Efficacy of Telehealth in Improving Physical Activity Level in Individuals with Overweight or Obesity: A Narrative Review

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ABSTRACT

Background and Objective. The COVID-19 pandemic drastically changed lifestyles and reduced opportunities to exercise, leading to physical inactivity in all populations, especially the obese cohort. Luckily, telehealth may positively help people engage in physical activity. This study aimed to determine the efficacy of telehealth in increasing physical activity among people with obesity.

Methods. This study is a literature review. Articles were sought from the CiNAHL, Proquest, MEDLINE, and PUBMED databases from August to September 2021 following predetermined strategies, inclusion, and exclusion criteria. The quality of the studies was appraised using the JBI Critical Appraisal Checklist Tools. Data Extraction was conducted using the JBI Data Extraction From for Observational/Experimental Studies.

Results. Five studies were included in this literature review. Due to the heterogeneity of study designs and outcome measures, a narrative synthesis was conducted. Most of the studies used mobile apps to deliver health programs to adults with obesity. Overall, studies reported the medium to large positive effects of telehealth in improving physical activity outcomes favoring the telehealth group (Fitbit d = 0.509, 95% CI= -0.36–0.427; Pedometer d = 0.918, 95% CI= 1.467–2.464), while one study found small positive effects on energy expenditure (SenseWear d = 0.446).

Conclusion. This study supports the use of mobile applications to bring a significant increase in physical activity levels in adults with obesity. Further studies evaluating telehealth with video conferences and hybrid formats are needed.

Keywords: obesity, overweight, telehealth, physical activity

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INTRODUCTION

Physical inactivity brings a higher risk of many health issues, such as chronic disease and obesity.[1] Obesity and overweight affected about 1.9 billion of the adult population in 2016.[1] The World Health Organization (WHO) defines overweight as a body mass index (BMI) greater than or equal to 25 kg/m^2, and obesity as a BMI greater than or equal to 30 kg/m^2. According to a systematic review in 2020, the prevalence of people with overweight and obesity increased gradually from 1990 to 2020, particularly in low- and middle-income countries and among poor people.[2]

During the COVID-19 pandemic, people abstained from social and outdoor physical activities to prevent the spread of the virus.[3] This situation increased physical inactivity (by 28.6%), unhealthy food consumption, and levels of anxiety. This is in contrast with the recommendation by the WHO for adults aged 18–64 years old: Adults should be physically active for at least 150–300 minutes of moderate-intensity

or 75–150 minutes of vigorous-intensity aerobic physical activity throughout the week.[4]

Furthermore, being overweight or obese is an independent risk and prognostic factor of the severity of COVID-19.[5,6] Individuals with obesity faced a 46% higher risk of contracting COVID-19 and a 48% higher risk of mortality due to COVID-19.[5] Moreover, vaccines were less effective to individuals with obesity. These facts emphasize the importance of obesity management. To reach patients during lockdown, the WHO recommended adopting telehealth as a form of care.[7] Telehealth has been evaluated to be an important healthcare tool while keeping patients and health providers safe during the COVID-19 outbreak.[8]

Telehealth is a concept in which telecommunication and information technologies are applied to provide healthcare services to people in remote or secluded areas.[9] In practice, a healthcare provider communicates with the client using any means of telecommunication, such as telephone calls, text messages, or video conferences. According to a study by Desilva and Vaidya, the use of telehealth in pediatric obesity care is growing due to the sharp decline in follow-ups to weight management clinics after the first and the second visit, about 47% and 76%.[10] For these reasons, telehealth may address attrition rates and provide remote health care. People with obesity found that telehealth improved their physical fitness and quality of life while being safe and viable for most.[11]

Therefore, this study aimed to summarize the use of telehealth in increasing physical activity levels. The formats and strategies used in telehealth were also identified to guide future telehealth care for the obese cohort.

METHODS

Search Strategy

The literature search was conducted using keywords and Boolean operators (AND, OR NOT, or AND NOT) to expand or specify the result. The search was conducted through CiNAHL, MEDLINE, and PUBMED, from August to September 2021 with the following keywords:

1. Population/problem is Overweight OR obese OR obese OR fat OR unhealthy weight OR high BMI
2. Intervention using Telehealth OR Telemedicine OR Telemonitoring OR Telepractice OR Telenursing OR Telecare
3. The outcome desired is Physical Activity OR Physical Fitness OR Physical Exertion

Selection Criteria

Studies were selected using the following inclusion criteria:

1. Patients aged 35–70
2. BMI ≥25 kg/m^2 (obese or overweight)
3. Telehealth or synchronous video
4. Contains clear physical activity parameters
5. Publication in English
6. Years of publication 2017–2021.

Exclusion criteria were: (1) not overweight/obese patients, (2) not discussing physical activity, and (3) the paper was not written in English.

Critical Appraisal

The included papers were appraised using the JBI critical appraisal tools form for Randomized Control Trials by two authors (TM and TK). Any disputes during critical appraisal were solved by a discussion with a third author (AD). An article was found eligible if it met the six criteria below:

1. True randomization is done
2. Allocation for the intervention group is concealed
3. Participant's conditions are similar to the baseline
4. The assessor is blind to the treatment assignment
5. Two groups are treated the same
6. Within the group, the result can be found in the article

Data Extraction Method

Data were extracted using the modified JBI Data Extraction Form for Experimental/Observational Studies. Information about the study sample size, baseline characteristics, interventions, and outcomes were extracted. The mean and standard deviation of the data were transformed into standardized mean differences using the formula from the Common Language Effect Size by McGraw & Wong, 1992.[12]

RESULTS

The search strategy resulted in 652 articles that met the inclusion criteria. The titles and abstracts were screened, resulting in 96 articles found eligible. The full texts of the 96 articles were screened, and 83 articles were excluded. Finally, 13 papers were critically appraised. In the end, five articles were reviewed (Figure 1).

Study Characteristics

The five studies were all randomized control trial studies. The oldest study was published in 2017 and the most recent was published in 2021 (Table 1). Two studies were conducted in the U.S., two in Australia, and one in Europe; none of the studies were conducted in Africa or Asia (Table 2).

Participant Characteristics

Five studies were reviewed with a total of 590 participants. Most of the participants were classified as obese with a mean BMI of 36.64. Most of the participants were female (n = 383).

Interventions

All of the articles reviewed used synchronous and asynchronous interventions (hybrid). Mobile applications for self-reporting, text messages, or motivational notifications

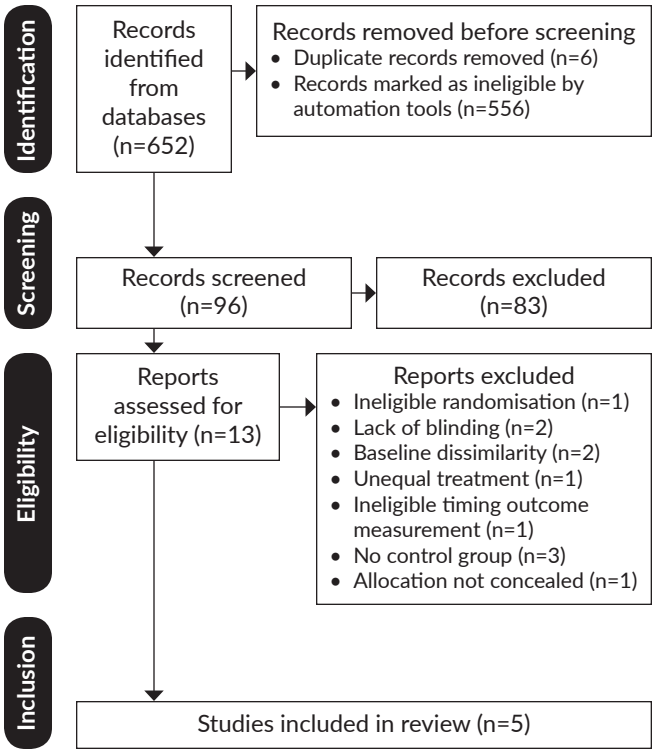

Figure 1. PRISMA chart.

were widely used. One article used phone calls (synchronous). Another used synchronous and asynchronous forum discussions. Health professional-delivered individualized interventions were the most common delivery method. Interventions all targeted behavioral changes.

Measurements

Physical activity was quantified in several methods: four out of five articles used steps/days (as measured by accelerometers and pedometers), while two out of five used the number of moderate to vigorous physical activities per week (Moderate-to-vigorous Physical Activity [MVPA] as measured by self-reporting methods using mobile applications).

Follow-up

The longest intervention period was six months, while the longest follow-up time after intervention was nine months. Two articles conducted examinations at baseline, after three months of intervention, and after three months of follow-up (Table 2).

Table 1. Characteristics of the included studies

Year	Authors	Study design	S/P (n)	BMI	Diagnosis	Telehealth	Control	Assessment Tool	Outcome
2019	Lewis, Emily [13]	RCT	T : 61 I : 32 C : 29	49.7 (37.5–79.2)	Overweight/ obesity	Telephone calls and motivational text messages were provided as an additional intervention for OMS care	Standard OMS care; including lifestyle change strategies.	SenseWear Pro3 Armband Mini	Steps/day
2020	Duncan, Mitch J [14]	RCT	T : 116 I : 80 (Traditional = 41; Enhanced = 39) C : 36	31.7 (3.9)	Overweight/ obesity	Pooled intervention groups (traditional; enhanced) were given access to the m-Health app to set goals and self-monitor target behaviour	Were asked to maintain weight, level of physical activity, and dietary intake.	Fitbit activity trackers (mobile application) and Accelerometer	MVPA
2017	Thomas, J. Graham [15]	RCT	T : 271 I : 185 (WWO = 94; WWO + AL=91) C : 86	33.9 (3.7)	Overweight/ obesity	Participants were given access to the application to set up individual goals on PA activity, food intake, etc. For WWO+AL, participants were given another device to automatically record PA entries.	General behavioural change education is given by newspaper	Computer application and ActiveLink (SenseWear Armband)	MVPA
2019	Hernández-Reyes, Alberto [16]	RCT	T : 67 I : 35 C :32	BMI IG = 32.34 ± 4.28	Overweight/ obesity	Participants were given an explanation about physical activity goals and given notifications through mobile app about health tips	Participants were given explanations and recommendation about physical activity goals	Pedometers	Steps
2021	Eisenhauer, Christine M. [17]	RCT	T : 80 I : 40 C : 40	35.59 ± 6.91	Overweight/ obesity	Participants were assigned to the premium version of an application to personalized goals and engaged in discussion forums also given motivational text messages.	Participants were assigned to the basic version of the same mobile app.	LoseIt! (smartphones application)	Steps (days/ week)

RCT – Randomized Controlled Trial

Table 2. Descriptions of telehealth intervention for adults with obesity

Year	Authors	Study	Tidier Checklist							Results
			Telehealth		Dosage	Setting	Format	Providers	Follow-up	
			Model	Modality						
2019	Lewis, Emily [13]	RCT	Hybrid	Telephone, text messages, self-monitor using paper/ mobile application	3 messages each week, telephone provided monthly	Canberra, Australia	Individual	Health Professionals	Baseline, 4 months of intervention, followed up 4 months after the intervention	874 steps/week, mean change [95% CI] = 874 [84; 1663]) at 4 months
2020	Duncan, Mitch J [14]	RCT	Hybrid	Mobile application, email, SMS, and handbook	Self-monitored through application minimum 4-7 days/week	Australia	Individual	Health Professionals	Baseline, 6 months of intervention, followed up 6 months after the intervention	MVPA at 6 months (mean change [95% CI] = 69.98 (61.54, 78.42)
2017	Thomas, J. Graham [15]	RCT	Hybrid	Mobile application, text messages	-	United States	Individual	Weight Watcher International	Baseline, 3 months of intervention, followed up 9 months after the intervention	MVPA at 3 months (mean change [95% CI] = 7.6 [0.5 to 14.8])
2019	Hernández-Reyes, Alberto [16]	RCT	Hybrid	Mobile application, notifications	Daily	Andalusia	Individual	-	Baseline, 3 months of intervention, followed up 3 months after the intervention	8179.77 average daily step [SD ± 1815.66] at 3 months
2021	Eisenhauer, Christine M. [17]	RCT	Hybrid	Mobile application (synchronous) and forum discussion, SMS (asynchronous)	Daily	United States	Individual	Health professional (nurse and trained physical moderator)	Baseline, 3 months of intervention, followed up 3 months after the intervention	Average 6.87 (0.41) days/ week of physical activity at 3 months

RCT – Randomized Controlled Trial

The Effect of Telehealth on Physical Activity in Adults with Obesity

The included studies evaluated the effects of telehealth from three to 12 months. In four studies, activity levels were evaluated with a pedometer (SenseWear Armband or Fitbit).[15–17] This study used the interval of effects sizes by Lenhart & Lenhart.[18] In three studies, step counts were evaluated as a parameter of physical activity level. Two studies found that telehealth moderately improved physical activity in overweight and obese adults (LoseIt App *d* = 0.523, 95% CI = -0.357–0.52) favoring the telehealth group, while one study found large positive effects (Pedometer *d* = 0.918, 95% CI = 1.467– 2.464) after three weeks.[16,17] The positive effects were generally maintained up to the sixth month of intervention (LoseIt App *d* = 0.608, 95% CI = -0.055–0.83; Pedometer *d* = 0.88, 95% CI = -2.219– -1.107).[14,16,17] Telehealth had medium to large effects in increasing the daily step count in overweight and obese adults.

MVPA levels were evaluated in two studies.[14,15] Overall, the studies reported that telehealth moderately increased physical activity in overweight and obese cohorts in the third month (SenseWear ArmBand *d* = 0.533, 95% CI = -0.177–0.409) and sixth month (Fitbit *d* = 0.509, 95% CI = -0.36–0.427) favoring the telehealth group. This effect was generally maintained until the 12th week of intervention (Fitbit *d* = 0.523, 95% CI = -0.312–0.475; SenseWear ArmBand *d* = 0.557; 95% CI = -0.091–0.5) favoring the telehealth group. Overall, telehealth had medium positive effects on improving MVPA in overweight and obese adults.

Other parameters were also used to evaluate physical activity in three studies.[13-15] One study found small positive effects of telehealth to enhance energy expenditure in an eight-week telehealth program (SenseWear *d* = 0.446) favoring the telehealth group.[15] Duncan et al. found medium positive effects of telehealth in decreasing overall sitting and sedentary time of the participants (Fitbit *d* = 0.513, 95% CI = -0.441–0.346) favoring the telehealth group.[14] In addition, a study by Eisenheur found medium positive effects to increasing weekly activity levels (Lose-It! App *d* = 0.603, 95% CI = -0.074–0.81) favoring the telehealth group.[17] Overall, these medium positive effects were maintained until the 12th week of the program.[13,14,17]

Dosages of Telehealthcare for Adults with Obesity

Overall, the prescribed telehealth programs lasted between six to 12 months consisting of dietary or weight monitoring and education or consultation from either a nutritionist, nurse, or trained physical instructor. The education was conducted in the form of a one-hour seminar about healthy behavior followed by a 10- to 30-minute

consultation which included motivational interviewing, goal setting, problem-solving, stimulus self-control, and self-reinforcement. Most of the monitoring methods used mobile applications or trackers such as Fitbit, giving real-time records. Feedback on the recorded data was given to the participants after four to five days, weekly.

Factors Influencing the Successful Telehealthcare

Text messages, motivational and intervention notifications, and synchronous forum discussions help patients engage by increasing motivation and creating an impression of concern for participants.[14,16,17] One article mentioned that the reduction in weight at the beginning of the intervention increased the participant's engagement in the intervention. Insignificant results may be attributed to the burdensome nature of self-reporting features in the application and a good recorded baseline condition.[13] One article stated that the physical activity tracker did not improve behaviors.[15] Only one article discusses the feasibility of mobile applications.[17]

DISCUSSION

This literature review aimed to explore the use of telehealth to improve physical activity levels in individuals with obesity. Five studies were included as they met predetermined quality criteria of the critical appraisal process to have a low risk of bias. Four studies that used mobile/online apps for healthy behavior as a modality showed medium to large positive effects of telehealth to increase physical activity.[14-17] Two studies found medium positive effects of telehealthcare to improve MVPA.[14,15] Other physical activity outcomes such as energy expenditure, sedentary/sitting time, and weekly activity level, telehealth care showed medium positive effects.[15-17] Overall, positive effects were maintained until the end of the study period (8th–12th weeks).

Our findings support telehealth as an effective method of care to improve physical activity levels in individuals with obesity. We also found that physical activity levels were maintained until the end of the study period. These findings were supported by a systematic review evaluating telehealth in other metabolic disorders.[11,19]

The positive effects of telehealth in our findings were possibly a result of better adherence to telehealth and sustained behavioral changes. This was supported by a systematic review evaluating telehealth in individuals with chronic heart disease by Rawstorn et al.[19] That study explained that telehealth could break through the limitations in physical activity participation, thus providing more opportunities to exercise with home-based and personalized interventions. Particularly, telehealth could meet the needs and preferences of the participant, leading to better adherence and outcomes.

Our findings also supported the use of mobile applications to improve physical activity levels in people with obesity. This finding was supported by a systematic review that found that participants' positive perceptions and attitudes toward the mobile application encouraged healthy behavior.[20] The review also suggests that the developers could research the user's needs and promote the application marketing.[20]

There are several limitations to our study. We did not conduct a meta-analysis due to the heterogeneity of the included evidence. Only a small number of studies were included in this review, and these leaned heavily on the use of mobile applications. Thus, the conclusion on the overall use of telehealth was limited.

CONCLUSION

Telehealth was effective in improving daily and weekly physical activity levels, increasing MVPA levels, and decreasing sitting/sedentary time. The positive effects of telehealth were maintained until the 8th to 12th weeks. The use of mobile applications to promote healthy behavior and encourage higher physical activity goals was effective. Adherence and successful behavioral change would lead to better physical activity outcomes in individuals with obesity. Further studies evaluating telehealth with video conference and hybrid formats are needed.

Statement of Authorship

All authors certified fulfillment of ICMJE authorship criteria.

Author Disclosure

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