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Exploring the Use of Sidekicks! for Children With Autism Spectrum Disorder (ASD)

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Clinicians and educators are increasingly using technology within the context of existing therapies and teaching methodologies. The growing use of mobile clinical tools is particularly exciting for individuals with autism spectrum disorder (ASD), as technologically based interventions have been shown to be both efficacious (to target academics, adaptive behavior, disruptive behavior, etc.) and accepted in this population (Odom et al., 2015). In addition, these tools have the potential to address two significant impediments in ASD intervention, the anxiety and/or skill deficits often associated with face-to-face interactions and skill generalization outside of the therapy office (Wieckowski & White, 2017). In other words, the use of technology may serve as an important preliminary or prerequisite step for face-to-face therapeutic progress. The purpose of this paper is to present a new, interactive clinical app that explicitly utilizes an individual's restricted interests to teach skills and improve communication. The paper will briefly review the ways in which individuals with ASD may be good candidates for technological-based interventions, explore the current role of technology in existing evidence-based therapies, and discuss the use of a new technology, Sidekicks!, that has been developed for this population. A case example will then illustrate the use of Sidekicks! and its anticipated functionality across several public service settings, including hospitals, outpatient clinics, and school systems, thereby coordinating the intervention efforts of various professionals involved in the treatment of children with ASD. Finally, limitations of the app (and of technology more generally) and the need for future research will be discussed.

Keywords: autism spectrum disorder, technology, restricted interests

Autism spectrum disorder (ASD) is currently understood as a broad spectrum of neurodevelopmental symptoms, including deficits in social interaction and communication, as well as the presence of restricted, repetitive and stereotyped patterns of behavior, interests and activities (American Psychiatric Association, 2013). While the topography of these symptoms may change throughout one's life, ASD is considered a lifelong condition and its prevalence appears to be increasing at an alarming rate (Blumberg et al., 2013; Boyle et al., 2011). Currently, the point prevalence among 8-year-old U.S. children is estimated to be 1 in 59 and is reported to occur in all racial, ethnic, and socioeconomic groups (Baio et al, 2018). The clear increase in affected children, coupled with the lifelong challenges associated with ASD, has truly created a public health and educational crisis.

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As mentioned above, restricted interests, or preoccupations, is a defining symptom of ASD. However, it is also a relatively understudied symptom area. Current estimates suggest that up to 95% of children with ASD have at least one restricted interest, yet our ability to target or reduce this "symptom" with traditional pharmacologic and therapeutic/behavioral interventions has been limited to date (Boyd, McDonough, & Bodfish, 2012; Poustka et al., 2014; Turner-Brown, Lam, Holzclaw, Dichter, & Bodfish, 2011). Moreover, it may not be clinically appropriate or practically necessary to do so. Recent studies using functional MRI (fMRI) have revealed that in individuals with ASD, engagement with restricted interests may result in unique reward circuitry responses in the brain (Dichter et al., 2012; Foss-Feig et al., 2016). As the identification, schedule, and magnitude of reinforcement have been determined to be critical components of skill acquisition in ASD (Fiske et al., 2014), this reward response associated with restricted interests has the potential to offer great clinical utility. While the use of a child's specific interests in the context of therapy is certainly not a novel approach, ASD clinicians and researchers are increasingly using circumscribed interests to bolster motivation, rapport, and to ultimately enhance treatment outcomes (Kryzak & Jones, 2015; Vismara & Lyons, 2007).

The search for effective treatments for ASD has led to a wide range of therapeutic approaches, with a myriad of psychopharmacological, medical, behavioral, and educational interventions all demonstrating compelling evidence for reducing and managing symptoms of the disorder (National Autism Center, 2009; Sandberg & Spritz, 2013). As such, an individual's treatment team often

includes a wide range of professionals (e.g., behavioral therapists, speech pathologists, psychiatrists, occupational therapists) and involves a combination of therapies and strategies. Thus, it is not uncommon for ASD intervention to take place across several public service settings, including school systems, hospitals, community centers, and outpatient clinics.

Despite well-developed treatments for symptoms of ASD, motivation for learning and skill generalization have been conceptualized as longstanding and significant intervention barriers in this population (Koegel & Mentis, 1985; Stokes & Baer, 1977). A common finding in the ASD treatment literature is that skills gained in therapeutic settings do not generalize across environments (e.g., school; Hwang & Hughes, 2000). Technology has been posited as a way to address both of these clinical concerns by its naturally motivating qualities, its ability to provide immediate feedback, and its ability to be used by caregivers and clinicians across a wide range of settings (Bishop, 2003; el Kaliouby, Picard, & Baron-Cohen, 2006).

Technology-based interventions may be particularly well suited for a population that inherently struggles with face-to-face interaction (Odom et al., 2015). In addition, children with ASD appear to have an innate interest in computers and technology (Kuo, Orsmond, Coster, & Cohn, 2014), making it an exciting vehicle for treatment. Due to its many potential benefits, technological tools are increasingly being used to assist in early diagnosis, treatment, and progress monitoring for individuals with ASD (Charlop-Christy and Daneshvar, 2003; Goldsmith & LeBlanc, 2004). For example, in applied behavior analysis, technology and telehealth play a central role in helping clinicians and families collect, graph, share, analyze, and monitor outcome data in individuals with ASD (Barretto, Wacker, Harding, Lee, & Berg, 2006; Dixon et al., 2009). Technology-based interventions, including computer programs, touch-screen apps, virtual reality, and robotics, have also shown promising results with respect to communication, academic, social, and vocational skill acquisition (Grynszpan, Weiss, Perez-Diaz, & Gal, 2014; Odom et al., 2015; Stephenson & Limbrick, 2015; Wieckowski & White, 2017). However, reviews and meta-analyses in this research area accurately highlight several limitations, including the use of static response software (vs. interactive), restricting samples to high-functioning participants, the need to investigate the possible negative effects of technology in children (e.g., using technology in replacement of potentially more appropriate training formats), significant design and measurement heterogeneity, and a lack of standardization and randomization procedures (Grynszpan et al., 2014; Odom et al., 2015).

Sidekicks!

Recognizing the potential benefits of incorporating technology into this therapeutic repertoire, app developers are increasingly interested in the ASD population. One promising new technology is called Sidekicks! Sidekicks! is a freely available iOS-based app patented and created by the Affinities Project, Inc. in which a "coach" (i.e., parent, therapist) is able to facilitate therapeutic interactions with the "hero" (i.e., child with ASD) using self-selected avatars ("sidekicks"). Its founder, Ron Suskind, is a Pulitzer-winning journalist and bestselling author, and father of a son with ASD. In his novel and documentary film, *Life Animated* (2014), Mr. Suskind details the ways in which he and his wife used *Disney* movies (i.e., a restricted interest) to foster communication with their minimally verbally son. Based largely on his family's experience, the goal of Sidekicks! is to provide the child with a vehicle to communicate with a parent, therapist, or other individual, using a platform that is highly motivating for the child, to create conversational (and skill training) opportunities that may not be present otherwise. On the app, speaking partners interact using chosen avatars and can view video clips of their choosing together using their smartphone device(s). The ability to use videos of preferred content is intended to help initiate and maintain motivation, and with guidance from a parent or a therapist, the video content has the potential to serve as a conduit for in vivo social and emotional coaching. While the app has been developed specifically for the strengths and challenges of ASD, it could theoretically be used to support children in a variety of developmental stages presenting with a range of symptoms and functional deficits (though further research is needed). In more clinical and/or educational settings, professionals may be able to facilitate instruction within various goal areas using the restricted interests, or affinities, of the child. For example, if a child has a restricted interest in Legos, and the goals for therapy include learning to control anger, the professional would be able to use video content from *The Lego Movie* to present and model emotion identification and coping skill use. Both the clinician and the child can save and organize clips so that they can readily access their previously viewed material (e.g., return to a salient clip to troubleshoot a subsequent problem).

As discussed above, when the child is engaged in didactic skills training with a professional, it is possible that the use of his or her restricted interests may initiate and maintain motivation and treatment adherence. With regard to generalization, when using Sidekicks!, the child has access to their therapy or educational content across a variety of public service settings. In the world of ASD treatment, where the individual is attending multiple therapies with regularity, interactive apps such as Sidekicks! provide an easily accessible platform that can be utilized across a variety of settings and can be accessed by a wide range of adult facilitators (e.g., parents, therapists, educators), with the child's preferred and instructional videos bookmarked and available to everyone who is connected to that child's profile. In short, all components of the app (the avatars, videos and chat capabilities, and automated features) aim to address the motivation and generalization barriers present in more traditional therapy approaches.

Sidekicks! is currently available in the Apple, Inc. App Store and is already being used by many children and families. While there is still much to be learned about the effectiveness of this technology in the treatment of ASD, it proves to be a unique and promising contribution to the growing technology intervention landscape in ASD. A case example has been included to further detail how Sidekicks! may be used in the context of an existing treatment paradigm. Limitations to technological interventions in ASD, and to Sidekicks! in particular, are incredibly important to emphasize. These limitations, as well as areas for future research, will be reviewed in the discussion section below.

Case Example

Sam was diagnosed with ASD when he was just four years old. He was delayed in learning to talk and he seemed content to play

on his own for hours. He loved trains and could spend hours arranging his trains on his train table. If anyone touched or moved a train Sam knew immediately and often became quite upset. He also knew every character, episode, and line from his favorite show, *Thomas the Tank Engine & Friends.*

As Sam got older, his interest and love for trains never lessened. Once, when he was six years old, he eloped from his family's home to see the trains leave the local commuter train station for their morning routes. He knew all of the train schedules and would often remind his father to leave the house in time for his morning train. When he met new people, Sam would often ask where they live, whether they took the train or subway to work, and then tell them about the train routes closest to their house. Just talking about trains, Sam would light up. Sam's love for trains was endearing. Staff at the local train station quickly learned his name and seemed to enjoy his enthusiasm.

As Sam moved through his elementary school years, many of his peers developed new interests in sports, new toys, and the latest videogames. Sam began to feel frustrated with his friends when they no longer enjoyed talking about trains and he felt sad when his friends would leave him behind on the playground to go play soccer. As he got older, these challenges got worse. He became isolated from his peer group. He saw a school counselor for a while and participated in a lunchtime social group with peers at school. Even with these supports, he continued to withdraw from his peers. His parents grew worried and asked his pediatrician what they could do to help Sam feel happier and connect with his peers. They tried social skills groups, soccer teams, Boy Scouts, and even counseling at their local community mental health center.

The first counselor that Sam saw encouraged him to play with toys in the office, but when realizing how much he became focused on trains, the counselor removed all the trains from his office before each of Sam's visits. Sam became upset and refused to talk to the counselor. He later told his parents that the counselor must not have liked him because he was hiding all of the trains.

Concerned that this might not be a good match, Sam's parents found another counselor who had some experience working with children with ASD. His new counselor quickly picked up on his interest in trains. During the first few sessions, she asked Sam to share his knowledge and he was excited to do so. After a few weeks, however, the counselor began to transition to talking more about friendships, how to compromise, and how to find ways to play with his peers. The counselor began to use trains as a reward for talking about these nonpreferred topics during their visits. If he participated in nonpreferred topics, he was allowed to play with and talk about trains at the end of the session. Sam seemed to like this counselor. She had a few trains in her collection that he didn't have at home. He continued to see her for nearly a year, but his parents discontinued treatment, unsure if his difficulties with peers, loneliness, and depression were any better.

Eventually, Sam learned not to talk much about his interest and trains, except for with a few people in his life. His parents encouraged him to participate in other activities, like playing on a local soccer team and joining a Lego club after school, but he continued to show increasing social withdrawal, irritability, and feelings of depression. His parents took him back to the local community mental health center, this time to see a psychiatrist to discuss the possibility of medication. The doctor talked them through their medication treatment options, but suggested one more attempt at counseling before they began any new medicine.

During his next intake appointment, Sam sat quietly waiting for the counselor to set the agenda for their visit. He wondered if the same train set he played with before was still in the building. Much like Sam's previous counseling experience, the first several sessions were spent building rapport and getting to know one another. The counselor asked Sam to share his interest in trains and he eagerly complied. From the start of treatment, the counselor introduced Sam to the app Sidekicks! Sam was impressed that he could find several *Thomas & Friends* video clips with the touch of a button. During the first session, Sam and his counselor watched their favorite video clips together and Sam's counselor helped him choose his own avatar from the app (a train character!). In the following sessions, Sam watched clips using Sidekicks! and talked about them through the avatars (one controlled by Sam and the other by the counselor). The counselor was able to guide the conversations and clip selections to specific goal areas or important topics. The app also allowed Sam and his counselor to bookmark specific clips that mirrored some of the challenges Sam had in his own life. For example, Sam and his avatar watched a clip from Season 20 Episode 2 when Philip the Diesel Boxcab Engine tried to befriend Toby the Tram Engine. Philip thought they would be good friends, but soon realized that they didn't seem to like the same things. Through this clip, Sam and his avatar were able to discuss friendship and what to do when you have different interests. Sam was quickly and accurately able to identify with each of the characters—using the clip to build his social perspective-taking skills. Then, once the app was put aside, the counselor encouraged Sam to brainstorm ways to help the characters resolve their differences—imagining what suggestions the other trains might make. Sam's counselor was able to keep him highly motivated for treatment and the large library of video clips meant that they could often explore topics in great detail and discuss them in terms that Sam could relate to.

Outside of therapy, his parents, school counselor, and private speech therapist all used the same avatar on Sidekicks! to interact with Sam. They were able to reference back to the clips saved during his counseling session to rewatch and discuss how the train characters approach day-to-day problems. This counseling experience was the first time Sam's interest in trains was a real asset to treatment. His interest was not avoided or merely used as a reinforcer, rather it was woven throughout every aspect of his treatment, from helping him to build emotion identification abilities and social perspective-taking to improving his social problem-solving skills.

Discussion

As the prevalence of ASD continues to rise, a growing number of families are affected by this lifelong developmental condition, and specialized therapists in communities are limited. The field is unquestionably in need of high-quality, accessible treatment. Given the mounting public health impact of ASD, it is imperative that we consider technology and telehealth as potential avenues for care. Not only has technology been found to be highly preferred in this population (Kuo et al., 2014), but individuals with ASD have inherent social deficits which can interfere with direct communication and be a significant barrier in face-to-face therapeutic

interventions. While the research on technological intervention platforms is still in its infancy, technology is currently being used for screening, communication, and direct intervention in ASD in the areas of adaptive behavior, challenging behavior, academics, social competence, cognitive functioning, independence, and vocational skills (Odom et al., 2015).

Although technology is certainly being used in various ways in ASD treatment delivery and education, no known technology exists to date that specifically uses the individual's restricted interests to teach skills and enhance communication within one interactive mobile app. Therefore, Sidekicks! offers an innovative mobile intervention platform that can specifically tap into the individuals' highly preferred interests, thereby enhancing motivation. In addition, Sidekicks! directly addresses the longstanding difficulties that individuals with ASD have had in generalizing their acquired skills to more naturalistic settings. Professionals and educators from various public service settings, as well as parents and family members, are able to simultaneously use Sidekicks! to target both discrete and overlapping goal areas and to foster meaningful communication and relationship-building. Importantly, this technology can be used with a wide range of individuals with ASD, despite the significantly heterogeneity within the diagnostic criteria. Sidekicks! is not a structured, standalone treatment package or preset skills training program; rather, it is a flexible vehicle for communication and teaching between an existing "coach" (e.g., parent, teacher, therapist) and an individual client. Therefore, the developmental level and complexity of the Sidekicks! communication can vary significantly according to the individual client's needs. For this reason, Sidekicks! may conceivably benefit other populations as well, including children with behavior problems, executive functioning deficits, global developmental delays, language impairments, social pragmatic challenges, anxiety, and depression. While Sidekicks! has the potential to address the multifaceted barriers to treatment for ASD, no clinical trials have been completed to date.

Sidekicks and other technology-based intervention tools carry important limitations and risks that are important to highlight. First, the American Academy of Pediatrics strongly recommends boundaries and limits with respect to screen time and media use in children and adolescents, as inappropriate, unrestricted, and/or unsupervised media use may have effects on sleep and weight, safety, and privacy and confidentiality (APA Council on Communications & Media, 2016). In ASD in particular, parents often struggle to manage screen time and set limits. They also work hard to foster more opportunities for real life social interaction. As such, increased device use might not be a feasible or satisfactory treatment methodology. Most importantly, it is important to emphasize that no single-case, pilot or randomized controlled trials on Sidekicks! exist to date. Therefore, there is no formal evidence to support what aspects of Sidekicks! may be beneficial, and for whom. Given the significant heterogeneity within ASD, it is possible that Sidekicks! may only be effective for a subset of the ASD community (e.g., those with intact cognitive/language skills, those with character-based restricted interests). In addition, current use of this app is largely up to the discretion of the therapist or educator facilitating the communication. Therefore, the development of a standardized intervention protocol (i.e., manual) and treatment integrity data collection will be necessary components of this line of research. In summary, it is critical that researchers explore the satisfaction, feasibility, and potential efficacy of using Sidekicks! with individuals with ASD, as scientific investigation should be considered a prerequisite for its future place on the global ASD treatment stage.

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