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MOBILE APPLICATIONS FOR THE CONTROL OF OBESITY: A SYSTEMATIC REVIEW OF THE LITERATURE

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ABSTRACT

Objective: This article aims to carry out a systematic review of the literature in order to identify scientific publications on mobile applications for the control and treatment of obesity. Methodology: The terms "mhealth application", "ehealth application", "adult overweight" and "adult obesity" were used in the databases provided by the portals PubMed Central, VHL and Cochrane Library, in the period from January 2013 to September 2016. We have included articles available in their full version, of the clinical trial type, performed with adults over 18 years of age regardless of study time, provided they described results regarding control of overweight (BMI ≥25 kg / M²) or obesity (BMI ≥30 kg / m²) by variables such as weight measurements, BMI or waist circumference. Pregnant women, adults unfit to engage in physical activity or with severe mental illness, articles with no implementation results, and duplicate articles were excluded. Conclusion: Mobile applications have proved to be important m-health tools, both for providing users self-promotion of health care and for remote monitoring of patients under chronic conditions, but there is still a need for improved usability, more personalized interaction, and to take into account pedagogical aspects that help both reducing and maintaining weight, bringing about a reeducation to healthier habits that leads to a better quality of life.

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INTRODUCTION

According to the WHO (World Health Organization) (WHO, 2011) the use of Information and Communication Technologies (ICTs) for healthcare using mobile devices is called Mobile-Health (or m-health). Its main objective is to improve service delivery and management of health systems by improving the flow of information from clinics and hospitals in electronic media. Thus, m-Health has great potential in both developed and developing countries, improving access to health information and contributing to perfect the quality of health services, besides reducing costs. For example, patient information systems can track individual health problems and assist in treatment over time because they allow analysis that can lead to a new view and understanding of health and disease, and are particularly more efficient with chronic diseases in which a health and treatment record over a period of time is needed (http://apps.who.int/iris/bitstream/10665/76794/1/9789241504645_eng.pdf?ua=1 and http://www.who.int/ehealth/en/). Morris (Morris, 2012), considers that the use of mobile devices in the context of health care can be explained by the concentration of three factors: the increase of chronic diseases, the decreasing access to clinical care, and innovations in mobile technologies. Therewith, there have been several health and technology studies made in an attempt to understand and create effective persuasive technological systems. In the case of mobile applications aimed to promote healthy habits, three themes of great importance stand out: 1) persuasion, which encourages the practice of healthy habits; 2) health "condition" in itself, which aims to understand the user and their needs; and 3) interaction design, since persuasive technologies are interactive computer systems intentionally designed to change a person's behavior or attitude (Fogg,

2011). According to literature reviews performed by Lemmens *et al*. (Lemmens, 2008), interventions to prevent obesity have proven to be effective, but traditional approaches to overweight and obesity control, such as clinical and pharmacological treatment, are not as effective. More research is needed to address strategies that focus on the underlying social causes of obesity and its effective treatment through actions in education, health and food policies, and social and economic policies. Consequently, the support of the currently available technologies becomes an important asset in developing these strategies to fight increases in the prevalence of overweight and obesity.

This article aims to identify scientific evidence that characterizes the use of m-health technologies to aid in weight control and increased obesity. Educational theories used for better adherence to treatment were considered in order to raise awareness and change behavior in adults, especially regarding dietary habits and physical activities. The present work is organized in five sections. The second section presents concepts related to the method employed, the research questions, search strategies, selected languages, as well as the selection procedures and criteria adopted. Section 3 presents the outcomes and section 4, the considerations about these outcomes. In section 5, the final considerations and future work will be describe.

MATERIALS AND METHODS

This is a systematic literature review based on the guidelines of the Ministry of Health's systematic review paper (Ministério Da Saúde, 2007). The Cochrane Reviewer's Handbook. Thus, the formulation of the research question was structured according to the PICO strategy, where each letter refers to a component of the question, according to the concepts described in Table 1.

Table 1. Description of PICO components

P (Population)	18-year-old adults or older, of both sexes,except for pregnant women, overweight or obese
I (Intervention)	Any mobile application aimed at weight loss. There were restrictions forstudies without implementation and results.
C (Control)	Comparisons made with control groups (which did not use applications), but engaged in a weight loss program, as well as groups that used applications in different degrees of interaction.
O (*Outcome)*	Weight loss with possible changes in eating habits and physical activity.

Based on these concepts, the question to be answered will be: *How does the use of mobile applications used by obese or overweight adults, focusing on obesity control, help not only weight loss but its maintenance, with changes to healthier physical and eating habits?*

Once the research question has been formulated, the next step is beginning the bibliographic search.

Selection Procedures and Criteria

The survey of articles was carried out in the VHL (Virtual Health Library), PubMed Health and Cochrane Library electronic databases. Scientific articles were found in the English, Portuguese and Spanish languages, which observed the use of mHealth technologies. The first evaluation was based on the titles, abstracts and keywords of each article. Those who did not meet the inclusion criteria were not considered. When there was uncertainty in the first evaluation, the full text was analyzed a second time. For the selection of all articles, the criteria considered are described in Table 2:

Table 2. Criteria for inclusion and exclusion

Criteria for Inclusion
Articles published between January 1, 2013 and September 30, 2016.
Persons aged 18 years or over.
Articles with implementation results.
Clinical or randomized trial studies (regardless of the follow-up time, provided they described results related to the control of overweight (BMI ≥25 kg / m²) or obesity (BMI ≥30 kg / m²) using variables such as weight measures, BMI or waist circumference).
Articles available in full version.
Non-duplicate articles from the same study in different databases.
Criteria for Exclusion
Pregnant women.
Adults unfit for physical activities.
Adults with severe mental illness.
Articles without implementation results.
Duplicate articles or articles from the same study with more than one publication

For all the databases, a two-word search phrase was used in order to involve the concepts of mobile applications and education / health care to control overweight and obesity in adults. Table 3 presents the search phrases.

Table 3. Search Phrases

"mhealth application" OR "ehealth application" AND
"Adult overweight" OR "Adult obesity"

Figure 1 shows the selection process of articles.

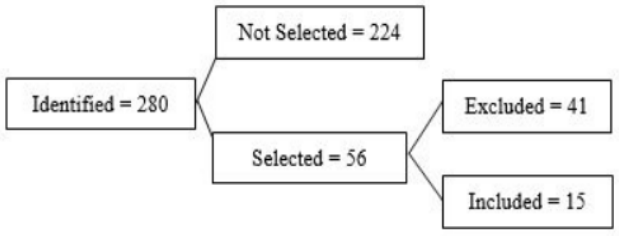

Figure 1. Synthesis of the selection process of articles for systematic review

RESULTS

Initially, a total of 280 articles were selected, out of which 131 came from the Virtual Health Library (VHL), 110 from the PubMed Health database and 39 from the Cochrane Library. In the first screening, 224 articles were excluded because they did not meet the selection criteria, out of which 7 were excluded because they were segments of the same study with more than one publication. 56 articles were selected for full reading and, in the end, 15 articles were included in the study, since they were in line with the objective of this review. Table 4 presents the selected articles, considering the characteristics of the studies included in their chronological order.

Table 4. Characteristics of the studies included in the systematic review

Author/ year (Country)	Delimitation (Duration) - Sample	Description Messaging and Applications	Results
Turner-McGrievy *et al*. / 2013 (USA) (8)	Clinical essay, *post hoc* analysis (6 months) • 96 participants • Aged 18 to 60 • BMI 25 to 45 Kg/m²	Group 1: sending of audio files (24 *podcasts*) Group 2: 24 *podcasts*, self-monitoring of diet and physical activity via applications, as well as social support (from fellow study participants) via Twitter social network.	Potential benefits related to remote self-monitoring methods. *Analysis between groups*: BMI: – 0.28 kg/m² Weight: – 0.93 kg
Allen, J. K. *et al*. / 2013 (USA) (9)	Randomized study (6 months) • 68 participants • Aged 21 to 65 • BMI 25 to 45 Kg/m²	Social cognitive theory, self-management and nutritional and physical orientation (face-to-face meetings lasting 1 hour). "Lose It!" Application: self-management, real-time feedback, social networking and support. G1: 1x / week orientation (1st month). Fortnightly (2nd to 6th month). G2 (Application): a session of basic orientation and use of the application. G3: (application): orientation 2x in the first month and then 1x / month until the 6th month. G4 (application): 1x / week orientation (1st month). 2x / month (2nd to 6th month).	G3 and G4: greater weight loss. G2: less weight loss. 64% of G4 participants and 40% of G3 participants achieved weight loss greater than or equal to 5%.
Hebden *et al*./ 2013 (Australia) (10)	Randomized study (3 months) • 51 participants • Aged 18 to 35 • BMI 23 to 31,9 kg/ m²	Control Group: printed diet booklet with instructions. Intervention Group: booklet + 4 msn / week, 4 emails / week and access to self-monitoring applications via smartphones and forums on the Internet.	Low involvement of the participants in the intervention group. Some positive but not significant changes compared to the control group.
Faghanipour, S. *et al*. / 2013 (Iran) (11)	A randomized, quasi-experimental study (3 months) • 80 participants • Aged 22 to 55 • BMI ≥ 25 Kg/ m²	Control Group: lecture + booklet with caloric recommendations and healthy eating tips + chart for weight control. Intervention Group: idem above + 2x / day text messages for weight management. Weighing instruction 1x / week on calibrated digital scale left in the workplace. Send data to the researcher via SMS weekly.	73 subjects completed the study. Weight loss equal to 2.94% and 0.95% of initial weight in the intervention and control groups, respectively. The BMI reduction was also higher in the intervention group: 0.83 ± 1.16 (kg / m) and 0.26 ± 0.48 (kg / m2) in the control group (P = 0.037).
Hebden *et al*. / 2013 (Australia) (12)	Randomized controlled study (9 months) • 354 participants • Aged 18 to 35 • BMI 23 to 31.9 kg / m²	All participants: national guidelines for physical and nutritional activities, and access to the TXT2BFiT program website. Control Group: monitoring of the program they receive through primary health care. Intervention Group: 3 month phase - intensive (8 motivational messages, 5 training calls, emails, website access, community blog and self monitoring apps); 4 to 9 month phase - maintenance (one text message + one email per month, 2 training calls)	The TXT2BFiT program in the 4 to 9 month phase (maintenance / low intensity) program was successful in preventing weight gain with modest weight loss, in addition to improving lifestyle behaviors among overweight young adults.
Thomas & Wing. / 2013 (USA) (13)	Pilot study (12-24 weeks) • 20 participants • Aged 18 to 70 • BMI 25 to 50 kg / m²	Two applications for self-monitoring: Health-E-Call and DailyBurn. Videos for education and training provided by Health-E-Call (15 short video lessons lasting about 5 minutes each, divided into 4 topics: (1) Keeping Track, (2) At the Moment, (3) Planning Ahead , (4) General Information).Feedback (automated and human). Redefinition of goals: 1x / week weighing with an interventionist. Participants received a booklet with weight loss lessons. Applications used for 12 weeks. Participants with a possibility to (re) enroll for another 12 weeks, but without information booklet.	On average, participants were obese at the beginning of the study with an average BMI of 36.3 kg / m2. All participants (20) completed the initial 12-week program, with 85% losing at least 5% of their initial weight. 15 participants chose to continue treatment for another 12 weeks, and of these, 87% lost at least 10% of their initial weight.
Carter, M. C. *et al*. / 2013 (United Kingdom) (14)	Randomized pilot study (6 months) • 128 participants • Aged 18 to 65 • BMI ≥27 kg / m²	The application used MMM (My Meal Mate) has an evidence-based behavioral approach. All participants had access to an Internet forum for social support. *Daily Food Group*: received a paper food journal, a calorie count book and a calculator. Smartphone Group: received a HTC Desire smartphone with the MMM application installed. *Website Group*: received a voucher for a 6 month access to the *Weight Loss Resources* website.	*Smartphone Group :* * BMI: -1.6 kg / m2 * % Body Fat: -1,3% *Daily Food Group:* * BMI: -1.0 kg / m2 * % Body Fat: -0.9% *Website Group :* * BMI: -0.5 kg / m2 * % Body Fat: -0,5%

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Steinberg, D. M. *et al*. / 2013 (USA) (15)	Randomized controlled study (6 - 9 months) • 91 participants • Aged 30 to 60 • BMI 2 to 40 kg/ m² • Maximum weight 149 kg	The study used four main components: (1) cell phones with "smart" scales (www.bodytrace.com); (2) a chart with weight trends; (3) weekly feedback via email; and (4) 22 classes on behavioral weight control via e-mail. All participants participated in a counseling session and received $ 25 as an incentive to complete follow-up evaluations at 3 and 6 months. *Control Group*: information on energy balance for weight loss, not encouraged to self monitoring, but instructed to use the scales. No daily weighing or weekly feedback. *Intervention Group*: daily weighing at the same time with feedback. After 6 months, they were followed up for another 3 months to evaluate the maintenance of weight loss, maintaining scales, without feedback.	In the intervention group weight loss was significantly higher in comparison to the control group. At 3 months / 6 months, the weight loss was: *Control Group:* *-0.37% / -0.35%* *Intervention Group :* -4.41% / -6.55% Among the intervention participants, daily weighing was viewed positively, which proves that an intervention focusing on this can produce clinically significant weight loss.
Patrick, K. *et al*. / 2014 (USA) (16)	Randomized controlled study (24 months) • 404 participants • Aged over 18 • BMI 25 to 34.9 kg / m²	SMART (Social Mobile Approaches to Reduce weighT) program: based on behavioral theory. Accompanying measures occurred in 6, 12, 18, and 24 months, with participants receiving an incentive of US$ 40 at the beginning of the study and US$ 50 in six months. Control Group: received information on weight loss via the web. Intervention Group: use of Facebook, SMS, use of self-monitoring applications, blogs and emails.	There were significant differences in weight loss at the 5% level with the intervention group in the first 6 months, however, it was not sustained. A "final" weight loss of 2.45% at the end of the study (24 months) was considered for the intervention group.
Laing, B. Y. *et al*. / 2014 (USA) (17)	Randomized controlled study (9 months) • 212 participants • Aged 18 to 35 • BMI ≥25 kg / m²	Participants received a leaflet on healthy eating from www.myplate.gov. They got a $20 bonus (3 and 6 months). Intervention Group: MyFitnessPal application (MFP), which is based on evidence-based theory and weight loss.	There was no significant difference between the control and intervention groups. Using a checklist with 58 respondents, 84% reported that MFP was tedious, 24% reported that it was not easy to use, and 88% reported "Other", such as being too busy or stressed (28%), losing or substituting a telephone (16%), technical questions (7%), and difficulty in registering home food (6%).
Svetkey, L. P. *et al*. / 2015 (USA) (18)	Randomized controlled study (24 months) • 365 participants • Aged 18 to 35 • BMI ≥25 kg/ m²	The Cell Phone Intervention for You study (CITY) is based on cognitive social theory and transtheoretical model. Data collection at 6, 12 and 24 months after randomization. Control Group: 3 leaflets on healthy eating and physical activity. Intervention Group 1: self-monitoring of weight and tracking, food intake and physical activity, with frequent alerts and feedback on results via application Intervention Group 2: weekly sessions with nutritionists trained in motivational interview + monthly telephone contacts with goal setting, challenges and social support. Application used for self monitoring of weight, food consumption and physical activity.	*Intervention Group 1* presented slightly greater weight loss than the Control Group (-0.5 kg on average). *Intervention Group 2*: greater difference in relation to the Control Group, mainly at 6 months (-2.19 kg on average) and at 12 months (-2.10 kg on average). It is concluded that effective intervention may require greater mobile technology efficiency, social support and human interaction from a personal trainer, as well as an adaptive approach to intervention design.
Martin, C. K. *et al*. / 2015 (USA) (19)	Randomized controlled pilot study (3 months) • 40 participants • Aged 18 to 65 • BMI 25 to 35 kg/ m²	SMARTLOSS^{SM} application is based on behavioral theory. Biometric and functional measurements performed at weeks 0, 4, 8 and 12. Control Group: health information through text messages or emails via smartphone. Topics included suggestions for stress management, healthy eating, exercise, and sleep hygiene. Intervention Group: diet prescribed according to the American Heart Association (AHA) recommendations = less than 10% kcal of saturated fat, 55% of carbohydrates and proteins derived from low-fat sources such as fish and poultry. Guidelines on gradually increasing physical activity, with a goal of reaching 10,000 steps / day.	At week 12, 80% and 50% of SMARTLOSSSM participants lost ≥5% and ≥10% of their body weight, respectively. In addition, they also had a reduction in blood pressure measurement and measurements of waist and hip circumferences. SMARTLOSSSM and weight-loss interventions based on similar smartphones can provide effective and scalable methods to remotely deliver weight-loss treatment to large segments of the population, including people with limited access to health care.
Choo, S. *et al*./ 2016 (South Korea) (20)	Pilot study (1 month) • 30 participants • Aged 20 to 70 • BMI ≥25 kg/ m²	Mobile application linked to an accelerometer (My Health Diary). Incentive of US$ 20 at 1 month visit. Patients accompanied for 4 weeks after downloading the app. It was analyzed: (1) the average number of logins per day; (2) the use of each module; (3) exercise calories per week; (4) percentage of weekly exercise goals achieved; (5) the total number of messages posted on social network services.	93% (28/30) of the participants completed the study. Most participants achieved more than their recommended exercise; The average percentage of achieved goals for target exercise per week was 125.9%.

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Rogers *et al*. / 2016 (USA) (21)	Randomized controlled study (6 months) • 39 participants • Aged 18 to 55 • BMI 35 to 45 kg/ m²	Control group: standard behavioral weight loss (30-45 min weekly meetings. Written materials, body weight assessment and self monitoring of food intake and physical activity with the use of a paper journal). Interaction Group 1: technology-based system + a monthly telephone call lasting 10 min. Using the BodyMedia® Fit System. *Web* portal to support and download data. Interaction group 2: same as above. The BodyMedia® FIT System combined with the LINK activity monitor (included *Bluetooth* capability).	Control Group: -3.39 ± 1.04 kg (3 months); -6.57 ± 1.65 kg. Interaction Group 1: -5.06 ± 1.08 kg (3 months); -5.18 ± 1.72 kg (6 months). Interaction Group 2: -4.76 ± 1.25 kg (3 months); -6.25 ± 1.95 kg (6 months) Diet Self-monitoring technology was not better compared to paper diary. Device to monitor physical activity was more frequent than a non-technological one.
Partidge *et al*. / 2016 (Australia) (22)	Randomized controlled study (9 months) • 248 participants • Aged 18 to 35 • BMI 23 to 31,9 kg/m²	Using the TXT2BFiT program. *Control Group*: leaflet explaining nutritional and physical activity guidelines, an introductory call (week 0) to present the program, 4 text messages and access to a site with a consent form, a statement of study information and contact information. *Intervention Group*: 3 months (intensive): 8 motivational messages; Weekly emails; 5 personalized training calls; access to Apps, community blog, and site support. • 4-9 months (maintenance): one monthly message and email and two training calls in the 5th and 8th months.	Intervention Group presented greater weight loss (between 1.12 and 2.30 kg) Training calls were reported as one of the most useful components, acting as an external motivator. Participants requested the incorporation of self-monitoring applications and features available on the site in a single smartphone application, with the possibility of being individualized by entering their personal data.

DISCUSSIONS OF SEARCH FINDINGS

Through this review, great potentialities in the use of smartphones in the context of weight loss programs became evident, but it was also possible to observe some limitations and associated problems that refer to the question to be answered: *How does the use of mobile applications used by obese or overweight adults, focusing on obesity control, help not only weight loss but its maintenance, with changes to healthier physical and eating habits?*

It can be noted that one of the challenges is to determine how to create an attractive application that will not only be downloaded and used for a time (for example, during a study), but which will keep the user's involvement over time and result in real changes of behavior, with the acquisition of healthier habits that promote improvement in the user's quality of life. According to the studies presented, the duration of applications use for initiating weight loss or maintenance is unclear, ranging from 1 month (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3910290/?tool=pubmed) to 24 months (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3910290/?tool=pubmed and http://onlinelibrary.wiley.com/doi/10.1002/oby.21226/full). Most of them present the interventions via smartphones between 6 and 9 months (Turner-Mcgrievy, 2013; https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3872411, https://www.ncbi.nlm.nih.gov/pubmed/23506013, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3636323/; https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3788086/; https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4422872/; http://onlinelibrary.wiley.com/doi/10.1002/osp4.18/full; https://ijbnpa.biomedcentral.com/articles/10.1186/s12966-016-0329-2).

Moreover, it is important to choose and combine various ways of using m-health to make healthcare more efficient and effective. In the case of mobile applications, studies show that multicomponent interactions (https://www.ncbi.nlm.nih.gov/pubmed/23992038; https://www.ncbi.nlm.nih.gov/pubmed/23506013 and https://ijbnpa.biomedcentral.com/articles/10.1186/s12966-016-0329-2), which present secure messaging more personalized to the user profile (http://www.ncbi.nlm.nih.gov/pubmed/23429637) together with a self-monitoring option (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3636323/; https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3910290/?tool=pubmed; http://onlinelibrary.wiley.com/doi/10.1002/oby.21226/full), as well as access to a website (https://www.ncbi.nlm.nih.gov/pubmed/23992038#; http://onlinelibrary.wiley.com/doi/10.1002/osp4.18/full), present greater potential because they allow their users to be constantly and simultaneously connected to several spaces and information, facilitating real-time feedback, consumption and production of information, which makes this type of technology more advantageous for health monitoring if compared to traditional alternative methods. However, in addition to the functionalities described above, programs that offer periodic direct contact (either face-to-face or telephone calls) with a health professional (e.g. personal trainer) were the ones that kept users more motivated to continue with the program (https://ijbnpa.biomedcentral.com/articles/10.1186/s12966-016-0329-2). An interesting point to note was the fact that some studies offered money as an incentive for participants to continue to engage and attend measurement visits (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3910290/?tool=pubmed; https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4422872/; http://onlinelibrary.wiley.com/doi/10.1002/osp4.18/full).

As for the educational theories used, the analyzed articles present their interventions based mainly on Behaviorism (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3910290/?tool=pubmed; http://onlinelibrary.wiley.com/doi/10.1002/oby.21063/full) and on Cognitivism (http://www.ncbi.nlm.nih.gov/pubmed/23429637; http://onlinelibrary.wiley.com/doi/10.1002/oby.21226/full). Finally, it is important to point out that 60% of the studies were conducted in the United States, 20% in Australia, and the other 20% equally distributed among Iran, South Korea and the United Kingdom (6.66...% for each country), by groups of researchers from different health areas (Medicine, Nutrition, Physical Education, Nursing), as well as Computer Science.

Conclusion and Future Work

The use of Information and Communication Technologies (ICTs) applied to the health care of individuals and populations have increased. In Brazil, the National Health Foundation (Funasa), through a document prepared by the Ministry of Health (http://www.funasa.gov.br/site/wp-content/files_mf/dir_ed_sau.pdf) establishes the Health Education Guidelines for Health Promotion, and one of its basic assumptions is the conceptualization of health education as a social practice. This process contributes to the formation of people's critical awareness of their health problems, based on their reality, and aims to stimulate the search for solutions and organization for individual and collective action. Considering the results of the present study, it is noticeable the real potential of mobile applications in interventions that seek solutions to help with weight loss. But we should not just think of weight loss in temporary terms. Provision should be made for the adoption of new life habits involving, for example, re-education of physical and eating habits. Thus, the authors are currently working on the development and validation of an application called Healthy Slimming, so that it can be used by a large segment of the population. Such an application should involve health care, with incentives for individual and behavioral changes to prevent and treat obesity, as well as support for health promotion and education actions. It is also worth noting that an interdisciplinary network of researchers in the area of obesity, with psychologists, physical trainers, doctors and programmers, are part of this development. With such a network and supported by conducted studies, we intend to create an application that can contemplate several aspects, seeking to keep the low maintenance cost for large-scale diffusion. The main ideas are protocols specific to certain user profiles, motivational messages directed to these specific profiles, interaction with professionals when necessary (via messages or video conferencing), application usability that includes specific guidelines for adopting new habits in the context of health, gamification, data mining for improvements, among others.

REFERENCES

Allen, J. K. *et al*. Randomized Controlled Pilot Study Testing Use of Smartphone Technology for Obesity Treatment. Disponível em: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3872411/>.

Carter, M. C. *et al*. Adherence to a smartphone application for weight loss compared to website and paper diary: pilot randomized controlled trial. Disponível em:<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3636323/>.

Choo, S. *et al*. Development of a Weight Loss Mobile App Linked With an Accelerometer for Use in the Clinic: Usability, Acceptability, and Early Testing of its Impact on the Patient-Doctor Relationship. Disponível em: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4832121/?report=classic>.

Faghanipour, S. *et al*. Mobile Phone Short Message Service (SMS) for Weight Management in Iranian Overweight and Obese Women: A Pilot Study. Disponível em: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3791584/>.

Fogg, B. J. BJ Fogg's Behavior Model, 2011. Disponível em: <http://www.behaviormodel.org/>.

Hebden, L. *et al*. A mobile health intervention for weight management among young adults: a pilot randomised controlled trial. Disponível em: <https://www.ncbi.nlm.nih.gov/pubmed/23992038#>.

Hebden, L. *et al*. TXT2BFiT' a mobile phone-based healthy lifestyle program for preventing unhealthy weight gain in young adults: study protocol for a randomized controlled trial. Disponível em: <https://www.ncbi.nlm.nih.gov/pubmed/23506013>.

LAING, B. Y. *et al*. Effectiveness of a smartphone application for weight loss compared to usual care in overweight primary care patients: a randomized controlled trial. Disponível em: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4422872/>.

Lemmens, V.E., Oenema, A., Klepp, K.I., Henriksen, H.B., Brug, J. A systematic review of the evidence regarding efficacy of obesity prevention interventions among adults. Obesity Reviews. Volume 9, Cap. 5, p. 446 – 455, 2008. Disponível em: <http://www.ncbi.nlm.nih.gov/ pubmed/18298429>.

Martin, C. K. *et al*. Efficacy of SmartLossSM, a smartphone-based weight loss intervention: Results from a randomized controlled trial. Disponível em: <http://onlinelibrary.wiley.com/doi/10.1002/oby.21063/full>.

Ministério Da Saúde. Diretrizes de educação em saúde visando à promoção da saúde: documento base - documento I/Fundação Nacional de Saúde Brasília: Funasa, 2007. Disponível em: <http://www.funasa.gov.br/site/wp-content/files_mf/dir_ed_sau.pdf>.

Ministério da Saúde. Diretrizes de educação em saúde visando à promoção da saúde: documento base - documento I/Fundação Nacional de Saúde Brasília: Funasa, 2007. Disponível em: <http://www.funasa.gov.br/site/wp-content/files_mf/dir_ed_sau.pdf>.

Morris, M. ´Motivating change with mobile: seven guidelines', v.19, n. 3, p. 26-31. 2012. Disponível em: <http://pt.scribd.com/doc/92691136/Motivating-Change-With-Mobile-Seven-Guidelines-2012>.

Partridge, S. *et al*. Process evaluation of TXT2BFiT: a multi-component m Health randomised controlled trial to prevent weight gain in young adults. Disponível em: <https://ijbnpa.biomedcentral.com/articles/10.1186/s12966-016-0329-2>.

Patrick, K. *et al*. Design and Implementation of a Randomized Controlled Social and Mobile Weight Loss Trial for Young Adults (project SMART). Disponível em:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3910290/?tool=pubmed>.

Rogers, R. J. *et al*. Applying a technology-based system for weight loss in adults with obesity. Disponível em: <http://onlinelibrary.wiley.com/doi/10.1002/osp4.18/full>.

Steinberg, M. D. *et al*. The efficacy of a daily self-weighing weight loss intervention using smart scales and email. Disponível em: <https://www.ncbi.nlm.nih.gov/ pmc/articles/PMC3788086/>.

Svetkey, L. P. *et al*. Cell phone intervention for you (CITY): A randomized, controlled trial of behavioral weight loss intervention for young adults using mobile technology. Disponível em: <http://onlinelibrary.wiley.com/doi/10.1002/oby.21226/full>.

Thomas, J. G., WING, R. R. Health-E-Call, a Smartphone-Assisted Behavioral Obesity Treatment: Pilot Study. Disponível em: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4114436/>.

Turner-Mcgrievy, G.M., Beets, M.W., Moore, J.B., kaczynski, A.T., Barr-Anderson, D.J., TATE, D.F. Comparison of traditional versus mobile app self-monitoring of physical activity and dietary intake among overweight adults participating in an mHealth weight loss program. J AmMedInform Assoc. 2013 May 1;20(3):513-8. Disponível em: <http://www.ncbi.nlm.nih.gov/pubmed/23429637>

WHO (World Health Organization) 'Management of patient information: trends and challenges in Member States: based on the findings of the second global survey on eHealth'. Global Observatory for eHealth Series, v. 6. Genebra: 2012. Disponível em <http:// apps.who.int/iris/bitstream/10665/76794/1/9789241504645_eng.pdf?ua=1>.

WHO (World Health Organization) eHealth'. Genebra: 2012. Disponível em: <http://www.who.int/ehealth/en/>.

WHO (World Health Organization). 'New horizons for health through mobile technologies: second global survey on eHealth'. Global Observatory for eHealth Series, v. 3. Genebra: 2011. Disponível em: <http://www.who.int/goe/publications/goe_mhealth_web.pdf>.

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