Commutation as a substitute phenomenon of the communicative competence of a hearing-impaired student with a complex defect structure

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Abstract. The article is devoted to a possible commutation resource as a phenomenon of substitute commutation in supporting education by the model of "mother hearing-impaired student with a complex defect structure, which includes autism spectrum disorder"; the commutation reserves are considered to understand family support technologies. On the one hand, the communication technologies manifesting the new digital communication era may be demanded by today's disabled young people as alternative tools for virtualization of modern life. On the other, the modern digital environment supports the concept of accessibility and equal opportunities for building individual education paths at the stages of both secondary and accessible professional education.

1. Introduction
The ethics of accepting human diversity changed in the 20th century under the influence of such great educators and philosophers as L.S. Vygotsky, V.P. Kashchenko, Carl Rogers, John Dewey, Jean Piaget. Global trends in understanding the uniqueness and inherent value of each human person were born in the context of global challenges in the theatre of world wars and pandemics of the 20th century. The fundamental positions of our understanding of the socialization of a hearing-impaired adolescent with a complex defect structure, which includes autism spectrum disorder, are pedagogical optimism and faith that allow revealing the true potential of each child by paying attention not to his difficulties and deficits but to his talents, success, and positive characteristics. The experience of supporting young men and ladies with developmental disorders shows that the modern realities of both special and inclusive education are not ready to support the socialization of such adolescents yet. At the same time, it seems that the future success of inclusive practice can largely change the usual cohort of special schools since the children with developmental disorders that are the most successful in learning will strive to receive education in general-purpose schools. And due to these circumstances, we hope that in the near future, a special boarding school will be able to direct its attention, as well as the accumulated scientific and methodological potential in the field of creating comfortable pedagogical conditions for students with a complex defect structure. At the same time, the experience of pedagogical support and family support allows us to consider a similar phenomenon in this article.

Modern special education perceives the individuality of the student in a very formalized way by completely focusing on the "deficits" of the adolescent rather than studying his resources: strengths and opportunities, considering him within the framework of the usual nosological group. If the child is deaf,
then there is only deprivation of hearing, if the child has MSDs, there are the problems of movement only, etc.

Full-fledged interpersonal communication in the process of socialization is the most important component of life success and the harmonious existence of each person in general. Thus, successful education is impossible without mastering communicative competencies because a person is not able to socialize and self-actualize without communication.

Every neurotypical child is capable of mastering speech by nature: first oral, then written speech. According to linguists, "this capability is realized through communication with the mother and other close relatives, and only then through involvement in communication with a gradually expanding circle of other people" [1]. In psychology, the concept of interaction is actively used nowadays, that is, some social interaction in the "person to person" dyad, when such joint actions take place as games, walks, watching comics. Let us single out the interactive approach as a constant and versatile social interaction between one or more subjects of a child and a child with forming signs of ASD. The peculiarities of the social life of autistic people allow taking advantage of any opportunity of social life, even the smallest one, which indirectly contributes to the formation of the prerequisites for an adequate identity. Meanwhile, there is a considerable number of children who need new searches for alternative interactions. Many of these children are bilinguals who master interpersonal communication having left their homes together with their parents, who come to work under a contract. These are children who are brought up in families who use their native language along with Russian. These are deaf children or hearing children from families with deaf parents who actively use sign language in communication.

2. Methodology
Understanding that generally accepted types of communication are available not for every person. If such children are not given the opportunity to learn how to use paralinguistic means, then they may be deprived not only of the opportunity to socialize but, what is much more terrible, their intelligence will not be able to develop properly because according to the concept of L.S. Vygotsky on the inner unity of thinking and speech, external and internal speech are interconnected. Therefore, according to the position of L.S. Vygotsky on the unity of the laws of normal and abnormal development of a child, it is necessary to provide such children with all sorts of options for substitutional communication in order to avoid brain stagnation, to launch the mechanism for the development of children's thinking along an "alternate route" in prolonged, even slower terms than in neurotypical children but according to the same laws of ontogenesis and the same stages.

Therefore, we have been requested to find a substitute type of communication suitable for a particular child. In this case, we proposed a commutation option to an adolescent with a complex defect structure. Let us explain how we understand the idea of commutation. From a technical point of view, commutation in a communication network is the process of connecting communication speakers through some transit nodes. In this case, the mother will be the "transit node" and storage. She provides, on the one hand, the "coverage area", i.e. continuous access provided at the first request of the "speaker", and on the other hand, the reserve – the "storage" of information until better times when the son can be "available", that is, he will develop his "coverage area" himself, by registering and taking its resource as an active user.

The context of our ideas is similar to the theory of the famous linguist J. Bruner, who emphasized that a child's communicative inclusion occurs only with the support of an adult. At the core of his concept, Bruner outlined the "format" of interaction in the familiar "mother-child" dyad, designating it with the well-known abbreviation LASS (Language acquisition support system). [2]

In this case, the accumulation of the communication resource in the dyad will take place in the tandem of the apparent phenomenon of commutation: virtualization, which we consider as a set of computing resources or their logical combination abstracted from the hardware implementation that, at the same time, provides logical isolation of computing processes performed on one physical resource from each other. Then virtualization can be considered as a phenomenon of launching several operating systems: while each of the samples of such guest operating systems works with its own set of logical resources
(processor, RAM, storage devices), the provision of the resources from the shared pool available at the hardware level is managed by the host operating system – a hypervisor (“mother support”). Data transmission networks, storage networks, platform, and application software can also be virtualized, that is, for a hearing-impaired adolescent with a complex defect structure, this is a possible resource for storing, processing, and broadcasting both academic and social information.

According to our data, many deaf children with a learning disability can be attributed to the cohort of children with a complex defect structure – primary mental retardation of cerebro-asthenic genesis, partial visual impairment, immaturity of the emotional-volitional sphere, etc. [3]

The research of Meadow K., 1984, describes deaf adolescents with a learning disability during the school period, who have certain psychological characteristics manifested in low efficiency and attention deficit. [4] These children progress much more slowly in their speech development than other deaf children. It is important for them to offer replacement types of communication as a transitional “flexible” form. Our vision allows us saying that a child with hearing-impairment and mental retardation does not fully master sign language: he learns only a small set of gestures used in everyday communication.

The novelty of our approach with commutation is that we offer a child with a complex defect structure not special-made cards with images or pictograms, as in AAC but photo and video materials presented on the Internet, and using the technology of the “mother's school” as an "attachment therapy", during the period of jointly divided activity becomes the “hands” of an autistic child or when the mother finds the “transit node” solely upon request when the young "speaker" needs it himself (or he searches these pictures and videos on his own in the Web). Can this be considered as a full-fledged sign system that can replace oral speech? Rather no than yes, but this option can be taken as a kind of temporary "bridge", which in the long term can lead an adolescent with systemic scleroderma to the realization of the use of oral speech as communication. This is possible if you combine the image data and videos that are urgently needed by the child-inventor with the gradual introduction of real units of oral and written speech.

3. Commutation technology in a specific case
Let us consider the commutation technology using the example of a hearing-impaired student with a complex defect structure. Ilya T. born in 2005 is the second hearing-impaired child in the family of hearing parents. He was born on time as a result of a planned cesarean section. The child was provided with hearing aid when he was 2 years old. At about the same time, it was revealed that the consequences of perinatal CNS injury of mixed genesis lead to deprivation in both auditory and visual function. The later was in the form of moderate myopia complicated by astigmatism. The adolescent has now passed an intellectual test with an ICD grade: “R 06.68 - organic emotionally labile (asthenic) disorder due to mixed diseases in a child with bilateral sensorineural deafness.” A similar diagnosis was interpreted by G. P. Bertyn as “harmonious psychophysical infancy with typical neurological and somatic symptoms” [5].

Our constant cooperation with Ilya's family and organized case follow-up began in 2016. At his mother's request, we tried to eliminate Ilya's lack of school progress by analyzing the components of his personal development. It was possible to reveal his preferences in creativity, especially in engineering design, in versatile high sports achievements in chess and swimming (participation in different competitions for the honor of the school and individual championships). Ilya is a friendly boy by nature. He is very neat and stylish in appearance. He found several friends in the school. The adolescent has practically learned how to compensate for hearing loss with eye contact. In communication, he is characterized by selective mutism. In our situation, in Ilya's family, the adolescent successfully contacts only with his mother, but he practically does not strive to communicate with his father and elder brother. According to him, we recorded the following: “There are few words and a lot of pictures in my head.” These days, Ilya is studying in the 8th grade of special general education boarding school no. 52 for hearing-impaired children in Moscow. After school, the adolescent attends a railway modeling class. He has a small circle of friends, let's single out his classmate Artyom in this circle. In communicating with him, Ilya uses WhatsApp iconography and/or video chat with a small set of gestures. But Ilya is of no
big concern. He either does not realize that he is not understood, or he does not care whether he will be understood, but it is important to express himself at this moment. Mother is the center of the adolescent's home planet. In all situations in life, he simply believes that the mother will always understand everything that he wants to tell. Perhaps this also happens because Ilya simply cannot express what he wants to. On the one hand, the observed communication disorders in Ilya T. concerned all the main functions and forms of oral and written speech, which is typical for adolescents with hearing impairments. On the other hand, he practically did not have a need for self-expression close to an adolescent whose personal development occurs in terms of the type of person with ASD. Mother notes that the son lip-reads a little, he gets tired almost immediately. Like receptive speech, his expressive speech is very poor and undeveloped. Analysis of Ilya's vocabulary shows that its volume is small: both passive and active. Most of his words are distinguished by a kind of excessive diffuse multiplicity. Ilya practically does not use word formation, but he calls all one-root words with the same word (for him, the word "race" acts as all the same-root words like "racing", "racer", "racing car"). The written speech of an adolescent largely reflects the shortcomings of oral speech.

When modeling the relationship in the "mother-adolescent" dyad, we formulated the task of finding a substitute type of communication suitable for a particular child. In the process of long observation of the adolescent, the mother noticed that he was happy to join in communication using the phone. Therefore, we proposed a commutation option to an adolescent with a complex defect structure. It must be said that in our case, an adolescent with hearing impairment does not fully master sign language: he learns only a small set of gestures used in everyday communication. The child does not use abstract and generalizing concepts. Today, thanks to modern technology, special children have many new opportunities for various types of substitute communication. Even if a person does not manage oral and written communication, he can send his friends and acquaintances emoticons, emojis, or, for example, animated pictures, challengers, and videos.

It is also very important that the child needs communication since special children do not always have this need. In our opinion, sometimes, an adolescent with developmental disabilities is closed in his own world. In fact, he feels comfortable there: he does not have a special need for close interaction with others. These may be both signs of autism spectrum disorder (ASD), and it may simply be a feature of the child's temperament and personality. Do not forget that there are no two identical children (just as there are no two identical mothers and two identical teachers); it is always necessary to take into account the adolescent's right to his identity, his uniqueness, and proceed from that, not try to fit him into some standard template.

Immaturity of the emotional-volitional sphere, increased fatigability and exhaustion of the nervous system, respectively, significantly reduce his susceptibility to new material. In addition, the identification of words in students with hearing impairments is difficult and requires significant efforts of specially organized correctional and pedagogical work of the teacher and is not easy for the young men and ladies themselves, for a hearing-impaired student with ASD, this task is unbearable.

All these diverse difficulties are arising in the process of perception and reproduction of oral speech. Sometimes it forces the child to abandon verbal communication completely. To prevent this from happening, it is necessary to allow him to mature, to overcome all the obstacles associated with the complex structure of his defect. In this case, commutation technology is quite suitable as a transitional form as a particularly careful and flexible approach to all the features of a particular adolescent's development. Thus, the activity in the "mother-adolescent" or "hypervisor-speaker" dyad allowed forming the adolescent's tendency to a step-by-step inclusion in propaedeutic substitutional communication-commutation. [6]

4. Implementation of commutation when watching videos
How does an adolescent with such difficulties in perceiving speech information gain knowledge, how does he receive and process the material necessary for his development? The feeling of constant connection and full contact with the mother – the accumulator of information, the hypervisor, plays a...
massive role in this. Undoubtedly, full contact with the mother is significant and necessary for any child, but for someone like Ilya it is really of primary importance.

In our case, the method of confidential family communication seems to be successful – "joint activity with a significant adult that is interesting to him" [7], for example, joint watching videos chosen independently by the son. For Ilya's mother, the most important thing is to try to become a part of his world picture, to understand how he comprehends information, how he accumulates and processes assimilated data.

5. Conclusion

Nowadays, a new era of digital communication, virtualization of modern life, has begun, which provides new opportunities not only for neurotypical people but also for people with non-standard development. In the process of virtualization, there is a search for a substitute, alternative types of information transfer that can be used as a transitional form: at a time when universal forms of communication, such as written and oral communication, are not available to an adolescent with a complex defect structure.

It is also essential that the child needs communication since special children do not always have this need. Sometimes a child is closed in his own world, and he feels comfortable there: he does not have a special need for close interaction with others. And these may not always be the signs of autism spectrum disorder (ASD); it may simply be a feature of the child's temperament and personality. Do not forget that there are no two identical children (just as there are no two identical mothers and two identical teachers); it is always necessary to take into account the individual characteristics of a particular child and proceed from that, not try to fit him into some standard template [8].

A child with a complex defect structure most often has immaturity of the emotional-volitional sphere, increased fatigability and exhaustion of the nervous system, and, respectively, his susceptibility to new material is significantly limited. In addition, the identification of words in a hearing-impaired student with systemic scleroderma is challenging and requires significant efforts, which further makes the adolescent exhausted.

All these diverse difficulties are arising in the process of perception and reproduction of oral speech. Sometimes it forces the child to abandon verbal communication completely. To prevent this from happening, it is necessary to allow him to mature, to overcome all the obstacles associated with the complex structure of his defect. In this case, commutation technology is quite suitable as a transitional form as a particularly careful and flexible approach to all the features of a particular adolescent's development. Based on the above, using contacts in the "mother-adolescent" "hypervisor-speaker" dyad, possible techniques have been discovered that allow the formation of communicative competencies step by step.

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References

[1] Frumkina R M and Braudo T Ye 2006 On sign systems that replace natural language Cultural-historical Psychology 3 28-37
[2] Bruner J 1983 Child's talk. Learning to use language (New York, US: W W Norton & Co)
[3] Bertyn G P and Solovyeva I L 1997 Model of a special educational institution for deaf children Defectology 6 14-8
[4] Meadow-Orlans K P 1990 Research on developmental aspects of deafness Education and developmental aspects of deafness eds Moores D F and Meadow-Orlans K P (Washington, DC, US: Gallaudet) pp 283–98
[5] Bertyn G P 1998 Clinical characteristics of deaf children with a complex defect Defectology 6 9-17
[6] Solovyeva I L and Alferova M A 2019 Forming communicative competence of a hearing-impaired student with a complex defect structure Proc. Int. Scientific and Practical Conf. “Communicative approach in the system of special and inclusive education of children with disabilities” (Moscow, Russia: Paradigma) pp 9-14

[7] Solovyeva I L and Alferova M A 2020 Virtualization as a factor of development of communicative competencies in a hearing-impaired student with special needs Advances in Social Science, Education and Humanities Research 437 865-70

[8] Solovyeva I L 1998 Recreation boarding school for deaf children with a complex defect structure – a model of a new type of special educational institution (Moscow, Russia)