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ORIGINAL PAPER

The use of the "Talk To Me" application in the therapy of speech development delays

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ABSTRACT

Introduction and aim. Computer techniques are increasingly used in speech therapy. The aim of the work is to present the results of the preliminary evaluation of the new "Talk To Me" application and its functionality in the treatment of speech development delays.

Material and methods. The study was conducted in 3 groups of children: the study group with the use of the "Talk To Me" application, the conventional therapy group and the control group - in the case of both groups with the intervention, additional reinforcements were used. All children included in the project showed delays in speech development. The recorded age of children in all analyzed groups ranged from 2 to 6 years. In order to verify language progress, the Scale of Language Skills Acquisition in the Field of Communication Competence was used.

Results. Acquisition of language skills varies depending on the group affiliation. The analysis of simple main effects for the time of measurement showed that in each group the differences between successive measurements turned out to be significant. In the study group, the increase in language skills differs from the other two groups ($p< 0.001$). However, there is no difference between the groups with conventional and control therapy ($p=1.00$).

Conclusion. Analysis of the research results allows us to conclude that the "Talk To Me" application is a tool that significantly affects the speed of therapy progress in the case of speech development delays concerning communicative competence.

Keywords. "Talk To Me" application, speech development delay, therapy

Introduction

Speech is an essential function enabling linguistic expression through which conceptualization, reasoning and understanding are possible.[1] One of the most frequent developmental problems that pre-school children face is delayed language acquisition.[2] Issues related to acquiring communicative competence at this age may result from a number of underlying causes, both environmental and biological. Environmental impact on acquiring communicative competence may commonly be connected with unintentional mistakes made by the caregivers, such as, fulfilling child's non-verbal requests or giving verbal explanation to what is expressed non-verbally by the child. Biological factors may be associated with autism, hearing impairment, intellectual disability or can be an effect of a combination of developmental delays, neurological dis-

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orders and genetic diseases. Unless there is a significant clinical factor involved in acquiring language the aforementioned problems are often attributed to developmental language disorder (DLD).[2] Any difficulties in the matter may significantly hinder child's social competence leading to frustration, relationships withdrawal and a variety of limitations in social functioning or even isolation. Additionally, it may have a negative impact on other areas such as academic achievements, mental health or quality of life.[3] The incidence of this developmental abnormality, depending on the source, may range from 5% to 16% for the age group 0-7 years. For half of these children, the difficulties are persistent.[4-7] For example, on a European scale, it is estimated that the problem of DLD affects about 5.8 million children.[8] Furthermore, language emergence in human growth plays crucial role in diagnosing delays in children with various impairments.[9]

In terms of language problems, prophylaxis is critical, because early diagnosis and intervention in many cases will prevent the occurrence of derivative problems, e.g., low level of school achievement or behavioral adjustment difficulties.[10]

Important factors accelerating the process of acquiring new skills by children, including language, are positive atmosphere and an appropriate level of motivation. Accordingly, in speech development delay therapy, one of the key factors leading to an optimal therapeutic result is the introduction of solutions that make exercising more attractive. Therefore, speech therapy solutions increasingly use modern technologies in the form of specially created games or programs. use modern technologies in the form of specially created games or programs.

Aim

Therefore, the purpose of this paper is to present the results of the preliminary evaluation of the new "Talk To Me" application and its functionality in the treatment of speech development delays.

Material and methods

The study was approved by the Bioethics Committee of the College of Medical Sciences of the University of Rzeszow No. 4/11/2020. It was conducted in 3 groups: the study group with the use of the "Talk To Me" application, the conventional therapy group and the control group - in the case of both groups with the intervention, additional reinforcements were used. All children included in the project showed delays in speech development. The recorded age of children in all analyzed groups ranged from 2 to 6 years. The size of each group was 15 participants. Approximately 64% of the children were boys and 36% were girls.

Therapy was conducted by a specialist in the presence of a parent. The whole therapeutic idea has been based on provoking the child to verbally realize speech sounds, syllables, in a strictly communicative situation. Therefore, before starting the therapy, an analysis of language capabilities was carried out – it was checked what syllables the child implements in spontaneous situations, which constituted the foundation for further proceedings. The application was complementary to therapeutic activities provoking the child to produce syllables – so that it would not be challenging for the child in order to avoid any kind of traumatization. The entire therapeutic process is to be regarded by the child as fun and pleasant, but above all it is to convince the child that by using speech (in this case syllables) and no other non-verbal/verbal behavior (moaning, grunting), the desired goal – the continuation of watching favorite cartoon etc. – can be achieved.

In the study, during therapy the child answered the therapist's questions, such as: „Do you want more?", „Do you want to continue watching the cartoon?" What was expected was a positive, verbal response, at this stage with any syllable (ta/da/na being most desirable). On creating the conditions facilitating verbal reaction to the specialist's commands, the child began sessions, during which the application was used. Similarly, the application automatically stopped displaying whatever the child was watching at the time eliciting functional syllables. Ultimately, the goal was to shorten the verbal reaction time to a minimum and to automate the ability to use speech for communication.

The duration of the study was 12 weeks. The examined functions were measured three times: 1 - before the start of therapy, 2 - after 6 weeks and 3 - after 12 weeks. The therapeutic tool in the main study group was the newly created application for speech therapy („Talk To Me"), an easy-to-use program aimed primarily at being used in therapy of speech delays and at accelerating the acquisition of communication and language competences. The therapy consists of controlling the application through voice commands in order to start and continue watching a selected film from various websites. At the research stage, it was a command in the form of functional syllable or syllables. The application aims to provoke the child to verbalize and convincing them at the same time that verbalization has a significant causative meaning (Fig. 1-3).

Therapy in "the conventional therapy group" consisted of conventional treatment based mainly on repetition and naming. Children imitated animal sounds, and attempted to name the presented pictures with nouns, answering the question: where is it? what is it? Material was adapted to the age and abilities of children. The control group consisted of children who, for various reasons, were not subject to therapy in the study period, despite the diagnosed delay in speech development.

In both cases, therapy sessions lasted 30 minutes once a week.

In order to verify language progress, the Scale of Language Skills Acquisition in the Field of Communica-

tion Competence (LSAFCC) was used. It is a quick and simple tool for verifying language skills used for communication, and assessing a given competence on a scale of 0–1 or 0–2. Whereas, depending on the competence, 0 means a correct presentation of a given language competence, 1 – a correct result or an intermediate grade between a correct and incorrect result, 2 – a incorrect result for the selected competences. Assessment issues concern the way of communicating needs, helping the child with verbalization or stimulating verbalization, the way of nodding/denying (verbally, non-verbally), spontaneously uttering syllables and repeating them.

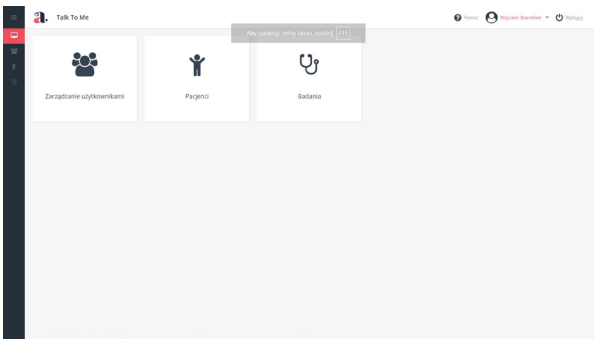

Fig. 1. The main menu of the application presenting buttons corresponding to individual functionalities: user management, patients, examinations

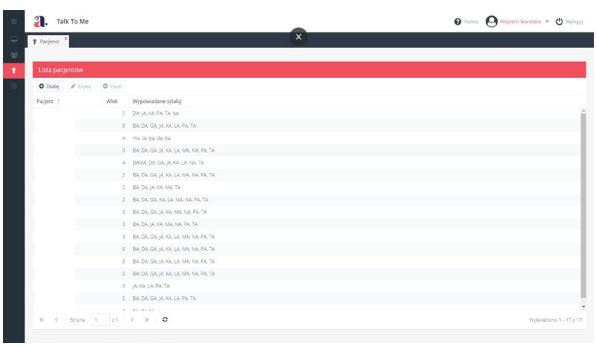

Fig. 2. Submenu of the application that allows to select the syllables to practice

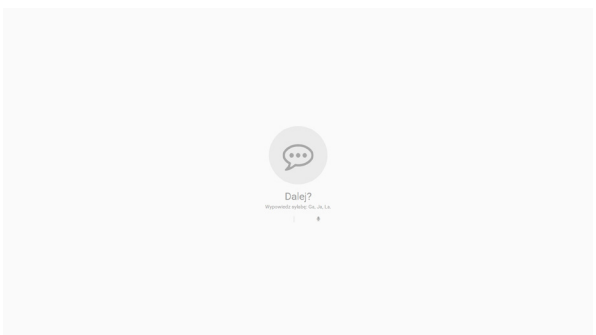

Fig. 3. The application window for the moment when syllables should be spoken in order to continue displaying the footage

The statistical analysis of the collected data was performed with the SPSS Statistics 23.0 (IBM, Armonk, NY, USA). In order to test the hypothesis regarding the impact of the type of therapy applied on the acquisition of language skills, a two-factor analysis of variance was performed in a mixed 3x3 scheme, where the intra-subject variable is the time of measurement (in weeks 1, 6 and 12), and the between-subject factor – group affiliation (group with the application conventional therapy group or control group).

Due to the fact that the assumption about the sphericity of the variables was not met, the Greenhouse-Geisser epsilon correction was used to calculate the significance level of the F test. A statistical significance level of $p<0.05$ was assumed. The "Talk To Me" application was created as part of a project implemented by BD Center sp. z o.o. entitled: "R&D works leading to the development of an innovative method of early diagnosis and speech therapy of children using a mobile application stimulating speech development", No. RPPK.01.02.00-18-0033/19-00, co-financed by the European Regional Development Fund under Priority Axis 1 "Competitive and innovative economy" of the Regional Operational Program of the Podkarpackie Voivodeship 2014-2020.

Results

The results of the analysis indicate a statistically significant main effect of the time of measurement/therapy ($F(2.84)=293.10$, $p<0.001$; $\eta^2 = 0.87$), the main effect of group membership ($F(2.42)=56, 24$, $p<0.001$; $\eta^2=0.72$) and the interaction effect ($F(4.84)=134.79$, $p<0.001$; $\eta^2=0.63$).

Post-hoc analysis for the main effect of the measurement time showed that, regardless of group affiliation, the Language Skills Scale score decreases over time (Fig. 4) – significant differences occur both between week 1 and 6, as well as between week 6 and 12 ($p<0.001$).

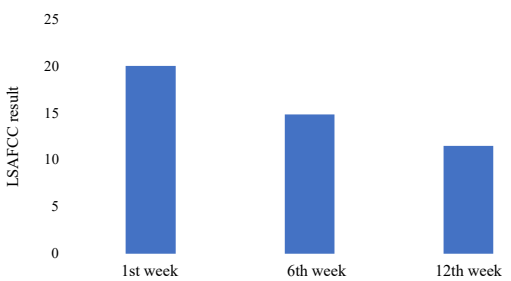

Fig. 4. The average level of language skills depending on the measurement time (weeks) in 1st, 6th and 12th

In the case of the main effect of belonging to a group, the post-hoc analysis showed that the average score of the Language Skills Scale in the group with the application is significantly lower than in the case of both other

groups (p<0.001) (Fig. 5). However, there is no significant difference between the conventional therapy group and the control group (p=1.00).

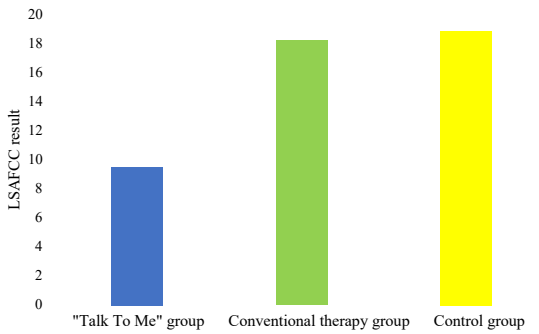

Fig. 5. Average level of language skills depending on group affiliation: blue – „Talk To Me group", green – conventional therapy group, yellow – control group

The statistically significant interaction effect means that the acquisition of language skills varies according to group affiliation. The analysis of simple main effects for the time of measurement showed that in each of the groups the differences between successive measurements turned out to be significant - the score on the Language Skills Acquisition Scale at week 6 is significantly lower than the score at week 1, and the score after 12 weeks is significantly lower than at week 6 in both the application and conventional therapy groups and the control group. This means that over time, even without therapy, language skills improve. The results of these analyzes are presented in Table 1 and Fig. 6. In the application group, however, the increase in language skills differs from the other two groups (p<0.001). However, there is no difference between the conventional and control treatment groups (p=1.00).

Table 1. Differences in the acquisition of language skills at 1, 6 and 12 weeks in the group with the application, in the conventional therapy and in the control group[a]

					F	η^2	
Group	n	1 week *M (SD)*	6 weeks *M (SD)*	12 weeks *M (SD)*			
Study group	15	17.47 (4.50)	7.60 (3.83)	3.47 (4.55)	194.33***	0.93	T1>T2>T3
Conventional therapy group	15	21.80 (1.47)	17.93 (2.76)	14.93 (2.66)	48.25***	0.77	T1>T2>T3
Control group	15	21.13 (1.88)	19.27 (1.71)	16.27 (2.46)	98.05***	0.87	T1>T2>T3

[a] F based on the Greenhouse-Geisser test; *p<0.05; **p<0.01; ***p<0.001

Discussion

It is natural to acquire passive language skills in the process of development through auditory stimulation, observation of articulation and repetition. The acquisition of the ability to transmit a language is inevitably connected with its purposeful use, the intention of using it in a communicative situation. Communication difficulties can be the cause of frustration, subsequent difficult behaviors, social isolation or changes in social relationships. Undoubtedly, this affects the reduction of the quality of life and the lack of optimal achievements in many spheres of functioning.[8] Usually, abnormalities in this area are detected early and thus early, most often in the age range of 2-3 years, children are referred for speech therapy. At the same time, the results of research in this area indicate that this problem affects boys more often (approximately 70% of cases) than girls.[5,11] A similar percentage was represented by boys in our study - 64%.

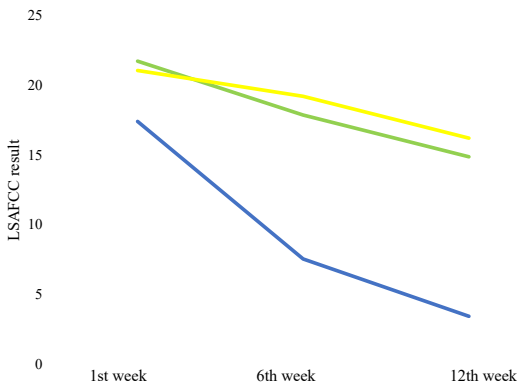

Fig. 6. Acquisition of language skills depending on belonging to a group in 1st, 6th and 12th: blue – „Talk To Me group", green – conventional therapy group, yellow – control group

The results of the research indicate that generally a positive measurable effect of speech therapy is achieved, which of course varies depending on many factors related to the disorder, attributable to the patient or external factors.[12] Therapeutic treatment of children with speech development delay is very diverse, because there are no universal guidelines for its unification. There are also no obvious reasons for undertaking a given therapeutic path, hence the decision depends on the therapist and the availability of services in this area.[12]

Therapeutic treatment can be carried out at home, in an educational unit, or in a specialist center. Differences can be observed in the intensity of therapy, its duration, availability of methods, forms and therapeutic agents, individual needs of the child, as well as regulations in the field of functioning of speech and language therapy services. The form of direct proceedings may also vary. It can be individual or group, depending on the age and needs of the child, as well as the facilities available. On the other hand, indirect interventions are based on the reorganization of the functioning environment in such a way that it facilitates and encourages communication development. Such a

naturalistic approach is progressively being used to maximally support/stimulate the child to communicate with its environment, while boost positive child/adult and child/parent (caregiver) interactions. The indirect approach is increasingly used. The therapist plays a crucial role in training those who work and care for children, providing them with programs and advice on creating an environment that stimulates the child's speech development.[12]

In speech therapy, new technological solutions are increasingly used, e.g., in the form of games aimed at children with speech and communication problems. For instance, what is often used to motivate the child to appropriate articulation are schemes introducing point systems or simply a possibility to advance to the next game level.[13] In the case of the analyzed application, the motivation factor is the willingness to continue the video material that children select independently according to their own preferences from a publicly available website (e.g., YouTube). The assumption of the therapy is to activate the film/cartoon by the child saying a pre-programmed functional syllable or syllables.

It is emphasized that therapy based on fun and modern electronic interactive solutions is imperative for the regularity of the therapeutic process and better prognosis. It is also a meaningful factor in involving parents in therapy and raising their awareness of its importance.[14-17]

Preliminary research on the effectiveness of the application showed differences in the process of acquiring language skills depending on group affiliation. The result was obtained both in the time interval of 1-6 weeks and after 12 weeks of the intervention – the relationship concerned all analyzed groups. In the study group, the increase in language skills was significantly different from the results obtained for the conventional therapy group and the control group, thus confirming the potency of the new tool in the therapeutic process ($p<0.001$). Similar results in terms of the effectiveness of speech therapy were obtained by Matej et al. conducting research on tablet game-supported speech therapy in environments with children. What's more, the authors emphasize the fact of increasing motivation and time spent on exercises thanks to the use of modern technological solutions.[18] Another team of researchers verified the effectiveness of SS4Kids – online music-based speech and language learning game as part of early intervention. This tool was also shown to be effective in supporting targeted word formation over the two-week intervention period. Likewise, researchers verified the effectiveness of the tool depending on the circumstances of its use. The results showed that the group conditions did not improve the effectiveness, speaking in favor of therapy in a clinical or home setting.[19]

Moreover, Saeedi et al. reviewing the literature in this field, based on 69 publications, confirmed the fact that the use of games in speech therapy was an important motivating factor and they can successfully be a component of the therapeutic process. However, the authors emphasize the fact that the initial process of creating a tool is very important, which should take into account the purposefulness of its operation as well as obstacles and challenges.[20]

To sum up, the conducted research showed the high effectiveness of the newly developed speech therapy tool in relation to the conventional method. A significantly higher effect was recorded in the form of activating the communicative competence of children from the study group. Increasingly, the literature on the subject emphasizes the importance of using modern technologies, including gamification, applications and online services as important components of speech therapy in children, which bring a positive therapeutic effect. Therefore, also in the case of the pronated therapeutic tool as well as other available solutions, due to their proven effectiveness, continuation of research is seen in order to optimize their operation, which is a factor that significantly encourages children to engage in therapy.[21]

It is true that the "Talk To Me" application still requires further work to improve its operation, making the graphic design more attractive and expanding its functionality. Nonetheless, as a therapeutic tool it is in line with the modern trend (the use of modern technological solutions, therapy in any environment in which the child functions, the involvement of people working/caring for the child in the therapeutic process and the possibility of constant observation of therapeutic progress) and already at the test level it has given promising therapeutic results.

Conclusion

The analysis of the research results allows us to conclude that the "Talk To Me" application is a tool significantly affecting the speed of therapy progress in the case of speech development delays. Further specific studies are needed to test the effectiveness and added functionalities of the application in subgroups of patients suffering from disorders presenting itself, among others, with speech development delay.

Declarations

Funding

The "Talk To Me" application was created as part of a project implemented by BD Center sp. z o.o. entitled: "R&D works leading to the development of an innovative method of early diagnosis and speech therapy of children using a mobile application stimulating speech development", No. RPPK.01.02.00-18-0033/19-00, co-financed by the European Regional Development Fund under Priority Axis 1 "Competitive and innovative economy" of the Regional Operational Program of the Podkarpackie Voivodeship 2014-2020. The presented research was also funded by project No. RPPK.01.02.00-18-0033/19-00.

Author contributions

Conceptualization, W.A.W.; Methodology, W.A.W., L.P. and J.P-B.; Software, A. G-M. and J.P-B.; Validation, L.P. and J.P-B.; Formal Analysis, A.G-M. and J.P-B.; Investigation, W.A.W. and J.P-B.; Resources, L.P. and J.P-B.; Data Curation, A.G-M.; Writing – Original Draft Preparation, W.A.W., J.P-B. and L.P.; Writing – Review & Editing, W.A.W., L.P. and J.P-B.; Visualization, A.G-M. and J.P-B.; Supervision, L.P.; Project Administration, L.P.; Funding Acquisition, L.P. and J.P-B.

Conflicts of interest

The authors declare no conflicts of interest in the research reported in this paper.

Data availability

The datasets analyzed during the current study are available from the corresponding author on reasonable request.

Ethics approval

The study was approved by the Bioethics Committee of the College of Medical Sciences of the University of Rzeszów No. 4/11/2020.

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