

Nutrition and Physical Activity: Digital Health and Telephone Interventions to Increase Healthy Eating and Physical Activity among Students at Institutions of Higher Education

Community Preventive Services Task Force Finding and Rationale Statement Ratified July 2021

Table of Contents

Context.....	2
Intervention Definition	2
CPSTF Finding.....	3
Rationale	3
Basis of Finding	3
Additional Physical Activity and Dietary Outcomes.....	4
Additional Outcomes of Interest.....	4
Applicability and Generalizability Issues.....	5
Data Quality Issues.....	6
Other Benefits and Harms.....	6
Considerations for Implementation.....	6
Evidence Gaps	6
References	7
Disclaimer.....	8

CPSTF Finding and Rationale Statement

Context

Poor diet and inadequate physical activity are well established risk behaviors for obesity, cardiovascular disease, cancer, and diabetes mellitus (Ford et al., 2012; Lloyd-Jones et al., 2010; U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2015; U.S. Department of Health and Human Services, 2018). These risk behaviors often cluster (Fine et al., 2004; Gillman et al., 2001), which creates an opportunity to intervene on multiple risk behaviors simultaneously (Spring et al., 2012).

Many behavioral interventions that address poor diet and physical inactivity use a combination of self-monitoring and goal setting, which are both based on behavioral theory (Burke et al., 2011). Participants record their dietary intake and physical activity to self-monitor and increase their awareness of these behaviors and set clear, measurable goals for themselves (Foster et al., 2005). Because self-monitoring and goal setting are intervention approaches that include recording information, they are often used in digital health interventions (Coons et al., 2012). Over the past decade, the use of digital devices such as computers, smartphones, and tablets to foster or support behavior change has steadily increased (Michie et al., 2018).

Internet use among young adults is nearly universal (Pew Research Center, 2021), and over 40% of young adults attend an institution of higher education (National Center for Education Statistics, 2020). Institutions of higher education offer educational programs that students complete to be awarded a degree (i.e., associate, baccalaureate, graduate, or professional), achieve full credit toward a degree, or gain academic training for gainful employment (U.S. Government Publishing Office, 2001; U.S. Government Publishing Office, 2011).

Intervention Definition

Digital health and telephone interventions to increase healthy eating and physical activity aim to support students at institutions of higher education who are interested in improving these behaviors. Interventions are delivered through websites, mobile apps, text messages, or email, or by one-on-one telephone calls.

Interventions include educational information, plus one or more of the following:

- Coaching or counseling from a professional or trained peer who provides personalized assistance related to eating or physical activity behaviors, or weight
- Self-monitoring to record eating or physical activity behaviors, or weight
- Goal setting related to eating or physical activity behaviors, or weight
- Computer-generated feedback that provides tailored information based on performance (i.e., prompts, meeting goals, and adherence)

Interventions also may include one or more of the following:

- Social support from peers through social media, internet forums, or discussion groups
- Motivational strategies that include incentives, rewards, and gaming techniques

CPSTF Finding (July 2021)

The Community Preventive Services Task Force (CPSTF) recommends digital health and telephone interventions that are implemented at institutions of higher education and focus on improving healthy eating and physical activity among students who are interested in improving these behaviors. Sufficient evidence of effectiveness shows these interventions lead to meaningful increases in fruit and vegetable intake, decreases in fat intake, and improvements or maintenance of weight status. Students who meet or exceed recommended levels of physical activity at baseline (U.S. Department of Health and Human Services, 2018) maintain their activity levels. There were too few studies, however, to determine whether interventions increase physical activity among students who do not meet recommended levels at baseline.

The CPSTF also recommends digital health interventions to increase healthy eating and physical activity among adults interested in improving these behaviors in both [community-based](https://www.thecommunityguide.org/findings/nutrition-and-physical-activity-community-based-digital-health-and-telephone-interventions-increase-healthy-eating-and-physical-activity) [https://www.thecommunityguide.org/findings/nutrition-and-physical-activity-community-based-digital-health-and-telephone-interventions-increase-healthy-eating-and-physical-activity] and [worksite settings](https://www.thecommunityguide.org/findings/nutrition-and-physical-activity-worksite-digital-health-and-telephone-interventions-increase-healthy-eating-and-physical-activity) [https://www.thecommunityguide.org/findings/nutrition-and-physical-activity-worksite-digital-health-and-telephone-interventions-increase-healthy-eating-and-physical-activity].

Rationale

Basis of Finding

The CPSTF recommendation is based on evidence from a systematic review of 17 studies with 18 arms (search period: January 2009 – February 2021).

A team of specialists in systematic review methods and subject matter experts synthesized select physical activity (e.g., time spent in physical activity), dietary (e.g., fruit and vegetable intake), weight-related (e.g., Body Mass Index [BMI]), and clinical outcomes (e.g., cholesterol) to assess intervention effectiveness. Many of the included studies reported multiple physical activity, dietary, weight-related, and clinical outcomes.

Evidence from the seventeen included studies showed interventions increased fruit and vegetable intake, decreased fat intake, and improved or maintained weight. See results in the Table. Interventions did not demonstrate meaningful changes in physical activity, sedentary time, sleep, or clinical outcomes, as described below. Students used instruments with demonstrated validity and reliability for this population to self-report their dietary and physical activity behaviors.

Table. Intervention Effects on Dietary and Physical Activity Behaviors and Weight-related Outcomes

Outcome	Studies (Arms)	Effect	Direction of Effect
Dietary Behaviors			
Fruit and Vegetable Intake	12 studies (13 arms)	Median: 0.40 servings/day, (Range: 0.18 to 0.74 servings/day; 9 studies, 10 arms) 3 studies could not be calculated in median: 2 of 3 studies were favorable	Favors the intervention
Fat Intake	5 studies (6 arms)	All studies were favorable	Favors the intervention

Outcome	Studies (Arms)	Effect	Direction of Effect
Physical Activity Behaviors			
Total Time Spent in Physical Activity	10 studies (11 arms)	Median: participants meeting or exceeding recommended physical activity levels at baseline: Median relative increase: 3.74% (IQI: -58.58 to 13.24%)	Favors the intervention
	1 study	Median: participants below recommended physical activity levels at baseline: Relative increase: 17.27%	Too few studies
Weight-related			
Body Mass Index	4 studies* (4 arms)	Median: study categorized as overweight at baseline**: -0.20 kg/m ² (Range: -0.43 to 0.02 kg/m ² 3 studies, 3 arms) 1 study that reported no change could not be calculated in median	Favors the intervention
	7 studies* (7 arms)	Median: study categorized as healthy weight at baseline: 0.0 kg/m ² (IQI: -0.28 to 0.10 kg/m ²)	Favors the intervention
Weight	4 studies	Median: study categorized as healthy weight at baseline: 0.0 kg/m ² (IQI: -0.28 to 0.10 kg/m ²)	Favors the intervention

* One study had two arms: one arm was in overweight at baseline and one arm was in healthy weight at baseline

** Studies were categorized as healthy weight or overweight based on baseline median BMI. Studies categorize in the overweight category likely included participants with obesity and healthy weight, and studies categorized in the healthy weight category likely included participants with overweight or obesity. Most studies excluded participants who were underweight

Additional Physical Activity and Dietary Outcomes

Five studies reported on sugar intake; two were favorable; two showed no change; and one was unfavorable. Four studies (5 arms) reported on whole grain or fiber intake; three arms were favorable: one arm showed no change; and one arm was unfavorable. Three studies reported energy intake; two were favorable, and one was unfavorable. One study reported overall diet quality and was favorable.

In addition to the studies reported in the table, five studies reported on different measures of physical activity; one was favorable; three showed no change; and one was unfavorable.

Five studies reported sedentary time per week. Of these, four studies reported a median increase of 18.0 minutes/day in total sitting or sedentary time (range: -54.0 to 43.8 minutes/day). The remaining study reported an increase in TV and leisure computer use.

Additional Outcomes of Interest

Three studies reported on perceived stress; two were favorable, and one was unfavorable. Two studies that reported health status showed no change. One study (2 arms) reported on body dissatisfaction; one arm was favorable, and one

arm was unfavorable. One study reported eating competence with an unfavorable finding. One study reported a reduction in emotional eating. One study reported improvements in mindful eating and reductions in uncontrolled and emotional eating.

Three studies reported on sleep, and all reported favorable findings.

Two studies (3 arms) reported prevalence of overweight or obesity; one arm was favorable; one arm showed no change; and one arm was unfavorable.

Two studies reported results for additional clinical outcomes, including changes in systolic blood pressure, diastolic blood pressure, total cholesterol, and glucose. Results were favorable for diastolic blood pressure, total cholesterol, and glucose, and there was no change for systolic blood pressure.

Applicability and Generalizability Issues

Based on evidence from the systematic review, this finding should be applicable to all students at institutions of higher education who are interested in improving these health behaviors.

Included studies were conducted in the United States (14 studies), Australia (1 study), and the United Kingdom (2 studies). Most studies were conducted at institutions of higher education offering baccalaureate, graduate, or professional degrees; one was conducted in an institution of higher education offering an associate's degree or other two year training program; and one was conducted at a vocational institution of higher education. The majority of studies were conducted at public institutions (13 studies). No studies were conducted in historically Black or Hispanic-serving colleges or universities, or tribal institutions of higher education. Of the six studies (7 arms) that reported whether students commuted or lived on campus, four reported more than half of students lived on campus; one reported nearly half the students lived on campus; and one reported all students commuted. Studies did not routinely report population density, with the exception of three studies conducted in urban populations and one study conducted in a rural population.

Across all studies, participants had a mean age of 19.7 years (IQR: 18.8 to 20.9 years). Studies reported higher proportions of females than males (on average, 69% were female).

Three studies reported socioeconomic status (SES). One study took place at a vocational school geared toward low-income students; one was conducted at a two-year college that reported 67.9% of students made less than \$12,000 per year; and one came from a four-year university that reported 33% of participants were Pell-grant eligible (U.S. Department of Education, 2021) and 37% of participants did not feel they always had enough money to buy food.

Six of the studies from the United States reported racial and ethnic distributions. Studies included participants self-identified as White (median 64.8%; 14 studies), Black or African American (median 14.6%; 14 studies), Hispanic or Latino (median 6.0%; 10 studies), Asian (median: 10.8%; 9 studies), American Indian or Alaska Native (0.8%; 1 study), Native Hawaiian or Other Pacific Islander (0.4%; 1 study), or other race/ethnicity (median 10.3%; 5 studies).

Intervention duration ranged from 1 to 24 months, with a median duration of 2.5 months. Baseline dietary and physical activity behaviors varied. For example, participants in four studies exceeded the dietary guidelines at baseline while participants in six studies did not meet them. Additionally, participants in twelve studies exceeded the Physical Activity Guidelines for Americans (U.S. Department of Health and Human Services, 2018) at baseline. Baseline weight status also

varied. Five studies reported a mean BMI that indicated participants had overweight or obesity, and seven studies reported a mean BMI that indicated participants were of a healthy weight.

Data Quality Issues

Study designs included randomized controlled trials (16 studies, 17 arms) and other controlled trials (1 study).

The most common study limitations, according to Community Guide quality scoring methods, were lack of description, loss to follow-up, and bias. While studies did not report challenges with recruitment, six studies reported attrition greater than 20%. Results did not differ by loss to follow-up.

Other Benefits and Harms

CPSTF noted the convenience of digital health as a channel for intervention delivery.

CPSTF identified increased risk of injury from increased physical activity as a potential harm. Programs may reduce this risk by helping participants select appropriate activities. None of the included studies reported musculoskeletal injuries.

Considerations for Implementation

The following considerations for implementation are drawn from studies included in the evidence review, the broader literature, and expert opinion, as noted below. It is important to note that these interventions were conducted among students at institutions of higher education; therefore, students outside of institutions of higher education may not benefit to the same degree. The CPSTF does not endorse any specific digital health intervention.

- Implementers may want to tailor the intervention based on gender, race/ethnicity, health literacy, urbanicity (rural vs. urban), or other student characteristics.
- Interventions may be implemented by various student services within institutions of higher education (e.g., student life, housing, dining, student health centers).
- If access to technology is an issue, programs may encourage students to use computer labs on campus, as one study did. While technology is constantly evolving, existing technology continues to work for these interventions (e.g., laptops, tablets, smartphones, telephone, websites, apps).
- Implementers may want to consider the food environment (e.g., policies in place for types of food offered), built environment (e.g., places for physical activity), and safety (e.g., adequate lighting on walkways).
- Data security and privacy issues need to be considered when individuals enter personal information electronically.
- Digital health is rapidly evolving. Newer digital health interventions, such as those that incorporate social media platforms, were not represented in this body of evidence.

Evidence Gaps

The CPSTF identified several areas that have limited information. Additional research and evaluation could help answer the following questions and fill existing gaps in the evidence base.

- How effective are these interventions when implemented at historically Black, or Hispanic-serving colleges or universities, or tribal institutions of higher education?
- How effective are these interventions when implemented at institutions of higher education with a high proportion of nontraditional students, such as 2-year institutions of higher education or vocational schools?
- Does effectiveness differ by students' housing (on or off campus)?

- How effective are these interventions when implemented at institutions of higher education with existing healthier food policies?
- Does perceived safety of campus environment affect participation in these interventions?
- Are these interventions effective in rural areas? One study was conducted in a rural location.
- How effective are interventions among students with food insecurity? Only one study reported whether participants had enough money to buy food.
- Does effectiveness differ by gender or race or ethnicity?
- Does effectiveness differ by health literacy level?
- How effective are these interventions among students with low baseline levels of physical activity?
- Does effectiveness differ by baseline weight status?
- Do objective measures of physical activity corroborate these results?
- What are the effects of incorporating wearable devices?

References

Burke LE, Wang J, Sevick MA. Self-monitoring for weight loss: a systematic review of the literature. *J Am Diet Assoc* 2011;111(1):92-102.

Coons MJ, DeMott A, Buscemi J, Duncan JM, Pellegrini CA, et al. Technology interventions to curb obesity: a systematic review of the current literature. *Curr Cardiovasc Risk Rep* 2012;6(2):120-34.

Fine LJ, Philogene GS, Gramling R, Coups EJ, Sinha S. Prevalence of multiple chronic disease risk factors: 2001 National Health Interview Survey. *Am J Prev Med* 2004;27(2)(suppl):18-24.

Ford ES, Bergmann MM, Boeing H, Li C, Capewell S. Healthy lifestyle behaviors and all-cause mortality among adults in the United States. *Prev Med* 2012; 55(1):23-7.

Foster GD, Makris AP, Bailer BA. Behavioral treatment of obesity. *Am J Clin Nutr* 2005 Jul;82(1 Suppl):230S-5S.

Gillman MW, Pinto BM, Tennstedt S, Glanz K, Marcus B, et al. Relationships of physical activity with dietary behaviors among adults. *Prev Med* 2001; 32(3):295-301.

Lloyd-Jones DM, Hong Y, Labarthe D, Mozaffarian D, Appel LJ, et al; American Heart Association Strategic Planning Task Force and Statistics Committee. Defining and setting national goals for cardiovascular health promotion and disease reduction: the American Heart Association's strategic Impact Goal through 2020 and beyond. *Circulation* 2010;121(4):586-613.

Michie S, Yardley L, West R, Patrick K, Greaves F. Developing and evaluating digital interventions to promote behavior change in health and health care: recommendations resulting from an international workshop. *Journal of Medical Internet Research* 2018;19 (6):e232

National Center for Education Statistics. Digest of education statistics, 2020. Date Accessed 7/2/2021. Available at: https://nces.ed.gov/programs/digest/d20/tables/dt20_302.60.asp.

Pew Research Center. Internet/Broadband Fact Sheet, 2021. Date Accessed 7/2/2021. Available at: <https://www.pewresearch.org/internet/fact-sheet/internet-broadband/>.

Spring B, Schneider K, McFadden G, Vaughn J, Kozak AT, et al. Multiple behavior changes in diet and activity: a randomized controlled trial using mobile technology. *Arch Intern Med* 2012;172(10):789-96.

U.S. Department of Education. Federal Pell Grants. Date Accessed 7/19/2021. Available at: <https://studentaid.gov/understand-aid/types/grants/pell>

U.S. Department of Health and Human Services. Physical Activity Guidelines for Americans, 2nd edition. Washington, DC: U.S. Department of Health and Human Services; 2018.

U.S. Department of Health and Human Services and U.S. Department of Agriculture. 2015–2020 Dietary Guidelines for Americans. 8th Edition. December 2015. Date Accessed 12/14/2020. Available at <http://health.gov/dietaryguidelines/2015/guidelines/>.

U.S. Government Publishing Office. 20 U.S.C. 1001 - General definition of institution of higher education, 2011. Date Accessed 7/2/2021. Available at: <https://www.govinfo.gov/app/details/USCODE-2011-title20/USCODE-2011-title20-chap28-subchapl-partA-sec1001>.

U.S. Government Publishing Office. 34 CFR 600.1 – Scope, 2001. Date Accessed 7/2/2021. Available at: <https://www.govinfo.gov/app/details/CFR-2001-title34-vol3/CFR-2001-title34-vol3-sec600-1>.

Disclaimer

The findings and conclusions on this page are those of the Community Preventive Services Task Force and do not necessarily represent those of CDC. Task Force evidence-based recommendations are not mandates for compliance or spending. Instead, they provide information and options for decision makers and stakeholders to consider when determining which programs, services, and policies best meet the needs, preferences, available resources, and constraints of their constituents.

Document last updated February 1, 2022