#KidsAnxiety and the Digital World

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KEYWORDS

• Child anxiety • Adolescent anxiety • Social media • Internet • Online gaming
• Digital technology

KEY POINTS

- Currently, there is limited research guiding clinicians' understanding of child or adolescent anxiety and the negative and positive impact social media may have on youth with anxiety.
- Problematic internet use in children and adolescents adversely affects sleep and healthy living habits (eg, diet, physical activity, sun exposure) that may exacerbate anxiety and depression.
- Limitations in research include potential biases toward negative consequences of digital technology and youth.
- There are emerging prevention and treatment tools through eHealth and mHealth technologies for addressing childhood anxiety.
- Recent COVID-19 restrictions and increased virtual platforms for education, meeting basic needs, and socialization are leading to "new norms" with respect to youth and screen time.

INTRODUCTION

Anxiety is the most common mental health condition in childhood, with prevalence rates ranging from 5% to 10% in children and up to 25% in teens.[1,2] When "screens" were first introduced through network television in the 1950s, children and teens may have seen 30 minutes of informational content on the national nightly news. Now anyone connected to the internet has access to constant streaming of news for 24 hours a day. Pandemic-related lockdowns, changing to virtual platforms for education, and an abrupt change of the social fabric for children and youth of all ages have led to an increase in prevalence of anxiety since March 2020.[3–5] Untreated anxiety in

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youth can lead to other mental health conditions, including depression and substance use disorders. Common presentations of anxiety in younger children include fear of separation from a caregiver, social worries, specific phobias, and anxiety with novel situations. Typically, a child's world is filled with developmental social tasks that are potentially anxiety provoking (eg, separating from parents to attend school, making friendships and managing peer relationships, learning, active class participation, and pursuing interests or socializing beyond the school setting). In adolescence, developing complex peer relationships, including romantic relationships, as well as planning for adulthood can cause or exacerbate anxiety. Over the past 10 years, social media and digital technology have become prominent components of our youth's lives, with usage peaking among 16- to 24-year-olds.[6] Younger children are also increasingly exposed to the digital world and social media.

This article reviews current understanding of how childhood anxiety disorders interplay with electronic media, including risks and protective factors, challenges faced by caretakers navigating the digital world of youth, and current and potential future digital apps ("apps") to treat anxiety in children and adolescents. This article includes the impact of the coronavirus disease 2019 (COVID-19) pandemic on child mental health, screen time, and preparing for a "new norm" for our youth and digital technology.

RISK FACTORS ASSOCIATED WITH COMPUTER HABITS

The ubiquitous nature of digital technology in the everyday life of modern youth makes it essential for clinicians to understand the potential risks these mediums pose. The currently limited research on the relationship between technology and anxiety in children and adolescents suggests there are associations between computer habits and symptoms of anxiety.[7–12] To best understand the implications of these relationships, the following are important:

1. Understand how the developmental tasks of youth are affected by technology habits.
2. Recognize how digital communication differs from face-to face interactions for anxious youth.
3. Identify individual factors associated with anxiety and problematic internet use (PIU) in youth.
4. Examine unique features of social media that may serve to worsen anxiety in young people.

Developmental Tasks

One of the major tasks of childhood and adolescence is the creation and maintenance of significant relationships. Friendship in childhood is followed by increasingly intimate relationships in adolescence. Modern life has changed the nature of play in the lives of youth. Most parents no longer consider wandering local neighborhoods to be safe for their children, thus virtual worlds provide an alternate setting for play.[13] The COVID-19 pandemic that led to lockdowns, social distancing, and virtual schooling throughout 2020 to 2021 has impacted developmental tasks of childhood and adolescence.[14] Conversely, the sense of safety provided by the digital world has enabled shy youth to explore friendships in games geared toward children as young as 5 years old. Games and websites, such as Fortnite, Roblox, Terraria, and Zuluworld, are developed for younger children and allow limited social networking.[15] Grom Social is a social networking site for children aged 10 years and older, which has been described as

safe but turns out to be flawed because links sometimes lead to inappropriate sites.[15] YouTube Kids has been marketed for youth as young as 4 years of age, and Instagram is in the process of creating an Instagram platform for those younger than age thirteen.[16] Minecraft is a popular video game played by latency-aged children that can facilitate engagement with peers in person and virtually.[17] Despite the growing number of these platforms, there is little research evidence to date regarding the potential of social media to facilitate friendships in younger children. Inherent risks of heavy digital technology engagement for latency-age anxious children include sleep impairment, use of the virtual world to avoid normative exposures in the real world, inadequate exercise, and development of problematic overuse.[18–20]

Important milestones of adolescence include the development of identity and managing relationships with peers. Self-presentation is the process by which individuals selectively manage the image and identity shown to others. Self-disclosure involves sharing one's thoughts, feelings, and behaviors.[21] Both self-presentation and self-disclosure are critical in the exploration of identity and relationships with others. However, anxiety may interfere with an adolescent's self-presentation efficacy, leading to avoidance of social interactions with peers. Thus, computer-mediated communication (CMC) offers an alternative platform to engage with others that is typically perceived by socially anxious youth as safer than face-to-face contact.

Computer-Mediated Communication

Social anxiety involves the fear of negative evaluation by others. Consequently, socially anxious youth tend to avoid experiences they believe may result in unfavorable impressions.[22] As CMC allows for text-based conversations without resorting to traditional audio or visual cues, this provides a comforting alternative for youth fearing judgements about their appearance, speech, and manifestation of physiologic signs of anxiety (eg, blushing).[23] CMC also enables asynchronized communication that allows participants to take more time to construct and edit messages before sending them. Asynchronicity especially appeals to youth who are self-conscious, easily embarrassed, or likely to withdraw in face-to-face settings.[21]

Social anxiety is positively related to preference for the freedom from nonverbal cues provided by CMC, according to a meta-analytic review of 22 studies.[23] The review found that socially anxious individuals prefer online interaction to in-person interaction and are more likely than peers to consider it as an effective medium for developing relationships.[23] With the greater comfort and perceived increased in self-presentational efficacy provided by CMC, the socially anxious individual's preference for online social interactions may be a risk factor for the development of PIU.[24]

Problematic Internet Use

PIU can lead to the development of cognitive and behavioral symptoms that result in distress and impairment in functioning.[22] PIU involves difficulty controlling the amount of time an individual spends online and distress when internet access is unavailable or poor bandwidth provides suboptimal virtual experiences.[23] PIU was one of the first and most broadly used terms in the taxonomy of tech-related problems and disorders. It has also been used interchangeably with other terms such as video game addiction (IVGA) or internet gaming disorder, internet addiction, virtual addiction, and technology addiction.

With the continued increase in different types of technologies, platforms, and use among youth as well as expanded research in these areas, several new terms have emerged in the literature identifying specific subcategories under the umbrella of PIU:

- "Appearance-related social media consciousness" is the extent to which individuals' thoughts and behaviors reflect ongoing awareness of whether they might look attractive to a social media audience. Such self-objectification tendencies have been associated with higher likelihood of anxiety as well as depression and eating disorders.[25]
- "Nomophobia" (ie, "no mobile phone") is the experience of extreme discomfort, anxiety, nervousness, or anguish caused by being out of contact with a mobile phone. Sharma and colleagues (2019) noted that this is an emerging mental health condition and is significantly associated with anxiety, depression, and poor quality of life.[26]
- "Phubbing" is a social exclusion behavior related to excessive focus on mobile phone use whereby an individual is being snubbed in favor of the phone (ie, phone snubbing). This habit can undermine interpersonal connection and have adverse effects to relationships that may subsequently affect mental health.[27] Of note, parents may feel "phubbed" by their child.
- "Social media disorder" (SMD) is a behavioral addiction where individuals experience uncontrollable urges to be on social media and to maintain an active presence in the platform at all times, as well as being overly concerned about the happenings in the social media and their perceived persona. The constant stream of approval in the form of retweet, likes, and shares from social media platforms induce dopamine that triggers the brain's reward area similar to those caused by other addictive agents including gambling and using recreation drugs.[28]

As the nomenclature grows under PIU, it is necessary for us to understand emergent information regarding prevalence and risk factors associated with these problem areas and their impact on young people. Various studies worldwide have noted that PIU results in impaired human interaction, poorer sleep quality, and development of unhealthy lifestyle habits (eg, less exercise, higher consumption of fast foods and sugary beverages, among others).[18–20,29–31] Furthermore, a history of psychological illness is associated with PIU. Users experiencing psychological problems may use online activity to escape negative feelings and increase positive ones, potentially creating a pattern of compulsive use.[7] Research has found that socially anxious youth needing social assurance are more likely to develop addiction to social media than those with little need for such assurance.[32] Socially anxious youth seeking to manage anxiety through external validation also seem to be at greater risk for developing problematic use than those with less need for social approval. These results reflect the importance of understanding individual cognitions and attitudes about online engagement because individuals are affected differently by internet habits.[33–35]

The type of screen time activity being used (active vs passive) can also be a risk factor for developing PIU. Active screen time is defined as time when an individual is actively engaging with the virtual platform such as learning skills, doing something creative, reading, or video chatting with another person. In contrast, passive screen time occurs when an individual is mindlessly scrolling through social media or watching TV or a movie. Passive screen time and the use of portable devices have been associated with higher likelihood of anxiety disorders and sleep disturbances.[19,20,36] Engagement in pathologic video gaming has also been identified as a risk factor in the development of anxiety in youth. In a longitudinal study, pathologic gaming (ie, use that disrupts interpersonal, psychological, and/or academic functioning) was noted to be a predictor for depression, anxiety, and social phobia. Children and adolescents who were able to stop pathologic gaming showed a reduction in all 3 areas compared with peers

who remained pathologic gamers.[37] These results are notable because this is the first research demonstrating that pathologic gaming is predictive of later-onset and maintenance of mental health disorders.

Social Media and Anxiety

Social media sites are designed to allow users to share content, interact with others, and disseminate information about themselves and their world.[38] Numerous social media platforms are used by both children and adolescents (eg, Spotlite, PopJam, Instagram, Snapchat, YouTube, TikTok). Social media sites play an important role in self-presentation.[39] Platforms such as Facebook and Instagram allow users to develop a digital identity that can be carefully constructed and digitally enhanced to the point of idealization, potentially creating a culture of unrealistic comparisons. Many youths feel the need to be constantly connected to social media platforms to maintain a presence in their peer group and may use social networking sites to alleviate the fear of missing out (FOMO).

FOMO is worry about missing connections that peers are enjoying without you, potentially risking loss of social status. Youth indicate that FOMO often results in anxiety and feelings of inadequacy.[6] Anxious youth, who also have heightened FOMO, are more likely to experience problems in functioning related to their use of social media. High levels of FOMO in youth mediated the relationship between anxiety symptoms and negative consequences (eg, impairment in academic and/or social functioning).[7] Unlimited access to many idealized representations of peers via social media can lead youth to believe that peers are leading better, happier, and more fulfilled lives. This engenders anxiety, self-consciousness, and perfectionism, which subsequently triggers compulsive use of social networking sites.[6,40]

Maintaining multiple social media accounts simultaneously is commonplace among youth and has been positively correlated with anxiety.[38] Youth who operate multiple social media sites may feel social pressure to sustain a carefully crafted online identity on multiple fronts, resulting in preservative thoughts and behaviors. Engagement with multiple social media platforms also increases demands for multitasking, which has been found to worsen mood and anxiety.[38] Adolescents who habitually plug in to social media late at night displace much-needed sleep. One in 5 youth report waking during the night to check messages on social media.[6] Having multiple social media accounts seems to increase cognitive demands, impair restorative sleep, increase tendencies for forming obsessive internet habits, and increase risk for anxiety.[6]

Some youth use social media to avoid unpleasant emotions and real-world stressors through distraction, excessive viewing of others' social media profiles (eg, passively viewing Instagram profiles, known as Instastalk), or posting complaints. Lonely teens may use social media, a more comfortable mechanism for expression, as an emotion-regulation strategy.[7] Ohannessian and colleagues (2021) pointed out that excessive social media use also increases the likelihood of corumination (ie, repeatedly discussing personal problems with peers), which subsequently lead to internalizing problems and anxiety symptoms.[35] These factors can lead to PIU impairing real-world relationships, especially in lonely individuals who prefer socializing online.[22] Young people often use social media to gain relief from distress (eg, loneliness, anxiety), but overuse increases the risk of a cyclic pattern of avoidant coping and social isolation, addictive use of social media, and ultimately exacerbated loneliness and social anxiety[41,42] (**Fig. 1**). Research has underscored this risk, identifying that youth experiencing SMD have higher rates of loneliness and sleep problems and are more likely to experience ostracism in daily living.[28]

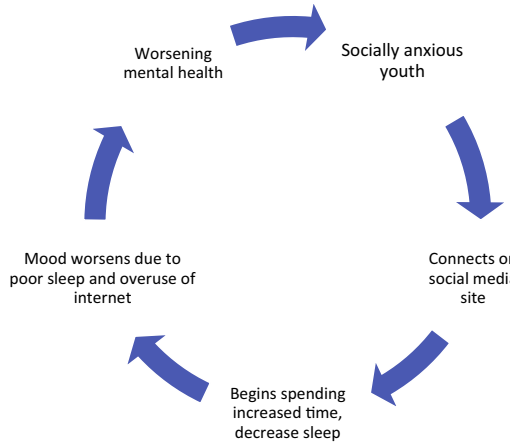

Fig. 1. Cycle of socially anxious youth and social media.

Limitations

Research in this area is continuing to develop but several limitations exist currently. First, most aforementioned studies are based on cross-sectional designs, of which causality is unclear.[38] For example, associations between anxiety and social media use may indicate that individuals with anxiety tend to use social media more, or that increased use of social media worsens anxiety, or both. Additional research using experimental design is needed to establish the direction of these relationships. Second, most studies have focused on older adolescents and young adults, so there is limited research on the relationship of social media use and anxiety among preadolescent children.[33] Third, most research is focused on community-based populations, and more work is needed studying these relationships in clinical populations.[38] Also of note, recent publications assessing/describing the impact of internet and social media use during the pandemic on pediatric mental health have been published at an exceptionally rapid pace in response to the pandemic. Many recent studies were limited to descriptive studies of a unique time and may not be generalizable to all post-pandemic settings.

BENEFITS AND PROTECTIVE FACTORS

There are several means by which online activities can benefit children and teens. The online world of youth is typically intertwined with their offline lives. Both can work in conjunction to support individual and interpersonal development.[39] Social media provides an opportunity for young people to share their own creations and demonstrate mastery: videos, pictures, blogs, and tweets. Status updates allow practice expressing self-disclosure skills, permitting communication that might otherwise be impossible. Social media is a platform for adolescent self-expression that can provide the framework for the development of identity while concurrently offers countless opportunities to connect with others of similar interests and enhance real-world social relationships.[6] Furthermore, preadolescents and adolescents interact online to remain connected to their real-world friends, which also confers important benefits for developing communication skills and maintaining interpersonal relationships.[33]

The internet also provides access to potential networks of support. Most teenagers surveyed endorsed having received support via social media during times of distress.[6] Online sources of support may be particularly helpful for youth whose anxiety interferes with their ability to seek support face-to-face. Specialized social media sites related to mental health (eg, Half of Us, Go Ask Alice!, To Write Love on Her Arms, Today is For Tomorrow, TeenMentalHealth.org) provide a platform for youth to access information and potential support from peers encountering similar problems, which may help alleviate stigma related to seeking help for mental health issues.[38] However, it is important for providers to understand how these sites operate and potential risks associated with the use of these sites.

Youth who are part of marginalized groups (eg, LGBTQIA youth) are at higher risk for developing mental health problems. They may find safety, support, and information through online interactions and social networking.[43] For example, nonheterosexual youth are able to connect, discuss aspects of identity, receive affirmation and support, and practice coming out.[21] Social media platforms also represent hubs of community for transgender adolescents. These communities provide emotional, appraisal, and informational support that transgender youth may not otherwise be able to access.[43] Research has found that adolescent mothers' use of social networking sites is related to reduced anxiety and improved confidence.[44] Given the potential of digital technology and platforms to support the most vulnerable youth, it is important that these youth are able to have access to these resources.[45] Without appropriate access to the internet, we are further exacerbating pre-existing disparities for our most vulnerable youth. An overview of risk and protective factors related to online engagement and anxiety is summarized in **Table 1**.

PARENTING AN ANXIOUS CHILD IN THE DIGITAL AGE

Children today are digital natives, whereas some parents are not. Parents may lack the technical abilities to keep pace with their childrens and may be unaware that passwords or filters are easily bypassed by savvy youth.[46] Parents and grandparents providing supervision are frequently naïve to the concept that children's offline lives intertwine with their online lives and that social media can also facilitate healthy socialization.[47] Managing the online behaviors of a socially anxious child is particularly challenging in balancing the need to limit the child's time spent online and protecting them from online risks with the potential benefits of increased socialization. Parents may also be prone to blame technology as the primary cause of mental health problems and be disconnected from younger generation's views of the vital role that technology and social media play in their lives.[45] Parents may struggle to reconcile this mixed picture, for example, when video games such as Minecraft are incorporated into school curricula, when providers recommend treatment applications ("apps") for anxiety, and when they may struggle with their own maladaptive internet habits.

Health care providers play a vital role in educating and guiding parents on the different ways that technology devices and platforms can impact child development in both positive and negative ways.[48] Providers need working knowledge and skills to support families as they navigate these complex issues. For example, youth may engage excessively with computers (eg, playing videogames) to avoid anxious thoughts, feelings, and physiologic symptoms that are triggered by real-world activities (eg, going to school, social activities with peers). When socially anxious youth refuse to go to in-person schooling (when available), caregivers should be advised to limit or restrict media and internet use until successful attendance occurs. Providers should advise caregivers to not allow youth with significant anxiety symptoms to

Table 1
Risk and benefits of online habits for youth with anxiety

Risks for Developing Problematic Internet Use/Consequences of PIU	Benefits of Online Engagement
History of premorbid mental health concerns	Identity exploration and expression
Loneliness	Practice with self-disclosure
Shyness	Increased creativity
Preference for online social interactions	Augmenting real-world social relationships
Great need for social assurance	Access to health-related information
High levels of Fear of Missing Out (FOMO)	Increased availability of mental health treatments
Use social media for more than 2 h daily	Destigmatizing mental health forums
Multiple social media accounts	Companionship for members of marginalized groups
Case Example 1: A 10-year-old with long history of anxiety; separation concerns, social phobia, generalized anxiety concerns has open access to constant news feed and recent mass shootings, COVID deaths, and natural disasters has led to further fears of leaving home and returning to school.	*Case Example 1:* A 13-year-old female adolescent always socially shy, able to connect with peers online to "practice" social conversations and engagement. Family monitors to ensure peers are "real peers", from school or extracurricular activities.
Case Example 2: A 14-year-old adolescent has been exploring sexuality and gender on the internet. Has been on Omegele and other sites for social connections. Felt "safe". Shared worries, concerns, and nude pictures online. Was "catfished" and then instructed to Venmo $2000 or nude photos would be posted on multiple social media platforms. Had panic attacks and became suicidal.	*Case Example 2:* An 8-year-old precocious boy teaching others on his YouTube channel about ways to overcome nervousness, speak up in class, make a new friend, strategies to "conquer worries".

participate in online schooling that provides no face-to-face peer interactions, when alternative in-person schooling options exist because this reinforces avoidant coping. For anxious youth, behavior plans that grant online entertainment as a positive reward for exposure to and engagement in real-world activities can promote the practice of active rather than avoidant coping. Finally, providers should consider the impact of caregiver mental health (and personal technology use) on children's use of technology because parents who experience long-standing distress may rely on the use of screens to help manage children resulting in less oversight of time on screens and the quality of content being viewed.[49]

PIU among mothers of young children has been associated with maternal social anxiety and a positive relationship between social media and social anxiety in offspring.[50] Maternal depression has also been associated with screen overuse among Korean children aged 2 to 5 years.[49]

Notably, there are several online resources that are available for managing children's and family's digital technology habits (**Table 2**).

Table 2
Resources for families

Resource	Link to Resource	Potential Use
Facts for Families Guide by the American Academy of Child & Adolescent Psychiatry (AACAP)	https://www.aacap.org/aacap/families_and_youth/facts_for_families/fff-guide/FFF-Guide-Table-of-Contents.aspx	Downloadable materials to guide parents in matters related to social media and internet use, including documents titled "Internet Use in Children", "Listening to Music and Watching Music Videos", "Movies, Media, and Children", "News and Children", "Social Media and Teens", "TV Violence and Children", "Video Games and Children: Playing with Violence", and "Watching TV/Screen Time and Children"
Healthy Children.org website by the American Academy of Pediatrics (AAP)	https://www.healthychildren.org/English/family-life/Media/Pages/How-to-Make-a-Family-Media-Use-Plan.aspx	Practical guidelines and support for families around mindful media use from birth through adolescence
Age-Based Media Reviews for Families by Common Sense Media	https://www.commonsensemedia.org/	Guidelines for parents around media use, and independent ratings of appropriateness of social media apps and games for youth of various ages
The App Evaluation Model by the American Psychiatric Association (APA)	https://www.psychiatry.org/psychiatrists/practice/mental-health-apps/the-app-evaluation-model	Evaluation of mental health apps including ease of use, privacy and safety, clinical foundation, and therapeutic benefits.

SCREEN TIME AND ANXIETY

According to the American Academy of Child and Adolescent Psychiatry (AACAP), children aged 8 to 12 years are spending on average 4 to 6 hours per day online, and teens up to 9 hours per day; however, the World Health Organization recommends no screen time for less than 1 year of age, at most 1 hour for preschoolers, and no more than 2 hours per day for all other youth ("Screen Time and Children" in AACAP Facts for Families Guide; **Table 2**). A commentary was published describing concerns of increased screen exposure of 40% among toddlers younger than 2 years with a smart phone and the potential impact on attachment and the development self-soothing skills.[51] Most recently published stories about screen time use and mental health conditions in youth are reviews of previous studies and report a "weak effect" of higher screen time use (greater than 2 hours per day) and trend toward increased anxiety.[12,19,52] When teasing out differences between active and passive screen time, greater than 4 hours per day of passive screen time was associated with increased rates of generalized anxiety disorder and social phobia in Canadian youth aged 12 to 18 years.[36] Additionally, the 4th survey of the Childhood and Adolescence Surveillance and Prevention of Adult Non-Communicable Disease (CASPIAN-IV) study indicated that screen time greater than 2 hours per day was associated with less

physical activity and an increase in anxiety among those aged 6 to 18 years.[18] In considering these findings, it is important to underscore that these studies are correlation studies that did not show causation. Furthermore, recent calls have been made to abandon the construct of screen time. Instead, perspectives should shift toward how youth are interacting with technology in their daily lives and the quality of these interactions rather than the quantity.[45]

TECHNOLOGY AND TREATMENT OF ANXIETY

Youth frequently use online searches and social networking to learn about health-related topics. Teens use online resources to gather health information, share their own related experiences, learn of others' experiences, and track data related to health goals.[53] Therapists have begun to use social networking, including the creation and posting of TikTok videos, to provide mental health literacy and help destigmatize mental illness and reach a broad audience of youth. Online platforms can also augment or replace conventional treatment. Mobile health (mHealth) interventions involve the use of text messaging and smart phone apps, whereas electronic health (eHealth) interventions include videogames and other computer-based interventions. Both mHealth and eHealth may augment conventional therapies or serve as stand-alone interventions for anxiety disorders and distress associated with medical procedures and conditions.[54]

There are numerous potential benefits offered by mHealth and eHealth interventions that can expand the scope of mental health services. Online treatments are often cost-effective and could increase accessibility for families with limited time, financial resources, transportation options, and who are in remote locations with few or no mental health care providers. They may also be preferable for anxious youth who desire greater autonomy and anonymity.[55] However, the efficacy of these novel treatments remains unproven, and when used in lieu of traditional care, they risk delaying access to more effective treatments.

Mobile Health Apps

Mental health care providers can partner with youth in using mHealth resources in a variety of ways.[56] Apps can be used to help youth better engage in treatment via reminders to take medication (eg, Round Health Medicine Reminder and Pill Tracker), track mood (eg, Moodtrack Diary), keep thought diaries (eg, Moodnotes Thought Journal), or engage in self-regulatory skills such as mindfulness (eg, Calm: Meditation to Relax, Focus & Sleep Better). A review report published in 2016 had cited 55 apps intended to help youth with anxiety available on Google Play and the Apple App store.[57]

Despite the availability of many mHealth interventions, there is limited research on the acceptability and usability of these apps and almost no research on the effectiveness of these apps. Bry and colleagues (2018) published an article reviewing 121 apps marketed to treat anxiety in youth.[58] The authors checked for the presence/absence of six evidence-based treatment (EBT) components: (1) psychoeducation, (2) self-monitoring, (3) cognitions and thought challenging, (4) problem-solving, (5) contingency management, (6) exposures. They also assessed for relaxation training. The content was at a 9th grade reading level. User safety was limited regarding confidentiality and risk statements leading to intervention. Only 23% of the apps reviewed contained at least two EBT components. The majority of the apps were distraction tools, games, coloring activities, and audio or visual distractions. About half provided relaxation strategies. The "Reach for Success" mental health application, which is a 6-session cognitive behavioral therapy (CBT)-based protocol designed for prevention of

anxiety problems in children 8 to 12 years old, was one of the few that were examined for usability. Children and preadolescents rated the app as having high usability, but future research is needed determine its effectiveness.[59] Grist and colleagues (2017) reviewed 24 articles that reported on 15 mental health apps for adolescents.[60] Among those reviewed, only two apps included randomized control trials, and there was no evidence found supporting the effectiveness of apps designed for children or teens with mental health concerns.

Clinicians should be aware of the variety of risks related to the use of these apps and educate patients and families regarding their potential dangers. Reviews of apps currently marketed for youth experiencing anxiety and depression demonstrated problems including lack of validated screening tools, lack of information regarding screening results, and insufficient professional support for apps that track negative mood and thinking patterns.[61] There is also an increased risk of harm through viewing strong and triggering negative contents posted in apps with sharing features. Notably, most apps do not have safeguards to warn users about negative contents or other systems that flag users who post suicidal comments. A recent review of apps for depression observed that less than a quarter of apps provided access to immediate suicide prevention or online therapeutic helplines.[61] Other risks inherent in using these apps are related to confidentiality and privacy.[58] Most apps currently available do not address confidentiality and use inadequate password protection, which could lead to data breaches. They also tend not to inform users about the types of data being collected and how these are used by the developers, nor provide options for users to control their privacy setting.[58] These concerns highlight the importance of increasing regulations of mental health apps to improve their quality, as well as to further promote the safety of individuals that use these platforms particularly youth.[60]

Finally, there is significant gap between apps available on the marketplace for download and apps that have been developed and are being researched in academic settings.[60] Despite the potential benefits of apps in addressing anxiety (eg, delivering of empirically based treatments, tracking of symptoms using self-report and/or biodata), it is important to recognize there is a gap in research to marketplace that needs to be addressed to effectively understand how mHealth interventions can and should be implemented among youth.[58] Considering that such minimal research validates the effectiveness of mental health apps for anxiety, providers should evaluate the content of individual apps before recommending use with patients. This kind of review is important given increasing numbers of youth are using apps and social networking sites to learn more about and gain support for their mental health.[62] To help assist with this process, the American Psychiatric Association has developed "The App Evaluation Model" which provides a hierarchical rating system to guide providers, parents, and patients in evaluating an app and how it may differ from traditional treatment modalities. The model includes a brief eight-question screener or the option for more comprehensive evaluation across five domains which include access and background, privacy and safety, clinical foundation, usability, and therapeutic goal.[63]

Electronic Health Prevention and Interventions

Other programs have also been developed for prevention and treatment of anxiety disorders in children and adolescents. Prevention programs have the potential to significantly reduce the burden of mental health problems for youth. One online prevention program was adapted from a manualized face-to-face version, targeting younger children at risk for developing anxiety disorders. Researchers conducted a randomized controlled trial comparing parents of inhibited preschoolers participating in an 8-module online prevention program providing psychoeducation and skills for anxiety

reduction (The Cool Little Kids) to controls. Participants reported high rates of satisfaction, and the children in the intervention group showed significantly improved anxiety compared with controls.[55]

A growing number of online programs show promise in the treatment of anxiety disorders. Some are intended to augment face-to-face psychotherapy, and others are intended as stand-alone therapy. Examples include Fearfighter, Beating the Blues, and The Brave Program. Most use empirically supported CBT practices.[64] A review of randomized controlled trials for such programs found that internet-delivered CBT self-help programs were highly effective in treating children and adolescents with anxiety, yielding comparable adherence and outcomes as traditional psychotherapy.[64] Internet-based therapy research is continuing to grow and find promising results. A recent randomized clinical trial also found that internet-delivered CBT was efficacious for children and adolescents (aged 10–17 years) with social anxiety disorder.[65] Furthermore, a randomized clinical noninferiority trial comparison of internet-delivered CBT to in-person CBT for children and adolescents with obsessive compulsive disorder found that internet-delivered CBT (followed up by in-person CBT if necessary) resulted in noninferior difference in symptoms at the 6-month follow-up.[66] These encouraging results suggest that online CBT-based treatment programs may be a viable, affordable, and accessible option to treat youth with anxiety disorders.

Electronic Health and Anxiety Related to Other Health Conditions

There are several eHealth interventions to help with prevention and intervention of anxiety related to acute and chronic health conditions. Online programs and games have demonstrated effectiveness as tools for children with preoperative anxiety, anticipatory dental anxiety, and anxiety comorbid with chronic physical conditions.[67–70] Preoperative anxiety in children has been correlated with distress immediately after operation, after which maladaptive anxiety and poor functioning may persist for up to 2 weeks. Researchers have found that video game play significantly decreases perioperative anxiety, delirium, and time to discharge when compared with treatment as usual.[67,68]

Other eHealth interventions for youth with long-term physical conditions address anxiety related to illness or treatment. A qualitative study of eHealth for youth with chronic physical illnesses revealed "(1) chronic illness as an anxiety-provoking journey; (2) limited access to information and eHealth interventions to support the journey; and (3) desires (among patients and their families) for interventions that assist with better understanding of the illness, personal support, and peer connection (especially for illnesses that restrict contact such as cystic fibrosis)." Therefore, eHealth interventions such as Quest for the Code, Re-Mission, and SPARX may be particularly valuable.[69]

Finally, a review of 22 eHealth prevention and intervention studies for supporting mental health related to treatment of physical health found that studies using CBT had the highest portion of achieving at least one intended outcome (80%) compared with problem solving (71%) and education alone (60%) with the authors suggesting that modality needs to be selected based on the medical situation (eg, education may be more useful in preoperative situations and less helpful for chronic illness).[71] This review also found that 4 out of 5 intervention studies targeting anxiety were successful in reducing symptoms.[71] In general, eHealth interventions have significant potential to help youth facing acute and chronic illness to gain mental wellness and valuable knowledge, increase social support with peers with similar health conditions, and reduce anxiety associated with treatment.

COVID-19 PANDEMIC

The COVID-19 pandemic has impacted the lives of youth across the globe, disrupting all aspects of normalcy in day-to-day life and interfering with developmental tasks including educational progression and interpersonal maturation through social connectedness. The consequences of the pandemic and subsequent quarantines will likely be widespread and longstanding. Research on the impact of past quarantines has identified that quarantined youth experience higher rates of posttraumatic stress disorder, depression, anger, and anxiety and that these symptoms can be longstanding and pervasive.[72] Quarantines may also have differential impact based on age, with younger children demonstrating regressive and clingy behaviors whereas older children are more likely to become anxious, restless, angry, and withdrawn.[73]

Initial research on the COVID-19 pandemic indicates that youth mental health is being significantly impacted. In a study of three European countries conducted during the early phase of COVID-19, researchers found that parents commonly reported children feeling bored, irritable, lonely, restless, and anxious.[72] Anxiety continued to be a commonly reported symptom for children and teens throughout the pandemic with rates of anxiety doubling in youth compared with prepandemic levels.[74] Additionally, adolescents who had psychiatric disorders before the pandemic were likely more vulnerable to worsening and new symptoms due to disruptions in therapeutic care exacerbated by difficulties coping with confinement.[75] Faced with these obstacles, youth engaged in higher levels of screen time to cope and adjust to the changing landscape of life in a pandemic.[76]

The demands of the COVID-19 pandemic have highlighted both the benefits and risk of using technology to cope during distressing and crisis situations. With the loss of face-to-face interactions in real-life setting, virtual platforms including digital technology, social media, and interactive gaming serve as a way for peers to maintain connection and reduce the negative impacts of social isolation.[75] Additionally, social media provides an outlet for youth to express and process feelings related to the pandemic and to engage in self-expression and distraction activities. Despite these benefits, the increased screen time and social media use on youth included taking time away from engagement in healthy routines and behaviors (eg, sleep, diet, outdoor time, physical activity). Additionally, there is an unending amount of information available on the internet, which may or may not be factual, and large consumption of this information can lead to increased anxiety, depression, and confusion. Researchers examining usage and attitudes of social media during the pandemic found that youth were more likely to report social media as being more valuable and positive (eg, social support, self-expression) than parents who were more likely to view social media engagement as either being inconsequential (eg, something to do when teens are bored) or interfering with completing necessary activities and tasks.[77] This highlights the potential discrepancy between youth and parents in how they understand and approach the function of technology in the lives of youth.

Given the necessity of using technology to adjust to COVID-19 restrictions, technology use and screen time soared among youth during the pandemic. Reports indicate that screen time has more than doubled among youth during the pandemic and that this impacted even our youngest children with a sample of kindergarten students averaging 6.6 hours of media use a day, with weekday use exceeding weekend use (6.8 hours and 5.8 hours, respectively).[78] Of note, all aspects of technology use, with the exception of connecting via video, was highest among parents and children, with higher rates of anxiety underscoring the complicated interplay and unknown directionality between technology use and anxiety.[76] Furthermore, the impact of

prolonged screen time on youth's mental health remains to be validated. However, it is likely that a subset of youth has developed PIU and will have difficulty transitioning back to use patterns that were more common before the pandemic. It will also be necessary for organizations to re-examine screen time guidelines and to provide ongoing guidance to practitioners and parents for ways to support youth's engagement with technology and social media in a postpandemic world.

As pandemic guidelines and restrictions change, it is important for clinicians to be aware of ways to support youth through these transitions. It is likely that a large portion of youth will experience residual distress and negative mental health outcomes due to the large-scale and long-standing nature of the COVID-19 pandemic.[73] Clinicians should routinely screen for anxiety and trauma symptoms in both children and parents and subsequently refer these families to relevant mental health services. Clinicians should also assess trends in technology usage of their patients and caregivers over the course of the pandemic to facilitate the development of a media transition plan that can help families balance the time spent online and offline. Finally, clinicians could support the development of guidelines and agreements between adolescents and parents; one that focuses on balancing the need for adolescent autonomy with parent's desire to have appropriate protections in place for online use.[77]

WHERE DO WE POKÉMON GO FROM HERE: VENTURING INTO THE WORLD

When the original article was published in 2018,[79] a description of the phenomenon of Pokémon Go, an augmented reality (AR) smartphone game introduced in the summer of 2016, was included. People of all ages rapidly embraced this game, which was played by an estimated 44 million people worldwide at the height of its popularity.[80,81] Pokémon Go encouraged exploration and activity by requiring players to physically travel around their communities seeking virtual treasures.[82] Anecdotally, child mental health providers have described children with severe social phobia, separation anxiety, and agoraphobia who were motivated to leave home to play Pokémon Go. Additional research examining the role of AR games among children in teens is needed, but these results suggest that AR games may prove useful in encouraging physical activity and social engagement and could serve to reduce symptoms of anxiety.[80–82] As our world opens after the pandemic, new AR platforms may be necessary to support the exposure for the socially anxious to leave the home.

SUMMARY

Recommendations for Providers

Despite limitations, current research related to online habits and anxiety reveals important considerations for mental health providers. Clinicians should assess online activity beyond simply assessing total time spent online, including specific aspects of use and individual factors that inform associated risks. The following points provide guidance for providers gathering information about the internet habits of young patients during clinical interviews:

- Type and frequency of online activities: What are the primary online activities (eg, YouTube, instant messaging [IM], social media, gaming) and how much time is spent on each? What is the general content, and does it include age-inappropriate material or interactions? How many social media accounts are currently being used?

- Active versus passive use: How much time online is spent actively posting content (text, pictures, videos) or engaged in real-time communication (IM, chatrooms)? How much time online is spent passively viewing content?
- Emotional valence: Is the content viewed and shared primarily positive (liking others' posts, communicating positive messages or stories about one's own life) or negative (unhappy status updates, sharing frustrations, critical or contentious interactions with others)?
- Beliefs and attitudes: Do individuals prefer online communication over face-to-face interactions? If so, why? How important are either the need for social assurance or FOMO as motivators for online engagement?
- What is the balance of screen time use, physical activity, and restful sleep? What times of day are screens being used, and how is screen time impacting sleep habits, quantity, and quality?
- Positive or avoidant coping skills: Is the youth using online activity to extend real-life friendships or spending time online avoiding school and other interpersonal interactions?
- Virtual gaming: Does the patient meet criteria for internet or video game addiction? If so, providers need to prioritize treatment of IVGA because these patterns have been found to predict the subsequent development of anxiety disorders.[37]

Technology is rapidly changing and will continue to come with both opportunities and hazards. Therefore, it is important for mental health providers to understand that virtual platforms including the internet and social media play an important role in the social development of young patients and to advise patients and families how online habits can either exacerbate or alleviate anxiety. Online resources (see **Table 2**) are also available to support parents to guide children and teens in traversing the virtual world.

A NEW NORMAL?

This original article was revised between April and June 2021, at a time when vaccines were offered for children aged 12 years and older, and hope was being held for "herd immunity" to the COVID-19 virus. However, the pandemic occurred at a time with rapid opportunities and changes to virtual technology platforms. Social distancing and lockdowns led to greatly increased screen time, less in-person socialization, less physical activity, and time in nonvirtual technology play. Time online allowed friendships to be developed and to continue, creativity emerged for live stream, peer-to-peer physical activities leading to decreased childhood anxiety,[83] and it is unclear what the "new normal" will be with respect to youth and virtual technology. Stay tuned…

CLINICS CARE POINTS

- Problematic Internet Use is a condition where youth experience obsessive thoughts about being online, have difficulty unplugging from devices, and experience disruptions in activities of daily living due to excessive time spent online.
- Clinicians working with youth need to routinely assess technology use including frequency, duration, quality of content, and impact of use on adaptive skills. Social networks can provide an important source of support and networking for youth who are members of marginalized groups (e.g. LGBTQPIA).
- There is a large research to practice gap for electronic and mobile health interventions, especially mental health apps for youth, so clinicians need to help support families in understanding how to evaluate and utilize these technologies.

- The COVID-19 pandemic resulted in youth across ages engaging in far more screen time than previously recommended and researchers are now re-evaluating the effectiveness of screen time as a guideline versus shifting to a focus of ensuring that technology is not interfering with sleep, physical activities, school work, and interpersonal relationships.

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DISCLOSURE

The authors have nothing to disclose.

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