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Acceptance of an mHealth program for obesity prevention in adolescents: mixed sequential study

Aceitação de um programa mHealth para prevenção da obesidade em adolescentes: estudo misto sequencial

Aceptación de un programa de mHealth para la prevención de la obesidad en adolescentes: estudio mixto secuencial

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Abstract

Background: The health area has been adapting to the use of technology, using it as an important ally in programs for monitoring and preventing obesity and associated problems.

Objective: To assess the acceptance of the TeenPower e-therapeutic program in adolescents.

Methodology: Sequential mixed-method study with 47 students in grades 6, 7, and 8 in Portugal. In the first phase, data were collected through a questionnaire consisting of sociodemographic data, acceptance questionnaire, food choices, body image (dis)satisfaction, lifestyle profile, and eHealth literacy. The second phase included an interactive online session with a discussion forum, followed by Bardin's content analysis.

Results: The acceptance of the TeenPower program by adolescents had a positive mean score in the 4 factors assessed on the scale. eHealth literacy was also positively associated with the perceived usefulness of the TeenPower program.

Conclusion: The successful acceptance of e-therapeutic programs can lead to innovation and improvement in obesity prevention, thus providing an effective response to the adolescents' expectations and needs.

Keywords: obesity; adolescent; eHealth; school health

Resumo

Enquadramento: A área da saúde tem-se adaptado ao uso de tecnologia, recorrendo a esta como um aliado relevante em programas de monitorização e prevenção da obesidade e problemas associados.

Objetivo: Avaliar a aceitação do programa e-terapêutico TeenPower em adolescentes.

Metodologia: Estudo misto sequencial realizado em 47 alunos do 6º ao 8º ano de escolaridade em Portugal. Na primeira fase, os dados foram recolhidos através de questionário incluindo dados sociodemográficos, questionário de aceitação, escolhas alimentares, (in)satisfação com a imagem corporal, perfil do estilo de vida e e-literacia em saúde. A segunda fase incluiu uma sessão interativa *online* com fórum de discussão, seguida de análise de conteúdo de Bardin.

Resultados: A aceitação do programa TeenPower por parte dos adolescentes apresenta um valor médio positivo nos 4 fatores avaliados pela escala. Verificou-se ainda que a e-literacia em saúde está positivamente relacionada com a perceção de utilidade do TeenPower.

Conclusão: A aceitação favorável de programas e-terapêuticos pode permitir a inovação e melhoria na prevenção da obesidade, respondendo eficazmente às expectativas e necessidades dos adolescentes.

Palavras-chave: obesidade; adolescente; eHealth; saúde escolar

Resumen

Marco contextual: El área de la salud se ha adaptado al uso de la tecnología y la ha utilizado como aliada relevante en los programas de monitorización y prevención de la obesidad y los problemas asociados.

Objetivo: Evaluar la aceptación del programa terapéutico electrónico TeenPower en adolescentes.

Metodología: Estudio mixto secuencial realizado en 47 estudiantes de 6.º a 8.º año de escolaridad en Portugal. En la primera fase se reunieron datos mediante un cuestionario que incluía datos sociodemográficos, cuestionario de aceptación, elecciones de alimentos, (in)satisfacción con la imagen corporal, perfil del estilo de vida y alfabetización electrónica en materia de salud. La segunda fase incluyó una sesión interactiva en línea con un foro de debate, seguida de un análisis del contenido de Bardin.

Resultados: La aceptación del programa TeenPower por parte de los adolescentes presenta un valor positivo promedio en los 4 factores evaluados por la escala. También se constató que la alfabetización electrónica en materia de salud se relaciona positivamente con la percepción de la utilidad del TeenPower.

Conclusión: La aceptación favorable de los programas terapéuticos electrónicos puede permitir la innovación y la mejora en la prevención de la obesidad, respondiendo así eficazmente a las expectativas y necesidades de los adolescentes.

Palabras clave: obesidad; adolescente; eHealth; salud escolar

Introduction

The exponential increase in the prevalence of overweight and obesity in children and adolescents has been a matter of concern worldwide, with the prevalence increasing by around one third between 2014 and 2018. According to data from the World Health Organization (WHO) report on health behaviors of school-aged children, one in five adolescents (21%) is overweight or obese (Inchley et al., 2018). In Portugal, the prevalence of obesity among adolescents is 8.7% (Lopes et al., 2017). The severe and multiple effects of this disease call for urgent prevention strategies. A successful approach can be the use of innovative health strategies, such as e-therapeutic programs based on the Health Information Technology Acceptance Model (HITAM; Kim & Park, 2012), focused on preventing and altering harmful behaviors for adolescent health. Portugal lacks e-health interventions with clinical validity for adolescents. The existing international mobile apps to promote healthy behaviors are automated and are not managed by healthcare professionals. The TeenPower e-therapeutic program fills this gap. It was developed within the scope of a transdisciplinary action-research project that aims to develop innovative interventions for promoting healthy behaviors in adolescence based on e-therapy and case management methodology. The project has been implemented in Portugal since 2018 and aims at developing adolescents' cognitive-behavioral skills using interactive strategies and increased contact with the multidisciplinary health team (Sousa et al., 2019). This article aims to assess the adolescents' perception of the acceptance of the TeenPower program based on the HITAM, as well as to assess the association between TeenPower acceptance and the adolescents' sociodemographic and cognitive-behavioral characteristics, lifestyles, and food choices.

Background

Interventions to prevent or reduce obesity in children and adolescents usually have little effect on weight or body mass index (BMI). However, their long-term impact on the treatment of obesity is still unclear. A systematic review of the literature showed that school-based eHealth interventions to prevent multiple lifestyle risk behaviours can improve lifestyles (Champion et al., 2019). Today, technology is an important ally in health and, in particular, in monitoring and preventing obesity and associated problems among adolescents (Sousa et al., 2019). The technology acceptance process in adolescents depends on the technology itself, its relevance and interest to the target population, but also on cultural and economic issues that condition access to equipment and the Internet. In turn, the adolescents' education level and personal experiences strongly influence their interpretation of technology (Franco-Aguilar, Alzate-Yepes, Granda-Restrepo, Hincapié-Herrera, & Muñoz-Ramírez, 2018). Adolescents use technologies more often to participate in game-related activities, thus mobile health (mHealth) systems are using

a rich experience that includes games to engage adolescents. The objective is to promote changes in adolescents' lifestyles, specifically their health and education, focusing on human motivation and satisfaction of psychological needs (Reis et al., 2019). The health area had to adapt to the presence of technology in everyday life. e-Health includes all applications that integrate the new information and communication technologies (ICTs) to treat and care for people, contributing to their empowerment. TeenPower is an e-therapeutic program that has developed an integrated, creative, and dynamic strategy to prevent obesity and promote healthy behaviors in adolescents. In addition to the TeenPower app, the intervention program includes face-to-face sessions on five topics: diet, physical activity, sleep, stress, and interpersonal relationships. For these therapeutic interventions to be effective, they should be based on behavioral change models. One of the most well-known models to characterize user acceptance of information technology, on the basis of which the TeenPower project was developed, is the HITAM (Sousa et al., 2019). This model categorizes the factors that influence behavioral intent to manage health-related data into three domains: health, technology, and information. The health domain includes important factors, such as health status and health beliefs. In the information domain, subjective norms stand out, such as social pressure. In the technology domain, perceived usability is affected by reliability in health information technologies, affecting perceived ease of use. The key factors identified in the three domains are the predictors that characterize the HITAM (Sousa et al., 2019).

Research questions

Is the TeenPower program well accepted based on the health information technology acceptance model? Is there a correlation between TeenPower acceptance and adolescents' cognitive-behavioral characteristics, lifestyle, and food choices? Are there differences in TeenPower acceptance based on gender and BMI?

Methodology

This is a sequential mixed-method study, with a non-probability sample of 47 students from schools in the central and Alentejo regions of Portugal who participated in both phases of the study. All participants in the TeenPower program met the following inclusion criteria: adolescents aged 12 to 16 years, attending grades 6, 7, and 8 in three selected school clusters in the central and Alentejo regions of Portugal, who agreed to participate in the study after consent and authorization from their legal guardians, and who used the TeenPower e-therapeutic program. They also met the following exclusion criteria: inability to communicate in writing and presence of severe cognitive impairment. These individuals were invited to participate in this study by e-mail. The intervention protocol of the TeenPower program has already been published (Sousa

et al., 2019).

Data were collected between October 2018 and April 2019. In the first phase, data were collected through an online questionnaire. To assess the adolescents' perception of TeenPower acceptance based on the HITAM, the TeenPower Acceptance Questionnaire was used. This questionnaire consists of 22 items rated on a 5-point Likert-type scale. The higher the total score, the better the acceptance. This instrument has four factors: Perceived usefulness; Perceived ease of use; Attitude towards TeenPower; Behavioral intention.

To assess the association between acceptance and sociodemographic data, a questionnaire consisting of sociodemographic data was created. Age- and gender-adjusted BMI was calculated based on WHO child growth standards, according to anthropometric data evaluated by physical education teachers.

The Portuguese versions of the Stunkard Figure Rating Scale (Stunkard, Sørensen, & Schulsinger, 1983) and the eHealth Literacy Scale (Norman & Skinner, 2006) were used to collect data for analyzing the association between TeenPower acceptance and cognitive-behavioral data. Body image dissatisfaction is assessed through a sequence of seven female or male figures illustrating body weight, ranging from very thin to very overweight. Participants were asked to choose the silhouette that most looked like them now (current figure) and the silhouette that they would like to have (ideal figure), and the difference between the scores was used as an indicator of body image (dis)satisfaction. Negative scores indicated a desire to gain weight and positive scores a desire to lose weight (Coelho, Padez, Moreira, Rosado, & Mourão-Carvalhal, 2013).

The eHealth Literacy Scale is based on an individual's perception of his/her own skills and knowledge in each of the evaluated domains of eHealth literacy. It consists of 10 items, but only eight items are part of the scale. It is rated from 1 to 5, and the higher the eHealth literacy levels, the higher the score (Norman & Skinner, 2006; Tomás, Queirós, & Ferreira, 2014). The Portuguese version of the Food Choice Questionnaire was used for assessing the association between TeenPower acceptance and food choices among adolescents. It consists of 26 questions ranging from *totally agree* to *totally disagree*. It is divided into five factors: Body satisfaction/weight control; Ethical concerns; Convenience; Sensory appeal; and Mood. For each factor, the mean is calculated, ranging from -2 to 2. The higher the total score, the higher its influence on food choices (Pereira, Silva, & Sá, 2015).

The Portuguese version of the Adolescent Lifestyle Profile (ALP) was used to assess the association between TeenPower acceptance and lifestyle. This scale measures the frequency of health-promoting behaviors. It consists of 36 items rated on a 4-point Likert-type scale divided into seven factors: Health Responsibility; Physical Activity; Nutrition; Positive Life Perspective; Interpersonal Relationships; Stress Management; and Spiritual Health. A higher score indicates a healthier lifestyle (Sousa, Gaspar, Fonseca, Hendricks, & Murdaugh, 2015). All these instruments are validated for the population of adolescents in Portugal, except for the TeenPower Ac-

ceptance Questionnaire, which is still in the preliminary validation phase.

In the second phase, an interactive online session (private discussion forum on Facebook) was held to discuss the following topics: 1) previous experiences in health promotion programs; 2) use of technologies in health promotion programs; 3) health monitoring through mobile applications; 4) communication with health professionals through mobile applications, and 5) Overall balance of the TeenPower project and suggestions for improvement. The questions were asked in writing on the discussion forum, and the researchers moderated the discussion. The questions were posed sequentially, and the moderators encouraged the adolescents to explore further and justify their opinions. Each discussion group lasted about two weeks. Data were processed following the three phases of Bardin's content analysis technique: pre-analysis, exploration of the material and treatment, and inference and interpretation of the results (Bardin, 2016). Regarding internal validity, a theoretical framework was developed based on the literature, using a set of categories and criteria for data analysis. Regarding external validity, the following steps were taken: a) clear criteria for case selection; b) use of multiple cases; and c) comparison between research findings and theory (Castro & Rezende, 2018).

The questionnaire applied in this study was authorized by the Ministry of Education (registration number 0254300004) and approved by the National Data Protection Commission (no. 11465/2017 of October 12). Both the legal guardians and the adolescents consented to their participation in the study.

Quantitative data were analyzed using IBM SPSS Statistics, version 23.0, and submitted to descriptive and inferential statistical analysis (Spearman's correlation coefficient and the Mann-Whitney U-test given the non-normal distribution). The students' opinions in the online discussion forum (phase 2) were subjected to content analysis with the selection of recording units, coding, and categorization.

Results

Of the 47 adolescents, 27 (57.4%) were girls, and 20 (42.6%) were boys, with a mean age of 12.93 ± 1.11 years. The average number of members per household was 3.93 ± 1.32, 20.0% of the sample lived in rural areas, 53.3% in urban areas, and 26.7% in suburban areas. It was only possible to calculate the age- and gender-adjusted BMI of 12 adolescents because the other participants did not provide the necessary anthropometric data. Of these 12 adolescents, 58.3% had a *healthy* BMI, and 41.7% had an *unhealthy* BMI.

With regard to cognitive-behavioral data, a reduced, but positive, mean dissatisfaction with body image (0.19 ± 0.83) was found, which indicates a slight desire for weight loss. The mean scores of eHealth literacy (3.23 ± 0.61) indicate a good level of skills in the search for and interpretation of digital health information (Table 1). The majority of the dimensions of the lifestyle profile showed mean

scores between 2.33 and 3.36, except for the Spiritual Health subscale, which had the lowest mean score (1.95 ± 0.86). Regarding the adolescents' food choices, it should be noted that all their indicators had low mean scores, especially the choice of foods based on Convenience (0.21).

Table 1

Sample characterization according to cognitive-behavioral data, lifestyle, and food choices

	M	SD	Min	Max
Cognitive-behavioral data				
eHealth Literacy	3.23	0.61	2.13	4.13
Body image dissatisfaction	0.19	0.83	-1.00	2.00
Lifestyle				
Health Responsibility	2.33	0.59	1.50	3.33
Physical Activity	2.57	0.75	1.20	3.80
Nutrition	2.91	0.50	1.86	3.57
Positive Life Perspective	3.37	0.57	2.50	4.00
Interpersonal Relationships	3.17	0.35	2.50	4.00
Stress Management	3.23	0.48	2.60	3.80
Spiritual Health	1.95	0.86	1.00	3.20
Global Lifestyle	2.76	0.34	2.25	3.44
Food choices				
Body satisfaction & Weight control	0.67	0.58	-0.83	1.33
Ethical concerns	0.63	0.75	-0.67	2.00
Convenience	0.21	0.63	-1.20	1.40
Sensory appeal	0.89	0.73	-0.50	2.00
Mood	0.69	0.74	-0.67	2.00

Note. M = mean; SD = standard deviation; Min = minimum; Max = maximum.

The results regarding the acceptance of the TeenPower e-therapeutic program are summarized in Table 2. They show that the weighted means for all dimensions and indicators were higher than the median value.

Table 2

Acceptance of the TeenPower program: descriptive statistics

	M	SD	Min	Max
Perceived usefulness	3.90	0.72	1.50	5.00
TeenPower is useful to have a healthier life	4.21	0.86	1.00	5.00
The information in TeenPower is relevant	4.23	0.63	3.00	5.00
With TeenPower, I improved my ability to have a healthy life	3.66	1.09	1.00	5.00
I think that it is easy to use TeenPower to participate in discussions with colleagues about health topics	3.55	1.10	1.00	5.00
I think that it is easy to use TeenPower to participate in discussions with health professionals and faculty about health topics	3.85	1.29	1.00	5.00
I can quickly find the information that I need in TeenPower	3.87	1.01	1.00	5.00
Perceived ease of use	4.10	0.72	1.75	5.00
TeenPower is easy to use	4.26	1.05	1.00	5.00
It is easy to find the information that I need in TeenPower	3.79	0.88	1.00	5.00
It is easy to log in to TeenPower	4.00	1.20	1.00	5.00
It is easy to check the messages in TeenPower	4.15	0.86	1.00	5.00
It is easy to communicate with the health professionals in TeenPower	4.11	0.76	3.00	5.00
TeenPower was always accessible when I needed it	4.00	0.96	1.00	5.00
The TeenPower app is easy to use	4.23	0.79	1.00	5.00
The information in TeenPower is clear	4.28	1.06	1.00	5.00
Attitude towards TeenPower	3.92	0.77	1.40	5.00
I like to use TeenPower	3.94	0.97	1.00	5.00
TeenPower was pleasing to use	4.04	0.86	1.00	5.00
TeenPower was exciting to use	3.81	0.99	1.00	5.00

		M	SD	Min	Max
TeenPower is user-friendly		3.89	0.89	1.00	5.00
I think that the time spent using TeenPower was of good use		3.89	0.96	1.00	5.00
Behavioral intention		3.74	0.87	1.00	5.00
I intend to continue using TeenPower		3.72	1.02	1.00	5.00
I'm willing to use TeenPower in my daily life		3.64	0.99	1.00	5.00
I intend to continue using TeenPower to monitor my health		3.85	1.04	1.00	5.00

Note. M = mean; *SD* = standard deviation; Min = minimum; Max = maximum.

The association between sociodemographic data, cognitive-behavioral data, lifestyle, and food choices and the acceptance of the TeenPower program were also analyzed (Table 3). A positive and statistically significant correlation was found between the eHealth literacy index and the perceived usefulness of TeenPower (*p* = 0.046). On the other hand, a negative correlation with marginal significance was found between the perceived ease of use of TeenPower and the choice of foods based on mood (*p* = 0.053). No statistically significant correlations were found between the remaining variables and the dimensions of acceptance of the TeenPower program (*p* > 0.05).

Table 3

Association between the acceptance of the TeenPower program and sociodemographic data, cognitive-behavioral data, lifestyle, and food choices

	Perceived usefulness		Perceived ease of use		Attitude towards TeenPower		Behavioral intention	
	r_s	*p*	r_s	*p*	r_s	*p*	r_s	*p*
Age	0.008	0.955	0.039	0.797	-0.193	0.193	0.082	0.585
Cognitive-behavioral data								
eHealth Literacy	0.523*	0.046	0.028	0.920	0.051	0.857	0.345	0.208
Body image dissatisfaction	0.271	0.310	0.234	0.383	-0.174	0.520	0.167	0.538
Lifestyle								
Health Responsibility	-0.036	0.898	-0.174	0.536	-0.025	0.928	0.105	0.711
Physical Activity	0.479	0.071	0.246	0.376	0.352	0.199	0.312	0.257
Nutrition	0.053	0.850	0.269	0.333	-0.019	0.946	0.062	0.828
Positive Life Perspective	0.449	0.093	0.345	0.208	0.335	0.222	0.269	0.333
Interpersonal Relationships	0.070	0.804	-0.190	0.497	-0.027	0.923	0.047	0.867
Stress Management	-0.057	0.840	-0.169	0.548	-0.003	0.992	-0.073	0.795
Spiritual Health	-0.192	0.494	-0.151	0.592	-0.266	0.338	-0.164	0.558
Global Lifestyle	0.061	0.829	0.076	0.787	0.011	0.969	0.038	0.892
Food choices								
Body Satisfaction & Weight Control	0.165	0.541	-0.028	0.919	-0.151	0.576	-0.098	0.719
Ethical Concerns	-0.095	0.726	0.019	0.944	-0.305	0.251	-0.244	0.362
Convenience	0.014	0.958	-0.002	0.996	-0.036	0.894	-0.086	0.752
Sensory appeal	0.095	0.727	-0.090	0.742	-0.184	0.494	-0.104	0.701
Mood	0.025	0.930	-0.508	0.053	-0.118	0.675	0.000	1.000

Note. r_s = Spearman's correlation coefficient; * *p* < 0.05

No statistically significant differences were found between the variables gender and BMI (adjusted for age and gender) and the dimensions of acceptance of the TeenPower program.

Table 4 shows the qualitative analysis of the contents of the interactive online session. Four main categories were identified: Importance of technology in health; Mobile health applications; Impact of the program; and Suggestions for improvement (TeenPower). The recording units that are associated with the indicators of each category were also identified. In the category Importance of technology in health, it is clear that the adolescents attribute great importance to the easy access to information and health care as a result of using the TeenPower app. In the category Impact of the TeenPower Program, the adolescents focused on learning, accountability, interactivity, fun, and monitoring of the program. It is evident from the reports of the adolescents who participated in the session that they attribute great importance to the TeenPower program in promoting and improving their health status. Regarding the Suggestions for improvement, the adolescents highlighted the development of the iOS version of the TeenPower app and the creation of more interactive content, such as games and videos focused on food and physical activity.

Table 4
Content analysis of the online interviews

Categories	Indicators	Recording units
Importance of technology in health	Easy access to information	"everyone has a cell phone, and we can check anything at any time" (P4, February 2019) "we have more information available." (P2, February 2019)
	Ubiquity of technology	"it's something we are very used to using." (P3, February 2019)
	Access to health care	"technologies are very important because sometimes we can't go to the doctor to ask." (P5, February 2019) "healthcare professionals can help us improve various aspects of our health" (P4, February 2019)
Mobile health applications	Accessibility	"apps and cell phones are present in our daily life" (P2, February 2019) "we spend a lot of time on devices." (P3, February 2019)
	Attractiveness	"a little slow and boring" (P2, February 2019)
Impact of the TeenPower Program	Learning	"it's a very good project to learn more about health" (P5, February 2019) "I enjoyed learning all the features" (P3, February 2019) "it teaches many things that can happen in our future" (P7, February 2019) "it helps you learn . . . exercises... food"; so we can be healthier" (P6, February 2019)
	Accountability	"it help us know our health a little better" (P3, February 2019) "It's very good because it's helping me a lot" (P8, February 2019) "I started to worry more about health" (P3, February 2019)
	Interactivity	"I liked the quiz" (P4, February 2019) "I liked the interactive classes more" (P5, February 2019)
	Fun	"the app helps in a fun and educational way" (P4, February 2019) "it's a very good app and the lectures too" (P7, February 2019) "cool" (P2, February 2019)
	Monitoring	"it helps us have a more balanced diet so we can improve our health" (P4, February 2019) "as the cell phone is present in our daily lives, we can control our health better." (P6, February 2019)
Suggestions for improvement (TeenPower)	Operating system	"[develop] IOS version" (P2, February 2019)
	Interactivity	"be a little more interactive." (P3, February 2019) "possibility to customize the avatar" (P9, February 2019)
	Gamification	"creation of games" (P4, February 2019)
	Empowerment strategies	"interactive videos with exercises and recipes" (P5, February 2019) "suggestions for a healthy life" (P7, February 2019)

Discussion

Despite the steady increase in mobile health applications, many of them fail during the development or implementation process in a real context. Non-technical factors account for 30% of implementation failures, of which insufficient user acceptance is the most significant one and a longtime obstacle to the successful adoption of ICTs (Jeon & Park, 2015). In this study, the quantitative analysis showed that the adolescents' overall assessment was positive. The intention to use mHealth apps can be explained or foreseen through the users' perceived usefulness and perceived ease of use. The ease of use of mHealth applications was reported as one of the main contributors, if not the main one, to the acceptance of these applications (Pan & Zhao, 2018). Wu, Wang, and Lin (2007) found that perceived usefulness and perceived ease of use were the factors that most contributed to the acceptance of mobile health systems, which is in line with the findings of this study.

In this study, although adolescents perceived the application as easy to use, their behavioral intention, that is, the intention to continue using the TeenPower application, had the lowest mean score. According to Nunes, Limpo, and Castro (2019), the more young people see ICTs as easy to use, the less they intend to use them. This situation may be associated with young people's interpretation of something that is easy to use, associating it with lack of innovation in that technology. As such, young people may feel less motivated to use mobile health applications because they consider them less challenging and interesting than other types of ICTs, as demonstrated in the qualitative analysis: "a little slow and boring" (P2, February 2019). The fun or pleasure derived from using technology may justify the decision to use it: "the app helps in a fun and educational way" (P4, February 2019). It was, therefore, suggested that younger people not only take into account perceived usefulness and perceived ease of use but also innovation when considering the use of new applications.

In the qualitative data analysis, the four thematic categories and their indicators were established by the team after analyzing the adolescents' reports. No model was followed given the specificities of the intervention. It is worth noting the importance that adolescents place on technology in their lives and the fact that they recognize its potential to access health care. According to the users' feedback, the use of the application could be maximized if it were more interactive and allowed for greater customization. One study highlighted these features as important for mobile app users, in addition to features such as feedback and personalized information (Mateo, Granado-Font, Ferré-Grau, & Montaña-Carreras, 2015). Thus, in addition to developing useful and easy-to-use eHealth programs, more attention should also be paid to analyzing user requirements with a view to identifying their expectations regarding the content of health applications. Participants whose practices are more consistent with their expectations have a higher probability of accepting the program, there is a greater possibility of a higher acceptance of the program.

The limitations of this study include the reduced participation of adolescents, which influenced sample size. The number of replies to the questionnaires may have been low for several reasons: they were carried out online, the invitation to be part of the group in the social media was sent by e-mail rather than directly through the social network, and some e-mails were sent to legal guardians rather than to the adolescents. The existence of incomplete records of anthropometric measurements made it impossible to calculate the BMI for the entire sample, thus no conclusions could be drawn on this matter. It should be noted that the tool for assessing TeenPower acceptance was developed by the researchers based on a robust theoretical foundation, but it is still undergoing validation. One of the strengths of this study is its innovative nature and the contribution to scientific knowledge in this field because few studies have assessed an e-therapeutic intervention for adolescents based on case management.

Conclusion

This study concluded that most adolescents have a positive opinion regarding the perceived usefulness and perceived ease of use of the TeenPower e-therapeutic program, as well as a positive attitude towards it. The TeenPower program was also assessed as a useful and easy-to-use program with relevant information, which allowed adolescents to take more responsibility for monitoring their health. These results also create an opportunity for the TeenPower program to be implemented in other contexts such as associations, support groups, or other institutions that support young adolescents. Thus, the results of this study may be useful for planning and creating other e-therapeutic programs that are adjusted to the adolescents' needs and interests, or even for adapting programs that have already been implemented.

Author contributions

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