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Online Treatment and Virtual Therapists in Child and Adolescent Psychiatry

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Summary

Online and virtual therapies are a well-studied and efficacious treatment option for various mental and behavioral health conditions among children and adolescents. That said, many interventions have not concerned the unique affordances offered by technologies that might align with the capacities and interests of youth users. In this article, we discuss learnings from child-computer interaction that can inform future generations of interventions and guide developers, practitioners, and researchers how to best utilize new technologies for youth populations. We highlight issues related to usability and user experience including challenge and feedback, social interaction, and storytelling. We conclude with innovative examples illustrating future potentials of online and virtual therapies such as gaming and social networking.

Keywords

treatment; children; eHealth/mhealth; design

Introduction

The need for mental health services among children and adolescents is extremely high. Estimates suggest that the one-year prevalence of any mental disorder among those aged 13

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to 17 years is 40.3%.[1] Furthermore, youth experience high rates of recurrence, suggesting that if left untreated, even symptoms that drop over time are likely to return. Unfortunately, most youth who need services do not receive them, with only 20% of youth meeting cutoff points on mental health screening questionnaires receiving services.[2] Those who do receive services most often receive them in education settings, followed by specialty mental health services and primary care.[3] Several reasons contribute to this problem, including an insufficient workforce that is heavily concentrated in urban areas,[4] lack of knowledge and stigma towards mental health services,[5] and the costs and resources required to regularly attend sessions that are necessary for proper care.[6] As a result, children and adolescents often receive either no or insufficient care.[7]

In light of this, several calls have been posed to transform mental health services and broaden the modes of treatment delivery.[8] One particularly promising pathway includes online and virtual therapies that could serve as alternatives and adjuncts to other services. Several instances of online and virtual therapies for children and adolescents exist,[9] with the majority focused on cognitive-behavioral principles. These tools expand access to services by creating low-cost, widely available resources and can be used in different settings by those with and without specialty mental health training.

The promise of online and virtual therapies can only be realized, however, if they are designed and implemented appropriately. Elsewhere, we have warned of the danger of relying on “psychological skeuomorphs” while designing technologies.[10] This refers to maintaining aspects of traditional mental health services that are unnecessary and sometimes counterproductive to their delivery in digital mediums. Additionally, an issue particularly critical for the use of these tools with children and adolescents is to ensure their appropriateness for these populations. Although most programs are tailored to be “age appropriate,” this tailoring often happens at the content level. That is, the programs may tailor examples and reading levels for children and adolescents, but many of the same design principles and interaction styles present in adult programs remain.

In the current review, we discuss the state of the practice for online and virtual therapies, highlighting what has been done and what has been effective. We then draw on learning from the field of child-computer interaction to illustrate the unique considerations necessary for designing interactive technologies for children and adolescents. We then conclude with some novel examples that are redefining the way online and virtual therapies are constructed and discuss implications for the future of providing mental health services to children and adolescents.

Common Practices in Online and Virtual Therapies

Although several online therapy programs exist, they tend to share similar features. Many programs are provided along with some human contact or coaching due to findings that supported programs tend to be more efficacious, and used more than self-guided programs.[11] For youth, this could be a therapist, teacher, or one’s parent. Programs also differ in terms of delivery platform and context. Many researched programs were developed to be completed on a desktop computer, either through CD-ROMs or a website. Lastly, the context of the

program with regard to the provision of care is sometimes a replacement for traditional services and other times serves as an adjunct.

Human Support

Supported programs lose some of the scalability of self-guided programs; however, this trade-off is seen as desirable due to the increases in efficacy and adherence. Completion rates in online treatments vary considerably, with a recent review finding values ranging from 12–100% with a median rate of 56%.[12] These rates tend to be much higher in supported programs.[13] In adult online therapies, support is most often provided by a clinician, facilitating the use of motivational tactics to increase use and ability to address technical and clinical issues that may arise. However, programs targeted at youth have the unique affordance that a parent, caregiver, or teacher could play the role of supporter. These individuals might not know as much about the clinical concepts, but have more knowledge about the child's behavior and context that might be helpful in the application of the material and supporting engagement. For example, research suggests that behavior change plans are viewed more positively when they are personalized to people's goals, patterns, and preferences, and that close others are better able to create such plans.[14] Furthermore, parents or teachers might be able to provide reinforcements that extend beyond the therapeutic relationship, thus further boosting adherence.

Delivery Platform

A majority of programs researched thus far have been designed for desktop computers and disseminated either as CD-ROMs or websites. This decision, however, does not only impact where children and adolescent access these programs, but also how they interact with them. The predominant mode of interaction has been to structure programs in several sessions or modules in which users complete interactive lessons and didactic materials and then complete assignments to reinforce and practice the skills before moving on to the next lesson. For example, Camp Cope-A-Lot is a 12-session computerized adaptation of the Coping Cat program.[15, 16] Each session takes approximately 35 minutes to complete. These sessions are completed with the assistance of a therapist and focus on skill building, exposure tasks, and rehearsal. Similarly, MoodGYM, an Internet-based program designed to prevent or decrease symptoms of depression and anxiety, uses a five-module structure.[17] The modules are meant to be completed in a set order and cover topics including feelings, thoughts, unwarping, de-stressing, and relationships. This highly structured format is an effective way to teach material and to ensure that users receive core content related to the relevant behavior change techniques. However, this format is most likely not akin to the typical way children and adolescents are used to interacting with information in technological mediums, especially as they report being online "almost constantly" and typically on mobile devices.[18]

Context

Online and virtual therapies represent opportunities to broaden the portfolio of available mental health services. As such, it is useful to note that these resources might interact with the mental health system in different ways. In some instances, this might mean being used instead of traditional mental health services, either where no other services are available or

when youth or parents prefer technological-based treatments. In other instances, these tools might augment traditional practices to enhance their efficacy through various means. As standalone treatments, it is worth noting that their ability to provide cost-effective, universal care, makes them particularly appealing to provide a standard level of care as an entry into the mental health system. For example, a large-scale deployment of MoodGYM across 30 schools was able to reach nearly 1500 students across Australia.[17] This reach occurred with minimal set up, as project coordinators and teachers received a manual with instructions without other training or support. The program ultimately produced small to moderate reductions in symptoms of depression and anxiety demonstrating the feasibility of such an approach.

Other programs might bring technology into the therapist's office, creating a novel form of interaction between child and therapist. These tools are often meant to enhance traditional psychotherapeutic activities. For example, SmartCAT is a child- and therapist-facing tool designed to facilitate use of psychotherapy skills outside of sessions and to provide therapists with information regarding skill use.[19] Children received a smartphone app consisting of notifications and rewards. Therapists receive a web portal to view information from the app. A small pilot trial of SmartCAT found high levels of engagement and acceptability. SmartCAT sent an average of 6.48 requests for complete entries related to skill per week and patients completed 82.8% of them. These high rates of completion might be attributable to the ease of use of the system. These entries took less than 5 minutes on average to complete and patients rated the app as highly usable.

Another approach, however, is to use virtual therapies to create completely new forms of therapeutic interactions. This might open novel avenues to engage a patient, perhaps providing a medium that is more acceptable for children to interact with mental health information. A perfect example of this is Personal Investigator (PI),[20,21] an interactive computer game designed to be used in psychotherapy sessions. In PI, children sit alongside the therapist while playing the game, with the goal of game material helping to open up therapeutic discussion in the session. In a few small trials of PI, promising evidence has supported this notion in the form of increased therapeutic relationship, improved structure in session, and boosted child engagement.[21] PI's gamified approach might be particularly appealing to youth. As such, it is worth considering how technology can uniquely attract and engage children through creating programs and interactions.

Learning from Child-Computer Interaction

As previously mentioned, an initial intuition in designing online and virtual therapies for children or adolescents may be to adopt an existing intervention by transitioning it to a digital device. For example, transitioning a paper journaling intervention to a mobile app.[22] This provides the immediate benefits of on-the-go access and historical data visualizations. However, this approach frequently overlooks the opportunity to design a novel intervention that leverages the unique capabilities of a particular technological system to engage and support children and adolescents. Unique technologies for these age groups have remained relatively unexplored, however we can apply lessons from the domain of Child-Computer Interaction to provide guidance for designing such systems in the future.

Two main principles need to be considered in technology design: usability and user experience. In both of these, youth have different needs, skills, and motivations than adults, and it is not usually appropriate to deploy adult technology interventions with child or adolescent audiences.[23] In discussing each of these principles below, we provide general design guidelines and examples of child-centered technology that puts these guidelines into practice.

Usability

The principle of usability refers to the child's ability to effectively use the technology in question. In general, text based input should be avoided, as children struggle with typing.[24] Voice[25] or handwriting recognition[26] may be able to solve this in the future, but current systems still struggle with interpreting children's input. Children also frequently struggle with positioning and manipulating a mouse pointer on a desired target,[27] though larger targets and other interventions may help address this challenge.[28] Touchscreen devices such as tablets or phones are better suited for children's pointing tasks, in that they allow for the direct manipulation of the digital object and children as young as two have been shown to have moderate ability in this mode of interaction.[29] However, children may still struggle with unintended touch of onscreen targets and drawn gestures (e.g., drag-and-drop).[30] One approach for addressing usability difficulties with digital interaction is known as embodied interaction, which focuses on supporting the child in acting on the physical world or through physical objects.[31] Technologies that integrate tangible, rather than mouse-based interactions, have been shown to support both better problem-solving and collaboration in children.[32] Children can accomplish complex tasks using physical objects instrumented with digital intelligence. For example, children can write a computer program without typing by assembling a wooden track where each piece corresponds with an instruction.[33] As another example, children can learn practical skills by interacting with an augmented physical object, such as a toothbrush that monitors and guides them.[34] Online and virtual therapies for children should consider how usability may be improved by allowing the child to rely on known gross motor and physical manipulation skills, rather than typing or precise pointing.

User Experience

In contrast to usability, user experience refers to the child's engagement and motivation to use the technology in question. A number of strategies can increase engagement and motivation. We highlight three of these strategies below: challenge and feedback, social interaction, and storytelling and self-expression.

Challenge and Feedback—"Flow" is an important state for which to design, as it is an indicative of high levels of engagement with the task at hand.[35] While experiencing a flow state, people report a loss of self-awareness, and a feeling of being at one with the activity. It has also been shown to increase interest and affect learning performance.[36] Enhancing flow could help promote completion of longer session tasks and smaller "micro-flow" interactions can incentivize people to return to shorter tasks more regularly. Challenge and feedback are key to achieving the optimal experience of flow.[37] Technology is uniquely suited to creating these optimal experiences through challenge and feedback, because it can adjust to the needs of a specific user to ensure that the challenge presented is appropriate to

his/her skill. Two design criteria may help a technology engender an experience of flow: 1) novelty and challenge, 2) clear goals and immediate feedback.[38] Perhaps the best example of flow interaction is video games,[39] where novelty is provided through an abundance of content created for each stage of the game or new challenges introduced through game elements. Further, goals and feedback are generally immediately visible in the system. Online and virtual therapies should focus on creating evolving challenges appropriate to the child's skills and providing clear feedback appropriate to the intervention goals, rather than more superficial components of gamification (e.g., sprites and GUI elements, fantasy worlds, rewarding practice of target skills with an opportunity to play a game, etc.). These principles can serve to ensure that such efforts enhance, rather than detract, from the underlying behavior change principles.

Social Interaction—Another way to increase motivation and learning is incorporating a social element into the technological intervention. One approach is in leveraging "cultural forms" for types of action that invite certain forms of social collaboration and learning. For example, integrating digital intelligence into a paper storybook encourages engaged parental involvement, as a bedtime story is a cultural form common to many cultures.[40] When designing to incorporate social learning with a parent or teacher who might be serving as a supporter, technology provides the opportunity to train the adult as an ally in helping the activity remain engaging. For example, one system helped adults and kids read together remotely through an interactive agent which suggested questions and activities that the adult could use to engage the child.[41] When designing technology to help multiple children collaborate or socially interact with each other, a system should encourage joint attention and perspective taking.[42] To support children of various skills levels and abilities, social systems work best when incorporating appropriate levels of scaffolding or support for each child. For example, one system allowed children of mixed abilities to compete and collaborate on a digital tabletop game by adjusting the difficulty of the physical task based on each child's ability.[43] Social interaction may also be achieved asynchronously by integrating gamification elements such as leaderboards and challenges, if the data presented is actively adopted to adjust to the current skill level of each user and is consistent with the goals of the intervention.[44]

Storytelling and Self-Expression—The ability to share stories and express aspects of one's identity may be particularly engaging to children and teenagers, and has been successfully used to support therapy,[45] literacy,[46] social skills,[47] and learning complex skills like programming.[48] Younger children may practice narrative play socially[49] or simply as a way of engaging in fantasy.[50] Older children and teenagers may tell and share stories and opinions in a performative manner, as a way of enacting their identity online.[51] In both cases, it is important to consider scaffolding not only for the act of storytelling itself, but also engagement with the perceived and real audience for the child's creation. Telling stories is inherently compelling, but only if the child feels that there is somebody listening.[50]

To summarize, technology provides an opportunity to engage and support children and adolescents in unique and powerful ways. While youth may experience usability challenges different from those of adults, reducing reliance on text-entry and mouse-based tasks may

ameliorate these issues. Instead, research shows promise in focusing on direct manipulation (e.g., simple pointing on touch screens) and interaction with the physical world (e.g., augmenting physical objects and environments with digital capabilities). Perhaps more importantly, technology provides opportunities to engage and motivate a child or adolescent to interact with an intervention. Three strategies for increasing engagement and motivation have shown great promise in child-computer interaction research and practice: challenge and feedback, social interaction, and storytelling and self-expression. To the extent that technology provides opportunities to integrate each of these features, it can significantly increase engagement and uptake of future online and virtual therapies for children and adolescents.

The Future of Child and Adolescent Online and Virtual Therapies

This current review highlights what is known and effective thus far in online and virtual therapies for children and adolescents. Similar to findings in the adult literature, these resources are effective for the treatment and prevention of mental health issues. Another overlap is that despite their efficacy, completion rates tend to be low, especially in the absence of human support. A lot of recent work in this space appears to be expanding evidence for the variety of disorders which can be treated with this approach, finding support for diverse conditions including depression,[52] anxiety,[53] chronic pain,[54] encopresis,[55] and smoking cessation.[56] However, we argue that new interventions should not merely look to transport programs to new populations in terms of disorder or age range. Instead, innovative technological resources should be inspired by the behavior change principles underlying empirically-supported treatments. We offer a few promising examples from varying sources as potential guideposts for the future of online and virtual therapies.

Social networking and messaging apps are increasingly growing in popularity and use, especially among children and adolescent populations. People, especially teens, report being on these platforms nearly constantly.[18] Leveraging social networks and peer interactions to create content for online and virtual therapies could open up new avenues for interventions and drive engaging platforms. Furthermore, as we noted social interaction can promote motivational and learning. One innovative example is *Panoply* a web-based, peer-to-peer cognitive restructuring platform designed to provide evidence-based techniques for mental health, without requiring the aid of clinical support.[57] In the *Panoply* platform, users post a negative thought, respond to others' thoughts, receive restructured responses, and get feedback on their performance. *Panoply* offers structure, training, and feedback to ensure that all interactions are aligned with the principles of cognitive restructuring. A proof-of-concept deployment of *Panoply* with adults in the general population found significant reductions in depressive symptoms and specific changes in reappraisal processes. Furthermore, *Panoply* was able to quickly and efficiently leverage the crowd to make personalized responses with an average response time of 9 minutes. Although training and supervision principles for adults might need to be altered for youth, this is a promising example of leveraging social interaction for motivational and learning purposes. Future systems that allow children and adolescents to be the drivers of new content could help create engaging, personalized, and novel interactions in online platforms.

Children and adolescents spend a significant amount of their leisure time engaged in fantasy play and other games. This tendency links with the notion of storytelling and self-expression previously discussed. As such, several attempts have been made to design games that can teach psychological skills while retaining elements that make games fun and engaging. One of the more innovative uses of game designs for mental health is that of SPARX, an interactive fantasy game based on the principles of cognitive-behavioral therapy.[58] Users navigate an avatar through a fantasy world overtaken by GNATs (Gloomy Negative Automatic Thoughts) and throughout the levels, master skills such as relaxation, communication, and cognitive restructuring. A non-inferiority trial of SPARX compared to treatment as usual taking place in specialty mental health practices, schools, and primary care clinics found that SPARX performed comparable to usual care and had higher rates of remission. A major challenge with games, however, is creating games that meet user expectations based on previous experience with the medium. The resources afforded to game development by traditional game studios far exceed the resources available in typical mental health intervention development. New mediums such as mobile apps might lower the bar for development of such resources but still necessitate the coordination of interdisciplinary teams with expertise in psychology, game design, and programming and development.

Concurrent advances in several technology-related areas including virtual reality, machine learning, and natural language processing has led to the development of “virtual humans” able to perform clinical tasks that had previously required humans. These tasks include providing health information and support, and clinical interviewing.[59] Virtual humans have an added benefit of being able to be tailored to match user characteristics. For example, children and adolescents could interact with a virtual peer who possesses a similar conversational style, but with the knowledge and skills of a seasoned clinician. These agents may be particularly useful for topic areas children are not comfortable disclosing to adults. Indeed, this method might help transition children to subsequent services when necessary. Currently, virtual humans have been most useful for highly structured tasks, such as information searches and interviewing, but advances in technology will further expand the capacities of such resources. Users with more experience and comfort with such technologies might be more likely to be comfortable with using such resources for health purposes and virtual humans are a promising avenue for integration into future online and virtual therapies for children and adolescents.

Conclusions

Online and virtual therapies are effective resources for addressing the mental health needs of youth. Although the majority of empirical research addresses cognitive-behavioral based programs delivered through CD-ROMs or Internet websites, new approaches continue to be developed and trialed. Indeed, the future of such techniques is limited only by the imagination and drive of those working in this space. Clinical practitioners could benefit from learning more about these resources that complement or extend their efforts. We have outlined several considerations that are relevant to the design of future resources aimed towards youth, and highlight that usability and user engagement concerns for these populations differ significantly from those raised when designing for adult populations. Innovative therapies incorporating social networking, games, and virtual humans appear to

be poised to make a major contribution to this area in the near future. Although these treatments may be familiar to mental health experts in terms of the core clinical skills they promote, the nature and style of interactions will hopefully leverage the unique affordances of the technological mediums they utilize. Engagement with online treatments and virtual therapists has the potential to successfully expand the mental health options available to curb the burden of mental health needs in children and adolescents.

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Key Points

- Effective online and virtual therapies have been developed and evaluated for children and adolescents for a variety of mental and behavioral health conditions.
- Children and adolescents have unique capabilities and interests with regards to technology-based interventions that makes the design of these treatments for these populations especially important.
- Future interventions should incorporate end user input early in the development process to design usable and impactful interventions for these populations.