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A Review of Technology-Based Youth and Family-Focused Interventions

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Abstract

In the past 10 years, mental and behavioral health has seen a proliferation of technology-based interventions in the form of online and other computer-delivered programs. This paper focuses on technology-based treatment and preventive interventions aimed at benefitting children and adolescents via either involving the parents and families, or only the youth. The review considered only technology-based interventions that had at least one published study with a randomized controlled trial design. Questions being addressed included: (1) What are the technology-based interventions in the mental/behavioral health area that have been systematically evaluated in published studies? (2) What are the common and unique characteristics of these interventions and their application with respect to sample characteristics, target problems, and technology characteristics (platforms, structures, elements, and communication formats)? and (3) Which intervention approaches and strategies have accrued the greatest evidence? The review identified 30 technology-based psychosocial interventions for children and families, 19 of which were parent or family-focused (32 studies) and 11 of which were youth-focused (in 13 studies). For the parent/family-focused interventions, greatest promise was found in those that addressed either youth behavioral problems or depressive/anxious symptoms, as well as more general bolstering of parenting efficacy. The youth-focused interventions showed some promise in reducing depressive/anxious symptoms. Advantages and disadvantages of the technology-based approaches were considered, and areas for future research and development were discussed.

Keywords

Technology; Mental health intervention; Behavioral health; Youth; Parents; Internet

Introduction

In the area of child behavioral health, technology-based delivery of interventions could potentially help to address a major demand. Behavioral and mental health problems in children, youth, and their families are widespread (Merikangas et al. 2010; Polanczyk et al. 2015). Between 13 and 20 % of youth experience a mental disorder in a given year (CDC

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Compliance with Ethical Standards

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2013; NAM 2013). The most prevalent disorders in childhood and adolescence are attention deficit disorder (6.8 %), substance use disorder (4.7 %), behavioral or conduct disorder (3.5 %), anxiety (3.0 %), and depression (2.1 %; CDC 2013). Collectively, these problems constitute a major public health challenge with an estimated annual cost in the U.S. of $247 billion due to the prevalence, early onset and overall impact of these issues on youth, their families, and the community (CDC 2013).

The magnitude of need in terms of prevention and treatment substantially outstrips the capacity of systems to deliver cogent intervention. A case can be made that sole reliance on traditional modes of intervention delivery will not suffice. Interventions that make use of technology-based platforms might contribute to the solution. Currently, a shortage of mental health workers available to address child, adolescent, and family behavioral health issues exists in the United States, with less than 50 % of those in need of treatment receiving it and only 20 % receiving services from a practitioner trained to work with youth and their families (APA 2016). Use of technological platforms ostensibly addresses several of the issues evident in reaching various groups lacking access, such as those living in remote locations, those who avoid intervention due to the stigma associated with traditional services for mental health problems, and those who cannot afford the cost of interventions delivered by professionals (Clarke et al. 2015; Reyes-Partillo et al. 2014).

Administering a protocol through a technology-based platform eliminates the need for the participant to travel to sessions, thus increasing intervention reach to those who might not otherwise participate. Additionally, technological platforms allow participants to access information and complete sessions in the privacy of their own homes. This protects the youth and their families' anonymity as well as ameliorates potential worries about the stigma surrounding receiving treatment. Many of these interventions require either a small fee or are free of charge, which essentially eliminates the need to costly facilities and office personnel, as well as removing the cost of participant travel to and from in-person appointments.

The past decade has seen an increased focus on the integration of technological platforms to better reach youth and their families (Clarke et al. 2015). Reviews of the literature on technology-based methods have focused principally on adult-focused interventions (Cuijpers et al. 2009; Spek et al. 2007). The current paper reviews the available literature on technology-based interventions intended to benefit children and youth. These technology-based interventions fall into two categories: (1) interventions for parents and families to impact children's and adolescents' adjustment, and (2) interventions for youth directly.

The move toward using technology-based platforms to deliver interventions for mental and behavioral health support is not surprising given the steady rise in accessibility and use of computers and handheld technological devices over the last 15 years (Pew Research Center 2015a, b). As of 2013, over three-quarters of homes in the United States were connected through personal computers, mobile phones, or tablets (File and Ryan 2014). Regarding youth specifically, 95 % of adolescents are 'online' with 78 % of them having access to mobile phones and 47 % of them owning their own Internet-enabled smartphone (Madden et al. 2013). Younger children have frequent access to technology with 22 % of five to 8-year-

olds having computer access daily and 52 % having access to smartphones, iPods©, or tablets (Common Sense Media 2011). Consumer preference also needs to be considered. Opinion surveys indicate that parents and youth who might participant in behavioral health programs have a stronger preference to receive such support through technological platforms over face-to-face delivery (Havas et al. 2011; Metzler et al. 2012).

Focus and Method

Purpose and Rationale

The current review explores technology-based interventions for youth themselves as well as those aimed at parents and families intended to support positive youth mental and behavioral health development. The review focuses on efficacy studies of interventions that engage youth (up to age 18) or parents and caregivers of youth within this age range. Three main questions are addressed in this review: (1) What are the technology-based interventions for youth or families in the mental/behavioral health area that have been systematically evaluated? (2) What are the common and unique characteristics of these interventions and their application with respect to sample characteristics, target problems, and technology characteristics (platforms, structures, elements, and communication formats)? and, (3) Which intervention approaches and strategies have accrued the greatest evidence?

The importance of the current review is apparent given several aspects of the existing research within this area. First, current reviews of technology-based interventions focus heavily on their use with adult populations or focus on their use in combating specific disorders (i.e., depression and anxiety). While those reviews have reported promising results in using certain techniques and approaches with adults, the extent to which these technology-based approaches can be generalized to children, youth, and families is unclear. Second, the current research base on technology-based interventions with youth and families, especially for the prevention or alleviation of child and adolescent mental and behavioral health problems, has been increasing but has not been substantially reviewed.

Third, as children and youth are exposed to technology-based interventions and platforms in many aspects of their lives, the use of interventions that utilize technology is a logical direction in which the mental and behavioral health field is moving. A review of the benefits and issues related to youth-utilized technology-based interventions would be advantageous in understanding the nature of these strategies as well as which are more promising. Lastly, like youth, parents rely heavily on technology in many facets of their lives. The ease, accessibility, and autonomy-focused characteristics of technology-based interventions offer promise in assisting parents who are attempting to address or prevent mental and behavioral health problems in their children. Prior reviews of technology-based interventions for families have focused extensively on parenting and parental outcomes. The current review serves to extend this knowledge base by focusing on outcomes associated with the youth.

Search and Selection of Studies

The first stage for identifying interventions and studies for this review involved a series of searches using PsycInfo, MEDLINE, and Web of Science starting in 1995 going forward.

All searches restricted the population to the birth-to-18 age group, and to articles written in English. The keywords in the searches included ones for intervention (intervention OR treatment), domain (mental health OR psychology OR psychosocial), and technology (technology OR computer OR Internet OR online OR mobile phone). These initial searches identified articles, interventions, and specific studies potentially related to the topic of the review. For the second stage, references found in some of the conceptual articles provided clues for other interventions and studies not captured by the first series of searches. The technology-based interventions identified by the literature searches were then subjected to further searching via Google to find studies not yet identified.

To be considered as an eligible technology-based intervention, these inclusion criteria needed to be met: (1) the intervention was delivered by computer, online/Internet mode, text-enabled cellular telephone, tablet, or video/DVD; (2) the focus was on the prevention or treatment of mental or behavioral health problems; (3) the intervention participants could include parents (or other parental caregivers), youth, or families; and, (4) the intervention was intended to benefit individuals in the birth to 18-year-old age range. The exclusion criteria included that: (1) the goal was management of a physical disorder or health condition (e.g., diabetes, chronic pain, asthma); (2) in-person contact was the primary mode of delivery (i.e., the technology component was supplemental to the actions of the interventionist); and, (3) there was not at least one randomized controlled study for the intervention, published in a peer-reviewed journal.

Overall, 30 interventions were included in the current review, 19 parent and family-based and 11 were youth-focused and of these 30 interventions, 44 RCTs were reviewed. The remainder of the current paper is split into four sections. The parent and family-based interventions and the youth-aimed interventions will be reviewed in separate sections. Each of these sections will review study design, participant demographics and overall intervention efficacy in addition to which technology platforms and characteristics are being utilized. The final two sections of the paper discuss the challenges of using technology-based interventions based and provide suggestions for future research.

Parent and Family-Focused Interventions

For the studies of parenting and family-focused interventions, Table 1 summarizes the sample characteristics, outcome variables, and efficacy. Table 2 summarizes the platforms, structure, elements, and communication formats of the interventions.

Sample Characteristics

Of the parent and family-focused intervention studies, 72 % reported the racial/ethnic breakdown of the sample, with 52 % reporting a sample with less than a fifth composed of minorities, and 39 % composed of over two-thirds minority. Three studies enrolled 100 % minority participants (e.g., *Cuidalos*) aimed at Hispanic either Asian families. Studies of *Parenting Wisely* and the *SA Risk Reduction I* interventions exemplified diverse samples (Table 1).

Most studies provided gender and child age—88 and 94 %, respectively. Generally, interventions aimed at assisting parents to address either child behavioral problems or symptoms of Autism Spectrum Disorder (ASD) were tested in study samples with a greater preponderance of males. Gender was more balanced in the other interventions focused on sexual health, substance use, depressed or anxious youth resilience or coping skills. The aforementioned studies involved young children, while the latter focused on youth ages 10–18. Regarding parent/caregiver gender, most studies enrolled families without specifying which parent was the primary participant. Three studies focused exclusively on mother-daughter dyads (i.e., pertaining to substance use risk reduction).

Three-quarters (24 of 32) of the studies provided socioeconomic (SES) information about their samples, either in the form of household income related or parental education data. Only 18 studies provided sufficient information about family income or parental education to be able to characterize inclusion of low SES families. Of those that reported specific information, all but two studies used samples comprised of over 20 % of participants who had earned a high school diploma, GED, or less. Regarding economic data, all studies providing this type of data reported that at least 5 % of their sample was from families living in poverty.

Technology Characteristics

A variety of platforms, structures, elements, and communication formats were utilized across the parent and family-focused interventions (Table 2). Interventions were split between Web site-based (66 %) and CD-ROM/DVD-based (38 %) platforms. One of the interventions (*Incredible Years*) used both. None of the parent and family-focused interventions relied solely on a phone text platform or a phone/tablet application (‘App’).

With respect to intervention structure, 79 % of the programs made use of modules or units. Those without modules utilized a self-directed structure that fell into two categories: an unstructured Web site which allowed parents to navigate through information at their own leisure and a CD-ROM/DVD-based program which permitted parents to select content freely without following a prescribed track. The former was found in two interventions (*Youth Mental Health; Kids Accident*) and the latter in two others (*Parenting Wisely*; *Play Nicely*). Of the 15 interventions that used a module-based structure, 87 % required the user to progress through the modules in a sequential or linear manner, requiring prior module completion before being able to access the next module. For the remaining module-based interventions, it was not clear whether a sequential progression was enacted.

The interventions varied with respect to elements to enhance the quality of participant engagement and assessment of learning. Audio/video components were used in 79 % of interventions to present program material. Oral presentation of information was an option provided for users who either could not or preferred not to read instructions. Videos were included to illustrate skills, present personal stories, or exhibit psychoeducational content. Animations were used in 26 % of interventions and 16 % integrated games to aid participant engagement with program material. For example, *Camp-Cope-A-Lot*, a computer-based version of the Coping Cat intervention, presented all intervention content principally through an animated game format.

Action tasks were an element found in 47 % of the parent and family-based interventions that fell into two categories: practice exercises and implementation activities. Practice exercises were activities completed as part of the module to engage participants in the material, while implementation activities completed between sessions, away from the technology platform. Content quizzes, administered throughout program modules, were completed to assess participants' learning and information retention in 63 % of the interventions. The timing of quizzes differed depending on the intervention and were most frequently administered at the end of module sections, complete modules or prior to starting a module, to assess material from prior modules.

Over half (58 %) of the interventions integrated technological communication strategies, mostly involving human-based interactions. Of those with a communication component, 37 % provided participants with an assigned 'coach', who were frequently mental or behavioral health practitioners that communicated with participants about program progress via videoconferencing technology or phone calls. Specifically two interventions (*BRAVE Online*; *Camp-Cope-A-Lot*), had coaches contact participants over the phone to aid in the creation of anxiety treatment fear hierarchies. Multiple interventions based coaching on the Parent–Child Interaction Therapy (PCIT) model through videoconferencing and 'bug-in-ear' technology allowing the practitioner to coach the caregiver through live practice of strategies reviewed during the didactic modules of the intervention (*TOPS*, *OFPS*, *I-inTERACT*).

Feedback to the participant regarding their progress was provided via program facilitators, or by the intervention platform itself, in 47 % of the programs. In addition to feedback being provided by coaches, it was provided through text message or emails (11 %) and telephone calls (16 %). Discussion boards (16 %) also allowed for feedback from program staff in addition to allowing participants to communicate with each other regarding struggles and successes.

Intervention Efficacy

The 19 parent and family-focused interventions, documented in 32 studies, focused on a variety of mental and behavioral health constructs. Constructs and efficacy results are delineated in Table 1. Reductions in child behavior problems, measured most frequently using the Child Behavior Checklist and Eyberg Child Behavior Inventory were assessed in eight interventions. Significant changes were reported in five of these eight interventions. Reductions in depressive symptoms, measured most frequently by the Child Depression Inventory were assessed in five interventions with significant positive changes reported in two (*BRAVE Online*, *SA Risk Reduction II*). Significant reductions in anxious symptomatology, measured most frequently with the Multidimensional Anxiety Scale for Children, were reported in all four interventions in which it was assessed. Two interventions (6 studies) focused on reducing adolescent substance use, based solely on youth report. All of these studies assessed reductions in alcohol, cigarette, and marijuana use, while only four of the six assessed prescription pill use. Reductions in alcohol use were consistently significant across the studies. While reductions in cigarette use had a relative lack of significant effects. Mixed results were reported regarding reductions in the use of marijuana and prescription pill use was significant across all four studies that assessed it. Two

constructs were assessed with one intervention apiece (Post-traumatic stress disorder symptoms; Social Communication-Autism Spectrum Disorder) with nonsignificant results reported for the former and significant results with a large effect size for the latter.

Parent–child communication and/or interaction were assessed in six interventions through eight studies with consistent results. All studies, except one, reported significant positive changes with effect sizes ranging from medium to large. Parental monitoring was assessed in each of the interventions focused on reducing adolescent substance use and results were mixed. Parent–child relationship quality, assessed in three interventions, reported consistently significant changes with large effect sizes. Nine of the interventions (14 studies) evaluated changes in the use of intervention-taught evidence-based parenting strategies. Five studies reported nonsignificant or unclear results, while the remaining nine reported significant changes with effect sizes ranging from medium to large.

Child and Youth-Focused Interventions

For the studies of child and youth-focused interventions, Table 3 summarizes the sample characteristics, outcome variables, and efficacy. Table 4 summarizes the platforms, structure, elements, and communication formats of the interventions.

Sample Characteristics

In the 13 studies of youth-focused interventions, seven did not report the racial/ethnic breakdown of the sample. Of the remaining six studies, three had predominantly minority samples and only one study has a low proportion (i.e., 3 %). The proportion of females in the youth samples was reported in all 13 studies and ranged from 10 to 100 %, with 9 of the 13 studies reflecting gender balance (33–76 %). With respect to youth age, 12 of the 13 studies focused on the 10–16-year-old range. One study extended the range down to age six (i.e., study of *FaceSay* for children with ASD).

Regarding participant SES, 11 of the 13 youth-focused studies failed to report this type of information. In the two studies that did report SES, one indicated that 5 % of their sample was low SES (i.e., for *Cools Teens*) and the other just noted that the SES breakdown was representative of the local community (i.e., for *My Body, My Life*).

Technology Characteristics

A variety of platforms, structures, elements, and communication formats were utilized across the youth-focused interventions (Table 4). Interventions were split between Web site-based (36 %), CD-ROM/DVD-based (55 %) platforms in addition to one intervention that used texting technology on the participant's phone (*MobileType*). In similarity to the parent or family-focused interventions, none of the interventions aimed at youth relied on the use of a phone/tablet application ('App').

Of the eleven youth-focused interventions, 91 % were comprised of modules, with half of them requiring participants to complete sessions in a sequential or linear manner, requiring prior module completion before being able to access to the next module and 28 % were unstructured. In contrast to the parent and family-focused interventions, two youth-focused

programs had weekly scheduled leader-directed ‘meetings’ to present module information conducted in a secure discussion/chat server (*My Body, My Life*) or virtual-reality world (*Breathing Room*). The literature regarding the *Think-Feel-Do* intervention was not clear whether a sequential progression through modules was enacted.

Fewer youth-focused programs used audio/video components (55 %) to enhance participant engagement. While a larger percentage (72 %) included some form of animation, with half of those programs using animated games to deliver principle program components. Action tasks were enacted in 64 % of the programs, while few programs quizzed participants to assess their learning prior to, during or after module completion (27 %).

Technology-based communication strategies involving human-based interaction, were integrated into over half of the youth-focused program (55 %). In contrast with the parent and family-focused interventions, one youth-focused program included an assigned coach (*Think-Feel-Do*) and none of the programs used videoconferencing technology. Feedback to the participant regarding their progress was provided via program facilitators, or by the intervention platform itself, in 27 % of the programs. The methods of providing feedback were similar to the parent and family-focused programs with text message or emails (18 %) and telephone calls (9 %) and discussion boards (9 %) being used. Two of the youth-focused programs made use of instant messaging or chat functions as a method for feedback delivery (*Breathing Room*, *My Body, My Life*), a method not used in any of the parent and family-focused interventions.

Intervention Efficacy

Eleven youth-focused interventions assessed seven mental or behavioral health constructs; the results of which are delineated in Table 3. In similarity to the parent and family-focused interventions, depression and anxiety were the most frequently assessed constructs. Seven interventions (8 studies) assessed reductions in depression symptomatology with mixed results. Only two of the interventions (*My Body, My Life*; *SPARX*) measured using the Beck Depression Inventory and Child Depression Rating Scales, reported significant positive changes with effect sizes ranging from medium to large. The remaining five interventions reported nonsignificant or unclear results regarding depression. Six interventions (8 studies) assessed changes in anxiety symptoms, most frequently using the Spence Children’s Anxiety Scale. Only two studies reported significant changes with small (*MoodGYM*) and large (*CoolTeens*) effect sizes.

The construct of ‘Thoughts/Schemas’ was evaluated by studies assessing the *Cool Teens* and the *MobileType* interventions, each of which reported nonsignificant changes at post-assessment. However, the study assessing *MobileType* reported significant changes at follow-up. Two interventions, aimed to helping participants with Autism Spectrum Disorder symptomatology, reported mixed results. One study reported significant results and a large effect size (*FaceSay*), while the other reported nonsignificant results (*Let’s Face It*). Three constructs were assessed through one intervention apiece. The *Think-Feel-Do* intervention reported nonsignificant results regarding increases in self-esteem, while the *My Body, My Life* (disordered eating) and the *Breathing Room* (substance use) interventions reported significant changes.

Participant Completion Rates

An emerging question about technology-delivered interventions pertains to the extent to which participants complete the program protocol. This question is especially relevant because these types of interventions rely heavily on self-administration of the programs.

An initial consideration is how often the reviewed studies reported participant completion rates. Presence or absence of reported rates was examined in both domains: 68 % of the 21 studies for parent/family-focused interventions and 69 % of the 9 studies for child/youth-focused interventions. Obviously, this type of information should be reported routinely in future published studies of technology-based interventions. For the studies which did describe participant participation, characterizing the rates was not straightforward for two reasons. First, there was variability across studies with respect to the details and quantitative information provided, and second, the various interventions have different lengths and formats which make standardized comparison of completion rates difficult.

For the parent/family-focused intervention studies, where it was clearly reported the percentage of parents completing the intervention program ranged from 43 to 100 % (median 84 %). For the youth-focused intervention studies, where it was clearly reported the percentage of individuals completing the intervention program ranged from 9 to 100 % (median 60 %).

These approximate figures likely overestimate the actual participation rate across all of the studies because some of the studies reported average number of content units completed without indicating the percentage of participants who completed all of the units, and because as noted above about a third of the studies gave no participation rates.

Discussion and Conclusion

This review identified 30 technology-based psychosocial interventions for children and families that have been systematically tested in randomized controlled studies. For parent and family-focused interventions, we reviewed 19 interventions evaluated in 32 studies. For youth-focused interventions, we review 11 interventions evaluated in 13 studies.

The parent and family-focused technology-based interventions showed promise especially in reducing youth behavioral problems, and depressive and anxious symptoms, as well as in teaching parents to make use of evidence-based parenting strategies. Results of other studies showed some promise for reducing youth substance use risk. The sparser areas pertained to youth PTSD and child ASD, with only one study of each.

The youth-focused interventions showed some promise in reducing depressive and anxious symptoms; however, results were mixed across interventions, studies, and follow-up assessment time points. Other areas of promise, albeit with relatively fewer studies, included disordered eating, substance use, and ASD symptom reduction.

With respect to technology characteristics, family-based interventions mostly used Web site platforms, while youth interventions used Web site and CD-ROM platforms about equally.

One can expect that the CD-ROM format will be phased out in favor of web-based programs, with anticipation of greater adaptation to smart-phones. For both the family-based and youth-based interventions, programs typically make use of audio/video enhancements as well as action tasks and self-scoring quizzes. Most of the interventions made use of modules to navigate through information in an organized way. Approximately a third of family-focused interventions included coaches, while only one of the 11 youth-focused interventions used coaches. Typically coaches checked on participant progress and sent program reminders through the communication formats of text, email, phone calls and/or videoconferencing.

Potential Advantages

Several advantages for technology-based interventions were described earlier in the article, which include addressing staff shortages, maintaining privacy, permitting self-pacing and flexible scheduling, and ensuring that no element of an intervention's procedures is skipped.

The use of technology in these interventions is obviously intended to improve reach for behavioral health services and prevention. Technology makes it possible to improve access to services for youth and families residing in remote areas or lacking adequate transportation. These interventions also have the potential to reduce stigma because participants do not have to reveal themselves in a conspicuous setting and can maintain some degree of control over confidentiality and anonymity. Another goal of these interventions ultimately is to lower cost. Relying on technology delivery decreases cost associated with staff, brick and mortar facilities, parking and the like.

Challenges and Potential Disadvantages

Despite these advantages, the challenges of technology-based interventions warrant mentioning. One challenge pertains to the nature of the technology and ease of access. Technology-based platforms lead to the potential of restricting access only to those with regular personal access to technology (i.e., computers, web cameras, tablets, smartphones, etc.). In most of the studies, implementers provided the required devices to any participants who lacked access to allow for study participation but that just begs the question. Access is improving, but individuals living in low SES neighborhoods still experiences lower rates of Internet connectivity (Fairlie 2005; Waheed et al. 2015).

As of 2015, 78 % of US adults own laptop computers, 50 % have tablet computers, 86 % have a smartphone, and 84 % report Internet use (Pew Research Center 2015a, b). Twenty-six percent of adults in households with less than $30,000 annual income do not have Internet access compared with 3–15 % of the rest of the population, and 44 % of adults without high school diplomas lack access compared with 5–24 % of the rest of the population (Pew Research Center 2015a, b).

The use of technology-based platforms increases the potential for challenges concerning confidentiality and ethical issues different from those commonly associated with in-person intervention. Without a practitioner being physically present, participants might not fully read or understand documents for informed consent, for example outlining limitations of confidentiality. Sharing personal information over the Internet has potential ethical issues

related to the privacy of that information. Furthermore, consumers of technology-based interventions might not be protected by state professional boards because they not residing in the state where the intervention platform is housed. Recently, the APA has established guidelines to address some of the ethical issues associated with these types of interventions (APA 2013).

Technology-based interventions present other kids of limitations not common to interventions delivered in person. Some of these include unreliability and failure of technological equipment, limited Internet access, absence of human contact that some participants might desire, and lack of opportunity to ask questions that the technology-based intervention is not able to accommodate.

Another challenge arises from the self-administrative characteristic of these interventions. Technology-based interventions require the user to be more self-directed in the absence of set appointments typical of more traditional interventions. This could lead to issues with continued engagement with the program without the aid of a practitioner dedicated to assisting the participant. Despite this concern, multiple reviewed studies reported consistent positive feedback about the use of such interventions in addition to their value as a format of intervention dissemination (Nefdt 2010; Taylor et al. 2008).

Areas for Future Research and Development

While the flexibility of these interventions is an advantage, one potential downfall is the risk of participants putting off module completion without practitioner contact. One way this issue was alleviated in some of the interventions (e.g., *I-InTERACT*, *TOPS*, *OFPS*) was through the use of videoconferencing sessions involving a practitioner. These opportunities provided participants modest structure while retaining the flexibility of moving through the program at their own pace. Further research is warranted to assess whether the addition of these check-in opportunities, or other forms of support over the course of program, is an efficacious middle ground between face-to-face and completely self-directed programs.

With respect to forms of human communication with participants specifically, none of the studies focused on whether contact with others was helpful in bolstering the impact of the intervention. As almost half of the interventions within each focus area did not include any form of human communication, this warrants the question of whether improvements in youth mental and behavioral health are possible with very little or no therapist contact. As communication with a practitioner has always played an important role in traditional therapeutic interventions, it is worth assessing whether including some form of social interaction increases efficacy, as well as enrollment and engagement in technology-based interventions over the long term.

Recent research has explored the importance of contact with a therapist while utilizing technology-based interventions in adults and suggests that reduced or no contact does not negatively impact treatment efficacy or therapeutic alliance (Newman et al. 2011; Clarke et al. 2016). However, those with clinical levels of mental health symptoms had the most optimal benefits when therapists played a role in treatment (Newman et al. 2011).

Comparison of working alliance in youth engaged in online or in-person treatment have found no significant differences, suggesting that this construct that plays an important role in the therapeutic process is not negatively impacted (Anderson et al. 2012). Keeping these findings in mind, further understanding of whether communication plays a role in intervention efficacy is important, especially regarding whether practitioners, or perhaps contact with other participants completing the same intervention, may benefit participants' overall outcomes.

Another matter to consider is the potential importance of understanding who is taking part in the intervention. When interventions are delivered in person, practitioners can readily see which family members are in the room. Conversely, this is almost impossible when families enroll in technology-based interventions completed in their homes. Some of the interventions (e.g., *I-InTERACT*; *OFPS*; *TOPS*) had specific logins for each family member, which provided some information as to who was completing certain tasks. However, most of the interventions had only one login per family, which obscured who was participating in the program. Relatively little is known about participation patterns of family members in the technology-based interventions.

At this stage in the testing and refinement of technology-based interventions, relatively little is known about which components of these interventions are contributing most to the observed outcomes. Regarding continued assessments of intervention efficacy, one could argue that relative small variations in interventions based on technological advances do not warrant a new RCT, much in the same way new therapists do not require new licensure after continued professional development. Future research should address this issue and also examine how variation in platforms and delivery features affect implementation quality and overall impact.

In contrast to in-person delivery, technology-based interventions are more prone to rapid changes in the technologies and online systems themselves. The challenge for researchers is whether each technological change needs to be tested in a new RCT if the program content remains unchanged. In most instances, the small return on investment does not justify testing a minor technological variation through a costly RCT. However, it is reasonable to conduct micro-studies examining potential variation in engagement, utility, and feasibility associated with technological refinements and changes. It is important that researchers working on technology-based interventions stay attuned to a field that is constantly changing due to rapid advancement in the creation of new and improved technologies (Hall and Bierman 2015; Jones 2014).

Technology-delivered programming adds to the variety of choices available to consumers of interventions. We know relatively little, however, about consumer preferences in the context of actual delivery of services when technology-based options are involved. Parallel to the psychotherapy field, future research on technology-delivered and in-person-delivered interventions needs to expand the goal of understanding what works with whom under what conditions. It would be invaluable to ascertain whether certain personal characteristics and circumstances enhance or inhibit the impact of technology-delivered services.

This review ascertained that technological platforms have been integrated with several mental and behavioral interventions aimed at youth and their families, with preliminary results that are generally promising. Despite the potential drawbacks associated with technology access, confidentiality, and ethical issues, this area of advancement is a critical one for mental and behavioral health intervention but one fraught with challenges (Jones 2014). The use of technological platforms is a possible avenue for improving access and increasing cost-effectiveness.

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Table 1

Parent and family-focused interventions—studies

Study	*N*	% Female	Age range	% Not white, non-Hispanic	Behavior problems	Depression	Anxiety	Substance use	PTSD symptoms	Social communication (ASD)	P/C comm. or interaction	Parenting strategies	P/C relationship quality	Parental monitoring
Adventures in parenting														
Bert et al. (2008)	134	53	2–3	18								NS		
BRAVE online														
Spence et al. (2006)	72	42	7–14	NR		*(0.67)	*(0.74)							
March et al. (2009)	73	55	7–12	NR		NS	**(0.31)							
Spence et al. (2011)	116	59	12–18	NR			***(0.91)							
Camp-cope-A-lot														
Khanna and Kendall (2010)	49	33	7–13	16		NS	***(1.34)							
3 month F/U						NS	NS							
Computer-assisted parent program														
MacKenzie and Hilgedick (2000)	46	51	3–5	18	NS							NS	NS	
Follow-up					NS							NS	NS	
Cuidalos														
Villarruel et al. (2010)	130	54	14	100							***(1.16)			
Incredible years														
Taylor et al. (2008)	90	48	4	19	UNK									
I-INTERACT														
Mast et al. (2014)	7	NR	3–9	14	*(2.76)							*(2.75)		
Interactive DVD—communication														
Nefdt (2010)	27	7	3	19						**(0.95)		***(4.12)		
InfantNet														
Baggett et al. (2010)	40	45	3–8 m	17							*(0.70)	NS		
Internet-PMT														
Enebrink et al. (2012)	104	42	3–12	3	**(0.67)							***(0.90)		
Kids accident														
Cox et al. (2010)	85	31	7–16	NR		NS	*(0.33)		NS					

Study	*N*	% Female	Age range	% Not white, non-Hispanic	Behavior problems	Depression	Anxiety	Substance use	PTSD symptoms	Social communication (ASD)	P/C comm. or interaction	Parenting strategies	P/C relationship quality	Parental monitoring
Parenting wisely														
Lagges and Gordon (1999)	62	100	17	29								***(1.07)		
Kacir and Gordon (1999)	38	50	12–18	0	**(0.97)							***(2.11)		
Cefai et al. (2010)	116	49	9–15	NR	NS									
Play nicely														
Scholer et al. (2010a)	259	NR	1–5	71								?		
Scholer, Hamilton et al. (2010b)	96	91	NR	89								NS		
Chavis et al. (2013)	258	NR	0.5–2	76								*		
Strongest families														
McGrath et al. (2011)	243	39	8	NR	**(0.62)		NS							
240 day F/U					*(0.48)		*(0.49)							
1 yearr F/U					NS		*0.43)							
TOPS and OFPS														
Wade et al. (2006)	45	38	11	19	NS									
Wade et al. (2011)	41	59	15	12	NS						**(1.15)			
Triple P online														
Sanders et al. (2008)	454	35	2–9	NR	*(0.32)									
6 month F/U					NS									
Sanders et al. (2012)	116	33	2–9	NR	***(0.89)							***(0.46)		
6 month F/U					***(0.74)							***(0.65)		
Sanders et al. (2014)	193	33	3–8	NR	***(2.89)							***(1.49)	***(2.67)	
6 month F/U					*(0.37)							***(0.55)	***(0.97)	
Substance abuse risk reductionI														
Schinke et al. (2004)	514	51	11	89				c						NS
1 year F/U								d						*
2 year F/U								e						*
3 year FU								f						*
Schinke et al. (2009a)	202	100	12	32				NS			*(0.29)			*(0.29)

Study	*N*	% Female	Age range	% Not white, non-Hispanic	Behavior problems	Depression	Anxiety	Substance use	PTSD symptoms	Social communication (ASD)	P/C comm. or interaction	Parenting strategies	P/C relationship quality	Parental monitoring
Schinke et al. (2009b)	252	100	11–13	73		NS		g			NS			NS
1 year F/U						NS		h			**(0.26)			***(0.42)
Schwinn and Schnike (2010)	413	56	17	91				i						
Substance abuse risk reduction II														
Fang et al. (2010)	108	100	10–14	100		*(0.39)		a			*(0.43)		***(0.83)	***(0.74)
Fang and Schnicke (2013)	93	100	12–16	100		NS		b			*(0.41)		***(0.59)	*(0.41)
Youth mental health														
Deitz et al. (2009)	99	NR	NR	7							NS			

Intervention names in italics are official names; Efficacy reported as *p* value

* $p < 0.05$;

** $p < 0.01$,

*** $p < 0.001$ (Cohen's d effect size); Not reported (NR); Not Significant (NS); Results listed for mother report only; see original article for paternal report; a = Alcohol**(0.49); Cig. (NS); Marij.**(0.53), Px Pills* (0.48); b = Alcohol*(0.35); Cig. (NS); Marij.*(0.35), Px Pills*(0.35); c = Alcohol (*); Cig. (NS); Marij. (NS); d = Alcohol (*); Cig. (NS); Marij. (NS); e = Alcohol (*); Cig. (*); Marij. (*); f = Alcohol (*); Cig. (NS); Marij. (*); g = Alcohol (NS); Cig. (NS); Marij. (NS); Px Pills***; h = Alcohol*(0.22); Cig. (NS); Marij.**(0.23), Px Pills***(0.31); i = Alcohol* (0.35); Cig. (NS); Marij.* (0.35), Px Pills* (0.35)

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Table 2

Parent and family-based interventions: platform, technology and communication formats

Intervention	Platform			Structure				Elements				
	Web site	CD/DVD	Phone text	Modules/units	Linear flow	Self-directed	Set meetings	Audio/video	Animation	Quizzes	Game(s)	Action tasks
Adventures in parenting	✓			✓	✓							
BRAVE online	✓			✓	✓				✓	✓		✓
Camp cope-A-lot		✓		✓	✓			✓	✓		✓	✓
Computer-assisted parent program		✓		✓				✓	✓	✓	✓	
Cuidalos		✓		✓				✓		✓		✓
Incredible years	✓	✓		✓	✓			✓		✓		
I-InTERACT	✓			✓	✓			✓		✓		✓
Interactive DVD—communication		✓		✓	✓			✓		✓		
InfantNet	✓			✓	✓			✓		✓		✓
Internet-PMT	✓			✓	✓			✓				✓
Kids Accident	✓					✓						
Parenting Wisely		✓				✓		✓		✓		
Play nicely		✓				✓		✓				
Strongest families	✓			✓	✓			✓		✓		✓
TOPS and OFPS	✓			✓	✓			✓		✓		✓
Triple P online	✓			✓	✓			✓				✓
SA Risk reduction I		✓		✓	✓			✓		✓		
SA risk reduction II	✓			✓	✓				✓	✓	✓	
Youth mental health	✓					✓		✓	✓			

Intervention	Communication formats							
	IM/chat	Disk. board	Text/email	Video sharing	Coach	Videoconf.	Phone call(s)	Feedback
Adventures in parenting								
BRAVE online			✓		✓		✓	✓
Camp cope-A-lot					✓			
Computer-assisted parent program								✓
Cuidalos								
Incredible years		✓			✓			

Intervention	Communication formats							
	IM/chat	Disk. board	Text/email	Video sharing	Coach	Videoconf.	Phone call(s)	Feedback
I-InTERACT					✓	✓		✓
Interactive DVD—communication								
InfantNet		✓		✓	✓		✓	✓
Internet-PMT		✓						✓
Kids Accident								
Parenting Wisely								✓
Play nicely								
Strongest families					✓		✓	✓
TOPS and OFPS					✓	✓		✓
Triple P online			✓					✓
SA Risk reduction I								
SA risk reduction II								
Youth mental health								

Web site: Int. accessed by logging into Web site; CD/DVD: Int. delivered via CD-ROM or DVD; Phone Text: Int. accessed via texts; Modules/ Units: delivered by delineated modules/units; Linear Flow: Program follows specific flow of modules; Self-directed: No structure to flow through materials; Audio/Video: delivery includes audio/video technology; Animation: Used to present information; Quizzes: questions to assess material retention; Game(s): Material presentation or practice of skills through interactive games; Action Tasks: activities completed during session or between sessions; IM/Chat: Comm. with other participants; coach/program staff; Discussion Board: Comm. with other participants, group leaders, coach; Text/Email: text reminders; reminder emails from program; coach; Video Sharing: participants share video for feedback/ discussion; Coach: contact staff person through videoconference; over phone; Videoconference: Comm. format with coach; Phone Calls: Comm. with coach/program staff; Feedback: from Web site, coach or program staff who monitored progress

Table 3

Youth focused interventions—studies

Study	*N*	% Female	Age range	% Non white, non-Hispanic	Depression	Anxiety	Disordered eating	Thoughts/schema	Substance use	ASD-related	Self-esteem
Breathing room											
Woodruff et al. (2007)	136	46	14–19	72					**		
3 month and 1 year F/U									NS		
The cool teens CD-ROM											
Wuthrich et al. (2012)	43	63	14–17	86		*(1.46)		NS			
FaceSay											
Hopkins et al. (2011)[a]	49	10	6–15	29						***(1.41)	
Let's face It											
Tanaka et al. (2010)	79	22	11	NR						NS	
Mobile type											
Reid et al. (2011)	114	63	14–24	NR	NS	NS		NS			
6 week F/U					NS	NS		*(0.58)			
MoodGYM											
Calear et al. (2009)	1477	56	12–17	NR	Mixed	***(0.21)					
My body, my life											
Heinicke et al. (2007)	73	100	14	3	*(0.56)		*(0.53)				
Problem-solving therapy											
Hoek et al. (2012)	35	76	16	NR	NS	NS					
SPARX											
Fleming et al. (2012)	32	44	13–16	75	***(1.61)	NS					
Merry et al. (2012)	170	63	16	NR	NS	NS					
The journey											
Stasiak et al. (2014)	34	53	15	29	NR						
Think-feel-do											
Stallard et al. (2011)	20	33	11–17	NR	UNK	NS					NS
Attwood et al. (2012)	25	12	10–16	NR		UNK					

Intervention names in italics are official names; Efficacy reported as *p* value

* $p < 0.05$;

** $p < 0.01$;

*** $p < 0.001$ (Cohen's d effect size); Not reported (NR); Not Significant (NS); UNK: results were unknown for this construct; see original article; Mixed = mixed results; see original article

[a] Results for high-functioning respondents, see original article for further results

Table 4

Youth-focused interventions: platform, technology, and communication formats

Intervention	Platform			Structure				Elements				
	Web site	CD/DVD	Phone Text	Modules/units	Linear flow	Self-directed	Set meetings	Audio/video	Animation	Quizzes	Game(s)	Action tasks
Breathing room	✓			✓	✓		✓	✓	✓			
Cool teens CD-ROM		✓		✓		✓		✓	✓			✓
FaceSay		✓		✓		✓		✓	✓		✓	
Let's face it		✓		✓		✓		✓	✓		✓	
MobileType			✓			✓						
MoodGYM	✓			✓	✓				✓	✓		✓
My body, my life	✓			✓			✓					✓
Problem-solving therapy	✓			✓	✓							✓
SPARX		✓		✓	✓			✓	✓		✓	✓
The journey		✓		✓	✓			✓	✓	✓	✓	✓
Think-feel-do		✓		✓					✓	✓		✓

Intervention	Communication formats							
	IM/chat	Disk. board	Text/email	Video sharing	Coach	Videoconf.	Phone call(s)	Feedback
Breathing room	✓							
Cool teens CD-ROM			✓				✓	✓
FaceSay								
Let's face it								✓
MobileType								
MoodGYM								
My body, my life	✓	✓						
Problem-solving therapy			✓					✓
SPARX								
The journey								
Think-feel-do					✓			

See Note under Table 2; same descriptions apply