# Lifestyle games are not only for people with obesity

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## ABSTRACT

Obesity is a health-related problem which has already reached epidemic proportions. Worse, obesity has been killing more people than the current COVID-19 pandemic, and for longer at that. And, like COVID-19, it deserves our attention. As any problem this one also requires a solution. Given the statistics, current measures are not effective enough to reduce the number of people with obesity. One of the measures that have been suggested is the usage of a specialized app to help the user to deal with obesity, however, these apps do not have many users and are significantly less popular than apps from other categories, making it less attractive for developers to create such apps as the revenue will not be high. Therefore, the aim of this paper is to investigate the possibility of integrating the functionality of a lifestyle app for people with obesity into a game which is interesting to the gaming industry. The contributions of this paper lie in its summary and analysis of the most attractive features of a lifestyle game, allowing to start creating one, and provides grounds for further research in the field.

## Keywords

Lifestyle app, obesity, lifestyle game, weight-management, game

## 1. INTRODUCTION

Over the past decades, the number of people suffering from obesity has increased significantly. By now, it has become three times larger since 1975 [25]. Moreover, by 2030, under the condition that such a trend will continue, it is expected that 1.12 billion people (of the adult population of the world) will have obesity [16]. Also, starting several decades ago, it has become clear that this disease has been taking on epidemic proportions, originating in the USA and Europe [12, 15].

However, sometimes simple-sounding measures can help to prevent this disease. Such as sticking to a healthy diet or being physically active [25]. To help people to deal with the obesity epidemic, special lifestyle games (apps) have been developed. This has become possible thanks to the progress in the mobile technology industry [9, 11]. Usually, these apps fall under the Health & Wellness (or Health & Fitness) category in mobile app stores. However, Health & Wellness apps are far from being the most popular category when considering the number of downloads. Apps from the Games category are leading, moreover, on average, people spend much more time per week in apps from the Social (133 min) or Games (116 min) categories, compared to Health & Wellness category (27 min) [14].


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This research aims to find ways how these apps can be made more attractive to the gaming industry. This may not only bring significant revenue to the creator of such apps but could also transform such apps into useful lifestyle games which may help users prevent obesity while being fun to play.

As such, the contribution of this paper is the discovery of overlapping features, which users find attractive, in regular lifestyle apps, e.g., the Health app by Apple, and current weight-management apps. Additionally, similarly overlapping features in (mobile) games and current weight-management apps are discussed. Finally, an intersection of these sets of overlapping features is constructed to determine the most important features of a lifestyle game. Based on the discovered conclusions, future research in the field can be done.

From the scientific point of view, it is important to study this topic because the current statistics [12, 15, 16, 25] show that this problem, regarding obesity, is well-known, but the current measures of dealing with it [6, 25] are not very effective, otherwise the statistics would be more positive. Moreover, this problem has a direct impact on the current generation as "the current generation of children are likely to have shorter life expectancies than their parents because of obesity" [15].

From a marketing point of view, this study is also important as it may give possible guidelines for creating a high-revenue game seeing as it will combine the most attractive features of (mobile) games and the features of a lifestyle app, which, in turn, will allow to make a game potentially interesting to a bigger audience as it may bring together the users of lifestyle apps and of (mobile) games. As such, the revenue may be expected to be high because the usual tendency is that the bigger the audience the more revenue the game generates due to, for example, built-in advertising or in-app purchases [19].

Finally, the structure of the paper is the following:

- Discuss the problem statement and formulate the research question(s).
- Analyze the interviews regarding the attitude towards general lifestyle apps.
- Conduct a systematic literature review regarding the most important motivations to play (mobile) games.
- Conduct a systematic literature review regarding the most important and/or used features of lifestyle apps for weight-management.
- Analyze the results of the three previous steps.
- Determine the most important features for a lifestyle game.
- Discuss the possibility of the future research in the field.

## 2. PROBLEM STATEMENT

Although there has been research done in the field of partial gamification of lifestyle apps for patients with obesity [2,

21], studies into the possibility of creating a complete game which includes features of a lifestyle app, for example reading information from the connected wearable(s), are lacking. It is important to investigate the possibility of filling this information gap as it may blur the line between the Health & Wellness and Game categories, combining the users of both categories and expanding the possible audience of these lifestyle apps. Moreover, it is important to compare what desirable features of regular lifestyle apps overlap with the desirable features of the lifestyle apps which are focused on weight-management as it may clarify what features could also be taken into consideration when creating a lifestyle game.

The actual problem is that people who can receive help from a lifestyle app for patients and who already have, or are prone to, obesity, are not interested or motivated enough to use these apps as they require lots of user input and because the users want them to be more personalized and to have more behavioral elements included [22]. Moreover, seeing as obesity is having epidemic proportions [12], making a wider range of people interested in these apps is essential.

## 2.1 Research Question

The problem statement leads to the following research question:

*How should the developer of a lifestyle game for patients with obesity make their game interesting for the gaming industry?*

This research question can be answered by first finding answers to the following sub-questions:

1. What initially motivates people to play a (mobile) game?
2. What functionality should a general lifestyle app have to be useful?
3. What functionality should a lifestyle app have to be useful, especially for patients with obesity?

# 3. METHODOLOGY

The structure of the research process with regards to answering the research question is shown in the Image 1.

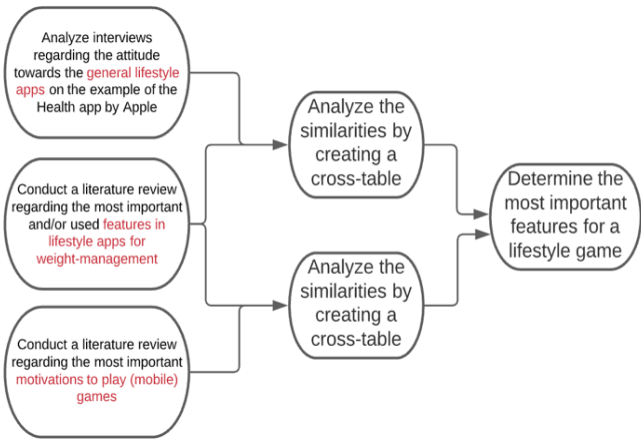


**Image 1. The structure of the research process**

The research begins with the analysis of 12 interviews to find the most positive features of general lifestyle apps. The results of this analysis are used to answer the second sub-question.

Afterwards, two systematic literature reviews are conducted, one with regards to (mobile) games and another one with regards to special lifestyle apps for weight-management, to find motivations to use these apps and to discover their top-rated features. Then the results of the reviews are analyzed and used to answer the first and the third sub-questions.

Once all the answers for the sub-questions are collected, the general analysis is carried on to get closer to answering the main research question. For this purpose, two cross-tables are made which discover and analyze the possible correlations of features of special apps for weight-management with the ones of games, general lifestyle apps and with the ones of (mobile) games respectively.

Finally, the most important features for a lifestyle game are discovered based on the produced cross-tables. The idea is to find the same highly rated concepts in general lifestyle apps, lifestyle apps for weight-management and (mobile) games. Identifying these concepts makes it possible to answer the main research question.

# 4. INTERVIEWS

In order to answer the second sub-question, 12 interviews have been analyzed with regards to the Health app made by Apple. This app was selected because, firstly, this is one of the most used lifestyle apps, and, secondly, because it has a lot of features, which allows for potentially getting more insights about their usefulness.

There were no special requirements for participants regarding age, gender, or nationality. The idea behind it is to get the broadest possible range of different people and opinions to select the most important features. As this app is intended for any iPhone user, owning an iPhone is a requirement for participation. Questions for the conducted interview can be found in Appendix A. The results of interviews can be found in Table 1 in Appendix B.

## 4.1 Analysis of the interview results

This section focuses on results of the analysis of the matrix produced while deriving the concepts mentioned in the interview, which can be found in Table 1 in Appendix B.

**Table 2. The most positively rated features**

| Feature | Mentioned (positively) by |
|---|---|
| Privacy | 12/12 |
| Ease of use | 12/12 |
| Insights in goals, activities | 11/12 |
| Social | 10/12 |
| Personal info may be shared with the app | 10/12 |
| Support | 9/12 |
| Info could be used for diagnoses | 9/12 |

Table 2 shows the features of the app that at least 75% of the interviewees mentioned positively, making these concepts extremely important to consider when creating a future game. It is clear from this table that all interviewees rated the ease-of-use highly, meaning the user-friendly interface for example, and privacy, meaning that the level of trust to this app is high. 11 out of 12 interviewees rated the possibility of getting insights in goals and activities positively, meaning, among others, the possibility to set these goals. 10 out of 12 interviewees said that they are willing to share personal information with the app, meaning, like how it was mentioned before, that the level of trust to this app is high. Finally, 9 out of 12 interviewees mentioned that they would not mind if their information from this app would be used for

medical diagnoses, and that they are satisfied with the level of support provided by the app, both social and technical.

**Table 3. The most negatively rated features**

| Feature | Mentioned (negatively) by |
|---|---|
| Money (investment) | 9/12 |

Table 3 shows the features of the app that at least 75% of the interviewees mentioned negatively, making these concepts extremely important to prevent when creating a future game. As it can be clearly seen, the only thing that users of the app dislike is investing money in the app. However, making part(s) of an app paid is one of the ways to monetize the product [3, 19]. Therefore, even though users do not like it, this feature may be inevitable.

However, the most interesting insight from the interview is the overview of the features that were mentioned by at least 50% of participants and received at least three positive and at least three negative votes. These features can be found in the Table 4.

**Table 4. Split-opinion features**

| Feature | Mentions |
|---|---|
| Additional medical equipment | 7/12 – negative<br>5/12 – positive<br>0/12 - neutral |
| Time investment | 7/12 – negative<br>3/12 – positive<br>1/12 – neutral |

These two features seem to receive more negative than positive votes, however, given that the study group was small, further research is needed. Additional medical equipment and time investment received controversial votes, therefore, they may require further investigation. For instance, what type of additional medical equipment are people willing to use or how much time are they willing to spend on such an app?

# 5. LITERATURE REVIEW

The method used for this research is a systematic literature review, based on the guidelines discussed by Wolfwinkel et al. (2011) [26]. The database used for searching relevant literature is Scopus.

This section discusses the steps that have been taken to answer the research question with regards to answering the first and third sub-questions.

First, mobile game features that make people want to play them have been found. Then, all the necessary information from the medical requirements for the app has been gathered. Afterwards, the research made in the field of gamifying lifestyle apps has been reviewed. Finally, knowing the results of first three steps, the research question has been answered.

## 5.1 First sub-question - games

To begin with, the inclusion criteria should be set. First, only recent articles, no older than five years, are used, as it concerns mobile games. This industry is rapidly developing and changing, making older-than-five-year-old articles much less useful. Also, if an article specializes on adults, but not children, it will have more weight for the current research as adults are a big part of the audience for these lifestyle apps. Finally, only articles written in English are considered.

The exclusion criterion is “the article is not relevant for the current research”.

```
TITLE-ABS-KEY ( why  AND play
AND games )  AND  ( LIMIT-
TO ( PUBSTAGE ,  "final" ) )  AND  ( LIMIT-
TO ( OA ,  "all" ) )  AND  ( LIMIT-
TO ( PUBYEAR ,  2021 )  OR  LIMIT-
TO ( PUBYEAR ,  2020 )  OR  LIMIT-
TO ( PUBYEAR ,  2019 )  OR  LIMIT-
TO ( PUBYEAR ,  2018 )  OR  LIMIT-
TO ( PUBYEAR ,  2017 ) )  AND  ( LIMIT-
TO ( DOCTYPE ,  "ar" )  OR  LIMIT-
TO ( DOCTYPE ,  "cp" )  OR  LIMIT-
TO ( DOCTYPE ,  "ch" ) )  AND  ( LIMIT-
TO ( LANGUAGE ,  "English" ) )  AND  ( LIMIT-
TO ( SUBJAREA ,  "SOCI" )  OR  LIMIT-
TO ( SUBJAREA ,  "PSYC" ) )
```

**Image 2. The first search query for the first sub-question**

```
TITLE-ABS-KEY ( motivation  AND play  AND mobile
AND games )  AND  ( LIMIT-
TO ( PUBSTAGE ,  "final" ) )  AND  ( LIMIT-
TO ( OA ,  "all" ) )  AND  ( LIMIT-
TO ( PUBYEAR ,  2021 )  OR  LIMIT-
TO ( PUBYEAR ,  2020 )  OR  LIMIT-
TO ( PUBYEAR ,  2019 )  OR  LIMIT-
TO ( PUBYEAR ,  2018 )  OR  LIMIT-
TO ( PUBYEAR ,  2017 ) )  AND  ( LIMIT-
TO ( DOCTYPE ,  "cp" )  OR  LIMIT-
TO ( DOCTYPE ,  "ar" )  OR  LIMIT-
TO ( DOCTYPE ,  "ch" ) )  AND  ( LIMIT-
TO ( EXACTKEYWORD ,  "Motivation" ) )  AND  ( LIMIT-
TO ( LANGUAGE ,  "English" ) )
```

**Image 3. The second search query for the first sub-question**

Given the criteria, the search query from Image 2 was made. With this search query 37 document results were found on Scopus. After reading the abstracts of these articles and later the entire papers only four [1, 5, 7, 20] were in the scope of the research, therefore, only four articles were added to the concept matrix for the literature review.

However, given the criteria, the research query could be formulated differently. Hence, the second search query as shown in the Image 3 is used. With this research query 14 document results were found in Scopus. Nevertheless, only two articles [10, 17] were in the scope of the research and, therefore, added to the concept matrix for the literature review.

Summing up, during the Define-Search-Select phases, six articles were chosen. The next step in the systematic literature review is the Analyze phase. The concept matrix for literature review has been created for these purposes which can be found in Table 5 in Appendix C.

## 5.2 Third sub-question – weight-management apps

For answering the second sub-question, only recent articles, no older than five years, are used as the functionality of the lifestyle apps changes rapidly. This is because the industry’s development depends greatly on the development of applications for mobile and, so, the functionality that is desirable changes as people realize more what can be put in an app and what cannot. Also, only articles written in English are considered.

The exclusion criterion is “the article is not relevant for the current research”.

```
TITLE-ABS-KEY ( app  AND weight
AND management )  AND  ( LIMIT-
TO ( PUBSTAGE ,  "final" ) )  AND  ( LIMIT-
TO ( OA ,  "all" ) )  AND  ( LIMIT-
TO ( PUBYEAR ,  2021 )  OR  LIMIT-
TO ( PUBYEAR ,  2020 )  OR  LIMIT-
TO ( PUBYEAR ,  2019 )  OR  LIMIT-
TO ( PUBYEAR ,  2018 )  OR  LIMIT-
TO ( PUBYEAR ,  2017 ) )  AND  ( LIMIT-
TO ( DOCTYPE ,  "ar" )  OR  LIMIT-
TO ( DOCTYPE ,  "cp" ) )  AND  ( LIMIT-
TO ( LANGUAGE ,  "English" ) )  AND  ( LIMIT-
TO ( EXACTKEYWORD ,  "Mobile Application" )  OR  LIMIT-
TO ( EXACTKEYWORD ,  "Mobile Applications" )  OR  LIMIT-
TO ( EXACTKEYWORD ,  "Adult" )  OR  LIMIT-
TO ( EXACTKEYWORD ,  "Obesity" )  OR  LIMIT-
TO ( EXACTKEYWORD ,  "MHealth" ) )  AND  ( LIMIT-
TO ( SUBJAREA ,  "COMP" ) )
```

**Image 4. The search query for the second sub-question**

Given the criteria, the search query from Image 4 was made. This query gives eight document results on Scopus. After selecting the articles based on abstract and then based on the full text, five articles [2, 13, 18, 21, 24] were added to the concept matrix for the literature review.

Summing up, during the Define-Search-Select phases five articles were chosen. The next step in the systematic literature review is the Analyze phase. The concept matrix for literature review has been created for these purposes which can be found in Table 6 in Appendix C.

## 5.3 Analysis of the systematic literature review results

This section focuses on the analysis of the matrices produced during the first step of the literature review which can be found in Table 5 in Appendix B and Table 6 in Appendix C.

Based on the results presented in Table 5, the most popular motivation to start playing a game, a mobile game in particular, is entertainment/enjoyment [1, 5, 7, 10, 17, 20]. All selected papers are mentioning this concept. Then, five out of six papers are mentioning social motivation [1, 5, 10, 17, 20]. Social is a broad term, it includes everything that is correlated with society, excluding the recommendations from friends or from the media as there are separate concepts for these. Also, the nature of the game is important [1, 5, 7, 10, 20], five out of six articles are mentioning it. Finally, four out of six papers are mentioning that competition [5, 7, 10, 20] and reward/achievement [5, 10, 17, 20] are serious motivations as well. Finally, five out of six papers have done their research on adults [1, 5, 7, 10, 17], which makes the results of these reviews even more applicable for the current study. Summing up, Table 7 provides an overview of the most rated concepts.

**Table 7. The top-3-rated motivations to play a (mobile) game**

| |
|---|
| I. Entertainment/enjoyment: the game should be interesting to play, it should give positive emotions and joy. Therefore, the conclusion here is that the game should not be routine or boring. |
| II. Social: the game should have social features such as sociability, helping, looking for company, competitive, or influence the social behaviour.<br>II. Nature of game: all sources are mentioning different types of games that are appealing for users, arcade, shooter, or puzzle are among them. |
| III. Competition: the game should provide some sort of competition; it can be a competition with self or competition with other players. |
| III. Reward/achievement: the game should provide a reward or keep track of achievements of the player. |

Based on the results presented in Table 6, the most used feature in a lifestyle app for people with weight problems, obesity in particular, is "self-monitoring", five out of five articles mention this [2, 13, 18, 21, 24]. This means that an app cannot do everything for the user, user input is required for making the app work properly. The next most important feature in a lifestyle app is "nonsessional, direct support and advice from credible sources", in the forms of "private support" and of "social support", four out of five articles [2, 13, 18, 21] mention it. Finally, three out of five articles [2, 13, 18] mention the use of an "activity tracker", three out of five articles [2, 18, 24] mention the possibility to set the goal, the preferred weight, for example, and mention the importance of a user-friendly user interface. Three out of five articles [2, 13, 21] mention the "healthy eating" feature, the recommendations provided regarding the current diet. Summing up, Table 8 provides an overview of the most rated concepts.

**Table 8. The top-3-rated features of a health app for people with obesity**

| |
|---|
| I. Self-monitoring: people should be able to track changes and log them in manually or via a wearable. |
| II. Private support: it is important for users to stay in contact with a trustful person, a doctor, who can provide support on the way to the goal.<br>II. Social support: it is as important as private support. When a user sees that he or she is not alone dealing with the problem and he or she can ask the peers for advice or support, it becomes easier for the user to deal with his or her problem. |
| III. Activity tracker: an (extra) tool that helps to self-monitor. It can be a simple pedometer or a complex wearable perform other measurements.<br>III. Setting the goal: a user should be able to set a target that he or she wants to achieve.<br>III. User-friendly UI: an app should be usable, meaning the design should not be too complicated, but rather intuitive.<br>III. Healthy eating: depending on the user input the diet may vary. This feature is important as it shows the eating plan and can adapt to a particular user. |

# 6. ANALYSIS OF COMBINED RESULTS

This section focusses on the analysis of the outcome of sections three and four. In order to find the intersections in the concepts discussed in the analysis of the three sub-questions two tables have been made. These tables can be found in Table 9 and Table 10.

## 6.1 Weight-management app VS Health app

Table 9 shows the intersection of the concepts of the Health app, which were derived from the interviews, and of weight-management apps, which were derived from the systematic literature review. Horizontally, there are concepts from the Health app, vertically there are concepts from the literature review. Given that weight-management apps are general health apps with a narrower perspective, it is important to see the correlation between these two.

The table shows direct and indirect correlation. Direct correlation means that the two intersecting concepts are the same or refer to the same idea or concept. Indirect correlation means that the two intersecting concepts are not the same, though they may have a logical correlation. Given that the weight-management app provides the starting-point concepts for a future lifestyle game, the following subsections discuss the correlation of each concept

**Table 9. Weight-management app VS general lifestyle app**

| | Insights in goals, activities | Ease of use | Info could be used for diagnoses | Personal info may be shared with the app | Privacy | Support | Social | | |
|---|---|---|---|---|---|---|---|---|---|
| self-monitoring | I | | I | D | | | | | |
| private support | | | | | I | D | | | **Legend:** |
| social support | | | | | | D | D | | D - direct correlation |
| activity tracker | I | I | | I | | | | | I - indirect correlation |
| providing the target / setting the goal | D | | | | | | | | |
| user-friendly UI | | D | | | | | | | |
| healthy eating | I | | | | | | | | |

derived from the systematic literature review of a lifestyle app for weight-management and the concepts derived from interviews on a general lifestyle app. Moreover, for concepts that have a direct correlation, the statistics of mentions, meaning the difference in frequency of what is mentioned in the literature and by the interviewees, are also included. Given that the general idea of these concepts is the same, it is important to see how literature rated the idea and how interviewees rated it and compare them as it may add extra value to the conceptual idea.

An important outcome of this table is that there are no empty rows or columns, this means that the most important/useful/attractive features of the Health app can be corresponded to the ones of a lifestyle app for weight-management. Moreover, as can be seen from Table 9, the most interacting feature is Insights in goals, activities. The design of the future game should clearly work around this concept, amongst others. Finally, the number of direct and the one of indirect correlations are almost the same, meaning that, though the concepts discussed are mostly same, there can still be a dynamic way of integrating various features.

### *6.1.1 Self-monitoring*

Self-monitoring, as an important feature of lifestyle apps for weight-management, was mentioned in every article [2, 13, 18, 21, 24] selected after the implementation of the query discussed in section 4.2 of the current research. Given the fact that every article mentioned this concept, it may be said that the correlations with this concept shall be paid extra attention to and that the developers of a future game should give priority to these correlations above others.

Regarding the possibility of sharing personal information with the app, ten people voted positively and just two – negatively, which highly rates this feature. The direct correlation with the self-monitoring concept can be discussed as follows: a user performing self-monitoring is logging their results to the app, these results are part of the personal information of the user, therefore, the two aforementioned features refer to the same idea. Moreover, this feature, as it can be seen, was highly rated by interviewees what adds an extra value to this correlation.

Regarding the insights in goals, activities, the indirect correlation may exist. To reach the goal an individual must perform self-monitoring. For example, the goal is to lose weight, from 85 to 70 kilograms, the user has to keep track of his progress, i.e., note down their weight every morning.

Regarding the possibility of using the information from an app for diagnoses, the indirect correlation may exist. If a user of the app consents for using their personal information by doctors for providing diagnoses, the gather of the insights in the user's physical condition via self-monitoring will ease the doctor's work.

### *6.1.2 Private support*

Private support as an important feature of lifestyle apps for weight-management was mentioned in four out of five articles [2, 13, 18, 21] selected after the implementation of the query discussed in section 4.2 of the current research.

Regarding the user support feature of a general lifestyle app, it was mentioned eleven out of twelve interviewees and out of these eleven the feature was rated positively by five participants and negatively by two participants. The remainder only mentioned it. The direct correlation can be discussed as follows: all three concepts concern the support of a user while using the app. Moreover, this feature was moderately rated by interviewees what makes it important to conduct more research regarding this feature as there is a difference in ratings of the feature in literature review and by interviewees.

Regarding the correlation with privacy, the indirect correlation may exist. If a person needs support, but they do not want to share their private information with anybody they do not trust, then the private support by a doctor is necessary.

### *6.1.3 Social support*

Social support as an important feature of lifestyle apps for weight-management was mentioned in four out of five articles [2, 13, 18, 21] selected after the implementation of the query discussed in section 4.2 of the current research.

Regarding the user support feature of a general lifestyle app, it was mentioned eleven out of twelve interviewees and out of these eleven the feature was rated positively by five participants and negatively by two participants. The direct correlation can be discussed as follows: all three concepts concern the support of a user while using the app. Moreover, this feature, as it can be seen, was moderately rated by interviewees what makes it important to conduct more research regarding this feature as there is a difference in ratings of the feature in literature review and by real-life people.

The concept of Social from the interviews should be interpreted as the social aspect surrounding the application. For instance, talking about what you do with the application with friends or family or the desire to have social functionality integrated into the application. This concept was mentioned by eleven interviewees and out of these eleven Social feature was rated positively by six participants and negatively by one. The direct correlation can be discussed as follows: both concepts concern interaction with other people, with the society. Moreover, this feature, as it can be seen, was highly rated by interviewees what adds an extra value to this correlation.

### *6.1.4 Activity tracker*

As it can be seen from the Table 9, activity tracker feature does not have any direct correlations, but it may have some indirect correlations.

**Table 10. Weight-management app VS (mobile) games**

| | entertainment / enjoyment | competition | reward / achievement | social | nature of the game (shooter, puzzles, etc.) | | |
|---|---|---|---|---|---|---|---|
| self-monitoring | | I | I | | | | |
| private support | | | | D | I | | **Legend:** |
| social support | | | | D | I | | D - direct correlation |
| activity tracker | | I | I | | I | | I - indirect correlation |
| providing the target / setting the goal | | I | D | | I | | |
| user-friendly UI | D | | | | | | |
| healthy eating | | I | I | | | | |

Regarding the correlation with the feature of getting insights in goals, activities, the goal or a part of the goal may be to walk couple of kilometers per day, for example, then an activity tracker could be used to generate insights into this goal.

Regarding the correlation with the ease of use feature it can be said that an activity tracker is a handy tool which allows to track what physical activities you are doing and synchronize them with the app, making it possible to avoid manual user input.

Regarding the correlation with the possibility of sharing personal information with the app, activity trackers are usually synchronized with a lifestyle app. Given that these trackers record personal information, user should consent to share this information with the app.

### *6.1.5 Providing target / setting the goal*

Providing target / setting the goal as an important feature of lifestyle apps for weight-management was mentioned in three out of five articles [2, 18, 24] selected after the implementation of the query discussed in section 4.2 of the current research. The possibility of the app to provide insights in goals/activities was mentioned by eleven interviewees and out of these ten rated this feature positively. The direct correlation can be discussed as follows: targets or goals are, in essence, a desired level of a measured unit, e.g., the number of daily steps. Insights in goals/activities, then, are insights in the measured unit, e.g., its current status, as they relate to this desired level. As it can be seen, interviewees rated the feature higher than the literature, therefore, further research may be needed into the importance of setting goals.

### *6.1.6 User-friendly UI*

User-friendly UI (User Interface) as an important feature of lifestyle apps for weight-management was mentioned in three out of five articles [2, 18, 24] selected after the implementation of the query discussed in section 4.2 of the current research. Ease of use is mentioned by all twelve interviewees and out of these mentioned positively by eleven participants. The direct correlation can be discussed as follows: both concepts are related to the idea that the app should be easy to use and this can be achieved by making intuitive interface and interactions with a user. As it can be seen, interviewees rated the feature higher than the literature, therefore, further research may be needed into the tendency of importance of setting goals.

### *6.1.7 Healthy eating*

Regarding the correlation with the feature of getting insights in goals, activities, for example, the goal is to lose weight, from 85 to 70 kilograms, then the app may provide not only tracking possibilities, but also the information regarding the most appropriate diet.

## 6.2 Weight-management app VS game

Table 10 shows the intersection of concepts of games and of weight-management apps which were derived from the systematic literature review. Horizontally there are concepts from games, vertically there are concepts from weight-management lifestyle apps. Given that the aim of this research is to provide grounds for gamification of weight-management apps it is important to see what aspects of games are already intersecting with existing weight-management apps.

The table shows direct and indirect correlation. Direct correlation means that the two intersecting concepts are the same or refer to the same idea or concept. Indirect correlation means that the two intersecting concepts are not the same, though they may have a logical correlation. Given that the weight-management app provides the starting-point concepts for a future lifestyle game, following subsections discuss the correlation of each concept derived from the systematic literature review of a lifestyle app for weight-management and concepts derived from systematic literature review of (mobile) games. Moreover, for concepts that have direct correlation the statistics of mentions is also included as, given that the general idea of these concepts is the same, it is important to see how literature rated the idea and how real-life people rated it and compare as it may add extra value to the conceptual idea.

An important outcome of this table is that there are no empty rows or columns, this means that the most important/useful/attractive features/motivations of (mobile) games can be corresponded to the ones of a lifestyle app for weight-management. Moreover, as it can be seen from the Table 10, the most interacting features are Competition, Reward/achievement and Nature of the game. The design of the future game should clearly work around these concepts amongst others. Finally, as can be seen in Table 10, the number of indirect correlations exceeds the number of direct correlations meaning that though the concepts mentioned are far from same, they can be correlated anyway making the future game more dynamic.

### *6.2.1 Self-monitoring*

Self-monitoring as a feature of lifestyle apps for weight-management does not have any direct correlations with any of the mentioned games features. However, the indirect correlation can be made with competition feature: users competing with themselves to achieve better results in the game requires self-monitoring, and with reward/achievement feature: user's analysis of their strategy and/or actions may be required to win the game.

### *6.2.2 Private support*

Private support as an important feature of lifestyle apps for weight-management was mentioned in four out of five articles [2, 13, 18, 21] selected after the implementation of the query

discussed in section 4.2 of the current research. Social as an important feature of games was mentioned in five out of six papers [1, 5, 10, 17, 20] selected after the implementation of the query discussed in section 4.1 of the current research. The direct correlation with the concept Social can be discussed as follows: both concepts concern interaction with other people, with the society. Moreover, this feature was equally often mentioned in the literature, what adds an extra value to this correlation.

Regarding the indirect correlation with the nature of the game, for example, when user is playing a game together with their friend, they are supporting each other to achieve better results as you are a team.

### *6.2.3 Social support*

Social support as an important feature of lifestyle apps for weight-management was mentioned in four out of five articles [2, 13, 18, 21] selected after the implementation of the query discussed in section 4.2 of the current research. Social as an important feature of games was mentioned in five out of six papers [1, 5, 10, 17, 20] selected after the implementation of the query discussed in section 4.1 of the current research. The direct correlation with the concept Social can be discussed as follows: both concepts concern interaction with other people, with the society. Moreover, this feature was equally often mentioned in the literature, what adds an extra value to this correlation.

Regarding the indirect correlation with the nature of the game, for example, when playing multiplayer games, especially where a user is a part of a team, their team supports them to make them work better and help the team to win.

### *6.2.4 Activity tracker*

Activity tracker as a feature of lifestyle apps for weight-management does not have any direct correlations with any of the mentioned games features. However, the indirect correlation can be made with competition: using the activity tracker a user can compete with themselves, for example, walking more/less to catch a Pokémon in PokemonGO, with the reward/achievement concept: can be implemented in a game like PokemonGO: after X kilometers walked the chance of catching a rare Pokémon is 50% higher, and with the nature of the game: playing games that make a user move, PokemonGO, for example, may make use of an activity tracker.

### *6.2.5 Providing target / setting the goal*

Providing target / setting the goal as an important feature of lifestyle apps for weight-management was mentioned in three out of five articles [2, 18, 24] selected after the implementation of the query discussed in section 4.2 of the current research. Reward/achievement as an important feature of games was mentioned in four out of six papers [5, 10, 17, 20] selected after the implementation of the query discussed in section 4.1 of the current research. The direct correlation with the concept Reward/achievement can be discussed as follows: rewards are not given for nothing, there should be a goal achieved. Moreover, this feature was equally often mentioned in the literature, what adds an extra value to this correlation.

Regarding the concept Competition, the following indirect correlation may be made: once the goal is set, a user is competing with themselves or with other players to reach the goal.

Regarding the indirect correlation with the nature of the game concept, the following reason for the correlation may be given: any game where a user is playing to get some achievements can serve this correlation.

### *6.2.6 User-friendly UI*

User-friendly UI (User Interface) as an important feature of lifestyle apps for weight-management was mentioned in three out of five articles [2, 18, 24] selected after the implementation of the query discussed in section 4.2 of the current research. Entertainment/enjoyment as an important feature of games was mentioned in six out of six articles [1, 5, 7, 10, 17, 20] selected after the implementation of the query discussed in section 4.1 of the current research. The direct correlation with the concept Entertainment/enjoyment can be discussed as follows: it is near to impossible to get joy from playing a game if the interface is unusable. As it can be seen, this concept appeared more often in the literature regarding games, therefore, an additional research into this concept may be necessary in the future.

### *6.2.7 Healthy eating*

Healthy eating as a feature of lifestyle apps for weight-management does not have any direct correlations with any of the mentioned games features. However, the indirect correlation can be made with competition: a game may want a user to log what they are eating and their weight statistics. Then, based on a ratio computed from these statistics, a user may advance through the leaderboards. Regarding the reward/achievement concept: same as with competition, but from the perspective that top-3 leaders may get some sort of a reward for their diligence.

## 6.3 The most important concepts for the lifestyle game

To better imagine the correlation of weight-management apps with general lifestyle apps and with (mobile) games, Image 5 was made. It reflects all the direct correlations and allows to see the "pillars" for the future lifestyle game for people with problems with weight.

As it can be seen in Image 5, there are four concepts on the weight-management app level that have connections with general

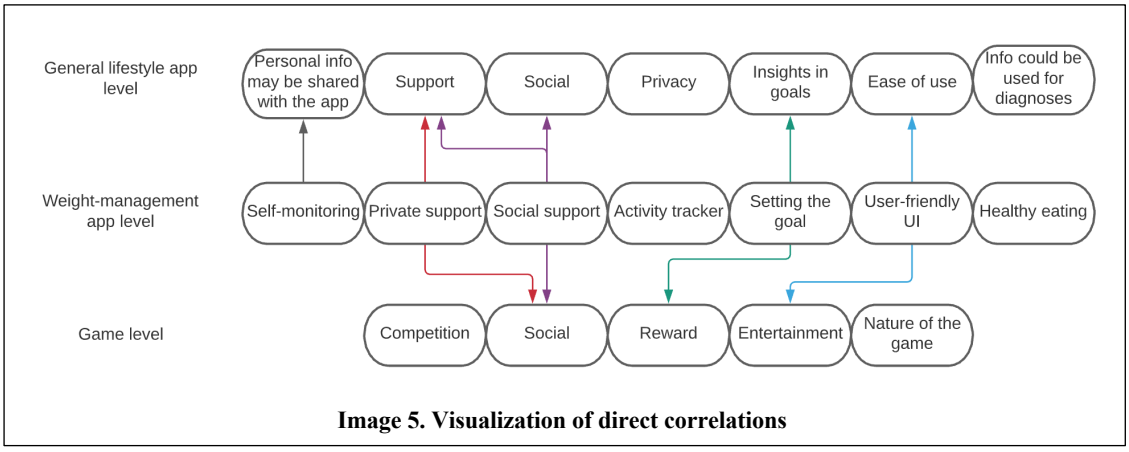


**Image 5. Visualization of direct correlations**

lifestyle app level and with game level: private support, social support, setting the goal and user-friendly UI. These four concepts should become the main ground for creating a lifestyle game as they can be found on all three levels showing that no matter what people are using, games or lifestyle apps, they highly appreciate the existence of these features in the app.

# 7. CONCLUSION, LIMITATIONS AND FUTURE WORK

In conclusion, given that the main purpose of this research is to find the ways of gamifying existing weight-management apps, the most important findings can be summarized as follows. In the Image 5 the four features on the weight-management app level have direct connections with three game concepts that people rated highly, namely Social, Reward/achievement and Entertainment/enjoyment. Based on the results, these three motivations could well be in the origin of the new lifestyle game. Moreover, as was mentioned in the section 5.2 of the current research, as it can be seen from the Table 10, the most interacting features of a (mobile) game are Competition, Reward/achievement and Nature of the game. Summarizing these findings, the list of the most important features that a future lifestyle game should have from the perspective of gamification is as follows:

- The game should allow the user to be social and allow users to get support when they need it: interacting with other players and/or coaches should be possible.
- The game should have a reward/achievement perspective as it gives users the motivation to start and continue playing. Given that the idea is to gamify a lifestyle app, it may be beneficial to allow users to set/adjust goals themselves.
- The game should not be boring, it should serve as an entertainment for the user. This may be complicated as the functionality should reflect the features of games and of lifestyle apps. However, it may be partially achieved by making a user-friendly UI that will allow users to navigate within the app with ease.
- The game should allow users to compete as it may keep them interested in the game.
- The nature of the game plays an important role in selecting the additional features for the game as, depending on the game's type, different features of a lifestyle app can be tailored.
- The game should be dynamic. Given that Table 9 and Table 10 show numerous indirect interactions, this feature can be added. Dynamic games may keep the player more involved and, what is more, it will allow to combine and add those indirectly-related features.

Answering the research question *How should the developer of a lifestyle game for patients with obesity make their game interesting for the gaming industry?*, it must be said that the focus of the developer should lie in the dimension of the aforementioned important features. They should be taken into account when creating the game and should serve as "pillars" for the future development of the game. Implementing these features may help to attract a wider audience to the product and, as a result, attract game companies or publishers that may want to buy or publish this game.

Therefore, the added value of this research lies in the discovery of the grounds for creating a lifestyle game for people with weight-management problems. However, given the limitations discussed further, the future work on the project should be done.

## 7.1 Limitations

Given the timeframe of the research; the inclusion-exclusion criteria of the systematic literature review, i.e. articles written only in English; and the small size of the participants in the interview pool, the current research does have some limitations and further investigation into the field may be required.

Firstly, because of the strict query search and the fact that this search was applied on Scopus only, there may be some articles or research papers that could add value to the current literature review.

Secondly, given a very limited timeframe for the research, only a small-sized interview on only one general lifestyle app, which was conducted prior to the start of this research by a third party, was analyzed.

Finally, while the top-rated features were chosen reliably, the small sample size makes that it is not as extensive as it could be without the described limitations.

## 7.2 Future work

Given the limitations of the current research, the suggested future work in this line of inquiry can be described as follows. To begin with, interviews about attractive (mobile) game-features with a large group of people, preferably with adults, should be conducted. Secondly, interviews about attractive features of general lifestyle apps, not only the Health app by Apple, should be conducted with a large group of people, preferably with adults. Moreover, it would be interesting to conduct interviews with (mobile) game developers about the most attractive features of games and compare the results with the ones received from the interviews with users. Additionally, the split-opinion features should be taken a closer look at as well as those mentioned in section 5 of the current research regarding a difference in ratings of the feature in the literature reviews and by interviewees. Finally, a broader literature review should be conducted using not only Scopus as the search platform, but also other reputable scientific databases, IEEE, for example. It will be important to compare "live" results with the ones from articles and research papers.

However, the outcome of this research is already sufficient to start developing a lifestyle app for people with obesity. While doing so, prototypes should be made and iteratively tested with the target group which includes not only people with obesity, but also regular game users, to generate more insights.

## 7.3 Final remarks

When developing an app, it may be important to think about the final product from different perspectives, such as financial, psychological, philosophical, etc. Below, some thoughts are summarized regarding the development of a lifestyle game for people with obesity:

1. Bullshitting in science does exist [8], therefore, all sources should be carefully checked and verified.
2. Given that the use of virtual assistants is increasing in the modern world [23], it is possible that in the future game one will be also used, therefore, it is important to maintain the balance in communicating with artificial agents and with real people.
3. The developer should keep in mind the values of the stakeholders and be ready to seek for compromise if these values are contradictory.
4. Given the recommendation mentioned in the future work discussion to conduct more interviews, the researcher should keep in mind the limitations of the "wisdom of the crowds" notion [4].

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# APPENDIX A – INTERVIEW QUESTIONS

1. To what extent does the Health app by Apple fit in your everyday routine?
   - 1.1 Most Health app mechanics contribute to various living and work processes. Can you name the most important processes/activities for which you use a computer?
   - 1.2 What kind of media do you use most frequently to contact other people? Mail, apps, social media? Which devices do you use most to do this?
   - 1.3 What kind of exceptions/disruptions cause the system to perform insufficiently to the point that you have to seek contacts through the other means than the computer?
2. Do you think that using the Health app can improve your personal well-being?
   - 2.1 To what extent would it improve and in what measure?
   - 2.2 Do you think the use of the Health app will be easy? Why?
   - 2.3 Do you agree that your health information may be used for a large scale statistical analysis? Why?
   - 2.4 Do you agree that medical professionals may use the use the data you provide for establishing diagnosis and treatments? Why?
   - 2.5 Regarding which points would employing ICT be to your personal benefit?
     - 2.5.1 What kind of application are you thinking in this case?
     - 2.5.2 For what purpose/situation would it be used?
   - 2.6 To what degree does ICT contribute to the information you receive (like social media or email)?
3. What is the quality of the information?
   - 3.1 Do you think that a quantity of medical information you receive increases if you use the Health app?
     - 3.1.1 Do you have easier access to information?
     - 3.1.2 Does the combination of information you provide and that of the doctors complement each other?
     - 3.1.3 Do you think that the Health app provides sufficient information for you to get good insights in your personal well-being?
     - 3.1.4 Do you think that the Health app can provide you with the information about every aspect of your well-being?
   - 3.2 Do you think that the quality of medical information you receive increases if you use the Health app?
     - 3.2.1 Will the information contain (more) errors?
     - 3.2.2 Will the information be consistent?
   - 3.3 Do you believe to have sufficient medical knowledge to properly interpret the data provided by the Health app yourself?
     - 3.3.1 Would you require additional media to do this (Internet/phone contact with a doctor)?
   - 3.4 What information would you be willing to share with the Health app?
     - 3.4.1 Physical data, such as heart rate or blood pressure?
     - 3.4.2 Habits, such as drinking, smoking or other addictions?
     - 3.4.3 Environmental, such as state of the work and living area?
4. What means do you have available or are you willing to make available?
   - 4.1 What kind of ICT facilities do you have available?
     - 4.1.1 Hardware, such as smartphone, PC, laptop, tablet?
     - 4.1.2 Software, such as operating system?
     - 4.1.3 Communication, such as webcam, WiFi, 3G, 4G?
   - 4.2 What kind of ICT facilities do you want to use while using the Health app?
   - 4.3 Do you think that a supplier of the Health app can offer you sufficient of the following in combination with your own facilities? Why?
     - 4.3.1 Reliability?
     - 4.3.2 Availability?
     - 4.3.3 Security/privacy?
   - 4.4 Do you think you will receive sufficient support if you want to use the Health app?
     - 4.4.1 Educational/instructional?
     - 4.4.2 Management support?
   - 4.5 How many of your own means are you willing to make available for successful usage of the Health app?
     - 4.5.1 Time?
     - 4.5.2 Money?
   - 4.6 Would you like to be able to use medical measurement equipment at home?
5. What is your attitude regarding the Health app and ICT?
   - 5.1 To what extent are you convinced that ICT applications are required to improve the quality of life?
     - 5.1.1 How much experience?
     - 5.1.2 How much time?
     - 5.1.3 Are there any positive experiences from the past?
     - 5.1.4 How often do you use the Internet?
   - 5.2 Do you feel social pressure to use the Health app?
     - 5.2.1 Have you ever talked about it with an acquaintance?
     - 5.2.2 Have you ever heard about it in the media?
   - 5.3 To what extent do you think that your privacy is compromised by using the Health app?
     - 5.3.1 Do you think the system can be hacked?
     - 5.3.2 Do you think that unauthorized people can consult your information?
   - 5.4 Are you being stimulated by your environment to participate in the changes?
6. What do you think are the crucial factors which determine whether to use the Health app or not?
7. Do you have anything else to share?

# APPENDIX B – CONCEPTS FROM THE INTERVIEWS

**Table 1. Attitude towards concepts from the interviews**

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Concept | Stimulated movement | xp | | xp | xp | | | | | | x | xp | xp | |
| | Insights in goals, activities | xp | xp | xp | xp | xp | xp | xp | | xp | xp | xp | x | **Legend:** |
| | Clear interface | xp | xp | | | xp | | | xp | xp | x | x | | x - concept is mentioned by the interviewee |
| | Step counter | x | | x | x | xp | | | x | | | xp | x | p - concept is positively mentioned |
| | Additional medical info | xn | | | | | xn | | | | | | | n - concept is negatively mentioned |
| | Insight about all health aspects | xn | | | | xn | | x | xn | xn | xn | xn | | |
| | Detailed documentation | xp | xn | | | | | x | xn | | | | | |
| | Simple documentation | | xp | | | | | | xn | x | | | | |
| | Notifications | x | | | | | | | | | | | | |
| | Money (investment) | xn | xn | x | xn | xn | x | xn | xn | xp | xn | xn | xn | |
| | Additional medical equipment | xn | xn | xp | xn | xn | xp | xp | xp | xp | xn | xn | xn | |
| | Setting goals | x | | | | | | | | | xp | | | |
| | Ease of use | xp | xp | x | xp | xp | xp | xp | xp | xp | xp | xp | xp | |
| | Stimulation for finding additional capabilities | xn | | | | | | | | | | | | |
| | Info could be used for diagnoses | xp | xn | xp | xp | xp | xn | xp | xp | xp | xp | xn | xp | |
| | Info alignment with professional opinion | x | xp | x | x | x | | | | xp | | | x | |
| | Personalised info | | xp | x | xn | xp | xp | | | x | xp | | xp | |
| | Info should be non-medical | | xp | | | | | | | | | | | |
| | Personal info may be shared w/ app | xp | xp | xp | xn | xp | xp | xp | xp | xp | xp | xp | xn | |
| | Privacy | x | xp | xp | x | x | x | x | xp | x | x | x | xp | |
| | Support | x | xp | x | x | xn | xp | xp | xn | xp | | xp | x | |
| | Time investment | xn | xn | xp | xn | xn | xp | xn | | xp | xn | x | xn | |
| | Calory intake | | x | x | | | | x | | | | | | |
| | Social | x | xp | xp | x | x | xp | x | xp | xp | xn | xp | | |
| | Integration in daily life | x | x | xp | x | | | xp | | | | | | |
| | Medical terms | | | x | | xn | | | | | xn | x | x | |
| | Wearable | | x | xp | xp | | | | | | | | | |
| | Sleep | | | | x | | | | | | | x | | |
| | Distance | | x | | x | | | | | | | | | |
| | Updates | | | | xn | | | xn | | | | | | |
| | Speed (measure) | | | | x | | | | | | | | x | |
| | Reliability of info | | | | xn | x | x | xp | x | x | xp | xn | xp | |
| | Motivation | | | | | xp | | | | | xp | x | xp | |
| | Sync to medical file | | | | | | xp | | | | | | | |
| | Brand as measure of reliability, availability, privacy | | | | | | x | | | | | | x | |
| | Weight | | | | | | | | | | x | x | | |

# APPENDIX C – CONCEPT MATRICES

## Table 5. Concept matrix for literature reviewing for sub-question one

| Article | | **Çırak, N. S., & Erol, O. (2020, February 6).** ***What are the factors that affect the motivation of digital gamers?*** | Nordby, K., Lokken, R. A., & Pfühl, G. (2019, June 13). *Playing a video game is more than mere procrastination .* | **Alha, K., Koskinen, E., Paavilainen, J., & Hamari, J. (2019, April 1).** ***Why do people play location-based augmented reality games: A study on Pokemon GO.*** | **Berkling, K., Faller, H., & Piertzik, M. (2017).** ***[PDF] Avoiding Failure in Modern Game Design with Academic Content - A Recipe, an Anti-Pattern and Applications Thereof*** | **Malik, A., Hiekkanen, K., Hussain, Z., Hamari, J., & Johri, A. (2020, November).** ***How players across gender and age experience Pokémon Go?*** | **Greenwood, J., Achterbosch, L., Meredith, G., & Vamplew, P. (2020).** ***Motivational Factors of Australian Mobile Gamers .*** | |
|---|---|---|---|---|---|---|---|---|
| Concept | skills development | X | | | | | | |
| | entertainment / enjoyment | X | X | X | X | X | X | |
| | challenging environment | X | | | X | | X | |
| | competition | X | X | | X | | X | |
| | reward / achievement | | X | | X | X | X | **Legend:** |
| | social | | X | X | X | X | X | X - concept is mentioned in the article |
| | break from stress | | X | | | | | **Article Name** - the study concerns adults |
| | escape reality | | X | | | | | Article Name - the study does not concern adults |
| | break from everyday life | | X | | | | | |
| | curiousity | | | X | | | | |
| | reports (media/friends) | | | X | | X | | |
| | physical activity | | | X | | X | | |
| | previous experience | X | | X | | X | | |
| | popularity of a game | | | X | | X | | |
| | technology | | | X | | X | | |
| | nature of the game (shooter, puzzles, etc.) | X | X | X | X | | X | |
| | immersion | | | | | X | X | |
| | nostalgia | | | X | | X | | |
| | something to do | | | X | | | | |

## Table 6. Concept matrix for literature reviewing for sub-question three

| Article | | Idris, I., Hampton, J., Moncrieff, F., & Whitman, M. (2020, January 20). *Effectiveness of a Digital Lifestyle Change Program in Obese and Type 2 Diabetes Populations: Service Evaluation of Real-World Data .* | Alturki, R., & Gay, V. (2019, March 14). *The Development of an Arabic Weight-Loss App Akser Waznk: Qualitative Results .* | Rivera, J., McPherson, A. C., Hamilton, J., Birken, C., Coons, M., Peters, M., Iyer, S., George, T., Nguyen, C., & Stinson, J. (2018, April 4). *User-Centered Design of a Mobile App for Weight and Health Management in Adolescents With Complex Health Needs: Qualitative Study .* | Stein, N., & Brooks, K. (2017, November 1). *A Fully Automated Conversational Artificial Intelligence for Weight Loss: Longitudinal Observational Study Among Overweight and Obese Adults .* | Martinez, M., Park, S. B., Maison, I., Mody, V., Soh, L. S., & Parihar, H. S. (2017, July 11). *iOS Appstore-Based Phone Apps for Diabetes Management: Potential for Use in Medication Adherence .* | | |
|---|---|---|---|---|---|---|---|---|
| Concept | self-monitoring | X | X | X | X | X | | |
| | incentivization through social rewards | X | X | | | | | |
| | nonsessional, direct support and advice from creadible sources | X | X | X | | X | | **Legend:** |
| | private support | X | X | X | | X | | X - concept is mentioned in the article |
| | social support | X | X | X | | X | | |
| | mental health support | | | X | | | | |
| | AI support | | | | X | | | |
| | educational articles | X | X | | | | | |
| | activity tracker | X | X | | | X | | |
| | providing the target / setting the goal | | X | | X | X | | |
| | physical activity | X | X | | | | | |
| | reminders | | X | | | X | | |
| | gamification features | | X | X | | | | |
| | merging with social media platforms | | X | | | | | |
| | user-friendly UI | | X | | X | X | | |
| | healthy eating | X | X | X | | | | |
| | action planning | | | | X | | | |
| | food database | | | | | X | | |