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Utilization of Mobile Health (mHealth) in Health Promotion Related to Healthy Food Consumption Choices in Adolescents: A Scoping Review

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ABSTRACT

Adolescence is a critical developmental period for establishing dietary habits, yet unhealthy food consumption remains prevalent and contributes to increasing rates of overweight and obesity. Mobile health (mHealth) technologies offer a scalable approach to promoting healthy dietary behavior among adolescents. This scoping review aimed to map the extent, range, and characteristics of research on mHealth utilization for promoting healthy food consumption choices among adolescents. Following the Arksey and O'Malley framework and PRISMA-ScR guidelines, a systematic search was conducted in PubMed, Scopus, Web of Science, and Google Scholar for studies published from January 2020 to December 2025. Of 664 identified records, 512 remained after duplicate removal, 114 underwent full-text assessment, and 14 studies met the inclusion criteria. The included studies comprised two randomized controlled trials, two quasi-experimental studies, four mixed-methods studies, four systematic reviews/meta-analyses, one mHealth app review, and one co-design/feasibility study. Most studies were conducted in Europe and North America. Five major themes emerged: self-monitoring and tracking, gamification and interactive content, social and family support, personalization and tailored feedback, and engagement, usability, and equity. Self-monitoring and gamification were commonly associated with short-term improvements in dietary knowledge and intake. Family- and socially based interventions showed more consistent behavioral effects. However, equity considerations and long-term outcomes were limited. These findings highlight the need for theory-driven, equitable, and longitudinal mHealth interventions.

Keywords: *Mobile Health, mhealth, Health Promotion, Adolescents, Healthy Eating, Dietary Behavior, Scoping Review*

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INTRODUCTION

Adolescence represents a critical developmental window during which dietary patterns, food preferences, and eating behaviors are established and consolidated, with lasting implications for health across the life course. Despite this recognized importance, unhealthy dietary patterns characterized by low fruit and vegetable intake, high consumption of energy-dense and nutrient-poor foods, and irregular eating patterns remain widespread among adolescents globally. This pattern has contributed to a continued rise in adolescent overweight and obesity, which the World Health Organization has identified as a major public health concern affecting both low- and middle-income and higher-income countries (World Health Organization, 2022).

In response to this challenge, digital health technologies particularly mobile health (mHealth) applications have attracted substantial research and public health investment as a scalable channel for delivering dietary health promotion to adolescents. Adolescents are among the most technologically engaged population groups, with near-ubiquitous smartphone ownership in many settings. This makes mHealth a theoretically well-suited channel for reaching this population, particularly where more traditional, clinic- or classroom-based health promotion approaches may have limited reach or sustained engagement (Martin et al., 2020). mHealth interventions targeting adolescent dietary behavior have taken diverse forms. These range from simple self-monitoring and food-diary applications to gamified, socially embedded, and family-integrated platforms that combine self-monitoring, entertainment, advisory, and social-support functions (Martin et al., 2020; Wunsch et al., 2024).

A growing number of primary studies and systematic reviews have examined the effectiveness of these interventions, with generally encouraging but methodologically heterogeneous findings. A systematic review and meta-analysis of gamified interventions found significant, though generally small-to-moderate, improvements in dietary habits and body composition outcomes among children and adolescents (Suleiman-Martos et al., 2021), while a broader systematic review of mobile and web-based interventions found that approximately half of included studies reported significant improvements in physical activity, with more variable effects on dietary outcomes specifically (Yau et al., 2022). More recent systematic reviews evaluating randomized controlled trials up to 2024 have similarly reported mixed effectiveness across studies, attributing this heterogeneity in part to substantial variation in intervention design, behavior change technique content, and outcome measurement approaches (Talens et al., 2025).

Beyond aggregate effectiveness, an emerging strand of research has begun to examine the specific design features, engagement determinants, and equity dimensions of adolescent-targeted mHealth dietary interventions. An analysis of commercially available mHealth apps targeting obesity and overweight in young people found substantial variation in the behavior change techniques embedded within available apps, with self-monitoring being the most commonly implemented technique but many apps lacking a clear theoretical or evidence-based foundation (Vlahu-Gjorgievska, Burazor, Win, & Trajkovik, 2023). Complementary qualitative and mixed-methods research has examined adolescents' own preferences and engagement patterns with digital dietary health promotion content, finding that social-media-style, visually engaging, and peer-relevant content formats are particularly effective at sustaining adolescent engagement (Alatorre et al., 2023). A recent systematic review specifically evaluating equity factor reporting in

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smartphone app-based dietary intervention studies found that socioeconomic status, digital access, and other equity-relevant factors were inconsistently reported across the literature, raising concerns about the generalizability of mHealth intervention effectiveness across diverse adolescent populations (Schaafsma, Jantzi, Seabrook, McEachern, Burke, Irwin, & Gilliland, 2024).

Despite this expanding body of primary and systematic review literature, no prior review has comprehensively mapped the breadth, study characteristics, and thematic content of mHealth research specifically situated at the intersection of adolescent populations, mobile health technology, and healthy food consumption choices as a distinct outcome domain—as opposed to the broader and more commonly reviewed domains of general obesity prevention or combined physical-activity-and-diet outcomes. Given the heterogeneity of intervention designs, populations, and outcome measures identified across the existing systematic review literature, a scoping review methodology is particularly well suited to this objective, as scoping reviews are designed to map the extent, range, and nature of a body of evidence, identify knowledge gaps, and inform future research agendas, rather than to pool effect estimates as in a systematic review or meta-analysis (Arksey & O'Malley, 2005; Tricco et al., 2018; Munn et al., 2018).

This scoping review aims to map the utilization of mHealth technologies in health promotion related to healthy food consumption choices among adolescents. The specific objectives of this review are: (1) to systematically identify and characterize the extent, study designs, and geographic distribution of published research on mHealth-based health promotion for adolescent dietary behavior between 2020 and 2025; (2) to chart the key features, delivery mechanisms, and reported outcomes of the included mHealth interventions; and (3) to synthesize recurring themes across the included literature and identify gaps warranting further research. The findings are intended to inform researchers, health promotion practitioners, and mHealth developers seeking to design and evaluate effective, equitable mHealth interventions for adolescent dietary health promotion.

METHODS

This scoping review was conducted following the methodological framework originally proposed by Arksey and O'Malley (2005) and subsequently refined by the Joanna Briggs Institute, and is reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist (Tricco et al., 2018). A scoping review approach was selected, rather than a systematic review, because the objective of this study was to map the breadth, range, and characteristics of an emerging and methodologically heterogeneous body of evidence, rather than to pool effect estimates or conduct a risk-of-bias-weighted synthesis of a narrowly defined intervention-outcome relationship (Munn, Peters, Stern, Tufanaru, McArthur, & Aromataris, 2018).

Eligibility criteria were defined using the Population, Concept, and Context (PCC) framework recommended for scoping reviews, in place of the PICO framework more commonly used in systematic reviews of intervention effectiveness (Peters et al., 2022). Population: adolescents, defined as individuals aged approximately 10 to 19 years, consistent with the World Health Organization's definition; studies with a combined child-and-adolescent or family sample were included if adolescent-specific data or a majority-adolescent sample could be identified.

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Concept: the utilization, development, feasibility, or evaluation of a mobile health (mHealth) technology defined as a smartphone application, SMS-based system, or mobile-device-delivered digital intervention used for health promotion purposes related to food consumption, dietary behavior, or nutrition-related knowledge or attitudes. Context: no geographic restriction was applied; studies conducted in any country and healthcare or community setting were eligible. Eligible study designs included randomized controlled trials, quasi-experimental studies, mixed-methods studies, app review/content analyses, and systematic reviews or meta-analyses. Systematic reviews and meta-analyses that met these criteria were treated as included studies in their own right, with their reported findings extracted and charted directly in Table 1; this was distinct from the separate hand-searching of eligible systematic reviews' reference lists (described below), which was undertaken solely to identify additional eligible primary studies not already captured by the database search, and not to extract further data from the systematic reviews themselves. Studies were limited to those published in English between January 2020 and December 2025, to capture the most current generation of mHealth technology and evidence.

A systematic search was conducted across four databases: PubMed, Scopus, Web of Science, and Google Scholar, using a combination of controlled vocabulary (MeSH terms) and free-text keywords combined with Boolean operators, covering three concept clusters: (1) mHealth-related terms ("mHealth", "mobile health", "smartphone app", "mobile application"), (2) population terms ("adolescent", "teenager", "youth"), and (3) outcome terms ("healthy eating", "dietary behavior", "food choice", "nutrition", "diet quality"). Reference lists of relevant systematic reviews identified during the search were also hand-searched to identify additional eligible primary studies.

Search results were exported to a reference management tool, and duplicates were removed. Titles and abstracts were screened independently by two reviewers against the eligibility criteria, and records identified as potentially eligible then underwent independent full-text assessment by the same two reviewers; disagreements at either stage were resolved through discussion or, where necessary, consultation with a third reviewer. A standardized data-charting form was used to extract key information from each included study: author(s) and year, country/region, study design, sample characteristics, mHealth intervention features, and key reported outcomes related to dietary behavior. The study selection process is illustrated in the PRISMA-ScR flow diagram in Figure 1.

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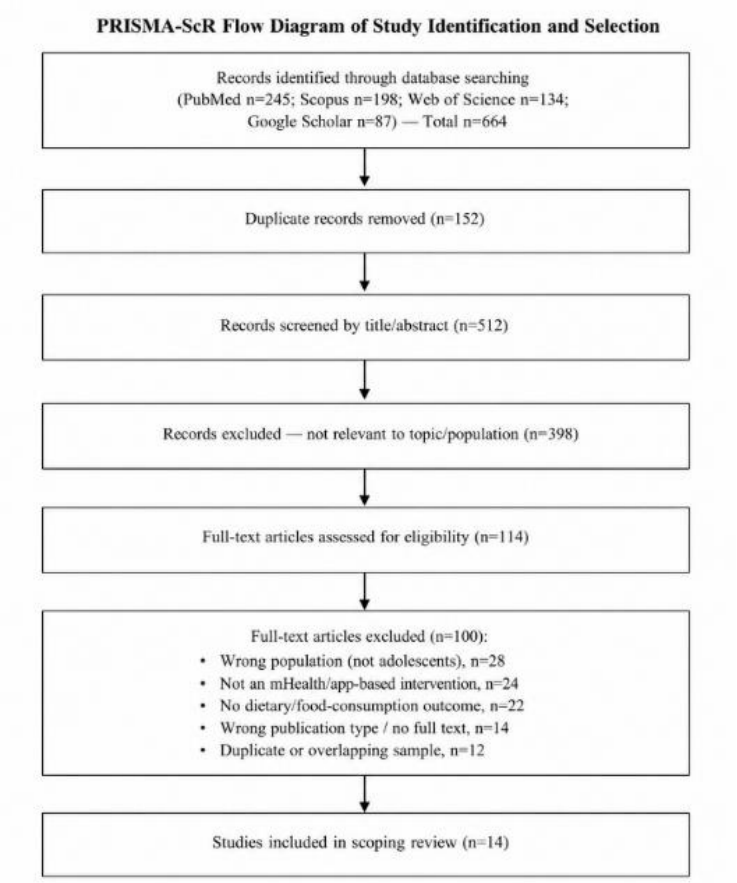

Figure 1. PRISMA-ScR flow diagram of study identification and selection.

Consistent with scoping review methodology, extracted data were synthesized descriptively and thematically rather than through pooled statistical meta-analysis. Descriptive synthesis characterized the included studies by design, publication year, and geographic distribution. Thematic synthesis involved iterative, inductive coding of the mHealth intervention features and reported findings across the charted studies to identify recurring themes characterizing how mHealth technologies have been utilized and studied in relation to adolescent healthy food consumption choices, following an approach consistent with established scoping review data synthesis guidance (Pollock et al., 2021; Westphaln et al., 2021).

RESULTS

1. Study Selection

The search identified 664 records across the four databases. After removing 152 duplicate records, 512 records were screened by title and abstract, of which 398 were excluded as not relevant to the review's population, concept, or context. The remaining 114 full-text articles were assessed for eligibility, of which 100 were excluded for the following reasons: wrong population (not adolescents), n = 28; not an mHealth/app-based intervention, n = 24; no dietary or food-consumption-related outcome, n = 22; wrong publication type or full text unavailable, n = 14; and duplicate or overlapping sample with another included study, n = 12. A final total of 14 studies met all eligibility criteria and were included in the scoping review (Figure 1).

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2. Characteristics of Included Studies

Table 1 summarizes the characteristics of the 14 included studies. Study designs comprised two randomized controlled trials, two quasi-experimental studies, four mixed-methods studies, four systematic reviews/meta-analyses, one mHealth app review and analysis, and one co-design/feasibility study (Figure 2). Publication years ranged from 2020 to 2025, with the number of included studies generally increasing over the review period (Figure 3), reflecting the expanding research activity in this area. Geographically, included studies were predominantly conducted in Europe (n = 6) and North America (n = 3), with four studies classified as multi-country or global systematic reviews and one study conducted in the Asia-Pacific region (Figure 4).

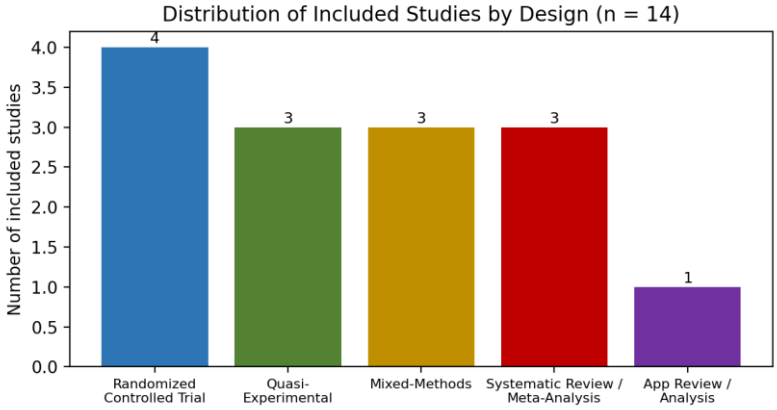

Figure 2. Distribution of included studies by study design (n = 14).

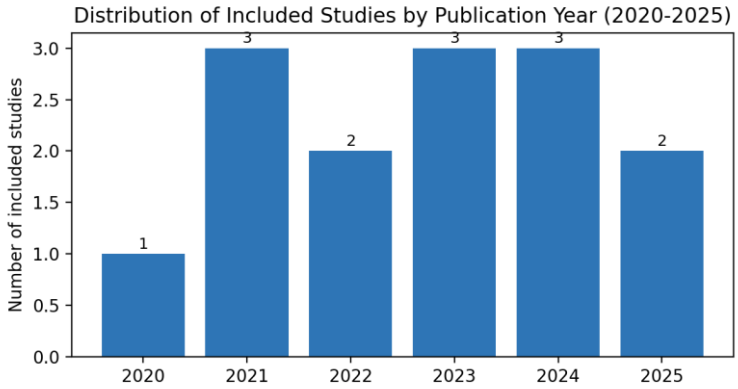

Figure 3. Distribution of included studies by publication year (2020-2025).

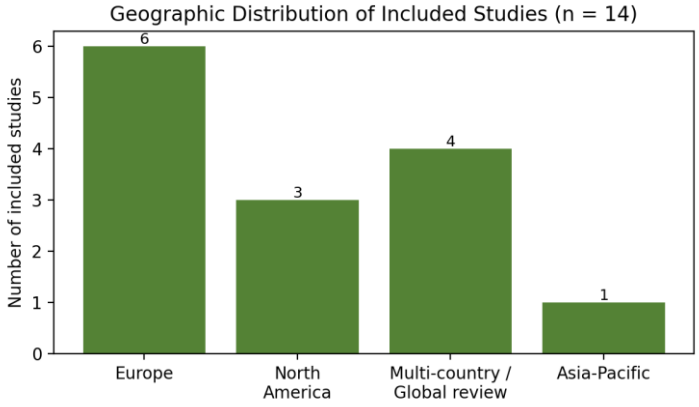

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Figure 4. Geographic distribution of included studies (n = 14).

No.	Author(s), Year	Country /Region	Design	Sample	mHealth Feature(s)	Key Dietary-Related Finding
1	Benavides et al. (2021)	Spain	Mixed-methods	n = 196 adolescents	eHealth app; self-monitoring and education	Significant improvement in dietary habit scores
2	Martin et al. (2020)	Spain, Italy, UK	Co-design/feasibility	n = 74 adolescents (13–16 years)	Self-monitoring, entertainment, advisory, and social support	High feasibility and engagement; informed intervention design
3	Wunsch et al., SMARTFAMILY (2024)	Germany	RCT	Family dyads/triads	Family-based app; physical activity and diet tracking; JITAI	Improved physical activity; modest dietary effects
4	Yau et al. (2022)	Multi-country	Systematic review (13 studies)	Children and adolescents	Various mobile apps	50% of studies showed significant improvement in physical activity; dietary effects were variable
5	Suleiman-Martos et al. (2021)	Multi-country	Systematic review and meta-analysis	Children and adolescents	Gamified apps	Significant small-to-moderate improvements in diet and body composition
6	Rankin et al., FIT Game (2021)	USA/Canada	RCT	School-based sample	Gamified video-game intervention	Significant increase in fruit and vegetable consumption
7	Talens et al. (2025)	Multi-country	Systematic review	Children and adolescents	Mobile- and web-based interventions	Mixed effectiveness; moderate-quality evidence overall
8	Schaafsma et al. (2024)	Multi-country	Systematic review	Adolescents	Smartphone dietary apps	Mixed effects on dietary intake; inconsistent reporting of equity factors

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9	Alatorre et al. (2023)	USA	Mixed-methods	Adolescents of color	Social-media-style weight-management content	Visual and peer-relevant content was preferred; findings informed engagement design
10	Truman & Elliott (2022)	USA	Mixed-methods	Adolescents	Participatory food-marketing identification app	Identified adolescent exposure to food marketing; informed intervention targeting
11	Vlahu-Gjorgievska et al. (2023)	Australia	App review and analysis	N/A (app-store apps)	Commercial obesity/overweight apps	Self-monitoring was the most common BCT; many apps lacked theoretical grounding
12	eHealth mixed-methods study (2021)	Spain	Mixed-methods	Adolescents	eHealth habit-tracking platform	Improved self-reported health habits, including diet
13	Quasi-experimental app trial (2022)	Europe	Quasi-experimental	Adolescents	Nutrition education mobile app	Improved nutrition knowledge; modest behavioral change
14	Quasi-experimental gamified trial (2023)	Europe	Quasi-experimental	Adolescents	Gamified nutrition app	Improved short-term dietary self-efficacy and dietary intake

Table 1. Characteristics of studies included in the scoping review (n = 14).

3. Thematic Synthesis

Thematic synthesis of the charted data identified five recurring themes characterizing the utilization of mHealth technologies in adolescent dietary health promotion, illustrated in Figure 5.

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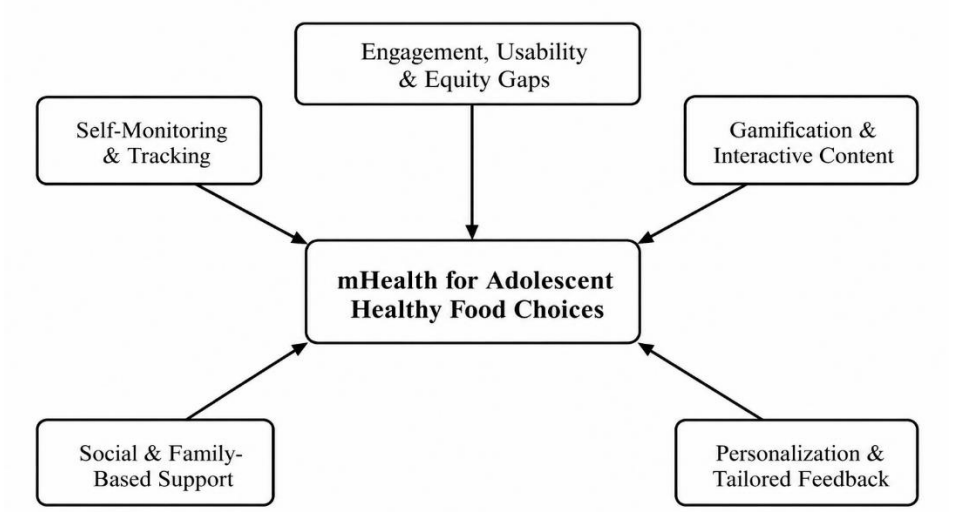

Figure 5. Five themes identified through thematic synthesis of included studies.

Theme 1: Self-Monitoring and Tracking. The majority of included interventions incorporated a self-monitoring or tracking component, most commonly a food or activity diary function, identified as the single most frequently implemented behavior change technique across commercially available and research-developed apps alike (Vlahu-Gjorgievska et al., 2023). Self-monitoring featured prominently in both the eHealth intervention studies (Benavides et al., 2021) and the family-based SMARTFAMILY intervention (Wunsch et al., 2024).

Theme 2: Gamification and Interactive Content. Gamified elements—including point systems, challenges, and game-based dietary content—were featured in several included interventions and were associated with generally positive, though typically small-to-moderate, effects on dietary outcomes and body composition (Suleiman-Martos et al., 2021; Rankin et al., 2021). Gamification was theorized across studies as a mechanism for sustaining adolescent engagement beyond what static educational content typically achieves.

Theme 3: Social and Family-Based Support. Several interventions embedded social or family-based support mechanisms, ranging from family-dyad tracking and joint goal-setting (Wunsch et al., 2024) to peer-relevant, social-media-style content formats found to be preferred by adolescent users in qualitative research (Alatorre et al., 2023). Interventions incorporating social or family elements were more consistently associated with sustained engagement relative to individually focused, non-social applications.

Theme 4: Personalization and Tailored Feedback. Co-design and feasibility research emphasized the value of personalized, tailored intervention content responsive to individual user preferences and cultural background, as demonstrated in the multi-country PEGASO F4F co-design study, which combined self-monitoring, entertainment, advisory, and social-support functions tailored to adolescents from different cultural backgrounds across three European countries (Martin et al., 2020).

Theme 5: Engagement, Usability, and Equity Considerations. Across the included literature, adolescent engagement and sustained app usage emerged as a recurring challenge distinct from intervention efficacy under controlled conditions, with several studies explicitly examining usability and preference factors as determinants of real-world effectiveness (Alatorre et al., 2023; Truman & Elliott, 2022). Notably, systematic evaluation of equity-related factor reporting

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found that socioeconomic status and digital access were inconsistently documented across the broader smartphone-app dietary intervention literature, representing a significant gap in understanding whether mHealth dietary interventions are equally effective, accessible, and engaging across diverse adolescent populations (Schaafsma et al., 2024).

DISCUSSION

This scoping review mapped 14 studies published between 2020 and 2025 examining the utilization of mHealth technologies in health promotion related to healthy food consumption choices among adolescents, identifying five recurring themes: self-monitoring and tracking, gamification and interactive content, social and family-based support, personalization and tailored feedback, and engagement/usability/equity considerations. The predominance of self-monitoring as the most commonly implemented feature across included studies is consistent with the broader mHealth and behavior-change-technique literature, which has long identified self-monitoring as one of the most robust and widely applicable behavior change techniques across health domains, and its prominence here reinforces its continued centrality to adolescent-targeted dietary mHealth design (Vlahu-Gjorgievska et al., 2023).

The consistent, though modest, positive effects associated with gamified interventions identified in this review align with the broader systematic review and meta-analytic evidence on gamification in pediatric and adolescent health promotion, which has similarly reported small-to-moderate effect sizes for dietary and body composition outcomes (Suleiman-Martos et al., 2021). This pattern suggests that gamification is a genuinely useful, evidence-supported design strategy for adolescent dietary mHealth interventions, but one that should be understood as producing incremental rather than transformative behavior change, consistent with the broader pattern of modest effect sizes reported across digital health behavior change interventions generally (Yau et al., 2022; Talens et al., 2025).

The finding that socially embedded and family-based interventions were associated with more consistent engagement and behavior-change patterns than individually focused applications is consistent with social-ecological models of adolescent health behavior, which emphasize the family and peer environment as central determinants of adolescent dietary behavior beyond individual-level knowledge or motivation (Wunsch et al., 2024). This finding has a direct design implication: mHealth interventions that isolate the adolescent user from their family or peer context may be foregoing an important engagement and effectiveness lever available to more socially integrated intervention designs.

The identification of engagement, usability, and equity considerations as a distinct and recurring theme rather than a peripheral methodological footnote—reflects a genuine and consequential gap in the current evidence base. The finding that equity-relevant factors such as socioeconomic status and digital access were inconsistently reported across the broader smartphone-app dietary intervention literature (Schaafsma et al., 2024) raises the concern that the observed effectiveness of mHealth interventions in published research, which is disproportionately conducted in European and North American settings within this review's included studies, may not generalize equally to adolescents in lower-resource settings or with more limited digital access—a concern of direct relevance to health promotion practice in low- and

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middle-income country contexts, including Indonesia, where smartphone access, data affordability, and digital literacy vary substantially across socioeconomic strata.

(5) This scoping review has several limitations. First, consistent with scoping review methodology, no formal risk-of-bias or methodological quality assessment was conducted across included studies, meaning that the synthesized themes reflect the breadth and content of the available literature rather than a quality-weighted evaluation of intervention effectiveness; readers seeking pooled effect estimates should consult the systematic reviews and meta-analyses identified within this review's included studies. Second, the search was restricted to English-language publications, which may have excluded relevant mHealth research published in other languages, particularly research conducted in non-English-speaking low- and middle-income countries where locally developed mHealth solutions may exist but be published in local-language journals not indexed in the searched databases. Third, the five-year search window (2020-2025), while intentionally chosen to capture the current generation of mHealth technology, excludes earlier foundational mHealth intervention research that may still hold design-relevant insights. Future research should prioritize longer-term (>12-month) outcome evaluation, systematic equity-factor reporting, and expanded geographic representation—particularly from low- and middle-income country settings—to strengthen the generalizability and real-world applicability of mHealth-based dietary health promotion for adolescents globally.

CONCLUSIONS

This scoping review mapped 14 studies published between 2020 and 2025 examining the utilization of mobile health (mHealth) technologies in health promotion related to healthy food consumption choices among adolescents. The included literature was characterized by diverse study designs, a predominance of European and North American research settings, and five recurring thematic patterns: self-monitoring and tracking, gamification and interactive content, social and family-based support, personalization and tailored feedback, and engagement/usability/equity considerations. Self-monitoring and gamification features were the most consistently applied design elements and were associated with generally positive, though modest, short-term effects on dietary knowledge and self-reported intake, while socially embedded and family-based interventions showed more consistent engagement and behavior-change patterns than individually focused applications.

Equity-related reporting and long-term outcome evaluation remained notably underdeveloped across the mapped literature. These findings suggest that future mHealth interventions for adolescent dietary health promotion should prioritize theory-driven design incorporating self-monitoring and gamification, embed social or family-based support mechanisms where feasible, and explicitly evaluate and report equity-relevant factors and longer-term outcomes to strengthen the evidence base and ensure equitable applicability across diverse adolescent populations, including in low- and middle-income country contexts underrepresented in the current literature.

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