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A Literature Review of Digital Behavioral Parent Training Programs for Parents of Adolescents

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Abstract

Parents of adolescents are faced with a variety of challenges related to their children's behavior and development. Behavioral parent training (BPT) programs may be effective strategies to mitigate adverse childhood experiences (ACEs) and other common behavioral problems in the adolescent period. Adolescence is the period following the onset of puberty and describes the transition from childhood to adulthood. Digital BPTs, including those delivered via the internet, downloaded digital content, text message, tablet, and video call, may present a unique opportunity to reach a broad audience of parents of adolescents by removing barriers to program accessibility (e.g., cost and transportation). We conducted a literature review to synthesize the existing evidence on digital BPTs for parents of adolescents. We described the digital BPTs, study designs, and evaluation and feasibility outcomes. A structured literature search identified studies meeting the following criteria for inclusion: (a) published between January 2000 and October 2022, (b) peer-reviewed, (c) available in English language, (d) study included a description of a digital BPT methodological approach, (e) study had to identify at least one parent or child behavioral outcome (e.g., parent-reported communication with their child) or feasibility outcome associated with the digital BPT, and (f) study included parents of adolescents aged 10–18 years. We extracted data on the characteristics of the study and demographic characteristics of participants, digital BPT, and evaluation and feasibility outcomes. Twenty-eight studies met inclusion criteria. Twenty-two unique digital BPTs were evaluated across the published studies. Thirteen digital BPTs (59.1%) were developed from or grounded by an identified theory. Six digital BPTs were freely accessible by the public, while the remaining 16 were available through study participation or purchase. One

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Conflict of Interest The authors declare no competing interests.

Declarations

Ethics Approval To the authors' knowledge, all studies detailed in this literature review are in accordance with ethical standards as laid down in the 1964 Declaration of Helsinki.

Consent to Participate Not applicable.

CDC Disclaimer The findings and conclusions in this manuscript are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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digital BPT was specifically tailored to parents of adolescents of a racial/ethnic minority group. Of the 16 studies that reported either parent or adolescent race/ethnicity, 10 consisted of more than 50% White parent or adolescent participants. Twenty-four (88.9%) studies provided evaluation data for the digital BPT. Fourteen studies (63.6%) employed a randomized control trial study design, and the remaining study designs included quasi-experimental ($n = 2$), mixed methods ($n = 1$), open trial ($n = 3$), case study ($n = 1$), pretest–posttest design ($n = 1$), and feasibility and acceptability trial ($n = 2$). All studies reported improvements in at least one parent-reported or adolescent-reported behavioral outcome or feasibility outcomes, with effect sizes (Cohen's d) ranging from small (e.g., 0.20–0.49) to very large (e.g., > 1.20). The findings of this review illustrate that technology may be a valuable way to deliver BPTs to parents of adolescents. However, few digital BPTs were developed for parents of adolescents from racial/ethnic minority groups, and many digital BPTs were not available without cost or participation in a research study. Considerations for future research are discussed.

Keywords

Digital; Online; Behavioral parent training programs (BPTs); Adolescents; Parents

Introduction

Adolescence is a period of development marking the transition from childhood to adulthood (Sawyer et al., 2018), and typically includes individuals between the ages of 10 to 19 years (Sawyer et al., 2018; World Health Organization, n.d.). During this time of growth, adolescents may encounter a variety of issues, including substance use, behavioral and conduct problems, and mental health disorders (Centers for Disease Control and Prevention, 2021). Behavioral parent training (BPT) programs may be effective tools to promote positive parenting among parents and caregivers of adolescents (hereafter referred to as “parents”) and encourage healthy family functioning (Lonigan et al., 1998; Lundahl et al., 2006), both of which are protective factors against adverse childhood experiences (ACEs) (Fortson et al., 2016). The CDC defines ACEs as preventable, potentially traumatic events that occur in childhood (0–17 years), such as neglect, experiencing or witnessing violence, and having a family member attempt or die by suicide (Centers for Disease Control and Prevention, 2019). Positive parenting practices and the prevention of ACEs may also prevent future problem behavior as well as future violence perpetration among adolescents when coupled with other supportive factors (Centers for Disease Control and Prevention, 2019).

BPT's most common methodological approaches include behavior modification or relationship enhancement (Schaefer & Breiesmeister, 1989). Most BPTs tend to use a combination of both methods, focusing on training parents in the skills and knowledge needed to improve child behavior and increase positive parent–child relationships (Cotter et al., 2013; Forehand et al., 2014). BPTs for parents of young children typically focus on increasing parental use of rewards and praise for good behavior, implementing time-outs, and providing effective directions and comments (Kaminski et al., 2008). However, as a child develops, so must parenting practices; therefore, BPTs should consider the child's developmental stage. BPTs for parents of adolescents may be effective at mitigating both

common parenting challenges, such as using appropriate consequences or setting consistent house rules (Cefai et al., 2010; Irvine et al., 2015; Stormshak et al., 2019), and more specific adolescent developmental concerns that involve sexual health, substance use, nutrition, and mental health issues (Schinke et al., 2009b; Scull et al., 2019; Wilson et al., 2014; Yap et al., 2017).

Despite the evidence of the effectiveness of BPTs, accessibility of traditional in-person programs remains an issue, often resulting in attrition of parents in these programs (Nock & Ferriter, 2005). Results from a meta-analysis of BPTs revealed a wide range of attrition rates with some as high as 60%; rates trended higher as the age of children in the program increased (Michael et al., n.d.). Attrition is also disproportionately distributed across parent groups, as higher attrition rates are more common among parents living in rural areas (Smokowski et al., 2018), parents from minority racial or ethnic groups (Danko et al., 2016), and parents living in low socioeconomic conditions (Chacko et al., 2016). Thus, to make BPTs more accessible, many programs were developed for digital delivery (i.e., internet, downloaded digital content, mobile applications, text messaging, video conferencing) to remove barriers, such as cost or transportation. Digital BPTs continue to gain popularity as the internet becomes increasingly accessible and the acceptability of telehealth continues to grow (Perrin, 2015), especially in part due to the COVID-19 pandemic (Garfan et al., 2021).

Digital BPTs for parents of adolescents have the potential to reach broad and diverse audiences. Although reviews of digital parenting programs have been published (Baumel et al., 2017; Corralejo & Domenech Rodríguez, 2018; Florean et al., 2020), reviews focus mostly on digital BPTs for parents of young children (0–12 years) rather than parents of adolescents. This paper seeks to address this gap by reviewing the literature on existing digital BPTs for parents of adolescents ages 10 to 18 years. We excluded parents of adolescents older than 18 years, as many adolescents make the transition to independent living after secondary education. We describe the digital BPTs (i.e., name and description of program, methodological approaches, number of modules, theory used in program development, and whether the digital BPT was freely accessible to the public), participant demographic characteristics (i.e., age range of adolescents, location of sample, parent/adolescent gender, parent/adolescent race and ethnicity, and parent education level), and evaluation components (i.e., study design, sample size, length of follow-up, parent/adolescent outcomes, feasibility outcomes, and attrition rate) of each digital BPT to inform the state of the literature and to identify areas for future research and program development.

Methods

We conducted a literature review with a structured search methodology of digital BPTs for parents of adolescents aged 10 to 18 years. A literature review may include certain elements of a systematic review, such as structured search methods and standardized coding and reporting across studies (Grant & Booth, 2009). However, literature reviews typically do not include quality assessment of studies and they do not include ongoing research or grey literature, like scoping or systematic reviews (Grant & Booth, 2009). A structured literature review was selected as the appropriate method to disseminate our findings due to the wide range of disparate parent and adolescent outcomes across studies.

The first author completed a title and abstract review. Articles were then divided among the authors, and articles meeting inclusion criteria were coded using an abstraction sheet developed by the authors. Finally, we synthesized the data for presentation.

For the purpose of this review, digital BPTs are defined as programs delivered using a digital platform, such as the internet, downloaded digital content, text message, tablet, and video call, that seek to modify parent behavior. We use the term “parent” throughout this article, but all types of caregivers were included, such as grandparents, other relatives, and foster parents.

Literature Search

We searched the literature to identify articles published between January 2000 and October 2021. An updated search was performed in October 2022 to identify additional articles published after the initial review. We restricted to the year 2000, because that was the point at which most Americans gained access to the internet (Perrin, 2015). The search was completed using Medline, Embase, PsychINFO, Cochrane Library, EbscoHOST, Scopus, and ProQuest Central. Preliminary search terms and phrases included combinations of the following keywords: *parenting programs, parent training, behavioral parent training, web-based, technology-based, adolescent, and teen*. Full search strategies are available upon request. To increase data saturation, we also used published meta-analyses and other reviews identified in this search as a search-forward tool and combed the references for articles that met the inclusion criteria to identify any missing relevant articles. Finally, an additional article was recommended to the authors during peer review.

Inclusion and Exclusion Criteria

For articles to be included in the analysis, they had to meet the following criteria: (a) published between the year 2000 and October 2022, (b) peer-reviewed, (c) available in English language, (d) include a description of methodological approaches of a digital BPT, (e) identify at least one parent- or adolescent-reported behavioral outcome or feasibility outcome that was the target of the digital BPT, and (f) the study included parents of children aged 10 to 18 years. We elected to exclude articles reporting BPTs for parents of adolescents older than 18 years, because it is unlikely the child would be living at home. We did not specify behavioral outcomes of interest for the purposes of the search or review. The study only had to report on a behavioral outcome as reported by the parent or adolescent. Articles that did not meet these criteria were excluded from further analysis.

Coding

Prior to the literature search, the authors developed a coding sheet using Microsoft Excel that detailed information of interest that was to be extracted from the studies. The sheet contained extracted data on general information (e.g., author(s), publication year), characteristics of the digital BPT, which included the method of delivery, the format of the program, time to complete the program, if the program was designed for mothers, fathers, either parent, or parents and adolescents together, theories used for digital BPT development, number of sessions/modules, and if the digital BPT was freely accessible to the public. Accessibility was assessed using an online search to determine if resources from

the digital BPT could be accessed by the public at no cost. Data extracted on demographic characteristics included parent and adolescent race/ethnicity, parent education, parent sex, adolescent age range, and adolescent sex. Evaluation information extracted included study design, sample size, length of follow-up, statistically significant parent or adolescent behavioral outcomes, feasibility and acceptability outcomes, and attrition rate. We reported effect sizes for significant parent or adolescent behavioral outcomes (i.e., Cohen's *d*, effect size conversion: very small $d < 0.19$; small $d = 0.20-0.49$; medium $d = 0.50-0.79$; large $d = 0.80-1.19$; very large $d = > 1.20$ (Cohen, 1988)) if they were reported by the study. Study design information included whether there were evaluation data available, type of study, parent outcomes, adolescent outcomes, and available dependent variables.

Study Coding Reliability

Articles were divided among the four authors for independent review. Once primary reviews were complete, a secondary review was completed on a subset by a different author to ensure accurate and consistent coding. Discrepancies were resolved through joint review and discussion between the primary and secondary reviewers. Every 6th article was marked for secondary review to ensure 15% of articles were assessed for reliability.

Results

Search Results

The initial literature search yielded 325 articles. After title and abstract review, 88 articles remained for full review. Of those, 22 met the inclusion criteria and were coded by reviewers. Search of published meta-analyses and systematic reviews identified through the original search and reference combing yielded an additional 5 studies. One additional article was brought to our attention during peer review bringing the total reviewed to 28 studies reporting on 22 digital BPTs. Supplementary Table 1 provides a summary of selected characteristics of digital BPTs, Supplementary Table 2 provides demographic characteristics for each digital BPT, and Table 1 provides evaluation data (e.g., parent and adolescent outcomes, feasibility data, and study design) for the studies with evaluation data.

Characteristics of Digital BPTs

The 28 studies reviewed included 22 different digital BPTs. All digital BPTs employed a behavioral approach to mitigating problem behaviors among adolescents and increasing positive parenting practices among parents. Some digital BPTs focused on specific issues related to adolescent development, such as nutrition, body image, and eating disorders (Bruning Brown et al., 2004; Wade et al., 2022; Wilson et al., 2014), substance use (Newton et al., 2018; Schinke et al., 2009a, b; Thornton et al., 2018; Yap et al., 2011), suicide prevention (Bjureberg et al., 2018; Hill et al., 2020), depression/anxiety (Khor et al., 2021; Yap et al., 2018, 2019), sexual health and teen dating violence and relationships (Aventin et al., 2020; Chokprajakchad et al., 2020; Rizzo et al., 2021; Scull et al., 2019, 2020), and one focused on supportive parenting of transgender youth (Matsuno & Israel, 2021). The remaining programs focused broadly on common parenting challenges for parents of adolescents, such as rule setting, applying consequences, and positive teen-parent communication (Choi et al., 2016; Cotter et al., 2013; Gelatt et al., 2010; Irvine et al., 2015;

Mello et al., 2019; Segal et al., 2003; Stormshak et al., 2019; Taylor et al., 2015; Wetterborg et al., 2019).

Thirteen (59.1%) digital BPTs utilized a theoretical approach in the development of the intervention. Theories were focused primarily on behavioral change through family (e.g., family interaction theory; family systems theory), social (e.g., social cognitive theory), and individual (e.g., theory of planned behavior, theory of reasoned action) systems; only two digital BPTs (Yap et al., 2011, 2018, 2019) focused on technology development for behavioral change (i.e., persuasive systems design).

Of the 22 digital BPTs, most were designed for parent-only participation ($n = 16$; 72.7%), and 6 digital BPTs (27.3%) were designed for parents and adolescents to complete together. One digital BPT, *The Safety Planning Assistant* (Hill et al., 2020), had one arm of the intervention intended for parents and adolescents, and the other arm intended solely for parents. One digital BPT was designed specifically for mothers (Schinke et al., 2009a, b), though none of the digital BPTs reviewed were intended specifically for fathers of adolescents. All but two digital BPTs were self-directed and not guided ($n = 20$; 95.5%). The digital BPT, *The Safety Planning Assistant* (Hill et al., 2020), consisted of one module that was self-directed and another module that was clinician-directed. Seven digital BPTs (31.8%) used additional assistance (e.g., text messages, emails, online coaching) to remind participants to complete their scheduled modules, answer questions, or provide feedback.

Twenty-six studies reported on the number of modules in the digital BPT. The mean number of modules was 7.1 and ranged from 2 to 13. The time to complete each digital BPT ranged from 15 to 25 min to 4 months; four studies did not report the length of time to complete the program. Only six of the 22 digital BPTs (27%) were freely accessible to the public. The remaining were only available through purchase or through participation in the study. Supplementary Table 1 provides the full description of each digital BPT's characteristics.

Demographic Characteristics

Of the 28 studies reviewed, 78.6% ($n = 22$) provided information on the location of recruitment; 11 studies recruited participants from the USA and 11 studies recruited participants internationally. Ten studies provided information on the race/ethnicity of adolescents who participated in the program (37%), and 12 studies provided race/ethnicity data for parents (44.4%). Of the 16 studies that reported on either parent or adolescent race/ethnicity, most (62.5%; $n = 10$) consisted of more than half White parents or adolescents. Only one digital BPT was specifically tailored to parents or adolescents in a racial/ethnic minority group (Wilson et al., 2014). In this study, Wilson and colleagues (2014) focused on improving nutrition among Black parents and their adolescents.

Seventeen of the 28 studies (60.7%) provided information on adolescent sex. Of the 17 studies that reported sex, 35.3% ($n = 6$) reported an approximately even distribution of male and female adolescents (e.g., less than a 60–40% split between males and females), 41.2% ($n = 7$) reported more female adolescents than male, and 17.6% ($n = 4$) reported more male adolescents than female. The one study that focused on parents of transgender youth reported 22% transgender girls, 59% transgender boys, and 19% non-binary adolescents

(Matsuno & Israel, 2021). The distribution of sex was less evenly split for parents than adolescent participants. Of 23 studies that reported on parent sex, all reported more female parent participants than male parent participants. Three studies included “non-binary” or “prefer not to say” as an available selection for parents or adolescents (Bjureberg et al., 2018; Matsuno & Israel, 2021; Scull et al., 2019). For parents, 67.9% ($n = 19$) of studies reported data on the level of education but differences in education attainment across countries make cross-study comparisons difficult. However, of the 19 studies that reported educational level of parents, 88.9% ($n = 16$) reported that at least half of parent participants attended at least some postsecondary education. Selected demographic data is available in Supplementary Table 2.

Three studies conducted moderation analyses using demographic moderators, such as adolescent age (Wetterborg et al., 2019; Yap et al., 2019), adolescent gender (Stormshak et al., 2019; Wetterborg et al., 2019; Yap et al., 2019), family socioeconomic status (Stormshak et al., 2019), and adolescent race/ethnicity (Stormshak et al., 2019). Two studies found significant effects for adolescent gender (Wetterborg et al., 2019) and family socioeconomic status (Stormshak et al., 2019).

Evaluation Data

Of the 28 studies reviewed, 24 (85.7%) reported evaluation outcomes for the digital BPT. Over half of the studies ($n = 14$; 58.3%) employed a randomized control trial study design. The remaining study designs included quasi-experimental ($n = 2$), mixed methods ($n = 1$), open trial ($n = 3$), case study ($n = 1$), pretest–posttest design ($n = 1$), and feasibility and acceptability trials ($n = 2$) (see Table 1). Twenty studies had a sample size of over 30 participants, and 23 studies reported length of follow-up, which varied and ranged from immediate postcompletion of the digital BPT to 24 months. One study did not report the length of follow-up. Fourteen (54.5%) studies included outcomes targeted for both parents and adolescents; seven (27.3%) reported parent-only target outcomes. Cotter et al. (2013), Gelatt et al. (2010), Khor et al. (2021), and Wetterborg et al. (2019) also reported intended family outcomes.

Thirteen studies reported on the digital BPT’s feasibility and acceptability based on survey and or qualitative data gathered from participants. Most studies ($n = 10$) used parent-reported survey data; however, other studies used adolescent-reported survey data in conjunction with parent-reported data ($n = 1$), parent-reported qualitative data ($n = 2$), and time spent interacting with the digital BPT’s platform ($n = 1$). Attrition rates from the digital BPTs were not available for all studies. However, from the data that was available ($n = 14$), study attrition rates ranged from 4 to 14% with an average of 9.5%. Table 1 provides a summary of evaluation data (i.e., study design, sample size, length of follow-up, statistically significant parent and adolescent outcomes, feasibility data, and attrition rate) available in the studies reviewed.

Significant Parent Outcomes

Parent-Adolescent Communication—Of the seven studies that assessed parent-reported parent-adolescent communication, six studies (85.7%) reported significant

outcomes. Chokprajakchad et al. (2020) found increases in attitudes, subjective norms, and intentions to communicate with their adolescent about sexual health, and increased levels of communication with their adolescent about sexual health topics (no effect size reported). Schinke et al. (2009a, b) found improvements in parent communication with their daughters (no effect sizes reported). Both studies by Scull et al. (2019, 2020) found increased quality of parent-adolescent communication (no effect size reported) and increases in parent belief in the importance of parent-adolescent communication about sexual health ($d = 0.74$ —medium). Lastly, Rizzo et al. (2021) found fewer parent reports of parent-adolescent communication problems ($d = 0.25$, small).

Self-efficacy—Of the seven studies that assessed parent-reported self-efficacy, five studies (71.4%) reported significant outcomes. Cotter et al. (2013) found an increase in both parental sense of competence ($d = 0.55$, medium) and self-efficacy to parent ($d = 0.75$, medium). Gelatt et al. (2010) reported improvements in parents' feelings of self-efficacy ($d = 0.31$, small) and their behavioral intentions to engage in positive parenting ($d = 0.61$, medium). Irvine et al. (2015) found improvements in self-efficacy (no effect size reported). Khor et al. (2021) found increases in parent-reported self-efficacy ($d = 1.44$, very large) and decreases in parental stress ($d = -0.84$, large), and Stormshak et al. (2019) found improved parenting confidence and self-efficacy ($d = 0.25$, small). Finally, Wade et al. (2022) reported improvements in parental knowledge, skills, and confidence to manage their adolescent's anorexia nervosa (no effect size reported).

Positive Parenting and Relationships—Of the nine studies that assessed positive parenting and parent-adolescent relationships, all nine (100%) reported significant outcomes. Bjureberg et al. (2018) found increases in adaptive parenting behaviors (effect sizes ranging from $d = 0.47$, small, to $d = 1.22$, very large). Cotter et al. (2013) reported improvements in parent-adolescent conflict ($d = 0.28$, small). Gelatt et al. (2010) reported improvement in lax parenting, overreactive parenting, and parents' intentions to practice positive parenting behaviors (mean $d = 0.37$, small). Irvine et al. (2015) reported improvements in behavioral intentions to practice positive parenting (no effect size reported), and Khor et al. (2021) found improvements in parent-adolescent attachment ($d = 0.39$, small). Segal et al. (2003) reported improvements in parental use of adaptive parenting skills (no effect size reported) and parental response to negative adolescent behaviors based on the Parent Daily Report ($d = 1.27$, very large). Taylor et al. (2015) found decreases in parent-teen dysfunctional interactions and parent-teen hostile relationship (no effect sizes reported). Finally, Yap et al. (2018, 2019) reported improvements in parent-reported current parenting behaviors to reduce adolescent depression/anxiety ($d = 0.27$, small; $d = 0.51$, medium).

Family Functioning

Of the five studies that assessed parent-reported family functioning, all five (100%) reported significant outcomes. Cotter et al. (2013) reported improvements in general family functioning ($d = 0.23$, small). Gelatt et al. (2010) found increases in both life satisfaction and family harmony and decreases in both unrealistic expectations of family adjustment and child conflict (mean $d = 0.49$, small). Khor et al. (2021) found decreases in impaired

family functioning ($d = -0.51$, medium), and Wetterborg et al. (2019) found improvements in family conflict ($d = 0.54$, medium). See Table 1 for all significant parent outcomes.

Significant Adolescent Outcomes

Parent-Adolescent Communication—Of the five studies that assessed adolescent-reported parent-adolescent communication, all five (100%) reported significant outcomes. Chokprajakchad et al. (2020) found an increase in adolescent communication with their parents about sexual health (effect sizes not reported). Schinke et al. (2009a, b) reported an increase in communication by daughters with their mothers (effect sizes not reported). Lastly, Scull et al. (2019) reported increases in adolescent positive attitudes towards sexual communication with parents (effect sizes not reported).

Problem Behaviors—Of the seven studies that assessed both adolescent- and parent-reported problem behavior, all seven (100%) reported significant outcomes. Bjureberg et al. (2018) found improvements in global functioning ($d = 1.01$, large), emotional dysregulation ($d = 0.75$, medium), and non-suicidal self-injury versatility (i.e., decreased number of different types of non-suicidal self-injury behaviors) ($d = 0.63$, medium). Cotter et al. (2013) found decreases in parent-reported adolescent violent behaviors ($d = 0.13$, very small) and externalizing behaviors ($d = 0.20$, small). Irvine et al. (2015) reported improvements in adolescent problem behaviors as measured by the Eyberg Child Behavior Inventory (ECBI) Intensity scale (no effect size reported). Rizzo et al. (2021) reported fewer adolescent dating violence perpetration behaviors (effect size not reported). Segal et al. (2003) reported improvements in parental perceptions of child adjustment as measured by the ECBI ($d = 0.78$, medium). Stormshak et al. (2019) reported a reduction in adolescent emotional problems ($d = -0.32$, small). Wetterborg et al. (2019) reported improvements in adolescent externalizing behaviors, as measured by the Oppositional Defiant Scale from the parent Disruptive Disorder Rating Scale ($d = 0.63$, medium), and conduct problems, as measured by the Strengths and Difficulties Questionnaire (no effect size reported). See Table 1 for significant adolescent outcomes.

Discussion

This literature review provides a comprehensive, up-to-date summary of the available literature regarding digital BPTs for parents of adolescents ages 10–18 years. The findings suggest that technology may be an effective way to deliver BPTs to parents of adolescents based on improvements in at least one parent- or adolescent-reported behavioral outcome or feasibility outcome. Similar to findings from studies of in-person BPTs, effect sizes varied (Dretzke et al., 2009; Leijten et al., 2019), though measures of effect sizes were small to medium for most participants were generally positive about and satisfied with the digital BPT and found the digital BPTs to be acceptable. Among studies that reported attrition rates (58.3%), rates were encouragingly low, based on parameters from the Community Guide, with an average of 9.5% (The Community Guide, 2023). However, we have identified several potential areas of improvement which are discussed in more detail below.

Gaps in the Extant Literature

While digital BPTs utilized theory during development, only one theory—persuasive systems design—concentrated on the use of technology in the context of the availability of many theories that focus on technology acceptance and adoption. The utilization of technology-focused theories (e.g., cognitive load theory), as well as other user experience and interface design principles, could reduce attrition rates, user acceptability, and intervention design (Taherdoost, 2018).

We also found that very few ($n = 1$) digital BPTs were tailored or adapted to be culturally specific to different racial and ethnic minority groups. Interventions are most effective when they are specific to their audience (Lustria et al., 2013), meaning there could be a potential gap in the current scope or reach of BPTs for parents of adolescents. Additionally, there were only three studies that assessed the moderating effects of demographic variables, one of which included the adolescent's race/ethnicity as a moderator (Stormshak et al., 2019). While there were no significant moderation effects observed for adolescent race/ethnicity, Stormshak et al. (2019) note in their limitations that the sample was fairly homogenous with regard to race/ethnicity. There were also no studies that reported on behavioral outcomes or attrition rates by demographic groups. Examination of outcomes by race/ethnicity, gender, education, and socioeconomic status as potential moderators and assessing whether attrition rate or response rates were different by demographic groups could strengthen future research. All studies were conducted in high or middle-income countries, according to data from the World Bank, which illuminates a large gap in the literature. Bearing in mind another large gap in the literature, digital BPTs that assess healthy use and behaviors surrounding technology among adolescents were notably missing from our search. Excessive technology use is of growing concern for professionals in the field, and future programs should consider ways in which parents can utilize positive parenting skills to influence healthy technology behaviors for their adolescents. Finally, only six digital BPTs were freely accessible by the public, which may limit the reach of digital BPTs, especially for families with low incomes and socioeconomic status.

Another shortcoming in the literature we reviewed involves the absence of physical parenting behaviors as measured outcomes and reporting across study outcomes. Many digital BPTs assessed parents' positive or adaptive parenting skills through their knowledge, perceived self-efficacy, and attitudes and beliefs towards positive parenting behaviors. Few studies measured actual parenting behaviors as outcomes. Increased knowledge of positive parenting skills, self-efficacy, and attitudes or beliefs towards positive parenting have value, and greater perceived self-efficacy and knowledge of positive parenting practices may be protective against exposure to ACEs (Poole et al., 2014). However, there may be gaps between parents' attitudes, beliefs, and intentions towards positive parenting and the behaviors they demonstrate. Another limitation is the reliance on self-reported data from parents, which may be biased. Adding adolescent report of parent outcomes may be more accurate. Given the nature of a digital format and the presumed limitations of data collection, evaluation studies of digital BPTs may not be able to monitor parent behaviors, but data on self-reported behaviors by parents of adolescent-reported parent behaviors could be collected.

We also note that not all studies reviewed provide evaluation data or complete demographic data for the participants. Therefore, it may prove difficult to compare significant results or draw conclusions for certain populations if valuable information is missing. It has been noted that for this field to advance, emphasis must be placed on evaluation data to assess what is and what is not effective (Fortson et al., 2016). Increased uniformity in outcomes, methods, and demographic information across evaluation studies in future research may be beneficial for comparison across studies with similar outcomes.

Limitations in Our Review Methods

This literature review used a broad search strategy and collected a sizeable number of studies related to digital BPTs for parents of adolescents. However, there is the risk that studies could have been missed in our initial search due to the search terms or databases used. We also limited the search by starting at January 2000; it is possible there are studies published prior to this date that our search missed. An informal search of relevant journals and citations listed within the included studies did not yield additional relevant studies. While search terms, inclusion criteria, and exclusion criteria were discussed and agreed upon by all co-authors, the initial title and abstract review were completed only by the first author, which could introduce the possibility of inaccurate inclusion or exclusion of articles. Though we did not limit the search to domestic research, we did limit articles to those published in English. This inclusion criterion could have eliminated relevant international studies in low- or middle-income country settings, which may have some generalizability to US populations. We also did not assess potential barriers to accessing and using digital BPTs (e.g., limited English language skill, experience with digital technology, or reliable technology access). Finally, this study was unable to include analyses on effect sizes due to disparate outcomes.

Conclusions

Digital BPTs are becoming widely used due to their flexibility of delivery, cost savings, potential to reach a wider range of parents, and popularity among parents (Corralejo & Domenech Rodríguez, 2018; Metzler et al., 2012). Findings from this literature review may be used to improve the evaluation of digital BPTs. Avenues for future research that may be of significance include exploring predictors of success and compliance with digital BPTs among parents of adolescents. Research has indicated that as the age of the child increases so does parental rate of attrition from BPTs (Michael et al., n.d.), and digital BPTs may offer more flexibility for parents with older children. It may also be beneficial to examine predictors of attrition from digital BPTs, such as parental age, employment status, and acceptance of program content, especially among parents of adolescents who identify as racial/ethnic minority group members. As mentioned, most samples of the evaluation studies reviewed were predominantly White and there were very few digital BPTs tailored specifically to minority families. Some digital BPTs that are not freely available may not be feasible for all families given disparities in available resources, and there is also the potential for cultural differences in parenting practices across racial/ethnic groups that could affect program acceptability (Sorkhabi & Mandara, 2013). Future evaluations of digital BPTs should include diverse samples, assessing attrition rates, and conducting moderation

analyses across demographic groupings, such as adolescent and parental gender, adolescent and parental race/ethnicity, family socioeconomic status, and parental education. The results of which may help researchers address the need for adaptation or demographically tailored digital BPTs on a program-by-program basis in an effort to reduce disparities for racial and ethnic minority families and families living with low socioeconomic status. Finally, given the multitude of effect sizes identified in this review, a meta-analysis may be able to provide further insight into the efficacy of these digital BPTs.

Findings may also be used as a resource to develop expansions of existing digital BPTs that currently target parents of younger children to parents of adolescents, such as CDC's existing Essentials for Parenting tool which is an online resource that teaches positive parenting skills to parents of toddlers and is freely accessible to the public at: <https://www.cdc.gov/parents/essentials/index.html>. BPTs have been found to be effective at influencing parenting practices among parents of children aged 0–12 years through the enhancement of parenting skills, positive family functioning, and promotion of optimal child development. The positive parenting practices learned from parents participating in BPTs may be associated with children's reduced exposure to ACEs, such as child abuse and neglect (Fortson et al., 2016; Whitaker et al., 2005). Therefore, BPTs have been included in CDC's prevention resources to help communities make use of the best available evidence to lessen the immediate and long-term harms associated with ACEs (Centers for Disease Control and Prevention, 2019). Positive parenting skills taught by BPTs may also prevent future adolescent problem behavior and involvement in violence, when coupled with other supports, such as individual and family counseling and school consultations (Centers for Disease Control and Prevention, 2019). Delivering BPTs digitally may allow for traditional BPTs to be scaled up, which may provide greater accessibility for some parents of adolescents—potentially reaching a larger and more diverse audience—and may influence population-level outcomes, such as the reduction of child abuse and neglect and other ACEs. The findings from our literature review broaden the evidence base of digital BPTs that has largely focused on parents of younger children to parents of adolescents and indicate that digital BPTs for parents of adolescents may increase positive parenting skills among parents of adolescents and improve adolescent outcomes.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Data Availability

All data extracted for this review are available in the published literature cited in this article.

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Table 1

Study details for digital BPTs with evaluation data

Author(s)	Study design	Sample size	Length of follow-up	Statistically significant behavioral outcomes	Feasibility and acceptability	Attrition rate
Aventin et al. (2020)	Mixed methods process evaluation	3179 adolescents completed program questionnaire and 58 adolescents participated in focus groups; 134 parents completed online survey and 10 parents participated in semi-structured interviews	n/r	n/r	87% of parents rated the program materials as "good" or "excellent" and 67% of parents reported the materials helped them prepare to talk to their child about sex and pregnancy	n/r
Bjoreberg et al. (2018)	Uncontrolled open trial design	23 adolescent-parent dyads	6 months	Parents: improved punitive parental reactions ($d = 0.47$), increased support of child's emotional expression ($d = 0.58$), and improved parental minimization of child's negative emotions ($d = 1.22$) Adolescents: improvements in past month non-suicidal self-injury (NSSI) frequency ($d = 0.88$), global functioning ($d = 1.01$), emotional dysregulation ($d = 0.75$), and NSSI versatility ($d = 0.63$)	n/r	4%
Bruning Brown et al. (2004)	RCT	152 adolescents; 69 parents	3 months	Parents: decrease in critical attitudes towards other's shape and weight ($d = 0.57$); improved healthy outlook ($d = 0.61$) Adolescents: decrease in eating restraint ($d = 0.29$) and increase in knowledge of program materials during postassessment (no effect size reported); no significant results at follow-up	n/r	n/r
Chokprajakchad et al. (2020)	RCT	80 adolescent-parent dyads	1 month; 2 months	Parents: increase in attitudes, subjective norms, and intentions to communicate with their adolescent about sexual health and levels of communication with their adolescent about sexual health topics (no effect size reported) Adolescents: increase in communication with parents about sexual health; change in norms about sexual abstinence, (no effect size reported)	n/r	n/r
Cotter et al. (2013) *	Quasi-experimental design	38 parent-adolescent dyads	5 weeks	Family: improvement in general family functioning ($d = 0.23$) Parents: increase in parenting sense of competence ($d = 0.546$) and self-efficacy ($d = 0.752$); improvement in parent-adolescent conflict ($d = 0.275$) Adolescents: decrease in parent-reported adolescent violent behavior ($d = 0.125$) and externalizing behaviors ($d = 0.199$)	n/r	n/r

Author(s)	Study design	Sample size	Length of follow-up	Statistically significant behavioral outcomes	Feasibility and acceptability	Attrition rate
Gelatt et al. (2010)	Single-arm RCT	300 parents/stepparents	8 weeks	Parents: improvements in lax parenting, overreactive parenting, parenting self-efficacy, and parenting behavioral intentions (mean $d = 0.37$); increase in life satisfaction and family harmony and decrease in unrealistic expectations of family adjustment and child conflict (mean $d = 0.49$); increase in couple self-efficacy, intentions to address couple's shared parenting issues, and decrease in couple difficulties (mean $d = 0.26$)	Parental program satisfaction $M = 4.2$ – 4.5 and parental program usability $M = 4.4$ – 4.7 ; both measures based on 5-point Likert scale	9%
Hill et al. (2020)	Pilot feasibility and acceptability trial	15 adolescent-parent/ guardian dyads	1 month	n/r	Adolescent satisfaction with the program $M = 14.00$ – 14.24 ; 16-point scale; parental program satisfaction $M = 15.14$ – 15.20 ; 16-point scale	n/r
Irvine et al. (2015)	Two-arm RCT	307 parents	1 month	Parents: improvement in over-reactivity, laxness, intensity, self-efficacy, and behavioral intentions to practice positive parenting (no effect size reported) Adolescents: improvement in problem behaviors as measure by the Eyberg Child Behavior Inventory (ECBI) Intensity scale (no effect size reported)	Parental program satisfaction $M = 5.6$ – 6.6 ; 7-point scale	13%
Khor et al. (2021)	Single-arm double-baseline open-label trial	71 parents	4 months	Parents: improvements in parenting behaviors targeted by the intervention ($d = 1.16$); increases in parent-reported self-efficacy ($d = 1.44$), parent-adolescent attachment ($d = 0.39$); decreases in impairment to family functioning ($d = -0.51$) and parental stress ($d = -0.84$)	Majority of parents reported satisfaction with the digital BPT, specifically reporting a good relationship with their online coach, ability to work on goals of their choice, being able to apply parenting strategies, and recommending the program to other parents	8.4%
Matsumo and Israel (2021)	Pilot feasibility and acceptability trial	27 parents	Postintervention	n/r	All modules were rated by parents on average above 4 out of 5 for acceptability, appropriateness, and feasibility	n/r
Mello et al. (2019)	RCT	37 adolescent-parent dyads	3 and 6 months for adolescents; 3 months for parents	n/r	63% of parents rated the digital BPT helpful or very helpful, 62% of parents did not find the digital BPT too complex and 88% did not need assistance to interact with the program's interface	n/r
Rizzo et al. (2021)	RCT	119 adolescent-parent dyads	9 months	Parents: improvements in parents' attitudes towards dating violence (DV) ($d = .20$); fewer parent-adolescent communication problems as reported by parents ($d = .25$) Adolescents: fewer adolescent DV perpetration and victimization events (no effect size reported); improvement in adolescent long-term emotion regulation abilities ($d = .36$); greater use of emotion regulation strategies ($d = .32$)	n/r	12%
Schinke et al. (2009a, b)	RCT	591 mother-daughter dyads	1 year	Parents: improvement in communication with daughters, establishment of rules against daughter's substance use, and	n/r	4%

Author(s)	Study design	Sample size	Length of follow-up	Statistically significant behavioral outcomes	Feasibility and acceptability	Attrition rate
Schinke et al. (2009a, b)	RCT	916 mother-daughter dyads	24 months	monitoring daughter's out-of-home activities (no effect size reported) Adolescents: increase communication with their mothers, knowledge of family rules about substance use, awareness of parental monitoring, non-acceptance of peer substance use as normative behavior, ability to refuse peer pressure, reduced use of alcohol, marijuana, and prescription/over-the-counter medications for non-medical purposes; decrease in intentions to use tobacco, alcohol, and other drugs in the future (no effect size reported) Parents: improvement in observance of family rituals, communication and closeness with their daughters, establishment of family rules against daughters' alcohol use; monitoring of daughters' out-of-home activities; decrease in parent alcohol consumption (no effect size reported) Adolescents: improved communication and closeness with mothers; increase in knowledge of family rules about substance use, awareness of parental monitoring, ability to cope with stress, recognition that adolescent substance use is not normative behavior, and drug refusal self-efficacy; fewer instances of alcohol, marijuana, prescription for non-medical purposes, and inhalant use; lower intentions to use tobacco, alcohol, and drugs in the future (no effect size reported)	n/r	9%
Scull et al. (2019)	RCT	355 adolescent-parent dyads	1 month	Parents: increased quality of parent-adolescent communication; increased media skepticism; decreased parent-reported ratings of media message completeness (no effect size reported) Adolescents: reported increase in family media rules; decreased in perceived parental permissiveness towards sexual behavior; decrease in youth willingness to "hook-up" when unwanted; increase in positive attitudes towards sexual communication, intentions to communicate with a medical professional about sexual health, and self-efficacy using contraception; decrease in perceived realism of media messages (no effect size reported)	Parents in the intervention reported greater feelings that the program could help parents talk to their child about sex and relationships ($M = 3.52$; 4-point Likert scale) and were more likely to report that they would tell other parents about the program compared to parents in the control group ($M = 3.45$; 4-point scale)	n/r
Scull et al. (2020)	RCT	56 parents	4 weeks	Parents: increases in parents' belief in the importance of parent-adolescent communication (PAC) about sexual health ($d = 0.74$)	Parental satisfaction with program comprehensibility $M = 3.62$, content $M = 3.41$, engagement $M = 3.27$, structure/appearance $M = 3.38$, and usefulness $M = 3.56$; 4-point Likert scale	7.7%
Segal et al. (2003)	Case study	42 parents	3 weeks	Multimedia intervention only: improvements in parental perceptions of child adjustment as measure by the Eyberg Child Behavior Inventory (ECBI) ($d = 0.78$), parental use of adaptive parenting skills (no effect size reported), parental knowledge of intervention materials (no effect size reported), parental response to negative adolescent behaviors based on Parent Daily Report ($d = 1.27$)	n/r	n/r

Author(s)	Study design	Sample size	Length of follow-up	Statistically significant behavioral outcomes	Feasibility and acceptability	Attrition rate
Stormshak et al. (2019)	Pre-posttest design	322 families	3 months	Videotape intervention only: improvements in parents' response to prosocial adolescent behaviors based on Parent Daily Report (no effect size reported), parents' response to negative adolescent behaviors based on Parent Daily Report ($d = .069$) Parents: improved confidence and self-efficacy ($d = 0.25$) in the web + coach treatment group Adolescents: reduction in emotional problems ($d = -0.32$)	The web + coach treatment group logged into, spent more time on the website, and completed more online assessments than the web-only intervention group	7%
Taylor et al. (2015)	Three-arm RCT	77 families	10 weeks	Parents: increase in parental knowledge of intervention materials; decrease in parent-teen dysfunctional interactions, perceptions of teen being difficult, parent-teen hostile relationship (no effect size reported)	n/r	n/r
Wade et al. (2022)	Open pilot trial	16 adolescent-parent dyads	12 weeks	Parents: improvements in parental knowledge, skills, and confidence (no effect size reported) Adolescents: increased adolescent BMI; improvements in adolescent eating disorder behaviors (no effect size reported)	Parents reported general acceptability measured through qualitative measures	7%
Wetterborg et al. (2019)	RCT	75 families	6 months, 9 months	Parents: improvements in family conflict ($d = 0.542$) Adolescents: improvements in externalizing behaviors as measured by the Oppositional Defiant Scale from the parent Disruptive Disorder Rating Scale ($d = .211$) and conduct problems as measured by the Strengths and Difficulties Questionnaire (no effect size reported)	Parental acceptability score $M = 7.0-7.1$; 8-point scale	14%
Wilson et al. (2014)	Quasi-experimental design	47 parents	1 week	Parents: increase in self-reported daily fruit intake and combined fruit and vegetable daily intake (no effect size reported) Adolescents: increase in parent-reported daily fruit intake and combined fruit and vegetable daily intake (no effect size reported)	Parental program feasibility $M = 3.38-4.00$; 4-point scale	12.77%
Yap et al. (2018)	Two-arm RCT	359 adolescent-parent dyads	3 months	Parents: improvements in parent-reported parenting behaviors to reduce adolescent depression/anxiety ($d = 0.27$)	n/r	Parents: 14% Adolescents: 8%
Yap et al. (2019)	RCT with active-control condition	294 adolescent-parent dyads	12 months	Parents: improvements in parenting behaviors to reduce adolescent depression/anxiety ($d = 0.51$) Adolescents: reduction in parent-reported adolescent depressive symptoms ($d = -0.21$)	n/r	11.14%

Effect size conversion 0.20 small; 0.50 moderate; 0.80 large; 1.20 very large (Cohen, 1988)

n/r=information not found from the manuscript

RCT=randomized control trial

* Only reporting online arm of intervention