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## **Using the Application Friendly Schedule on a Tablet to Promote Independence in Children with Autism Spectrum Disorder**

### **Abstract**

The prevalence of autism spectrum disorder (ASD) has increased in recent decades. The need to provide evidence-based practices in the field of ASD is also growing. The Institute for Child Development (IWRD) in Poland is offering science-based intervention to children with autism, based on the model developed initially by McClannahan and Krantz (1993) in the Princeton Child Development Institute, USA. Their research and clinical experience show that activity schedules are very effective in teaching people with autism many new skills. However, activity schedules in the “traditional” paper version could lead to stigmatization while used in the social environment. It is essential to give people with autism spectrum disorder socially acceptable tools, which can help them to function more independently. The intensive development of modern technologies as well as an easy access to various types of mobile devices inspired us to implement tablets into our treatment. Friendly Schedule is an application for children and youth with autism and related disorders, which was developed as a joint initiative of the Gdańsk University of Technology and the Institute for Child Development. The application was created as a “non-profit” project. The data from our research show that manual prompts

are very effective in teaching children with autism to follow activity schedules on a tablet. All of our participants learned to use the application Friendly Schedule to complete five tasks independently. In the IWRD program the application Friendly Schedule is used to teach students with autism a variety of new skills, including verbal and social behaviours.

**Key words:** autism, activity schedules, application, assistive technology, manual prompts, independence

## **Autism Spectrum Disorder**

Autism was described for the first time 75 years ago by Leo Kanner. There is no brain scan, blood test, or any other objective test which can diagnose autism. The diagnosis must rely on observations of a person's behaviour. The definitions and diagnostic criteria for autism have changed many times over the years. The latest changes made by the American Psychiatric Association are very broad. The Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM; APA, 2013) included autism within the neurodevelopmental disorders. DSM-5's classification also changed the diagnostic name to "autism spectrum disorder" (ASD) to emphasize that the level of functional independence among individuals with autism can differ from very mild to severe. Individuals with ASD show varying degrees of severity of major symptoms: difficulties in social communication, restricted and repetitive behaviour, and sensory abnormalities (De Groot & Van Strien, 2016). The prevalence of autism is still growing. The data from 2016 published by the Centers for Disease Control and Prevention (Maenner et al., 2020) estimate autism's prevalence as 1 in 54 children aged eight years. A strong male bias in autism spectrum disorder (ASD) prevalence has been observed – the combined male to female prevalence ratio was 4.3 to 1. The first symptoms of autism appear before the child reaches the age of three. Deficits in social reciprocity are the most significant factor for autism. People with ASD have difficulties with a normal back-and-forth conversation; they very often fail to initiate or respond to social interactions and rarely share their interests or achievements with others. For some people with autism, the development of spoken language will be delayed, and others will have no spoken language. Difficulties in verbal communication are not compensated by nonverbal communication. People with autism can show marked impairment in the use of eye contact, facial expressions, or body postures. They also have deficits in understanding and using gestures during social interaction

(APA, 2013). Limited communication and inability to express personal needs may result in unwanted behaviours such as tantrums or aggression. In the diagnostic criteria of ASD, there are also listed restricted, repetitive, and stereotyped patterns of behaviour, interests, and activities. People with autism can show inflexible adherence to specific, non-functional routines or rituals. They can engage in different types of stereotyped or repetitive motor movements. In ASD, developmental deficits are very extensive and limit a person's ability to function properly in many different areas of life.

### **Applied Behaviour Analysis**

Although no cure for autism is known, there are well-documented treatment approaches which can address some of the challenges associated with ASD. Behavioural approaches have been recognized by many researchers and practitioners as the most effective treatment methods (Green, 1996; Howard et al., 2005; Eikeseth et al., 2007; Peters-Scheffer et al., 2011). In these approaches, treatment procedures are based on the principles of applied behaviour analysis. Applied behaviour analysis (ABA) is the data- and research-based application of behavioural principles to socially significant behaviour (Cooper et al., 2007). The best results for children with autism can be achieved by a long-term, comprehensive ABA intervention. Positive effects can be observed in intellectual functioning, language development, and adaptive behaviour of people with autism. More evident results can be achieved in verbal IQ, receptive and expressive language than in non-verbal IQ or independent social functioning (Virués-Ortega, 2010).

Through decades of research, applied behaviour analysts have developed many teaching procedures. These procedures are very effective in increasing deficit behaviour and reducing problem behaviour. ABA techniques can be used for children with autism to develop their social, communication, play, and self-care skills, as well as the ability to manage their own behaviour.

### **Activity Schedules**

People with ASD may get fixated on one activity and have problems in independent transitioning between different tasks or performing a complex chains of behaviours (Clarke et al., 1999). The ability to learn sequential tasks is also impaired in high-functioning individuals with ASD. Promoting independent functioning of people with disabilities is one of the main goals in educational and vocational settings. Independent functioning and reduction of prompt dependency is necessary for the successful inclusion of students with autism to the society. Children with autism can complete a variety of activities but very often depend on prompts to switch from one activity to another (McClannahan & Krantz, 2010). Dependency on prompts and verbal cues from others is a significant problem for

students with disabilities, because in many educational institutions or intervention programs whole learning process is built on teachers' cues and assistance (MacDuff et al., 1993), thus running the risk that the students will not respond to natural stimuli.

A well-known and scientifically documented instructional strategy which demonstrated multiple benefits for students with autism, including transitional skills and promoting independence, is an activity schedule. McClannahan and Krantz (2010) defined an activity schedule as a set of photographs, pictures or words which cues a person to complete a sequence of activities. The most important benefit of an activity schedule is that stimulus control can be transferred from a parent or teacher to a visual cue (Copeland & Hughes, 2000). When people with autism learn to respond to picture cues, these cues can guide their behaviour in the absence of supervising adults. Activity schedules usually consist of notebooks depicting a series of photographs, symbols, and/or words which are presented sequentially to cue a chain of responses (McClannahan & Krantz, 2010). There is much research supporting the use of activity schedules to teach and promote functional independence in children with autism. The research also indicates that schedule-following may have positive correlation with reductions in stereotypic or disruptive behaviours (Krantz et al., 1993; Koyama & Wang, 2011). Schedules may be used with preschoolers, teenagers, and adults at different levels of functioning. Activity schedules can be used to teach students with autism independent play, communication skills, daily living skills and on-task behaviours (Krantz et al., 1993; Banda et al., 2009).

### **Modern Technologies**

Over the last few years, we could observe modern technologies becoming more popular in special education. The amount of research done in this area is growing. The results are very promising, with a clear conclusion that modern technologies can be very effectively used in the daily treatment of people with disabilities.

These technologies allow support and learning to occur at all times of the day, whether at home or at school; they also permit self-management and self-instruction. A stunningly great feature of these devices is the fact that they are now so commonplace in our society that they can provide a less stigmatizing method for supporting and teaching students with disabilities (Silton, 2014, p. XIX).

The review of studies and literature showed that students with a moderate to mild intellectual disability and/or with autism can use technological aids to learn

academic, communication, employment, and leisure skills (Kagohara et al., 2013; Den Brok & Sterenburg, 2015; Valencia et al., 2019). New skills are acquired through prompting, interaction with devices, and also practicing in realistic virtual environments. iOS based devices can be used also to increase independence for the persons with autism, so the assistance of an adult can be reduced (Carlile et al., 2013). The research also indicates that therapists should use science-based teaching techniques and generalization procedures during introducing modern technologies in the treatment to achieve better outcomes for people with ASD (Hong et al., 2018).

### **Friendly Applications Project**

Friendly Schedule (Przyjazny Plan) is an application for children and youth with ASD, which was developed in Poland as a joint initiative of the Gdańsk University of Technology (GUT) with the coordinator A. Landowska, PhD, and the Institute for Child Development (IWRD) with A. Budzińska, PhD, and I. Ruta-Sominka as the coordinators. The goal was to create an application which would allow therapists or parents to create activity schedules on a tablet and give them the opportunity to add audio scripts and use the scripts and script fading technique to develop social and verbal behaviours in children with autism. From the beginning, the project was based on a non-profit principle – the application is available for free, and the software code is open for anyone willing to develop the application (Landowska et al., 2016). The application is dedicated for tablets with an Android operating system.

Friendly Schedule consists of two separate programs:

1. Friendly Schedule Manager – a mobile application for the therapist or parent, which enables the teacher to prepare or modify the schedules that the child can use later on his or her application;
2. Friendly Schedule – an application for the student, which cues him or her to engage in a sequence of activities and/or interactions.

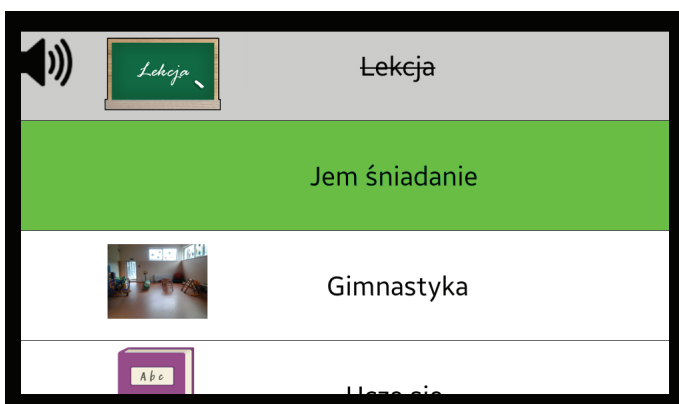
The application Friendly Schedule Manager allows the therapist to adjust the schedule for the child's individual needs (Landowska et al., 2016; Landowska et al., 2017). When preparing the first activity schedule, the teacher must know the student's current abilities. For beginners, the schedule can be prepared as a slide show with one activity per "page" (Figure 1). The therapist could decide which type of visual stimuli is the best for his or her student to put on the slide: a photograph of a real object or a symbol. He or she can also add written cues to the picture. If the schedule is used to teach the child to initiate interactions with others, the therapist could add audio scripts (a sound, word, or sentence), so the child could listen to the script on the device and repeat it to the conversational partner.



*Figure 1.* A screenshot from the application Friendly Schedule (Przyjazny Plan) on Samsung Galaxy 7" tablet, showing the activity schedule as a slide show with one activity per page.

Note: Friendly Schedule is an open-source application created by the Gdańsk University of Technology and the Institute for Child Development with the symbol added by authors (the source of the drawing: own work).

For more advanced students, the teacher can create the schedule as a sliding list with colour coding. In this type of schedule, the teacher can also add symbols and/or audio scripts to the written cues.



*Figure 2.* A screenshot from the application Friendly Schedule (Przyjazny Plan) on Samsung Galaxy 7" tablet, showing the activity schedule in the form of a sliding list with colour coding and the task already completed by the student, which was automatically crossed out.

Note: Friendly Schedule is an open-source application created by the Gdańsk University of Technology and the Institute for Child Development with symbols added by authors (the source of the photo and drawings: own work).

Friendly Schedule is an application that is intended to be very accessible and easy to use for people with autism, but full success is possible only when the teacher or parent knows how to teach the student with ASD to use the schedule on a tablet. This was the main subject of our study.

## **Teaching Children with Autism to Follow an Activity Schedule on a Tablet Using the Application Friendly Schedule**

Even a properly prepared schedule on a tablet will not be a useful tool for a person with autism if the therapist does not teach him or her how to use it. Teaching people with ASD can be a real challenge, so every teacher should use only those teaching techniques whose effectiveness has been scientifically proven. The study shows the use of the application Friendly Schedule and graduated manual guidance in teaching three boys with autism to follow an activity schedule on a tablet. The target behaviour was to teach the students to independently complete five tasks, following an activity schedule on the tablet without any prompts from the teacher.

### **Participants and Settings**

Three boys with autism at preschool age participated in the study. All met the ICD-10 criteria for childhood autism (WHO, 1992) – the classification of mental and behavioural disorders which was obligatory in Poland at that time. All participants have been receiving four and a half hours of therapy daily at the Institute for Child Development (IWRD) in Gdańsk, Poland. At the time of the study, one of the boys has been a student at IWRD for 25 months and the other two for 13 months. All the students have acquired all needed prerequisite skills and could match identical objects, as well as distinguish a picture of an object from the background. All the boys also accepted manual guidance (McClannahan & Krantz, 2010). All of the participants had prior experience in using tablets to play simple games or watch cartoons. Before we started the study, all our participants had previous experience with activity schedules on paper and they could follow different activity schedules in the form of a notebook or a daily activity schedule in the form of a written list with small pictures. All of the participants have mastered various simple tasks, such as stacking puzzles, colouring simple pictures, completing simple tracing worksheets, matching pictures or words, etc. They had no experience with following any type of activity schedules on a tablet.

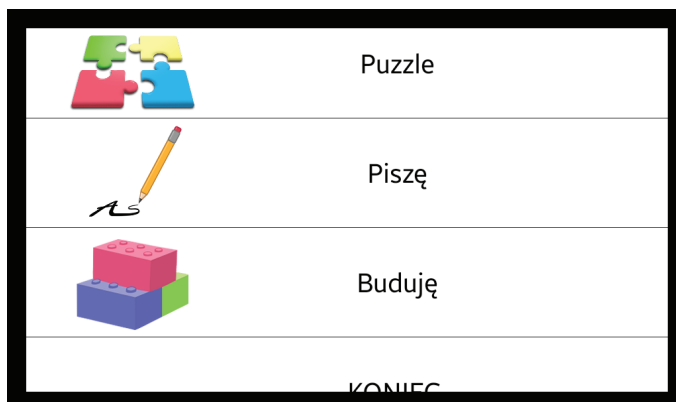
The setting was a preschool and a research center for children with autism (IWRD). Baseline, intervention, and ongoing generalization probes were conducted in a typical classroom furnished with desks, chairs, and bookcases. The tablet was placed on a small table, near the shelves where all the materials were located. The chair and the table for the student were in the same room. Generalization sessions were all held in this same setting but with different teachers.

## Materials

We selected five basic categories of tasks which could be done independently by our students: stacking puzzles, tracing pictures, building with blocks, matching pictures, and completing simple worksheets for preschoolers. All the tasks had a clear ending, so the participants did not need a timer to stop the activity. For each participant, we selected 15 simple tasks, with three different tasks for each category. All the tasks have already been mastered during one-to-one sessions with the teacher. For one session, only five tasks were selected, and the remaining ten activities were used for the subsequent sessions.

Each participant had his own Samsung Galaxy Tab A 7.0" tablet with the application Friendly Schedule. Individualized activity schedules were embedded into the devices.

The schedule on each tablet consisted of a list of five written cues with small pictures (Figure 3). After all five activities were completed, the symbol “Koniec” (“Finished”) was automatically presented on the screen. The tasks in the schedules



*Figure 3.* A screenshot from the application Friendly Schedule (Przyjazny Plan) on a tablet, showing written cues with small pictures on the left in an individualized activity schedule.

Note: Friendly Schedule is an open-source application created by the Gdańsk University of Technology and the Institute for Child Development with symbols added by authors (the source of the drawings: own work).



were presented in a variable order for every session. All the materials for the tasks were placed on the shelves. Materials for each task were placed in separate baskets or folders. Each basket or folder was marked with one written cue and a picture, the same as in the schedule.

### **Experimental Design and Measurement Procedures**

In multiple baseline designs, the intervention is introduced sequentially to different clients, behaviours or settings (Morgan, 2009). In multiple baseline designs a single transition from baseline to intervention (AB) is introduced at different times across multiple subjects. Multiple baseline designs eliminate the need to return to baseline and therefore are particularly suitable for evaluation of intervention when a long-term effects are expected (Krasny-Pacini & Evans, 2018).

In our research, a multiple-baseline across participants design was used to assess the effects of prompting procedures. Data were presented as the percentage of correctly completed components in the chain in the activity schedule. The interobserver agreement (IOA) conformity test was conducted during every session and data were collected to determine whether the data recorded by two independent observers were congruent. Percentage interobserver agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. Mean interobserver agreement on the occurrence of correct responses was 100%.

### **Independent Variables**

During the study, graduated manual guidance was used as the teaching procedure. Manual prompts were defined as manual assistance in displaying the desired response. In the literature (MacDuff et.al., 2001), graduated guidance has been described as providing physical prompts as needed and fading them immediately (within a session) as the student begins to respond correctly. The fading is not systematically planned and relies on the student's responding during the sessions. Fading can apply to the location of the prompt on the student's body (e.g., hand, forearm, upper arm), and/or the intensity (e.g., pressure, force) of the prompt. The practitioner should shadow the student's movements, allowing for immediate corrections as necessary. In graduated guidance, the instructor provides manual prompts to complete an action, and then fades these prompts by changing their intensity or locations" (MacDuff et.al., 2001, p. 42).

### **Dependent Variables**

Task analysis was used to identify the components required to complete the chain of activities. The student is following the activity schedule on the tablet

during independent tasks when he completes independently all the components of the chain:

- turns on the screen on the tablet (if it is black);
- touches the correct written cue with a picture on the tablet;
- takes materials;
- completes the task and puts the materials away;
- returns to the tablet.

The application Friendly Schedule has already been opened for the student.

### **Baseline**

Prior to teaching, baseline measures of target responses were obtained. During the baseline phase, the therapist did not use any prompts or rewards; he could only give one verbal instruction at the beginning, “check your schedule.” Baseline sessions were terminated if the participant did not start to follow the activity schedule on the tablet during the first 30 seconds or stopped completing the components of his activity schedule for 30 seconds.

### **Intervention**

The sessions occurred three times per day; five days per week. At the beginning of the single session the researcher gave a short instruction, such as “check your schedule,” in the presence of a corresponding activity schedule on the tablet and all tasks located on the shelf. If the participant did not follow the activity schedule on the tablet, the teacher manually guided him to complete the chain correctly. The consistent time delay for prompting was five seconds. If an error occurred, a behaviour rehearsal trial was conducted, in which the teacher provided manual prompts to correct the error. Manual prompts were gradually faded when the child correctly performed any component of the chain. Prompts were faded in frequency and intensity as rapidly as possible (Cooper et al., 2007).

At the beginning of the teaching, edible rewards were delivered by the teacher after every correctly performed component of the chain. When the data showed that the participant had 50% (or higher) of correct components, reinforcement was thinned. The edible rewards were delivered after the child correctly performed the whole chain for a single task and at the end of the whole schedule.

### **Generalization**

Generalization data were collected prior to and after the teaching. When the criterion of 100% of correct components of schedule following was met, the generalization was checked in the same place but in the presence of a new person. There were no verbal or manual prompts or rewards during the testing of generalizations.

The new person could give only one verbal instruction at the beginning, “check your schedule.”

### Results of Research

During the baseline measurements, two students did not complete any schedule component; for one participant – student 2 – the mean percentage of correctly completed components during the baseline was 2%. When manual prompts and reinforcement were introduced, our students learned to use the application correctly. The first student’s percentage of correctly completed components increased

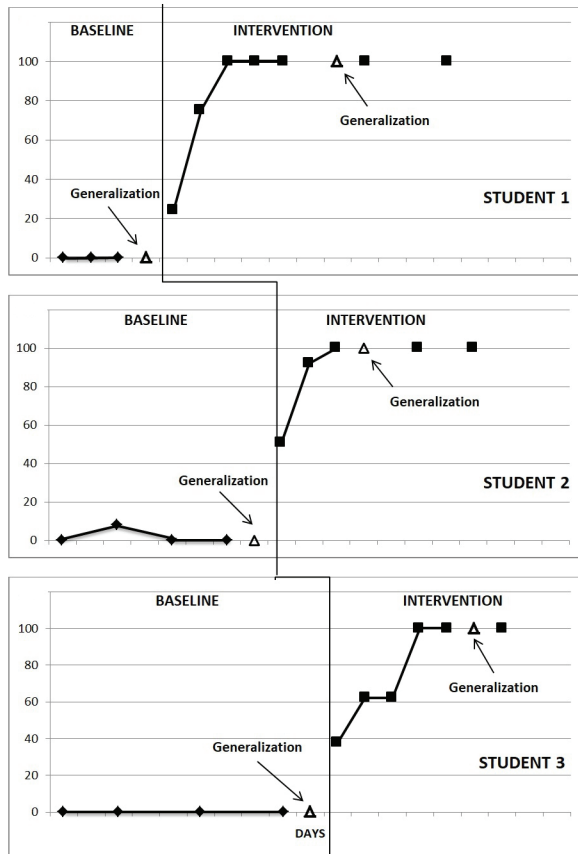


Figure 4. Percentage of correctly completed components during baseline and intervention with generalization probes for three participants.

Note: Solid diamonds represent the percentage of correctly completed components during the baseline measurement. Solid squares represent the percentage of correctly completed components during the intervention. Open triangles represent the percentage of generalization (the source: own research).

to a mean of 66% (range: 24–100%) during the intervention, with mastery of all the schedule components occurring within seven sessions. The second student's percentage of correctly completed components increased to a mean of 81% (range: 51–100%) during the intervention, with mastery of all the schedule components occurring within seven sessions. The third student's percentage of correctly completed components increased to a mean of 60% (range: 38–100%) during the intervention, with mastery of all the schedule components occurring within ten sessions.

The generalization was assessed with a person who did not participate in the teaching; all of the students scored 100% of correctly completed components (Figure 4).

We can conclude that graduated manual guidance was a very effective procedure in teaching the students to follow activity schedules on a tablet. Another conclusion is that the application Friendly Schedule is a great tool which can be used to prepare activity schedules for students with ASD.

Maintenance data were not collected, because all our students were continuously using Friendly Schedule on a tablet during their daily treatment and we introduced the application to other educational programs to develop a variety of deficit behaviours.

## Discussion

Based on the results of our research, we can conclude that the application Friendly Schedule is a very useful tool which can be used to prepare activity schedules for students with ASD. We can also conclude that graduated manual guidance is an effective procedure in teaching the students with ASD to follow activity schedules on a tablet. In our research, a multiple-baseline across participants design was used to assess the effectiveness of intervention strategies. The main reason for choosing this design was that we did not have to return to the baseline. It was not ethical to remove the effective intervention and return to the baseline, as required in ABA design, because after the teaching phase all the participants began to continuously use the application in the kindergarten, as well as during their home-programming. We are aware that the number of participants was small, but the multiple-baseline design allowed for prediction, verification and replication. In our research, we can observe the same pattern across all the participants to prove the effectiveness of the intervention. However, because only three students with autism participated in the study, we can admit that our results cannot be generalized. However, our results

are an important indication that it should be worthwhile to verify the effectiveness of the application and the teaching procedure with a larger group of participants to confirm the results. Given that all the participants had some prior experience using activity schedules on paper, we can presume that this had an impact on the acquisition of the target behaviour. More research is needed to examine the use of Friendly Schedule with children who did not have previous experience with any type of activity schedules. Teaching children with autism to use the Friendly Schedule application on tablets has an important social validity, because this method can be considered more natural, and the child with autism should be less stigmatized in the social environment.

We are continuously using the application Friendly Schedule at the Institute for Child Development in Gdańsk, and we have noticed some limitations for wider use of the application. One is that new users – teachers or parents – cannot use it effectively without instructions from an experienced person who would explain how to use the application to prepare the schedules and, also, how to teach the student with ASD to follow the activity schedule on the tablet in a proper way.

Our data from daily treatment shows that the application can have a much wider use (Landowska et al., 2016). We are using the application to develop new playing skills, such as building with blocks or drawing, and to develop self-help skills such as dressing oneself. By adding audiotaped scripts to an activity schedule, we can also teach children with autism new verbal and social behaviours, such as conversations or making requests. More research can be done to show the effectiveness of using the application Friendly Schedule to develop other deficit skills in children with ASD.

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## **Wykorzystanie aplikacji Przyjazny Plan na tablecie do rozwijania samodzielności u dzieci z zaburzeniem ze spektrum autyzmu**

### Streszczenie

Częstotliwość występowania zaburzeń ze spektrum autyzmu (ASD) znacząco wzrosła w ostatnich dziesięcioleciach. Wzrasta również potrzeba zapewnienia osobom z ASD terapii opartej na badaniach naukowych. Instytut Wspomagania Rozwoju Dziecka (IWRD) w Gdańsku oferuje dzieciom z autyzmem terapię wzorowaną na modelu opracowanym przez dr McClannahan i dr Krantz (1993) w Princetone Child Development Institute w USA. Ich badania i doświadczenie kliniczne pokazują, że plany aktywności są bardzo skuteczne w uczeniu osób z autyzmem wielu nowych umiejętności. Jednak plany aktywności w „tradycyjnej” papierowej wersji mogą prowadzić do stigmatyzacji osoby z autyzmem w środowisku społecznym. Istotne jest, aby dać osobom z ASD społecznie akceptowane narzędzia, które pomogą im w jak najbardziej niezależnym funkcjonowaniu. Intensywny rozwój nowoczesnych technologii, a także łatwy dostęp do różnego rodzaju urządzeń mobilnych zainspirowały nas do wdrożenia tabletek do codziennej terapii.

Przyjazny Plan (Friendly Schedule) to aplikacja dla dzieci i młodzieży z autyzmem i zaburzeniami pokrewnymi, która została opracowana dzięki wspólnej inicjatywie Politechniki Gdańskiej i Instytutu Wspomagania Rozwoju Dziecka. Aplikacja na tablet została stworzona jako projekt „non-profit”. Dane z naszych badań pokazują, że wypowiedzi manualne są bardzo skuteczne w uczeniu dzieci z autyzmem korzystania z planów aktywności na tablecie. Wszyscy uczestnicy badania nauczyli się korzystać z aplikacji Przyjazny Plan podczas samodzielnego wykonania



ciągu złożonego z pięciu zadań. W IWRD aplikacja Przyjazny Plan jest obecnie wykorzystywana do uczenia uczniów z autyzmem różnych nowych umiejętności, w tym zachowań werbalnych i społecznych.

**Słowa kluczowe:** autyzm, plany aktywności, aplikacje, technologia wspomagająca, podpowiedzi manualne, samodzielność

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### **Использование приложения Дружественный план (Przyjazny plan) на планшете для развития самостоятельности у детей с расстройством аутистического спектра**

#### **А н н о т а ц и я**

Заболеваемость расстройствами аутистического спектра (РАС) значительно возросла за последние десятилетия. Также возрастает потребность в проведении научно-исследовательской терапии для людей с РАС. Институт поддержки развития ребенка (IWRD) в Гданьске предлагает детям с аутизмом терапию, смоделированную по модели, разработанной доктором МакКланнэн и доктором Кранц (1993) в Принстонском институте развития ребенка в США. Их исследования и клинический опыт показывают, что планы действий очень эффективны в обучении аутичных людей многим новым навыкам. Однако планы деятельности в «традиционной» бумажной версии они могут стигматизировать человека с аутизмом в социальной среде. Важно дать людям с РАС социально приемлемые инструменты, которые помогут им действовать максимально независимо. Интенсивное развитие современных технологий, а также легкий доступ к различным типам мобильных устройств вдохновили нас на внедрение планшетов для ежедневной терапии. Дружественный план (Przyjazny plan) – приложение для детей и подростков с аутизмом и связанных с ним расстройств, который был разработан благодаря совместной инициативе Гданьского технологического университета и Института поддержки развития ребенка. Приложение для планшетов было создано как «некоммерческий» проект. Данные нашего исследования показывают, что мануальные подсказки очень эффективны в обучении аутичных детей использованию планов действий на планшете. Все участники исследования научились использовать приложение Дружественный план (Przyjazny plan) при самостоятельном выполнении последовательности из пяти задач. В IWRD приложение Дружественный план (Przyjazny plan) в настоящее время используется для обучения учеников с аутизмом различным новым навыкам, включая вербальное и социальное поведение.

**К л ю ч е в ы е с л о в а:** аутизм, планы действий, приложения, вспомогательные технологии, мануальные подсказки, самостоятельность

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## **Uso de la aplicación Horario Amigable en una tableta para promover la independencia en niños con trastorno del espectro autista**

### **R e s u m e n**

La prevalencia del trastorno del espectro autista (TEA) ha aumentado en las últimas décadas. También está creciendo la necesidad de proporcionar prácticas basadas en evidencia en el campo de los TEA. El Instituto de Desarrollo Infantil (IWRD) en Polonia ofrece una intervención científica para niños con autismo, basada en el modelo desarrollado inicialmente por McClannahan y Krantz (1993) en el Instituto de Desarrollo Infantil de Princeton, Estados Unidos. Su investigación y experiencia clínica muestran que los horarios de actividades son muy efectivos para enseñar a las personas con autismo muchas habilidades nuevas. Sin embargo, los horarios de actividades en la versión impresa “tradicional” podrían llevar a la estigmatización cuando se utilizan en el entorno social. Es esencial brindar a las personas con trastorno del espectro autista herramientas socialmente aceptables que puedan ayudarlas a funcionar de manera más independiente. El intenso desarrollo de tecnologías modernas como también el fácil acceso a varios tipos de dispositivos móviles nos inspiró a utilizar tabletas en nuestro tratamiento. Horario Amigable es una aplicación para niños y jóvenes con autismo y trastornos relacionados, que se desarrolló como una iniciativa conjunta de la Universidad Tecnológica de Gdańsk y el Instituto de Desarrollo Infantil. La aplicación fue creada como un proyecto “sin fines de lucro”. Los datos de nuestra investigación muestran que las indicaciones manuales son muy eficaces para enseñar a los niños con autismo a seguir los horarios de actividades en una tableta. Todos nuestros participantes aprendieron a usar la aplicación Horario Amigable para completar cinco tareas de forma independiente. En el programa IWRD la aplicación Horario Amigable se utiliza para enseñar a los estudiantes con autismo una variedad de nuevas habilidades, incluidos comportamientos verbales y sociales.

**P a l a b r a s c l a v e:** autismo, horarios de actividades, aplicación, tecnología de asistencia, indicaciones manuales, independencia