis of the adolescent's food intake is used to test the viability of the mobile application. Utilising voice or text recording modes, respondents documented every meal and drink they had. They provided information about food tracking, using applications to track food intake, and providing personal dietary information. They have found that "Diet-A," a dietary self-monitoring program, has helped them generate nutrient consumption to some extent. This software can deliver brief messages on the avoidance of serious illnesses like diabetes, hypertension, and dyslipidaemia as well as real-time information on particular nutrients. Similarly, the usefulness of weight-management strategies implemented with mobile medical devices as a supplementary tool for obese women was clarified by Siriwoen et al. (2018). Several overweight and obese women, ages 25 to 52, participated in an exploratory study using mobile health (mHealth) technologies.

Objective 2: To analyse and compare the impact of the LPM Mobile app self-management of weight loss as compared to the impact of private practice

Majority of the study participants that is 33.4 per cent held a neutral perspective regarding the statement that they like the database of food items and their nutritional value on the LPM application. While 16.6 per cent agreed and disagreed regarding this statement. The findings of the

present research study are similar to those of Vlahu-Gjorgievska et al. (2023) who talked about mHealth Apps designed to reduce youth obesity and overweight. Around a quarter of the younger generation at least experiences significant wellness issues and medical illnesses as a result of eating too many calories. At this point, mobile health applications save the day by promoting healthy habits and improving medical results. These apps offer young individuals special chances to follow through on medical treatments while performing the required actions to keep their body measurements in check. Long-term user commitment to medical treatments is expected to be minimal.

Out of the total number of respondents, the majority of them approximately 24.9 per cent strongly disagreed that they are able to set personalised and achievable weight loss goals on the LPM app. While 16.8 per cent of the respondents held a neutral perspective, only 16.6 per cent of the respondents agreed and strongly disagreed that they are able to set personalised and achievable weight loss goals on the LPM app.

In this context, Kozak et al. (2017) revealed that previous studies have discovered that approximately 96.8% of participants will experience considerably greater weight loss with high levels of compliance with the treatments (Kozak et al. 2017). A case of adherence could be visiting a research website to create objectives. Better adherence is found to be significantly associated with greater weight loss, according to intent-to-treat assessment. These results suggest that adherence to eHealth therapies can play a significant role in the process of losing weight. As opposed to gauging individuals' degree of participation, future mobile applications will measure and report compliance data to ascertain users' objectives and goals (Kozak et al., 2017).

Objective 3: To determine the characteristics of the app most valued by the users

The study examined the features of the LPM app that consumers found most valuable. It was found that the majority of the respondents, 19.9 per cent disagreed regarding the fact that the LPM app is easy to use and navigate. This is followed by 16.7 per cent per cent of the respondents who held a neutral perspective that the LPM app is easy to use and navigate. While 16.5 per cent of the respondents strongly disagreed with the same. Additionally, Tiwari & Balasundaram (2021) suggested that over the past ten years, mobile technology has proven to be highly beneficial in aiding with weight management and reducing the prevalence of obesity. To get the greatest outcomes, a sizable portion of the population has already combined these applications with their weight control regimen (Tiwari and Balasundaram 2021). These smartphone apps can be helpful, particularly for low-intensity techniques. To fully grasp the utility of these programmes, more investigation is necessary. Of all the apps, the LPM mobile application is the most adaptable since it takes a user-friendly method to cover significant lifestyle factors associated with weight management (Tiwari and Balasundaram 2021).

Furthermore, 24.9 per cent of the respondents disagreed that they were satisfied with the features and functionalities of the LPM application, also 24.9 per cent of the respondents strongly disagreed that they were satisfied with the features and functionalities of the LPM application. Vaz et al. (2021) revealed that randomised controlled study for a novel, approachable, and engaging lifestyle modification for weight loss. Because they include manually registering actions on webpages and logging into them, electronic-based lifestyle changes are typically labour-intensive. These procedures take a lot of time, and the individual involved must give them their whole attention. The method may be more inaccurate and inconsistent if there are no human instructors. The present investigation offers a thorough lifestyle modification that uses an amicable, collaborative meeting via a smartphone-driven app to tackle these relevant difficulties.

4.3 Conclusion

The Pearson Correlation values are used in the correlation table to show the magnitude and trend of the relationships between different factors. The various components of weight management, such as private practices and the LPM application, are included in these factors. The study revealed that a positive user experience may lead to more recommendations and continued usage. Furthermore, continued usage is associated with the ease of acquiring information and deciphering the calorie intake. The study depicts that the application helps in users becoming mindful of calorie intake which further leads to weight loss. The study also found that Both app usage and private practice effectiveness highlight the importance of personalized and consistent support in weight management.

Initially, the investigation examined the features of the LPM app that consumers found most valuable. A large percentage of participants, or 19.9 per cent disagreed about how user-friendly and straightforward the LPM app is. 16.7 per cent of those surveyed revealed a neutral that the LPM application is simple to learn and explore. Merely 16.5 of the participants expressed significant disagreement with the same. Moreover, 24.9 of those surveyed disagreed that they felt pleased with the characteristics and capabilities of the LPM usage, whilst 24.9 per cent of respondents strongly disapproved. Of the total responses, most respondents strongly disapproved that the LPM app allows users to set individualised and realistic weight loss targets (around 24.9 % of the overall). Only 16.6 per cent of respondents agreed that the LPM application allows them to define individualised and realistic weight loss targets, compared to the 16.8% who had a neutral opinion. The survey also discovered that while 24.9 per cent of those surveyed agreed that they enjoyed being able to check their caloric intake and calories burned while physical activity, the

majority of participants did. An equal percentage of the respondents disagreed with the same. Concerning the assertion that they enjoy the database of food items and their nutritional worth on the LPM programme, a similar percentage of respondents, 16.6 per cent, agreed and disagreed. However, 33.4 per cent held a neutral perspective regarding the statement.

From the research study, that there is an impact of using weight management mobile apps like of LPM Mobile app oneself-management of weight loss of patients.. It has been found that the conventional calorie measurement is not comprehensive for effective weight management because it may not take into account the quality of food. The application bridges the gap and provides extensive lifestyle management in a user-friendly way. Similarly, Islam et al. (2020) revealed that mobile applications may assist in encouraging weight loss and enhancing physical activity which will in turn affect obesity that may lead to severe health crises. These applications provide innovative solutions to manage both exercise and weight. Moreover, Lee et al. (2017) and Siriwoen et al. (2018) revealed the advantages of mHealth technologies concerning weight management in individuals with obesity. These technologies show the potential to lower the risk of chronic disease through improved lifestyle choices by assisting users in tracking their food intake and providing suggestions.

Moreover, the differences in the impact on self-management of weight loss between LPM Mobile apps compared to the impact of private practice was analysed using Pearson correlation coefficient. The null hypothesis stated "H_0: There is no impact on the difference self-management of weight loss between LPM Mobile apps compared to the impact of private practice." The analysis found that there is no significance among the variables. Hence, it is concluded that there is no relationship among the Impact of Private Practice and LPM Mobile Apps. Along similar lines, Vlahu-Gjorgievska et al. (2023) that these applications may assist in reducing medical outcomes like

obesity and enhancing healthy habits. However, a very small percentage of individuals agree that the LPM application helps them in setting achievable goals for the weight loss journey. In this context, Kozak et al. (2017) revealed that the intervention of digital health initiatives has substantially improved weight loss awareness and consciousness among individuals. Therefore it also depicts the role of these technologies in user engagement and accomplishment of the goals. Thus, mobile health apps may assist in tracking and monitoring data enhancing user support and accomplishing the weight management goal. The contrast shows that although mobile applications have special chances for health management, regular user participation and adherence to rules are essential for success. This is consistent with research showing that organised support, whether from digital or individual methods, increases the likelihood of successful weight control.

The investigation looked at the LPM app's aspects that users thought were most useful. It was found that the majority of the respondents, 19.9 per cent disagreed regarding the fact that the LPM app is easy to use and navigate. This is followed by 16.7 per cent per cent of the respondents who held a neutral perspective that the LPM app is easy to use and navigate. While 16.5 per cent of the respondents strongly disagreed with the same. Furthermore, Tiwari & Balasundaram (2021) proposed that mobile technology has demonstrated significant benefits in the last 10 years in terms of helping individuals manage their weight and lowering the incidence of obesity. The LPM smartphone application is the most flexible of all of them because it covers important lifestyle elements related to weight control in a way that is easy to use (Tiwari and Balasundaram 2021). Furthermore, 30.2 per cent of participants disapproved of the LPM application's capabilities and features, while 29.9 per cent firmly agreed that they were pleased with them.

In general, mobile applications are frequently more effective than little intervention cohorts in helping individuals reduce weight, and they can be just as effective as or even more effective than

conventional paper-and-pencil weight reduction therapies. Smartphone applications encourage a variety of practices, such as peer support, instructional materials, and tracking one's own weight, activity, and nutrition. App varieties vary widely, thus it's challenging to determine which elements are most important for the program's success. The degree to which patients interact with the mobile application determines the efficacy of the program. Smartphone applications are a practical, affordable substitute for rigorous in-person weight loss treatments and can aid individuals in losing weight. Their future viability requires further investigation, particularly for communities that are difficult to access.

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APPENDICES A

Reliability Analysis

Part B:

- Performed Reliability test to check the acceptance of the data.
- The Cronbach alpha value is given by 0.768 which is good and accepted.

Case Processing Summary

		N	%
Cases	Valid	4000	100.0
	Excluded[a]	0	.0
	Total	4000	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.768	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
LPM mobile application helped me in achieving my weight loss goals	11.19	1.557	.328	.797
It is easy to get information about weight loss exercise and nutrition on the LPM application	11.79	1.216	.641	.686
I would recommend the LPM application to friends and family members for weight loss	11.59	1.285	.677	.675
I would continue using LPM applications for weight management	11.29	1.402	.587	.710
Utilizing application for weight management help in being mindful of my calorie intake	11.29	1.522	.492	.742

Part C:

- Performed Reliability test to check the acceptance of the data.
- The Cronbach alpha value is given by 0.756 which is good and accepted.

Reliability Statistics

Cronbach's Alpha	N of Items
.756	10

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
I like the fact that the LPM app is easy to use and navigate	25.83	5.391	.240	.757
I am satisfied with the features and functionalities of the LPM application	26.23	4.294	.644	.698
I like that I am able to set personlized and achievable weight loss goals on LPM app	26.63	4.887	.537	.722
I like the fact that the LPM Mobile application offers a personalized meal plan for me	25.83	4.806	.570	.717

I like the exercise tracking feature of the LPM app	26.04	4.586	.614	.708
I like that the LPM app allows me to track my calorie intake and calories burned during the exercise	26.03	5.046	.345	.747
I like the progress-tracking feature of the LPM app	25.95	5.174	.307	.751
I like the database of food items and their nutritional value on the LPM application.	26.07	5.154	.260	.760
I like the educational resources provided on the LPM application related to healthy lifestyles, nutrition, and exercise	25.95	5.141	.248	.763
I like the community and social features of the LPM app that allow me to connect to people who are trying to lose weight	25.85	4.769	.474	.728

Overall Likert Scale:

- Performed Reliability test to check the acceptance of the data.
- The Cronbach alpha value is given by 0.799 which is good and accepted.

Reliability Statistics

Cronbach's Alpha	N of Items
.799	15

APPENDICES B

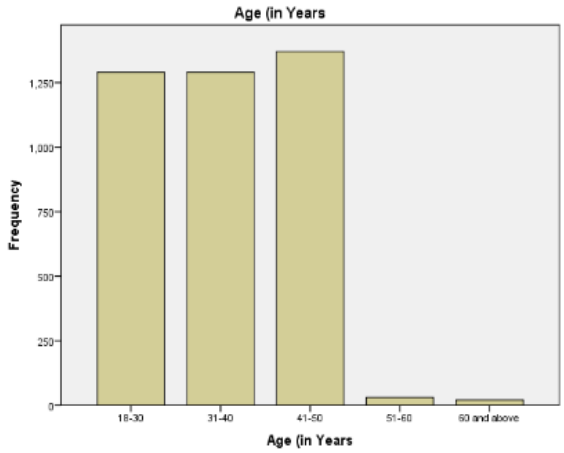
Descriptive Analysis

Age:

- 28.5% of the respondents are of 41-50 age category.

Age (in Years

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		800	16.7	16.7	16.7
	18-30	1290	26.9	26.9	43.5
	31-40	1290	26.9	26.9	70.4
	41-50	1370	28.5	28.5	99.0
	51-60	30	.6	.6	99.6
	60 and above	20	.4	.4	100.0
	Total	4800	100.0	100.0	

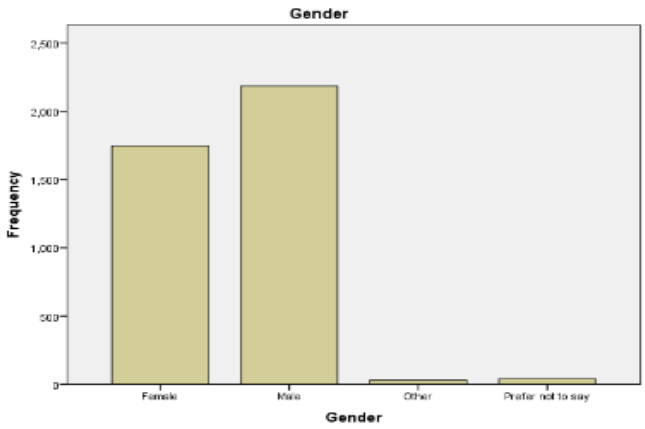


Gender:

- 54.6% of the respondents are Male.

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	1745	43.6	43.6	43.6
	Male	2185	54.6	54.6	98.3
	Other	30	.8	.8	99.0
	Prefer not to say	40	1.0	1.0	100.0
	Total	4000	100.0	100.0	

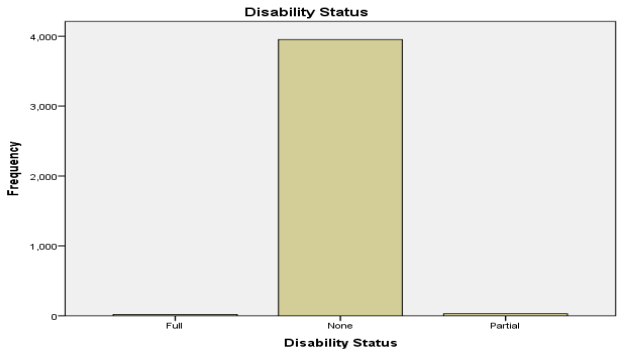


Disability Status:

- 98.8% of the respondents do not have any Disability.

Disability Status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Full	20	.5	.5	.5
	None	3950	98.8	98.8	99.3
	Partial	30	.8	.8	100.0
	Total	4000	100.0	100.0	

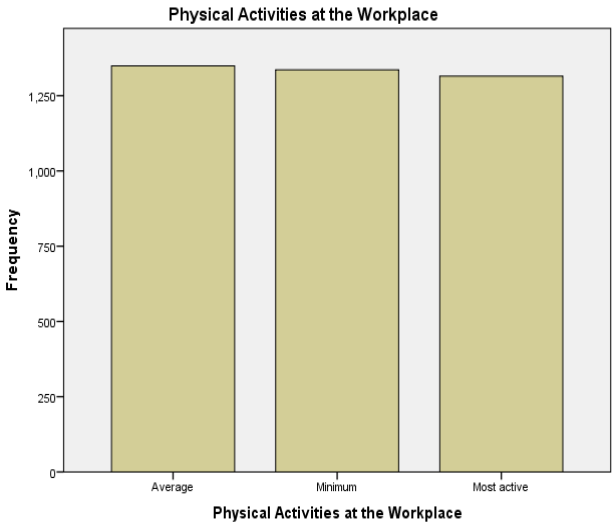


Physical activity at workplace:

- 33.7% of the respondents opt for Average.

Physical Activities at the Workplace

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Average	1349	33.7	33.7	33.7
	Minimum	1336	33.4	33.4	67.1
	Most active	1315	32.9	32.9	100.0
	Total	4000	100.0	100.0	

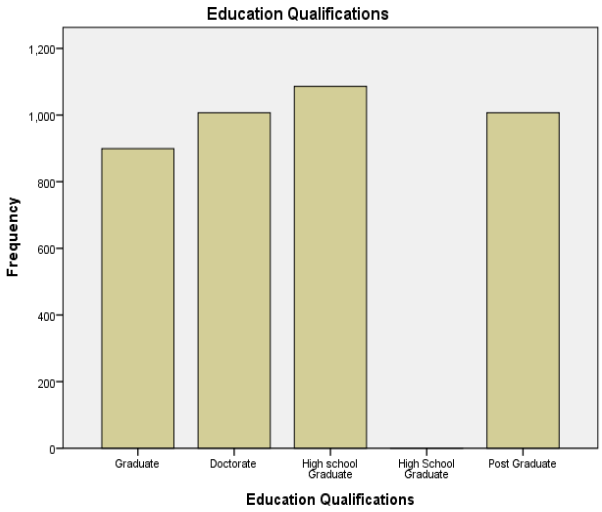


Education Qualification:

- 27.2% of the respondents are High School Graduates.

Education Qualifications

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Graduate	899	22.5	22.5	22.5
	Doctorate	1007	25.2	25.2	47.7
	High school Graduate	1087	27.2	27.2	74.8
	Post Graduate	1007	25.2	25.2	100.0
	Total	4000	100.0	100.0	



Weight Management method utilized:

- 26.3% of the respondents used LPM mobile application.

Weight Management Method Utilized

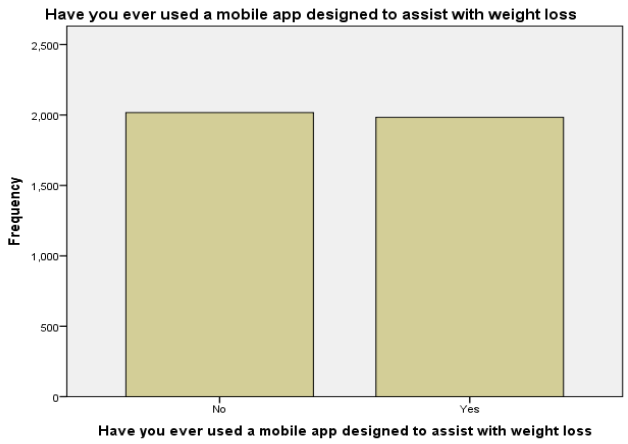
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Both	1001	25.0	25.0	25.0
	LPM Mobile applicatiom	1051	26.3	26.3	51.3
	None of the Listed	1000	25.0	25.0	76.3
	Personal Practice	948	23.7	23.7	100.0
	Total	4000	100.0	100.0	

Have you ever used a mobile app designed to assist with weight loss?

- 50.4%of the respondents opt for No.

Have you ever used a mobile app designed to assist with weight loss

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	2017	50.4	50.4	50.4
	Yes	1983	49.6	49.6	100.0
	Total	4000	100.0	100.0	

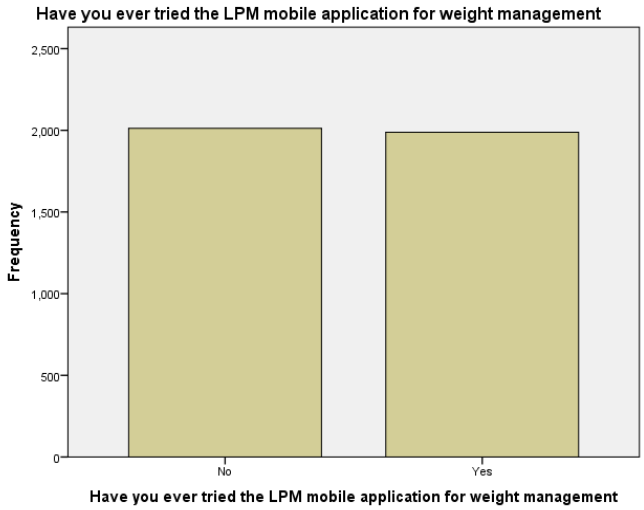


Have you ever tried the LPM mobile application for weight management?

- 50.3%of the respondents opt for No

Have you ever tried the LPM mobile application for weight management

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	2012	50.3	50.3	50.3
	Yes	1988	49.7	49.7	100.0
	Total	4000	100.0	100.0	



1) What is the impact of using weight management mobile apps like of LPM Mobile app oneself-management of weight loss of patients?

- Performed Regression analysis to test the impact of using weight management mobile apps like of LPM Mobile app oneself-management of weight loss of patients.
- H_0: There is no relationship regarding LPM mobile app and Weight loss of patients.
- From the regression analysis we reject our Null Hypothesis and conclude that there is an impact of using weight management mobile apps like of LPM Mobile app oneself-management of weight loss of patients

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Utilizing applicationsapplication for weight management helpshelp in bebeing mindful of my calorie intake, It is easy to get information about weight loss exercise and nutrition on the LPM application, I would recommend the LPM application to friends and family members for weight loss. , I would continue using LPM applications for weight management[b]	.	Enter

a. Dependent Variable: Have you ever used a mobile app designed to assist with weight loss

b. Tolerance = .000 limits reached.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.037[a]	.001	.000	.500

a. Predictors: (Constant), Utilizing applicationsapplication for weight management helpshelp in bebeing mindful of my calorie intake, It is easy to get information about weight loss exercise and nutrition on the LPM application, I would recommend the LPM application to friends and family members for weight loss. , I would continue using LPM applications for weight management

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.379	4	.345	1.380	.238[b]
	Residual	998.578	3995	.250		
	Total	999.958	3999			

a. Dependent Variable: Have you ever used a mobile app designed to assist with weight loss

b. Predictors: (Constant), Utilizing applicationsapplication for weight management helpshelp in bebeing mindful of my calorie intake, It is easy to get information about weight loss exercise and nutrition on the LPM application, I would recommend the LPM application to friends and family members for weight loss. , I would continue using LPM applications for weight management

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.503	.028		18.144	.000
	It is easy to get information about weight loss exercise and nutrition on the LPM application	-.017	.009	-.037	-1.985	.047
	I would recommend the LPM application to friends and family members for weight loss.	.010	.008	.026	1.333	.183
	I would continue using LPM applications for weight management	.010	.007	.029	1.337	.181
	Utilizing applicationsapplication for weight management helpshelp in bebeing mindful of my calorie intake	-.004	.009	-.011	-.501	.617

a. Dependent Variable: Have you ever used a mobile app designed to assist with weight loss

2) What are the differences in the impact on self-management of weight loss between LPM Mobile apps compared to the impact of private practice?

- Pearson correlation coefficient is done to test the relationship among the variables.
- H_0: There is no impact on the difference self-management of weight loss between LPM Mobile apps compared to the impact of private practice.
- Here, there is no significance among the variables. Hence, we conclude that there is no relationship among the Impact of Private Practice and LPM Mobile Apps.

Correlations

		The LPM mobile application helped me achieve my weight loss goals	It is easy to get information about weight loss exercise and nutrition on the LPM application	I would recommend the LPM application to friends and family members for weight loss.	I would continue using LPM applications for weight management	Utilizing applications application for weight management helpshelp in bebeing mindful of my calorie intake	I often engage in private practice (one-on-one sessions with a dietitian, nutritionist, or personal trainer) to manage my weight	I have been engaging in private practice for quite some time	Private practice has been quite effective in helping me achieve my weight loss goals	Personalised guidance and customised meal plans were most beneficial to me	Regular in-person sessions and motivational support were quite effective in private practice
The LPM mobile application	Pearson Correlation	1	.223**	.569**	.525**	1.000**	.001	.000	.003	.001	.000

helped me achieve my weight loss goals	Sig. (2-tailed)		.000	.000	.000	.000	.966	.978	.874	.937	.984
	N	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
It is easy to get information about weight loss exercise and nutrition on the LPM application	Pearson Correlation	.223**	1	.218**	.514**	.223**	-.001	-.001	.000	.000	.000
	Sig. (2-tailed)	.000		.000	.000	.000	.972	.967	.986	.981	1.000
	N	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
I would recommend the LPM application to friends and family members for weight loss.	Pearson Correlation	.569**	.218**	1	.249**	.569**	.001	.001	.002	.002	.000
	Sig. (2-tailed)	.000	.000		.000	.000	.952	.969	.874	.912	.984
	N	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
I would continue using LPM applications for weight management	Pearson Correlation	.525**	.514**	.249**	1	.525**	.000	.000	.002	.001	.000
	Sig. (2-tailed)	.000	.000	.000		.000	.976	.996	.901	.933	.996
	N	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000

Utilizing application sapplicatio n for weight manageme nt helpshelp in bebeing mindful of my calorie intake	Pearson Correlati on	1.000**	.223**	.569**	.525**	1	.001	.000	.003	.001	.000
	Sig. (2-tailed)	.000	.000	.000	.000		.966	.978	.874	.937	.984
	N	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
I often engage in private practice (one-on-one sessions with a dietitian, nutritionist, or personal trainer) to manage my weight	Pearson Correlati on	.001	-.001	.001	.000	.001	1	.242**	.564**	.000	.211**
	Sig. (2-tailed)	.966	.972	.952	.976	.966		.000	.000	.998	.000
	N	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
I have been engaging in private practice for	Pearson Correlati on	.000	-.001	.001	.000	.000	.242**	1	.523**	.591**	.510**
	Sig. (2-tailed)	.978	.967	.969	.996	.978	.000		.000	.000	.000

quite some time	N	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
Private practice has been quite effective in helping me achieve my weight loss goals	Pearson Correlation	.003	.000	.002	.002	.003	.564**	.523**	1	.600**	.216**
	Sig. (2-tailed)	.874	.986	.874	.901	.874	.000	.000		.000	.000
	N	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
Personalised guidance and customised meal plans were most beneficial to me	Pearson Correlation	.001	.000	.002	.001	.001	.000	.591**	.600**	1	.540**
	Sig. (2-tailed)	.937	.981	.912	.933	.937	.998	.000	.000		.000
	N	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
Regular in-person sessions and motivational support were quite effective in private practice	Pearson Correlation	.000	.000	.000	.000	.000	.211**	.510**	.216**	.540**	1
	Sig. (2-tailed)	.984	1.000	.984	.996	.984	.000	.000	.000	.000	
	N	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000

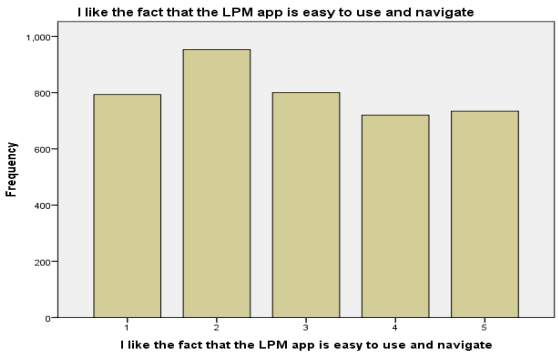
**. Correlation is significant at the 0.01 level (2-tailed).

3) What are the characteristics of the app most valued by the users?

- The Characteristics of the app most valued by the users is mentioned below.
- 16.7% of the respondents opt for Neutral as the response

I like the fact that the LPM app is easy to use and navigate

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	793	16.5	19.8	19.8
	Disagree	953	19.9	23.8	43.7
	Neutral	800	16.7	20.0	63.7
	Agree	720	15.0	18.0	81.7
	Strongly Agree	734	15.3	18.4	100.0
	Total	4000	83.3	100.0	

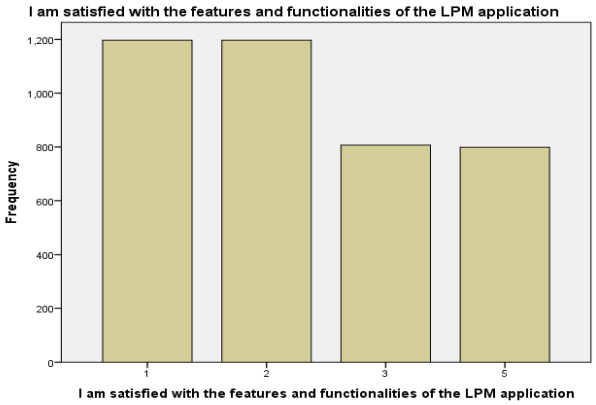


- 24.9% of the respondents opt for Disagree as the response

I am satisfied with the features and functionalities of the LPM application

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1197	24.9	29.9	29.9
	Disagree	1197	24.9	29.9	59.9
	Neutral	807	16.8	20.2	80.0
	Strongly Agree	799	16.6	20.0	100.0

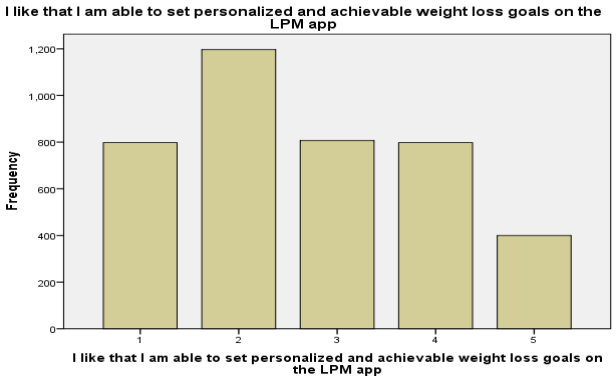
	Total	4000	83.3	100.0	



- 24.9% of the respondents opt for Disagree as the response

I like that I am able to set personalized and achievable weight loss goals on the LPM app

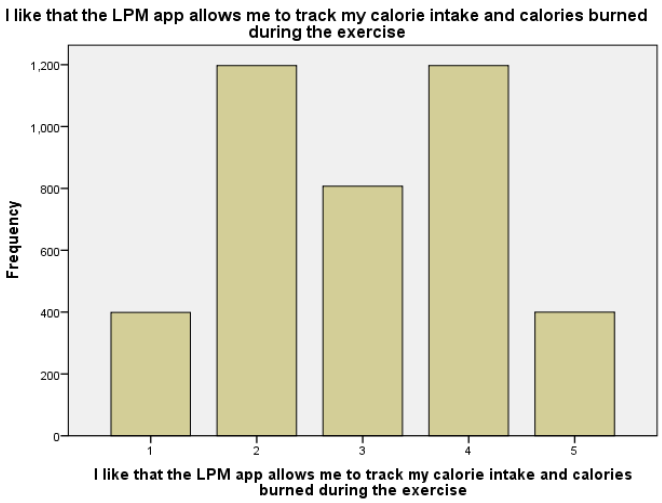
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	798	16.6	20.0	20.0
	Disagree	1197	24.9	29.9	49.9
	Neutral	807	16.8	20.2	70.1
	Agree	798	16.6	20.0	90.0
	Strongly Agree	400	8.3	10.0	100.0
	Total	4000	83.3	100.0	



- 24.9% of the respondents opt for Agree as the response.

I like that the LPM app allows me to track my calorie intake and calories burned during the exercise

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	399	8.3	10.0	10.0
	Disagree	1197	24.9	29.9	39.9
	Neutral	807	16.8	20.2	60.1
	Agree	1197	24.9	29.9	90.0
	Strongly Agree	400	8.3	10.0	100.0
	Total	4000	83.3	100.0	



- 33.4% of the respondents opt for Neutral as the response

I like the database of food items and their nutritional value on the LPM application.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	399	8.3	10.0	10.0
	Disagree	798	16.6	20.0	29.9
	Neutral	1605	33.4	40.1	70.1
	Agree	799	16.6	20.0	90.0
	Strongly Agree	399	8.3	10.0	100.0
	Total	4000	83.3	100.0	
Missing	System	800	16.7		
Total		4800	100.0