

A Critical Analysis on the Factors Impacting the Consumers Adoption of Fitness Applications on Smartphones

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Abstract

Despite the all-pervasive impact of smartphones on day-to-day life of human beings, the adoption of mobile apps for fitness tracking has however been observed as low. The objective of this research paper is to look at some of the key factors that influence consumers at large in adopting mobile app for fitness tracking. Apart from undertaking a detailed data analysis on the various demographics to which the consumers belong, the content analysis validates the importance of behavioural characteristic techniques which have evolved over a period of time in recent years to describe the positive and negative impacts of both internal and external environment on the consumers. The paper is intended to be a good reference point for the marketing professionals as well as software vendors to have a thorough understanding on the adoption of fitness apps as per usage preferences.

Keywords: Adoption, Usage, influencers, user behaviour, motivational triggers, Content analysis

Introduction

The wellness industry world over is poised for a quantum growth in the next one decade or so. Some of the prime reasons for such a projected growth include the increase in the level of awareness for the need to remain fit due to high adverse impact of lifestyle diseases like diabetes, the easy access to diverse information, the quantum jumps in digitization due to mobile revolution and the influence of social media in everyday life. As per the recent assessment made by forecast of the Global Wellness Institute, the wellness industry itself is estimated to be at \$4.5 trillion worldwide as of 2021, and is expected to grow at around 5.3% annually. The World Health Organization and many governments including the Government of India have been propagating the dire need for the citizens to keep healthy and fit all through as it essentially helps them to increase their lifespan and the quality of life. Healthy life ultimately leads to improved productivity, which makes the economy grow at a faster pace while providing better lifestyle and comfort.

It is not surprising to see the mobile devices markets are getting flooded with mobile fitness applications which are primarily designed for overall health and fitness monitoring, diet management, tracking fitness and physical activities, thereby enabling healthy lifestyle. The number of people who have downloaded fitness apps by 2021 is estimated to be 50 percent of approximately 5.48 billion mobile users. A recent survey done by Accenture across seven countries has revealed that, the number of users gets doubled in

every two years. The market penetration of Fitness Apps and their wide popularity and access thereof underlie the fact that people who work out, do physical exercise, jog or run either for health or for sense of joy and pride now have easy and cost-effective ways of monitoring their level of fitness.

However, the behavioural pattern driving them to track their own fitness level is relatively a new trait. The key factors that drive the end-users' to adopt and make Fitness App an integral part of their life is yet to be fully understood. According to a research study done by Laura Studen and Victor Tiberius (Faculty of Economics and Social Sciences, University of Potsdam, 14469 Potsdam, Germany) young adults with high social media usage tend to feel socially more isolated than those with lower social media usage. In contrast, Pittman (School of Journalism & Communication, University of Oregon, United States and Reich (Lundquist College of Business, University of Oregon, United States in their research paper "Social media and loneliness" emphasize that the perception of loneliness declines if image-based social media networks such as Instagram or Snapchat are visited.

Likewise, users' experience with image-based platforms tend to increase the level of happiness and satisfaction in life. Individuals who enjoy feeding their ego in terms of receiving instant feedback and positive recognition on social media platforms are more likely to show addictive behaviours towards social media. Hence, it is pertinent to note that social media influencing the individual behaviour is a double-edged sword.

Notwithstanding the impact of technology and social media influencing on the individual's choices and preferences, it is ultimately people's attitude towards their health and fitness that rule the roost on their popular choice and selection of Fitness Apps. Given the potential of fitness and running apps to improve users' health condition (Bert, Giacometti, Gualano, & Siliquini, from Department of Public Health Sciences, University of Turin, Italy), the role of users' valuation of their health in increasing the use of those apps also merits attention. Furthermore, considering the many risks related to privacy, security, information quality etc. (Lewis Warwick Medical School, University of Warwick, Coventry, Great Britain & Wyatt, Leeds Institute of Health Sciences, Faculty of Medicine, Health & Psychology, University of Leeds, Leeds, GB, 2014) associated with the use of mobile fitness apps, the effect of trust in the software development, platform and sustenance of the app usage deserve a complete understanding.

A Nielsen research report mentions that only 25% of the downloaded apps are used repeatedly on a daily basis. Given this finding, it is important to find out what triggers the motivation for end-users to use the fitness app continuously. Moreover, one wonders how people decide on whether or not to continue using apps they have downloaded. Specifically, considering the current research's focus, when a person downloads a fitness app and decides to use it for a couple of times, factors influencing the end-users using that app merits broader understanding and analysis. Hence this study focusses on the research question: *'What are the key factors that influence the users' in the usage or adoption of a mobile fitness app?'*

Research Objectives

Today, there is wider gamut of influences of the smartphones on the personal and social behaviour of the demographics across the age groups, like the percentage adoption by the millennial population, technology preferences, public policy making, usage of gadgets, friends, medical reasons, family etc.

The broad objectives of this research paper are therefore focused on:

1. Providing deeper insights into the adoption of fitness apps in general
2. Recognising the factors that influence the behaviour pattern and usage of the fitness app.
3. Identifying the behavioural characteristics of different age group and their perspective of using fitness mobile apps.
4. Picking out the user level expectations on various activities to be made available for usage in the fitness app
5. Pinpointing different motivational triggers for the end-users to adopt and use the fitness app

Besides the above listed broad objectives, the study is also focussed at analysing the key factors that impact the adoption of mobile apps at the consumer level so that App developers can consider these factors to influence the customer usage effectively. This will also bring out the need for integration of the allied industries like healthcare, medical insurance, diet, nutrition and food supplement industry etc. for the extended benefit of the fitness enthusiasts.

Literature Review

In reality, human behaviour by itself is not structured or self-disciplined. The dynamics is rather wide and complex. As revealed by Quirin, M et. al (2020) in such a given scenari, motivation is a key trigger for people to work out and keep themselves fit. Hardley, M., (2019) attributes the biggest advantage of leveraging technology like mobile apps in the present day's digital world to a new normal in today's world, where there are no barriers to awareness on health consciousness and staying fit. Recent research in this newly evolved area unambiguously mentions that the consumers are driven by a committed motivation to visualise and internalize a long-term state of fitness. The findings mention how personal health and fitness improve when it is visually promoted.

Apps are now based on the user needs, and are elastic in nature - always available on demand, provide continuous feedback mechanisms and interactive features which can be personalized. Many researchers have found out that behaviour change related to fitness and health occurs through appropriate behavioural interventions. They have also tried to evaluate how extensive use of Apps create an impact on the end-user.

Setting up a target, measuring and monitoring the progress of physical exercise and continuous improvement thereof by providing immediate feedback and analysis with data, and visualization of the results motivate the end-user in a big-way, which not only make them stay healthy but eventually make them active and productive to have a positive outlook and performance. Continuous feedback mechanism helps one to take timely course correction as appropriate. Mobile fitness apps show the performance on a regular interval through various visualization tools and methods showing the output in a run-charts, burn ratio, progress on a periodic basis, how their performance stand viz. their peers etc. Peer group pressure and working as a team using collaborative platforms like social media enhance the percentage of completion and output significantly.

Research study by Xang (School of International Communications, Faculty of Humanities and Social Sciences, University of Nottingham, Ningbo, China) and Xu (Institute for Mobile Studies, Faculty of Humanities and Social Sciences, University of Nottingham, Ningbo, China, 2020) have identified a host of influencing factors that drive the youth to use the fitness apps. Some of the significant influencing factors that positively affect youth segment in support of their continuous intention to use fitness apps are purpose of usage, simple to use features, happy about using, fitness goal achievement and social networking.

Gamification features like risk vs rewards, recognition through badges in the apps are some of the ways and means by which App developers keep the millennial generation motivated to use the fitness apps.

Zou Wenting (Learning Technologies Program, Department of Curriculum & Instruction, The University of Texas at Austin, TX, USA), et. al identify the game elements in non-gaming contexts for the purpose of changing individuals' behaviours. Deterding (Professor of Design Engineering, Imperial College London) et al 2011 applied in many services. Huotari (Researcher at Helsinki Institute for Information Technology HIIT) and Hamari (Gamification Group, UNITE Flagship, Tampere University, 2017), such as mobile banking (Baptista (NOVA IMS, Universidade Nova de Lisboa) and Oliveira (Full Professor at NOVA IMS, Universidade Nova de Lisboa, 2017), online travel sites (Sigala, University of Piraeus, 2015), and fitness tracking apps (Hamari, Gamification Group, UNITE Flagship, Tampere University) and Koivisto (R&D lead at Solsten; Postdoctoral researcher at Tampere University, 2015b). Marketing research mentions the advantages of gamification and suggests that gamifying services can help to improve the fitness. They conducted ANOVA on participants' intrinsic motivation to keep using the fitness app. The results indicated that the participants using fitness apps had higher intrinsic motivation and showed significant higher levels of control when using the fitness app.

Research Gaps

In the long term, it is also very critical for the sustenance of the usage of the apps. In this background, it is very important to understand why users choose though they were not keen on using any fitness app so that appropriate measures can be taken to fix the issues. The top 3 reasons are pre-determined and elicited from the respondents and their corresponding distribution are mentioned below. In addition, the methodology ignores the blank responses as it neither confirms nor negates an opinion in a perception-based survey.

Research Hypothesis

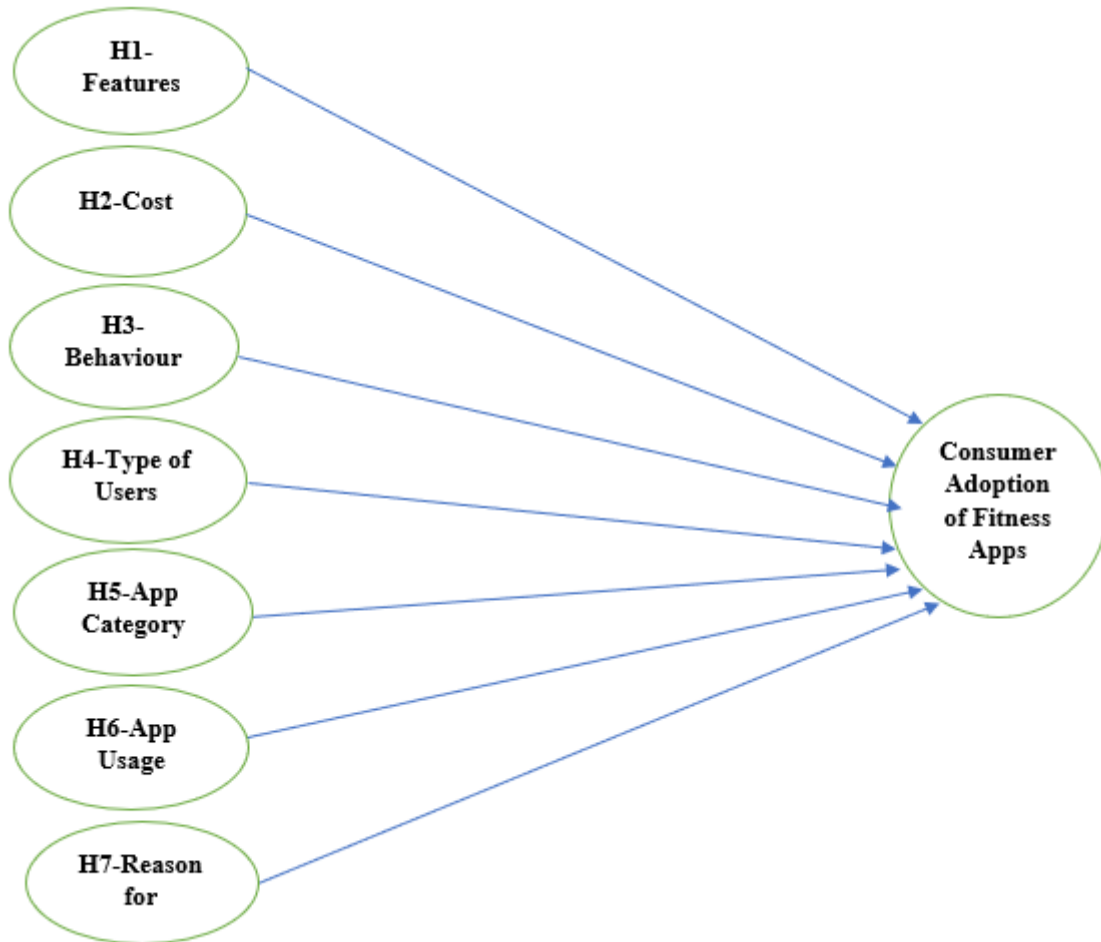


Figure-1: Features influencing the Consumer adoption of Fitness Apps

On the basis of the literature survey and close observations made on the users, it is hypothesised that all the seven features influence the consumer adoption of Fitness Apps, albeit with different degree of influence.

H1-Features: Various features of the fitness apps are being considered like Reminder-Alerts-Notifications and Rewards-Gamifications.

H2-Cost: In the present-day scenario, apps are available free for downloading in store or Android play store. Hence, cost for the app is not being considered.

H3-BCT: Behavioural Change. Many consumer behaviour traits have evolved over the decade and will continue to evolve like adoption, Usage, features etc.

H4-Types of Users: Heavy User, Light User based on the Usage frequency.

H5-App category – Different Apps available in a wellness scheme of things; Lifestyle Apps specific to Diet, Nutrition, Weight loss and Fitness (Running, Jogging, Walking, cycling etc.,

H6-App usage – Frequency of usage of Apps like Daily, monthly, fortnightly etc.

H7-Reason for Adoption – Peer influence, family influence, social media influence, employer driven, medical advice, self-motivation etc.

In the above hypothesis, factors like types of users in H4 (Light vs Heavy) give us usage pattern and preferred choices that influence the usage of apps. They are driven by other demographic factors and features too. However, most important dynamic variable is behavioural change. Every personal facet like age, gender, competing apps is likely to have a direct impact on the fitness adoption. Behavioural change is the most critical factor to be dissected further for analysis. The reason being that some of the characteristics of the behavioural change are individual centric while others are society centric. Some are mandated by law or employment organization etc. while others get influenced by closely knit pressure groups like family, friends, peers etc. In addition to this, relationship between all these pressure groups viz, the behaviour and adoption of the fitness app will make the study more meaningful and relevant.

Research Methodology

A questionnaire-based survey was administered to around 250 respondents through random selection to understand the implied needs, critical success factors and gaps in the existing Apps based on their perception and usage. The survey was conducted online over a period of two weeks in 2022 by sending emails across to the participants while asking them to respond on the questionnaire prepared on Google Forms, with English as a medium of communication. The questionnaire was designed in such a way that it would take took 3-5 minutes on an average for each participant to complete to complete the survey.

Similar to the study done by Ryan M. Alturki and Valerie Gay (School of Electrical and Data Engineering, University of Technology Sydney, Sydney City, Australia, 2017), a ranking procedure was adopted for the key influencing factors that triggered the usage behaviour of the respondents basing on their experiences with the Apps extensively used by them. The survey was intended to capture the behavioural characteristic of the users evolved over a period of time so that Apps are modified or re-created to address the research gaps in order to suit the current trends.

This study as such adopts content analysis as the research method. The data and content provided by the respondents are analysed to understand the key features of fitness-apps, their usage pattern and the activities that had high influence amongst the end-users, and are more effective in transforming their behaviour. The following stepwise procedure has been followed to study the factors impacting the usage of Fitness App.

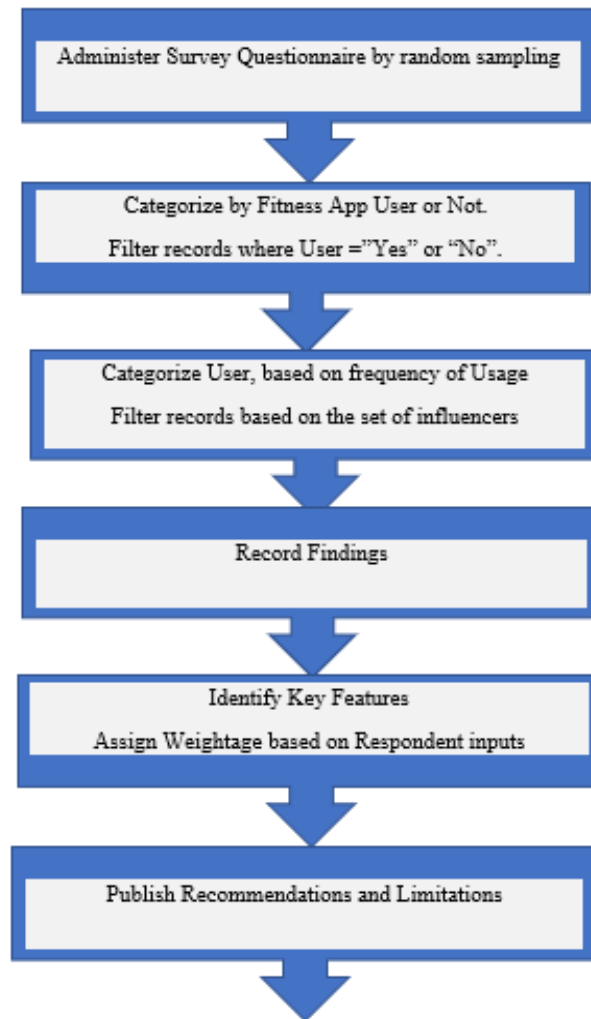


Figure:2- Flowsheet showing the stepwise process of the survey-based study

Survey Questionnaire Classification

Table:1- Survey Questionnaire

Category	Measurement
Socio Demographic	1. What is your gender? 2. What is your age?
Adoption & Usage	Do you use mobile apps for tracking your fitness? If the answer is 'Yes' Pls respond to the below set of questions.
	1. Does Friends influence the decision to use the fitness App? 1. Agree 2. No
	2. Does social media influence the decision to use the fitness App?

Influencers	1. Agree 2. No
	3. Does Family influence the decision to use the fitness App? 1. Agree 2. No
	4. Does Employer influence the decision to use the fitness App? 1. Agree 2. No
	5. Does Medical Advice influence the decision to use the fitness App? 1. Agree 2. No
	6. Does your self-motivation influence the decision to use the fitness App? 1. Agree 2. No
Consumer Preferences	1. What is the name of the fitness App you use? 2. What specific purpose do you use the fitness App for? 3. Do you think features like alerts, reminders would motivate you to use the Fitness App? 1. Agree 2. No. 3. Not sure
Technology Environment	4. What type of phone do you use?
Triggers for Non-Usage	1. In case you are not using the fitness App, which of the following could be the likely reason? a. Too technical for me b. I do not see any purpose. c. Add additional stress chasing a target. 5. Any other (Pls specify the reason if you can)

The users were classified into 2 (two) different categories viz. Heavy User and Light User.

Table:2- Categories of Users

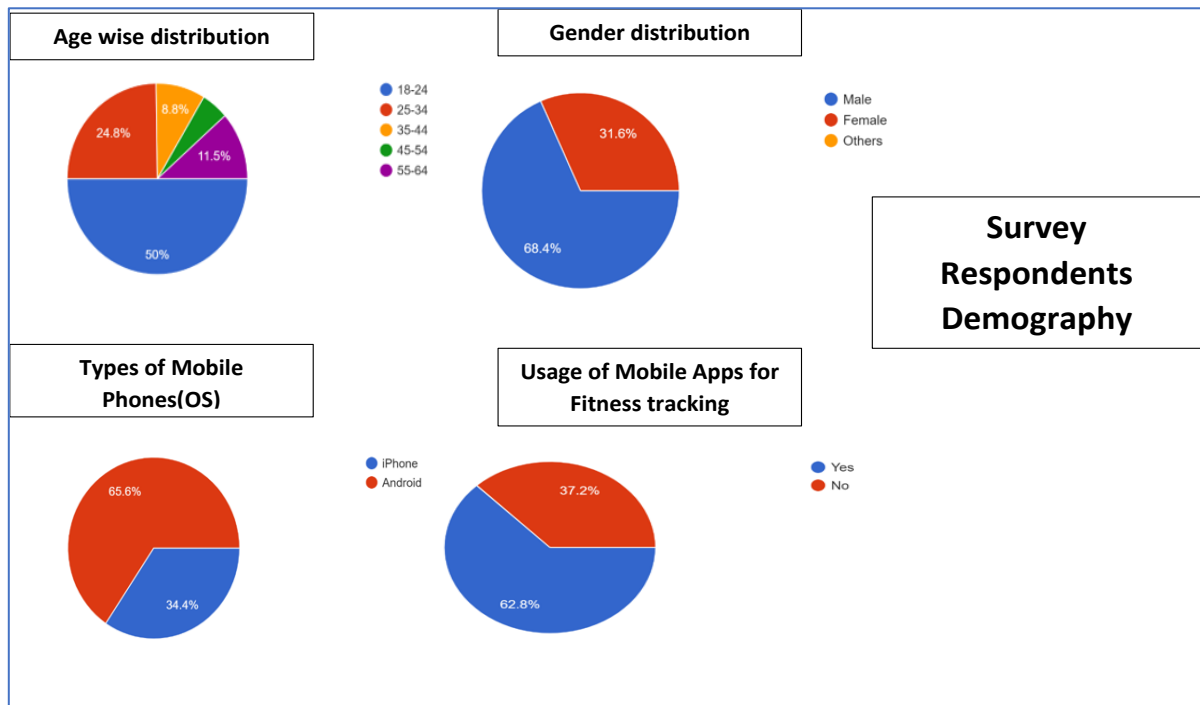
Classification of User	Usage Frequency
Light User	Daily Once
Heavy User	Multiple Times Daily

Demographic Factors

1. Age (Youth and Middle Aged)
2. Gender
3. Heavy User/ Light User
4. Popular Apps recalled by users
5. Type of Operating System (Android, iOS)

The demography of the survey respondents is captured in the pie chart as under basing on the 5 (five) important criteria as indicated above.

Figure:3- Demography of Survey Respondents



The following are the key inferences from the demographic details.

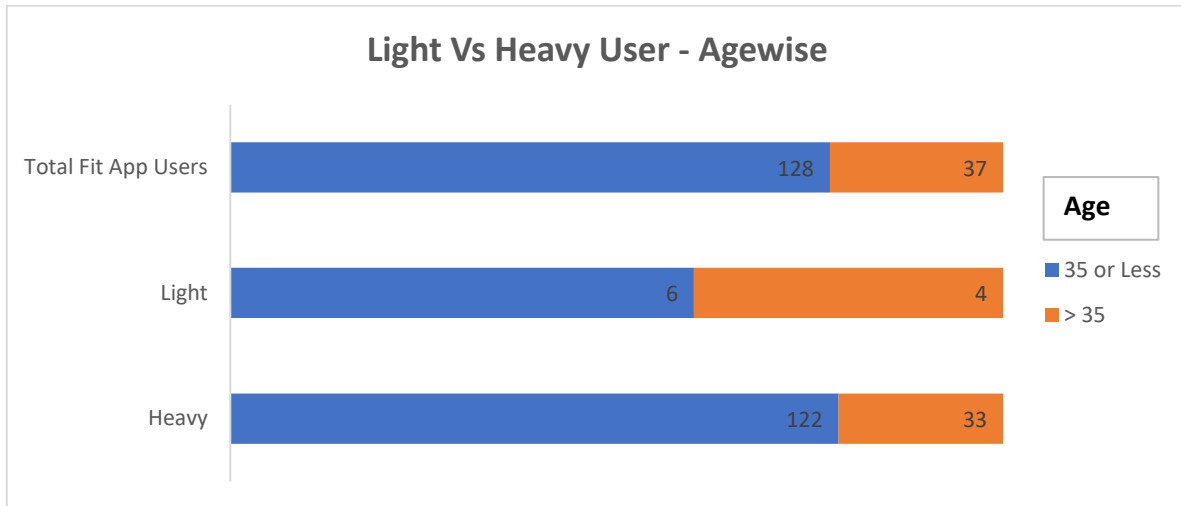
- 75% of the respondents belong to the youth segment (< Age 35) and rest are categorized as middle age segment.
- 68 % of respondents belong to male and the rest are categorized as female.
- 65.5% of the respondents use android and rest 34.4% use iOS (iPhone)
- 62.8% of the respondents use mobile applications for tracking their fitness.

Category of User viz... viz. Age group.

Across these two age groups, and amongst those who responded as ‘Yes’ for the question whether they use any fitness, the users were further classified as ‘Heavy User’ and ‘Light User’. Those who use the

app only once in a day are categorized as ‘Light User’ and those who use the app multiple times in a day with higher frequency of usage are categorized as “Heavy User”.

Figure:4 - Demography of respondents - User wise



95% of the youth (Age < 35) segment who use fitness apps categorize themselves as Heavy Category Users and 89% of the Middle-aged category (Age > 35) are Light Users.

Existing Popular Apps

Figure:5- Popular Fitness Apps used by respondents

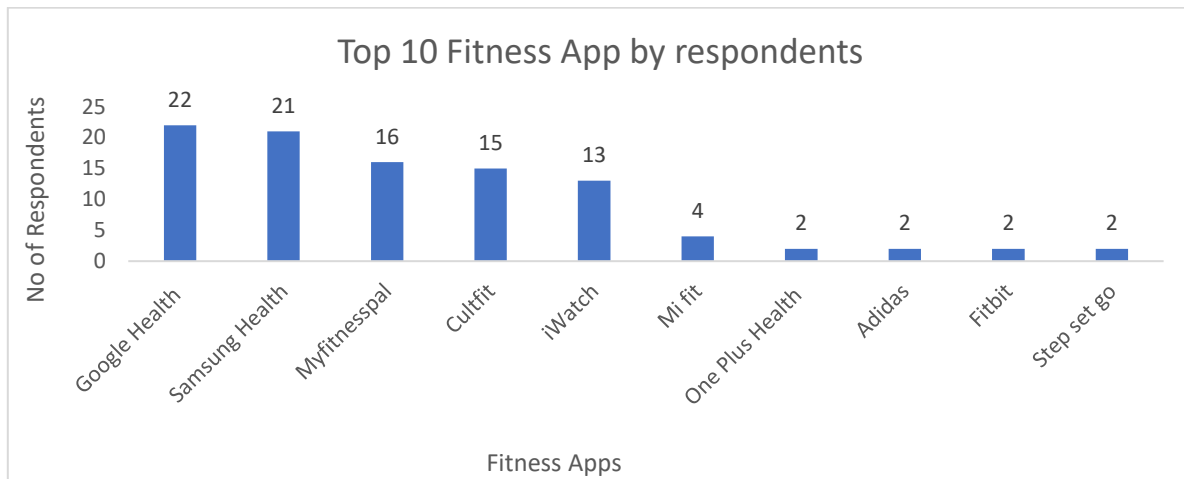


Table:3- Definitions and Description of terminologies used

Definitions	Description
FIT	Fitness
SD	Standard Deviation
iOS	Operating System of Apple’s iPhones
Android	Operating System of other than iPhones

SPSS	Statistical Package Software for Social Sciences used to measure Stability, Reliability
Cronbach a	Cronbach Alpha – a proven model using which stability, reliability, correlation are established for any statistical data.
Alerts	Warnings or reminders for any exceptional scenario
Middle Age	Age > 35
Youth	Age < 35

Data Analysis

The variables used in this study are demographic factors like age, gender, user category, type of operating system. In addition to that, the data were primarily analysed to know the key influencing factors and the age category of the users. For ease of understanding, age category less than 35 is classified as youth segment and greater than age 35 is classified as middle age segment. In addition, the study also analyses the reliability of the degree of ‘influencers for using the fitness apps’, ‘motivational triggers’, ‘frequency of usage of fitness app’, in the questionnaire using Statistical Package for the Social Science (SPSS).

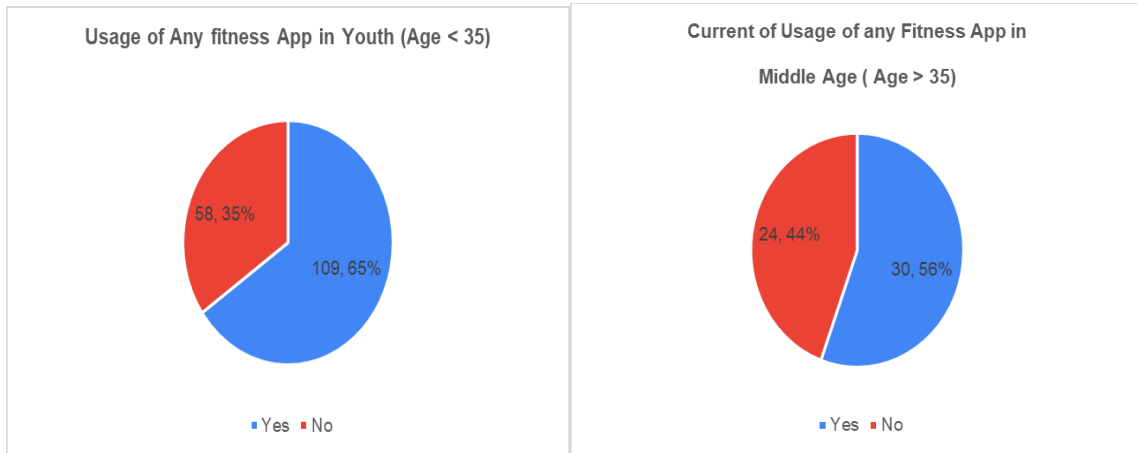
The reliability test is performed for ensuring consistency and stability using Cronbach’s alpha. The survey results elicited from the respondents include the six predetermined influencers like friends, social media, family, medical advice, self-starter and employer. Along with the frequency of usage and motivational trigger as exception where the questions were not responded aka blanks, Cronbach’s alpha is found to be at 0.865 demonstrating that the questionnaire has a good level of reliability.

Features Factors

1. Fitness App Adoption
2. Activity looked in the fitness Apps
3. Influencers for using the app for different age groups
4. Reasons for Non adoption
5. Triggers for Motivation

Fitness App Adoption by Age category

Figure: 6 – Demography by Age

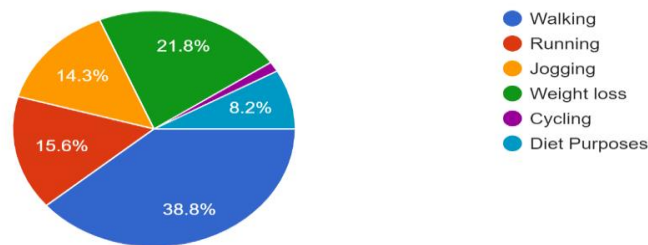


Activities Performed

Overall, various types of predetermined set of activities were given to the respondents and they were asked to choose the primary purpose for which the users used the fitness app currently. The activities are further segmented by age wise.

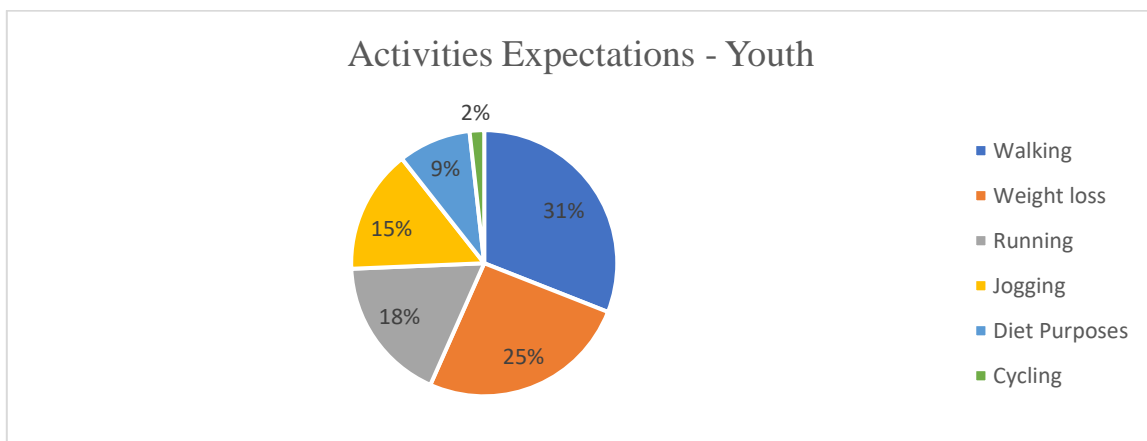
Figure: 7 – Activities performed using fitness app

What specific purpose you use the fitness app for ?
147 responses



Youth (Age < 35) Category

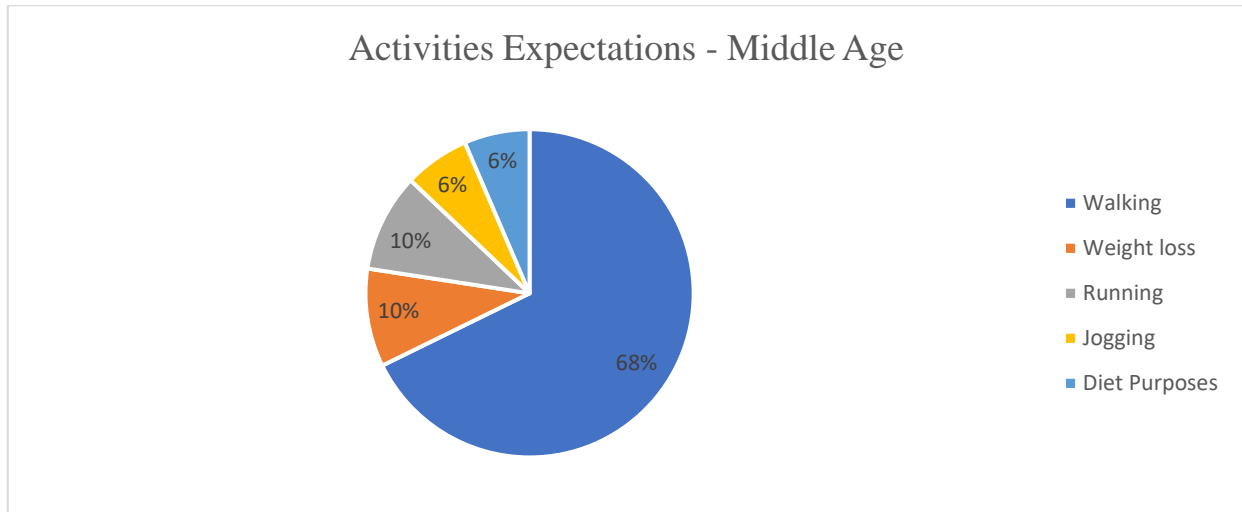
Figure:8- Activity importance shown by youth



Though walking is most preferred activities in both the segment youth and middle aged, it is to be noted that youth respondents attach significant importance to weight loss.

Middle Age (Age > 35) Category

Figure:8- Activity importance shown by middle aged



The Key Influencers

The survey asked the respondents whether they ‘Agree’ or ‘Do not Agree’ given a set of predetermined influencers in the using a fitness App. The below table mentions the no affirmative and non-affirmative responses for each of the influencers.

Table:4 – Influencers for Respondents Age wise

Age	Social Media		Friends		Family		Medical Advice		Employer		Self-Motivation	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Less than 35	45	71	40	76	12	104	8	108	7	109	4	112
Greater than 35	3	29	15	17	4	28	5	27	0	32	5	27

Figure:9- Influencers for youth for usage for fitness apps

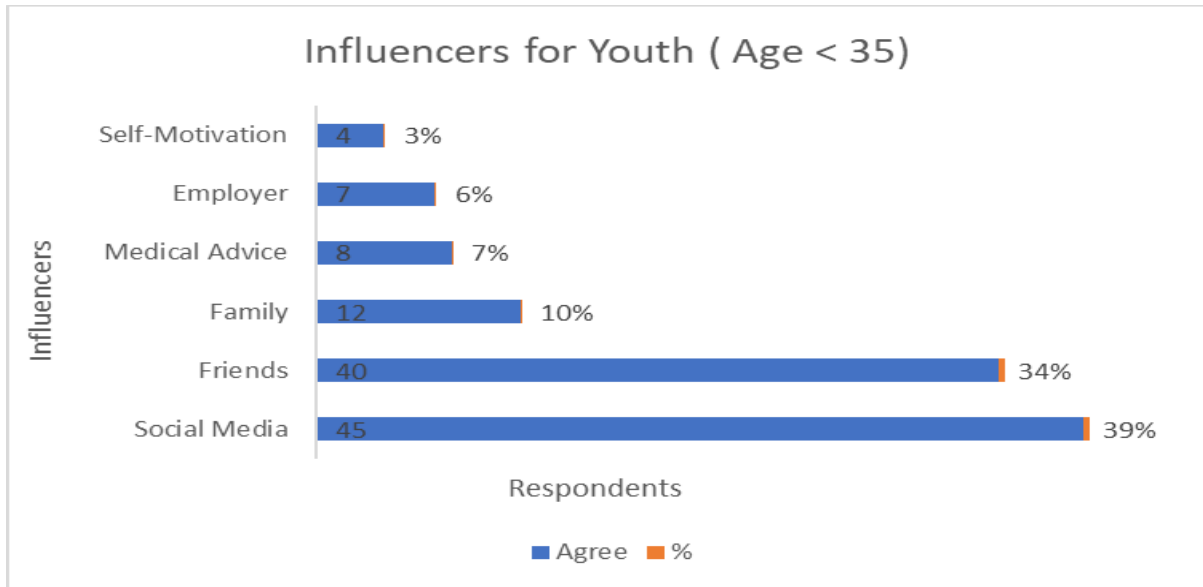
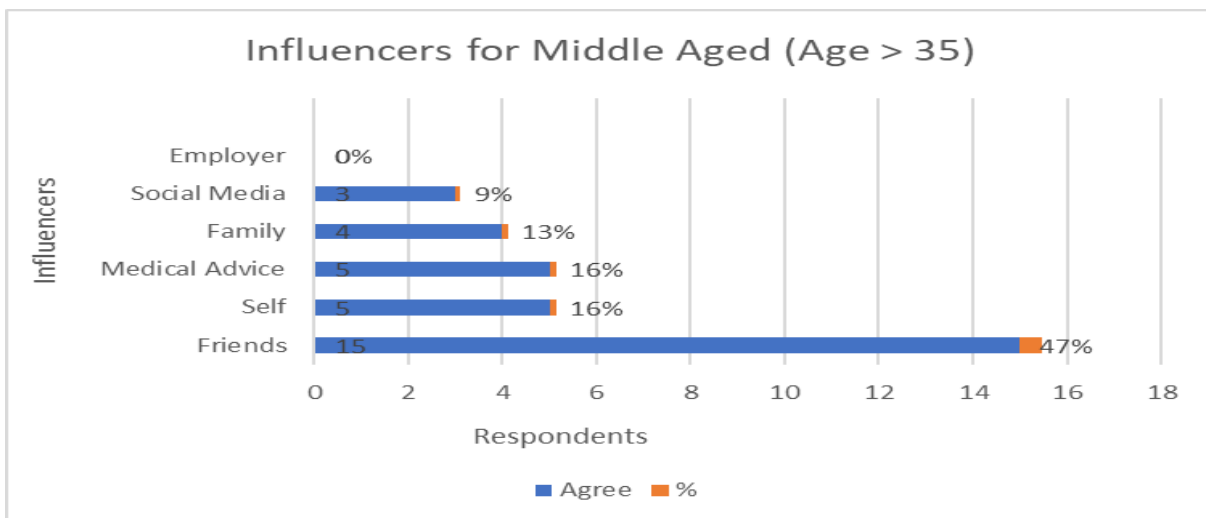
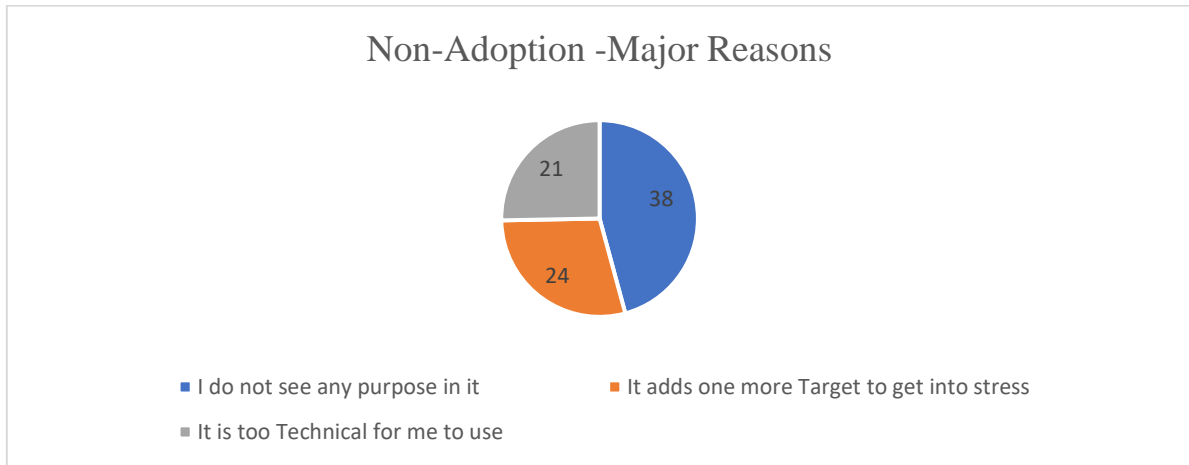


Figure:10 - Influencers for middle aged for usage for fitness apps



Influence of friends has a larger say in both youth as well as middle age segment. Social media is the primary driver for the youth segment which has a huge impact on fitness app usage. Similarly medical advice also is an important influential factor for the middle aged one. Also, the employer impact for the middle age segment is zero based on the survey as an eye opener.

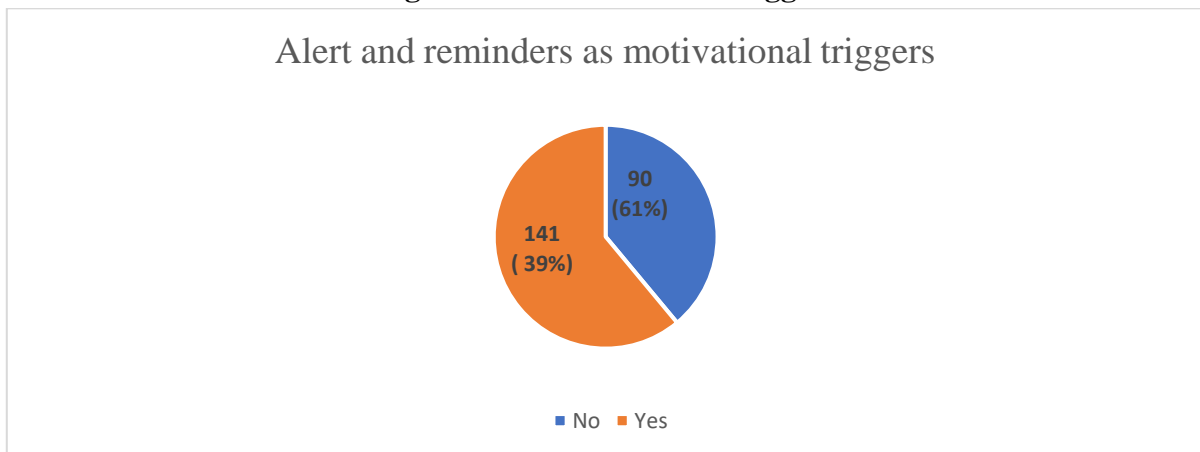
Figure:11- Reason for Non-adoption



Motivational Triggers

Overall, 61% of the respondents have mentioned features like Alerts and Reminders would help them and stay motivated to adopt the usage of fitness apps in their daily life.

Figure:12 - Motivational Triggers



Results

Arithmetic mean indicates the measure of central tendency of variables on observed data. When the arithmetic mean is high, it shows most of the respondents are in agreement with an item. Variance and standard deviation indicate how much discordant the respondents are from central tendency of variables on observed data. When standard deviation is higher, it exhibits opinions vary significantly amongst respondents. This study also records the arithmetic mean and standard deviation of the major attributes like key influencers, motivational trigger and usage frequency as mentioned above.

Figure: 13 – Reliability

Scale: Vish-Alpha			
Case Processing Summary			
		N	%
Cases	Valid	216	93.1
	Excluded ^a	16	6.9
	Total	232	100.0
a. Listwise deletion based on all variables in the procedure.			
Reliability Statistics			
	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
	0.869	0.865	8
Item Statistics			
	Mean	Std. Deviation	N
Friends Influenced the usage of Fitness App	1.46	0.500	216
Social Media Influenced the usage of Fitness App	1.49	0.501	216
Medical Advice Influenced the usage of Fitness App	1.45	0.499	216
Employer Influenced the usage of Fitness App	1.45	0.499	216
Self Motivation Influenced the usage of Fitness App	1.49	0.501	216
Family Influenced the usage of Fitness App	1.49	0.501	216
If the Answer is ' Yes', how many times you use in a month.	1.82	0.382	216
Do you think Alerts, Reminders would motivate to use the Fitness App	1.06	0.563	216

Inter-item correlation

There are totally 6 pre-determined influencing factors for triggering the usage of the fitness which was administered as a part of the questionnaire. The below table indicates the inter-item correlation. Respondents who have chosen Friends as the primary influencing factor which is shown as 1.0 in the below table have chosen social media, family and self-motivation as the next influencing factors which is shown as .955 and rest like medical advice (0.879) and employer as (0.888). Similarly, those who have chosen social media as the primary influencing factors, the corresponding other preferences are also measured statistically. As all the factors are from 0.86 to 1.0, we can say questionnaire administered is statistically in conformity.

Figure: 14 - Correlation

Inter-Item Correlation Matrix

	Friends influenced the Usage of fitness App	Social Media influenced the Usage of App	Medical Advice influenced the usage of App	Employer Influenced the Usage of App	Self Motivated to use the App	Family influenced the usage of App
Friends influenced the Usage of fitness App	1.000	.955	.879	.888	.955	.955
Social Media influenced the Usage of App	.955	1.000	.928	.937	1.000	1.000
Medical Advice influenced the usage of App	.879	.928	1.000	.860	.928	.928
Employer Influenced the Usage of App	.888	.937	.860	1.000	.937	.937
Self Motivated to use the App	.955	1.000	.928	.937	1.000	1.000
Family influenced the usage of App	.955	1.000	.928	.937	1.000	1.000

Summary of item-wise statistics.

Overall, if we look at the data applying the statistical principles, the variance in the item is less which is 0.042 while the inter-item variance is 0.292. Altogether 8 (eight) variables are considered for analysing the responses to find out the degree of influence and the conformity. Responses which do not fit as per the standard acceptability of alpha factor of a minimum of 0.65 are not considered and hence deleted. The mean of the alpha score for 6 (six) influencers, frequency of usage and motivational triggers are found to be 0.8, 0.912 and 0.942 respectively. While adjusting for all the deletions, the Cronbach alpha score for all the standard items is derived at 0.865 which is a testimony to the reliability of the survey.

Figure: 15 – Item wise statistics

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Friends Influenced the usage of Fitness App	10.25	5.749	0.918		0.819
Social Media Influenced the usage of Fitness App	10.22	5.643	0.968		0.813
Medical Advice Influenced the usage of Fitness App	10.26	5.812	0.890		0.822
Employer Influenced the usage of Fitness App	10.25	5.791	0.899		0.821
Self Motivation Influenced the usage of Fitness App	10.22	5.643	0.968		0.813
Family Influenced the usage of Fitness App	10.22	5.643	0.968		0.813
If the Answer is ' Yes', how many times you use in a month.	9.88	8.335	-0.128		0.912
Do you think Alerts, Reminders would motivate to use the Fitness App	10.65	8.536	-0.199		0.942

Considering all the above, the weightage for each feature is mentioned below which will be useful for introduction of any new fitness app in the market. This provides a gap analysis, adoption, preferences, usage based on age category, potential competitors, activities expectations from the target market.

Feature evaluation of a Fitness App

Table: 5 – Weightage of features

Features	Weightage
Activities	30
Influencers	30
Fitness App Adoption	20
Triggers for Non-Adoption	10
Motivational Triggers	10

Given the various data points elicited from the survey, it is highly recommended for any new fitness app when introduced in the market should consider the features like Activities, Key influencers, fitness app adoption and reasons for non-usage and motivational triggers the users think that would encourage them for more usage. Based on this, each one of the features is associated with a weightage to determine the course of correction. This is a general thumb rule adopted based on the responses.

Conclusions

The research findings from the above data analysis corroborate the following.

- a. The impact of digitization and usage of mobile for fitness consciousness is high in the younger age group.
- b. Social media, peer group and recommendations from the app store has a high degree of influence for adoption, primarily in the youth category.
- c. Medical advice is one of the triggers that motivates the middle-aged respondents to use the Fitness Apps extensively.
- d. Continuous feedback mechanism and gamification motivate people to stay fit and healthy.
- e. Consumer needs are evolving and so are the apps, which need to address the gaps on an ongoing basis.
- f. Ease of usage and providing relevant information like diet and nutrition can be considered for sustenance of the usage of apps.
- g. Employer impact is almost nil in the middle age segment which can be used as a strategy to increase the market penetration.
- h. All these factors along with the weightage would help any new Fitness App to incorporate this to be successful and popular amongst its users.
- i. The reasons for the non-usage of the apps must be addressed which would help penetrate the market for an increased market share.

Future scope of research

The behavioural influences of end consumers in this case, fitness app users can be broad based with more variables which can be dynamic in nature. Using a predictable behavioural model driven by data analytics and artificial intelligence bringing appropriate interventions. This would help to scale the sample size to a

very large target market so that marketing professionals can slice and dice and do a thorough data mining. This would help the research to make it more holistic and comprehensive.

References

1. Alturki, R.M., 2016. A systematic review on what features should be supported by fitness apps and wearables to help users overcome obesity. *International Journal of Research in Engineering and Technology*.
2. Ana Isabel Canhoto & Sabrina Arp (2017) Exploring the factors that support adoption and sustained use of health and fitness wearables, *Journal of Marketing Management*, 33:1-2, 32-60, DOI: 10.1080/0267257X.2016.1234505
3. Anil Gupta, Neeraj Dhiman, Anish Yousaf & Neelika Arora (2021) Social comparison and continuance intention of smart fitness wearables: an extended expectation confirmation theory perspective, *Behaviour & Information Technology*, 40:13, 1341-1354, DOI: 10.1080/0144929X.2020.1748715
4. Ardion D. Beldad & Sabrina M. Hegner (2018) Expanding the Technology Acceptance Model with the Inclusion of Trust, Social Influence, and Health Valuation to Determine the Predictors of German Users' Willingness to Continue using a Fitness App: A Structural Equation Modeling Approach, *International Journal of Human-Computer Interaction*, 34:9, 882-893, DOI: 10.1080/10447318.2017.1403220.
5. Deterding, S., Sicart, M., Nacke, L., O'Hara, K. and Dixon, D., (2011). Gamification using game-design elements in non-gaming contexts. In CHI'11 extended abstracts on human factors in computing systems (pp. 2425-2428).
6. Fotuhi, O., Ehret, P. J., Kocsik, S., & Cohen, G. L. (2022). Using self-affirmation to trigger motivation and a behavioural ladder to channel it. *Journal of Personality and Social Psychology*, 122(2), 187–201. <https://doi.org/10.1037/pspa0000283>
7. Guanxiong Huang, Yuchen Ren, Linking technological functions of fitness mobile apps with continuance usage among Chinese users: Moderating role of exercise self-efficacy, *Computers in Human Behavior*, Volume 103, 2020, Pages 151-160, ISSN 07475632, <https://doi.org/10.1016/j.chb.2019.09.013>. (<https://www.sciencedirect.com/science/article/pii/S0747563219303413>)
8. Hardey, M., (2019) On the body of the consumer: performance-seeking with wearables and health and fitness apps. *Sociology of Health & Illness*, 41(6), pp.991-1004. <https://doi.org/10.1111/1467-9566.12879>
9. H. Erin Lee & Jaehee Cho (2017) What Motivates Users to Continue Using Diet and Fitness Apps? Application of the Uses and Gratifications Approach, *Health Communication*, 32:12, 1445-1453, DOI: 10.1080/10410236.2016.1167998.
10. Lee, C.; Lee, K.; Lee, D. Mobile Healthcare Applications and Gamification for Sustained Health Maintenance. *Sustainability* 2017, 9, 772. <https://doi.org/10.3390/su9050772>
11. Mark A. Bonn, Woo Gon Kim, Sora Kang & Meehee Cho (2016) Purchasing Wine Online: The Effects of Social Influence, Perceived Usefulness, Perceived Ease of Use, and Wine Involvement, *Journal of Hospitality Marketing & Management*, 25:7, 841-869, DOI: 10.1080/19368623.2016.1115382

12. Morris, M. E., & Aguilera, A. (2012). Mobile, social, and wearable computing and the evolution of psychological practice. *Professional Psychology: Research and Practice*, 43(6), 622–626. <https://doi.org/10.1037/a0029041>
13. Mustafa, A.S., Ali, N.A., Dhillon, J.S., Alkaws, G. and Baashar, Y., 2022, January. User engagement and abandonment of mHealth: a cross-sectional survey. In *Healthcare* (Vol. 10, No. 2, p. 221). MDPI.
14. Quirin, M., Robinson, M. D., Rauthmann, J. F., Kuhl, J., Read, S. J., Tops, M., & DeYoung, C. G. (2020). The Dynamics of Personality Approach (DPA): 20 Tenets for Uncovering the Causal Mechanisms of Personality. *European Journal of Personality*, 34(6), 947–968. <https://doi.org/10.1002/per.2295>
15. Reyes-Mercado, P. (2018), "Adoption of fitness wearables: Insights from partial least squares and qualitative comparative analysis", *Journal of Systems and Information Technology*, Vol. 20 No. 1, pp. 103-127. <https://doi.org/10.1108/JSIT-04-2017-0025>
16. Siepmann, C., Kowalczyk, P. Understanding continued smartwatch usage: the role of emotional as well as health and fitness factors. *Electron Markets* 31, 795–809 (2021). <https://doi.org/10.1007/s12525-021-00458-3>
17. Windasari, N. A., & Lin, F. (2021). Why Do People Continue Using Fitness Wearables? The Effect of Interactivity and Gamification. *SAGE Open*, 11(4). <https://doi.org/10.1177/21582440211056606>
18. Zhang, X. and Xu, X., (2020). Continuous use of fitness apps and shaping factors among college students: A mixed-method investigation. *International journal of nursing sciences*, 7, pp. S80-S8)) <https://doi.org/10.1016/j.ijnss.2020.07.009>.