Sosyal Bilimler Akademi Dergisi
The Journal of Social Sciences Academy
ISSN 2636-7599

Mayıs – 2018 Cilt: 1 Sayı: 1 May – 2018 Volume: 1 Issue 1

IPAD INTERVENTION FOR COMMUNICATION SKILLS OF CHILDREN WITH AUTISM

OTIZMLI ÇOCUKLARIN ILETIŞIM BECERILERINDE IPAD DESTEĞI

Abdullah ÇİFTÇİ*

Abstract

Nowadays, technology is being instrumentalized for educational purpose to support the academic and social skills development of children with autism. This paper aims to discover an appropriate intervention to promote communication skills for better engagement to social life. iPad is being used as an intervention by using speech-generating applications, such as Proloquo2Go, a programme which is being analysed by many researchers to determine how an augmentative and alternative communication (AAC) system can enhance the development of communication skills of children with autism. The mobile application provides features of accessibility, portability and affordability. Individualisation and customisation of the application allow to adjust the intervention in accordance with the need of children, therefore the use of mobile devices for educational purpose increases. Children with autism improve their communication and social skills by using such applications and their perception towards mobile devices are positive. The affordability, accessibility, or popularity of the application however might not necessarily entail that the intervention method is exactly appropriate.

Key Words: Intervention, Ipad, Skills, Children With Autism, Proloquo2Go.

Özet

Günümüzde, teknoloji, otizmli çocukların akademik ve sosyal beceri gelişimini desteklemek amacıyla eğitim amaçlı araçsallaştırılmaktadır. Bu çalışma, sosyal yaşama daha iyi katılım için iletişim becerilerini geliştirme adına uygun bir yöntemi ifade etmeyi amaçlamaktadır. iPad, otizmli çocukların iletişim becerilerinin gelişimini nasıl daha iyi geliştirebileceğini belirlemek amacıyla birçok araştırmacı tarafından analiz edilen bir program olan Proloquo2Go gibi konuşma uygulamalarını kullanarak bir destekleme aygıtı olarak kullanılmaktadır. Mobil uygulama, erişilebilirlik, taşınabilirlik ve satın alınabilirlik özellikleri sunmaktadır. Uygulamanın kişiselleştirilmesi ve özelleştirilmesi, desteklenmenin çocukların ihtiyacına göre ayarlanmasını sağlar, bu nedenle eğitim amaçlı mobil cihazların kullanımı artırmaktadır. Otizmli çocuklar bu tür uygulamaları kullanamı iletişim ve sosyal becerilerini geliştirmekte ve mobil cihazlara yönelik algılarını positive etmektedir.

Anahtar Kelimeler: Destek, Ipad, Beceriler, Otizmli Çocuklar, Proloquo2Go.

* Doctoral, Institute of Education, University College London

Ipad Intervention for Communication Skills of Children with Autism

Introduction

Children with autism lack communication and verbal skills, not to mention nonverbal communication (Banda and Koul, 2014). The Augmentative and Alternative Communication (AAC) system which uses pictures, photos, symbols, written words, hand gestures and manual signs, help children with autism create conducive communication environments (Boyd et al., 2015). The multi-purpose device called the iPad has been utilised for education, social networking, entertainment, gaming, and information purposes for several years; it is now being used to support the different needs of children with special needs (O'Malley et al., 2014). Since the iPad is being used for this purpose, the next logical step would be to develop an AAC application for that device to be used in schools and by families with children who have autism (McNaughton and Light, 2013).

This paper aims to discover an appropriate intervention method for providing children with autism the communication skills to engage them in social life and to create an environment in which might make them more independent. iPads can be used as an intervention device by using the Proloquo2Go application, a programme which is being analysed by many researchers in order to determine whether it enhances the communication skills of children with autism (Boyd et al., 2015). Furthermore, Proloquo2Go is an affordable and accessible application (Kings et al., 2014). This app provides one with the opportunity of customising the concept of intervention for an individual who may have different needs and strengths (Boyd et al., 2015). For example, children with autism can create sentences with Proloquo2Go by tapping related icons which indicate their needs, ideas and wants (Sigafoos et al., 2013).

Autism and Augmentative and Alternative Communication

It has been indicated that children with autism have difficulties with developing sufficient speech for daily use (Chien et al., 2015; Smith and Sung, 2014). In addition, it has been reported that more than 50% of individuals with autism have difficulties with nonverbal communication (e.g., making eye contact, gesturing and pointing), as well as limited verbal skills (Alzrayer, Banda and Koul, 2014; Boyd et al., 2015). Moreover, they might display challenging and repetitive behaviour, have social, sensory and motor problems, and differences in intellectual functioning (Alzrayer, Banda and Koul, 2014; Boyd et al., 2015). Based on the latest statistical update, one in eighty-eight children develop autism, with autism being four times more prevalent in boys than in girls (Hill and Flores, 2014). Nevertheless, many such children do not receive sufficient intervention in order to enhance their communication skills.

Augmentative and Alternative Communication (AAC) interventions are being recognised amongst researchers as being one of the most effective methods of improving communication skills in children with autism (Alzrayer, Banda and Koul, 2014; Xin and Leonard, 2014; Grace et al., 2014). This system includes using pictures, photos, symbols, manual signs, hand gestures and written words that stimulate and facilitate the formation of opinions, ideas, needs and wants by using visual

presentations (Boyd et al., 2015; van deer Meer et al., 2015; Xin and Leonard, 2014). Picture exchange communication systems and speech-generating devices (SGD), which can all be used by means of an iPad, are common methods of ACC (Alzrayer, Banda and Koul, 2014; van der Meer et al. 2013; Chan et al., 2014). However, the effectiveness of AAC depends on the experiences, approaches and expectations of the user's communication partners (parents and teachers) (Desai et al., 2014). The lack of common experiences and motivations amongst the partners might bring them to abandon the AAC system (Desai et al., 2014). Parents and teachers with enough knowledge, awareness, experiences and skills might increase the effectiveness of AAC system (Desai et al., 2014). On the other hand, increase in the use of computerised communication might limit face-to-face, humanised way of communication.

iPad for Intervention

Technology is being widely used for educational purposes, with many different kinds of app, and programme in order to provide interventionary support for children with autism so that they may better learn academic, social, and communication skills (Smith and Sung, 2014; Odom et al., 2014; Lorah et al., 2013). In addition, it has been indicated that mobile technologies such as the iPad are cheaper, more available and procurable than traditional AAC devices (McNaughton and Light, 2013). The wide availability of mobile devices is the key reason for using these devices for any purpose. In reviewing 15 studies, the research of Kagohara et al. (2013) posits that the iPad is an applicable technological device for supporting the many different needs of children with autism (Lee et al., 2013). Furthermore, the iPad is compatible with a plethora of apps which were built for the sole purpose of developing the communication skills of children with autism. More researches, however, should be conducted to improve programmes for developing different types of verbal behaviour (Alzrayer, Banda and Koul, 2014).

iPads can be used in conjunction with AAC systems for supporting the communication skills of children with autism by using picture-based communication boards or electronic speech-generating devices (Waddington et al., 2014). The iPad and AAC systems are similar in that they both use picture-based and speech-based communication boards, with children selecting an icon which either relates to a corresponding picture or speech output for the ultimate purpose of helping them communicate and express their needs (van der Meer et al., 2012). Sigafoos et al. (2014) suggest that the methods which are most suitable to the needs, strengths, and weaknesses of autistic children should be identified (Sigafoos et al., 2014). As King et al. (2014) suggests, both systems can either be used to work together or be synthesised for promoting the communication skills of autistic children. Nevertheless, one can create picture-based systems by using the iPad which, in turn, could help improve the communication skills of autistic children by creating sentences with pictures for the purpose of teaching students colour, fruits, vegetables, foods, jobs and items with pictures (Chen et al., 2015).

On the other hand, some researchers have claimed that using the iPad is more normalising and less stigmatising for children with special needs (Lorah et al., 2013) and has a positive impact on peer acceptance (Flores et al., 2012). Nevertheless, visual presentations are often preferred by students with autism, and animated or video presentations are more effective when used to teach them (Odom et al., 2014). Children with autism show interest in smiling, sound effects, and playfulness (Vellonen et al., 2012), with all of these features being easily supplied by simply using an iPad. It has also been claimed that children with autism tend to use electronic media more often; and that, moreover, the game-like nature of using technology may be more interesting for them (King, Thomezcek, Voreis and Scott, 2014). However, iPad use may increase social isolation, repetitive and stereotypical movements, and reduce social interaction (ibid). also, the gamification of the education can lead to perceiving education as a game and entertainment only. This approach can transfer the understanding towards education in the foreseeable future as now use of video games and gamification of other aspect are very common practice.

On the other hand, there are still some drawbacks in using the iPad, such as having very limited alternative access methods, a lack of trained people, and it can easily be diverted from its educational purpose to that of providing entertainment (Alzrayer, Banda and Koul, 2014). Nevertheless, people still prefer the iPad. Indeed, in a survey, they indicated their preference for using the iPad, saying that it is easy to use, that they spend less time preparing for things, that it can be implemented using only a few materials, and that participants can increase their communication skills (Flores et al., 2012). However, these results did not demonstrate that the use of AAC compatible iPads was better than using other types of intervention method (ibid). The important question is whether children with autism can successfully learn from iPads as an Speech-Generating Device (SGD) intervention which gives opportunity to create sentences with voice output by tapping icons, for engaging in communication (Sigafoos et al., 2013; Still et al., 2014). The study also suggests that children with autism can be taught to use iPads in order to learn SGD (Sigafoos et al., 2013; van der Meer et al., 2013).

The benefits of using SGD software with iPads include its mobility, its affordability when compared to traditional AAC devices, its social acceptability and high quality of voice output (Lee et al., 2013; Still et al., 2014); moreover, it can be individualised based on its needs and strengths (Hill and Flores, 2014). It is cost efficient, easy to operate, and more portable compared to traditional SGDs (King, Thomezcek, Voreis and Scott, 2014). In addition, iPads can easily be used in the mainstream because of its being socially acceptable and because it might help teachers to diversify and differentiate their teaching methods (McNaughton and Light, 2013). On the other hand, in one study, one student indicated that “I felt a sense of normalcy and acceptance” when using the device, with another student saying that: “I have [a] disability. Kids using an iPad have [a] device that says, I’m cool. And being cool, [is like] being like anyone else” (McNaughton and Light, 2013, p. 108). Thus,

and has already been indicated by users of the iPad, its use might enhance their inclusion in the mainstream (van der Meer et al., 2015).

It might also increase the awareness of parents and teachers in that they can benefit from intervention, and their communication skills can also be increased by using the iPad since it is widely used in daily life (McNaughton and Light, 2013). SGD devices in iPads are being used for communicative functions to express wants and needs, as well as being part of interactions with other people (Waddington et al., 2014). The outcomes of some researches have suggested that the use of SGD through the iPad have often been successful in teaching children communication skills; nevertheless, it might be difficult for some students to use SGDs (Waddington et al., 2014). Moreover, some studies have shown that SGDs can improve communication skills and reduce inappropriate behaviours in autistic children (Flores et al., 2012) and facilitate their engagement in the classroom by teaching them important academic skills (King, Thomezcek, Voreis and Scott, 2014).

Applications for Communication

There are different SGD iPad apps for supporting communication skills in children with autism, such as the "Proloquo2Go" and "Sono Flex" (Xin and Leonard, 2014). Xin and Leonard's (2014) study focuses on the use of the iPad through speech-generating devices with apps like the Proloquo2Go software. Proloquo2Go contains a large number of icons, text-to-speech voices, colour-picture symbols and a vocabulary of over 7000 items (Hill and Flores, 2014). New vocabulary and concepts can be added in order to individualise the use of the software, and it might help children who dislike changes and prefer consistency with minimal disruptions (Xin and Leonard, 2014). The simple way with which one might use the software, like touching an icon on the screen, might reduce learning anxiety (ibid). Furthermore, the visual language is helpful for nonverbal children with autism (ibid). Thus, this kind of programme might be most beneficial for children with autism who have a strong visual capability; thus, the intervention should be designed around their needs, more focus on their strengths.

Nowadays, people are familiar with using the iPad, and the functionality and interconnectivity of the iPad increases its potential benefit in terms of intervention (McNaughton and Light, 2013). It includes available speech output for creating face-to-face interactions, available written output for the purpose of participating in educational activities, an internet connection for the purpose of gathering more information, access to multimedia such as video and photos for the purpose of enhancing presentations, texting, cell phones, and access to social media in order to increase social interactions and connections (McNaughton and Light, 2013). However, it might be difficult to keep the focus on communication because it might isolate educational outcomes, just focus on technology, and neglect the aim of enhancing the users' communication skills (ibid). If technology has the power to facilitate an effective relationship and interaction between children with special needs and their caregivers,

teachers, and peers, then it can be used in order to make them more active in society and support their participation in daily life (ibid).

In order to gain benefit from apps before downloading that app, the skills and needs of children should be taken into consideration because recent surveys have found that these apps are often purchased without professional support or knowledge;for that reason, parents and children require technical support (ibid). The evaluation of apps for the purpose of finding an appropriate communication system might increase the effectiveness of intervention and decrease the frustration of parents and teachers (ibid). On the other hand, if the app cannot be individualised to create better supportive, communicative competence, children cannot take maximum benefit from their intervention. As King et al. (2014) indicates, however, the SGD intervention app Proloquo2Go can easily be individualised. For that reason, without the individualisation of the app, children with autism might not take maximum benefit from the use of the iPad (McNaughton and Light, 2013).

SGD Intervention Proloquo2Go

Speech generating devices like Proloquo2Go are portable electronic devices which use synthesised or digitised speech output (van der Meer and Rispoli, 2010). Students are taught to touch the icon on the screen to make the devices produce prerecorded messages such as "I want to drink juice" (ibid). There are instructional procedures for SGD which might be reviewed in order to implement the software effectively. This instruction contains a presentation of opportunity, a discriminative stimulus, reinforcement for communication, and prompts for behaviours from children with autism (ibid). Based on this, the SGD application Proloquo2Go can give autistic children the opportunity to eliminate the communication barrier associated with other AACs, such as manual signs, because children can understand better if a natural voice output is provided (King et al., 2014).

The SGD app Proloquo2Go has a video on YouTube which shows how it works (https://www.youtube.com/watch?v=k4vHGKlzREE). There is an app icon which opens by tapping the screen. After the app is opened, the home page on the screen will appear and will include many icons. At an essential level, Proloquo2Go includes the icon for the propositions and phrases of "I want, food, drinks, about me, I need help, toys, my tv and dvds, chat, I feel, activities, people, more, I want to go, home, school and I need a break." Under all of these icons, there are more related options for children to express their needs, wants, ideas and opinions. As mentioned earlier, this programme can easily be individualised for a child by adding more options, favourite things about the children, their identity and special wishes, needs, opinions and information (King et al., 2014). In this video, we can see how Rayn uses Proloquo2Go (https://www.youtube.com/watch?v=k4vHGKlzREE). In addition, there are many more videos on YouTube which depict how Proloquo2Go can be used.

As can be seen from the videos, this SGD intervention app combine words, phrases, and sentences by clicking on icons for the purpose of creating sentences which express wishes, ideas, needs and wants from pre-recorded, or programmed, voice outputs (King et al., 2014). The application

works by creating sentences like "I would like a drink please or I would like to play with that toy" through the use of icons (Sigafoos et al., 2014). Teaching children how to request things using Proloquo2Go by selecting icons from the screen of the iPad makes children learn quickly when compared with other AAC systems. They also, however, learnt requesting skills from other types of ACC systems as well (Kagohara et al., 2013). In another similar SGD app, "GoTalk Now," children increased their communicative behavioural skills (Desai et al., 2014). Nevertheless, Hill and Flores (2014) have found that students demonstrated more requesting behaviours when they utilised Proloquo2Go.

The type of voice output should be taken into consideration because the lack of variability, as well as the robotic nature of the speech, might not be the best option for some students (van der Meer and Rispoli, 2010). If children are not comfortable with the synthesised voice, the mother's voice or the voice of someone who makes them comfortable can be used instead. The aim of the Proloquo2Go is to make children better understood and give them the opportunity of better communicating with others (ibid). Moreover, the Proloquo2Go can provide larger icons for the better convenience of its users which is one of the affordances of mobile devices (King et al., 2014). Furthermore, it can be claimed that using large screen devices might be more useful than using smaller ones for children with autism (Odom et al., 2014).

All of this demonstrates that children with autism prefer to learn with iPad interventions with well-established instructional procedures for enhancing their communication skills (Kagohara et al., 2013). On the other hand, even though SGDs require fewer training sessions in order to reach mastery (Lorah et al., 2013), some researchers have claimed that there is no difference in how quickly the children learned with different AAC systems and that both systems are equally effective in terms of ease of acquisition (Sigafoos et al., 2014). The study conducted by Waddington et al. (2014) demonstrated, for instance, that some children were successful in maintaining communications and found new communication partners by using iPad interventions. Moreover, by using this systematic intervention, they learned more complicated and extended multi-step communications (ibid).

The significant criteria for effective iPad intervention are met by Proloquo2Go. For example, this application supports features which allow its users to customise the program for individuals by allowing the individual to input some special information by its users (Boyd et al., 2015). In addition, grammar and vocabulary can be updated to better represent the child's current level of language. Moreover, children can also change the colour, voice and pictures used in Proloquo2Go. This app, however, requires that the child have the basic motor skills to use an iPad; thus, parents and teachers should take into consideration the requisite motor skills needed (Boyd et al., 2015). Some researches have stated that it takes less time to learn how to use Proloquo2Go, and learning how to operate the iPad and its applications in a very short amount of time is a significant criterion for any intervention (ibid). Evaluating popular software in terms of whether they are helpful for children might facilitate

educators and parents to find more appropriate interventions (van der Meer et al., 2013). Based on what has been found, many studies have come to the conclusion that Proloquo2Go is an effective intervention tool for teaching communication skills to autistic children (Boyd et al., 2015). Nevertheless, even though Proloquo2Go is affordable when compared to other SGDs, there are still cheaper apps on the market that work quite similarly to Proloquo2Go (Boyd et al., 2015; Xin and Leonard, 2014). Also, ease of use and affordability does not necessarily demonstrate the educational value of mobile devices. Pedagogical implications of technological devices still need to be under scrutiny to be able to develop better educational practices.

Conclusion

Children with autism can benefit from SGD intervention software such as Proloquo2Go by creating sentences with speech outputs. iPads are used for many educational purposes, and especially for supporting children with special needs (Falloon, 2013). Studies suggest that children with autism increase their communication skills when iPad-based intervention programmes such as Proloquo2Go are utilised (King et al., 2014). In addition, this app is suitable with AAC systems in that it uses pictures and photos. The study suggests that children with autism learn better with visual support and that they might actively participate in this kind of intervention (van der Meer et al., 2015). The use of iPads might make children active learners and increase their social participation because they feel more accepted when they use the iPad (O'Malley et al., 2014). Proloquo2Go gives them the opportunity to customise their intervention by better focusing on the needs and strengths of children with autism. Using intervention programmes on the iPad, however, might divert children out of participating in their educational activities and instead make them want to use that device's entertainment features instead. For that reason, teachers and parents should be careful to keep their children on task, or buy an iPad specifically designed for educational purposes so as to avoid such inverted behaviours (Still et al., 2014). Parents and teachers might need guidance and support to find the appropriate intervention app for their children. The affordability, accessibility, or popularity of the application might not necessarily entail that the intervention method is exactly appropriate (Boyd et al., 2015). For that reason, professional support should be provided to users in order to better facilitate their using the intervention programme that they have opted for (ibid).

References

Alzrayer, N., Banda, D. R., & Koul, R. K. (2014). Use of iPad/iPods with Individuals with Autism and other Developmental Disabilities: A Meta-analysis of Communication Interventions. *Review Journal of Autism and Developmental Disorders*, 1(3), pp. 179-191.

Boyd, T. K., Barnett, J. E. H., & More, C. M. (2015). Evaluating iPad Technology for Enhancing Communication Skills of Children With Autism Spectrum Disorders. *Intervention in School and Clinic*.

Chan, J. M., Lambdin, L., Graham, K., Fragale, C., & Davis, T. (2014). A picture-based activity schedule intervention to teach adults with mild intellectual disability to use an iPad during a leisure activity. *Journal of Behavioral Education*, 23(2), pp. 247-257.

Chien, M. E., Jheng, C. M., Lin, N. M., Tang, H. H., Taele, P., Tseng, W. S., & Chen, M. Y. (2015). iCAN: A tablet-based pedagogical system for improving communication skills of children with autism. *International Journal of Human-Computer Studies*, 73, pp. 79-90.

Desai, T., Chow, K., Mumford, L., Hotze, F., & Chau, T. (2014). Implementing an iPad-based alternative communication device for a student with cerebral palsy and autism in the classroom via an access technology delivery protocol. *Computers & Education*, 79, pp. 148-158.

Falloon, G. (2013). Young students using iPads: App design and content influences on their learning pathways. *Computers & Education*, 68, pp. 505-521.

Flores, M., Musgrove, K., Renner, S., Hinton, V., Strozier, S., Franklin, S., & Hil, D. (2012). A comparison of communication using the Apple iPad and a picture-based system. *Augmentative and Alternative Communication*, 28(2), pp. 74-84.

Grace, E., Raghavendra, P., Newman, L., Wood, D., & Connell, T. (2014). Learning to use the Internet and online social media: What is the effectiveness of home-based intervention for youth with complex communication needs?. *Child Language Teaching and Therapy*, pp. 1-17.

Hill, D. A., & Flores, M. M. (2014). Comparing the Picture Exchange Communication System and the iPad™ for Communication of Students with Autism Spectrum Disorder and Developmental Delay. *TechTrends*, 58(3), pp. 45-53.

Kagohara, D. M., van der Meer, L., Ramdoss, S., O'Reilly, M. F., Lancioni, G. E., Davis, T. N., ... & Sigafoos, J. (2013). Using iPods® and iPads® in teaching programs for individuals with developmental disabilities: *A systematic review. Research in developmental disabilities*, 34(1), pp. 147-156.

King, M. L., Takeguchi, K., Barry, S. E., Rehfeldt, R. A., Boyer, V. E., & Mathews, T. L. (2014). Evaluation of the iPad in the acquisition of requesting skills for children with autism spectrum disorder. *Research in Autism Spectrum Disorders*, 8(9), pp. 1107-1120.

King, A. M., Thomeczek, M., Voreis, G., & Scott, V. (2014). iPad® use in children and young adults with Autism Spectrum Disorder: An observational study. *Child Language Teaching and Therapy*, 30(2), pp. 159-173.

Lee, A., Lang, R., Davenport, K., Moore, M., Rispoli, M., van der Meer, L., ... & Chung, C. (2013). Comparison of therapist implemented and iPad-assisted interventions for children with autism. *Developmental Neurorehabilitation*, 18 (2), pp. 97-103.

Lorah, E. R., Tincani, M., Dodge, J., Gilroy, S., Hickey, A., & Hantula, D. (2013). Evaluating picture exchange and the iPad™ as a speech generating device to teach communication to young children with autism. *Journal of Developmental and Physical Disabilities*, 25(6), pp. 637-649.

McNaughton, D., & Light, J. (2013). The iPad and mobile technology revolution: Benefits and challenges for individuals who require augmentative and alternative communication. *Augmentative and Alternative Communication*, 29(2), pp. 107-116.

Odom, S. L., Thompson, J. L., Hedges, S., Boyd, B. A., Dykstra, J. R., Duda, M. A., Szidon, K. L., Smith, L. E. & Bord, A. (2014). Technology-aided interventions and instruction for adolescents with autism spectrum disorder. *Journal of autism and developmental disorders*, pp. 1-15.

O'Malley, P., Lewis, M. E. B., Donehower, C., & Stone, D. (2014). Effectiveness of using iPads to increase academic task completion by students with autism. *Universal Journal of Educational Research*, 2(1), pp. 90-97.

Sigafoos, J., Lancioni, G. E., O'Reilly, M. F., Achmadi, D., Stevens, M., Roche, L., ... & Green, V. A. (2013). Teaching two boys with autism spectrum disorders to request the continuation of toy play using an iPad®-based speech-generating device. *Research in Autism Spectrum Disorders*, 7(8), pp. 923-930.

Sigafoos, J., O'Reilly, M. F., Lancioni, G. E., & Sutherland, D. (2014). Augmentative and alternative communication for individuals with autism spectrum disorder and intellectual disability. *Current Developmental Disorders Reports*, 1(2), pp. 51-57.

Smith, V., & Sung, A. (2014). Computer Interventions for ASD. In *Comprehensive guide to Autism* (pp. 2173-2189). New York: Springer. [online] Available at: <http://link.springer.com/referenceworkentry/10.1007%2F978-1-4614-4788-7_134> [Accessed 15 June 2015].

Still, K., Rehfeldt, R. A., Whelan, R., May, R., & Dymond, S. (2014). Facilitating requesting skills using high-tech augmentative and alternative communication devices with individuals with autism spectrum disorders: A systematic review. *Research in Autism Spectrum Disorders*, 8(9), pp. 1184-1199.

Van der Meer, L., Achmadi, D., Cooijmans, M., Didden, R., Lancioni, G. E., O'Reilly, M. F., & Sigafoos, J. (2015). An iPad-Based Intervention for Teaching Picture and Word Matching to a Student with ASD and Severe Communication Impairment. *Journal of Developmental and Physical Disabilities*, 27(1), pp. 67-78.

Van der Meer, L. A., & Rispoli, M. (2010). Communication interventions involving speech-generating devices for children with autism: A review of the literature. *Developmental Neurorehabilitation*, 13(4), pp. 294-306.

Van der Meer, L., Sigafoos, J., Sutherland, D., McLay, L., Lang, R., Lancioni, G. E., ... & Marschik, P. B. (2013). Preference-enhanced communication intervention and development of social communicative functions in a child with autism spectrum disorder. *Clinical Case Studies*, pp. 1-14.

Van der Meer, L., Sutherland, D., O'Reilly, M. F., Lancioni, G. E., & Sigafoos, J. (2012). A further comparison of manual signing, picture exchange, and speech-generating devices as communication modes for children with autism spectrum disorders. *Research in Autism Spectrum Disorders*, 6(4), pp. 1247-1257.

Vellonen, V., Kärnä, E., & Virnes, M. (2012). Communication of children with autism in a technology-enhanced learning environment. *Procedia-Social and Behavioral Sciences*, 69, pp. 1208-1217.

Waddington, H., Sigafoos, J., Lancioni, G. E., O'Reilly, M. F., Van der Meer, L., Carnett, A., ... & Marschik, P. B. (2014). Three children with autism spectrum disorder learn to perform a three-step communication sequence using an iPad®-based speech-generating device. *International Journal of Developmental Neuroscience*, 39, pp. 59-67.

Xin, J. F., & Leonard, D. A. (2014). Using iPads to Teach Communication Skills of Students with Autism. *Journal of autism and developmental disorders*, pp. 1-11.