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THE RELATION BETWEEN THE DEVELOPMENTAL LEVEL OF COMMUNICATION SKILLS AND THE DISPLAY OF CHALLENGING BEHAVIORS IN CHILDREN WITH ASD

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ABSTRACT. The present study was carried out over a period of four years and aimed at investigating the existing relation between the developmental stage of communication skills and the manifestation of challenging behavior with the purpose of conveying refusal in the case of three children with ASD. The participants were subjected to an intervention based on language and communication stimulation method addressed to children with autism spectrum disorder (LCSMA, Dascăl Crişan, 2012) and according to the results obtained, LCSMA proved its efficiency in the case of the 3 participants included in the study. They acquired functional communication skills to express refusal, acquisitions that facilitated a reduction in the frequency of exhibiting problem behaviors.

Key words: *autism, challenging behaviors, LCSMA, language developmental stage.*

INTRODUCTION

The problem behaviors or oppositional defiant behaviors involve various socially unacceptable, and harmful behaviors, both towards self and others and/or the environment, being associated with several negative consequences (Matson et al., 2011). Even though these behavioral patterns are not typical to individuals with autistic spectrum disorders (ASD), studies show that this population exhibits various forms of oppositional defiant behaviors in about 94,3% of cases (Matson, Wilkins & Macken, 2009). However, the types of behaviors displayed and the level of aggressiveness ranges on a continuum from most severe to most "tolerated" by the people around. In addition, Kozlowski & Matson (2012) noticed that these behaviors were more frequently displayed when autism was associated with mental retardation and less frequently displayed when autism was associated with pervasive developmental disorder not otherwise specified symptoms (PDD-NOS).

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Thus aggressiveness or self-harm, shouting, crying, tantrums, biting, property damage (Tiger et al., 2009) might be displayed by children with autism (generally by those who lack functional communication skills) as a way to draw attention, to escape from an unpleasant or overwhelming task, to escape a stressful situation, to object or receive something (food or object), to indicate the violation of routine or simply to manage social interactions (Wetherby, Schuler & Prizant, 1997).

Seen from a language developmental stage approach, these behaviors can range from expressions lacking intentionality or preintentional, to the ones bearing functionality and purposefully intended to influence the behaviors of others (Prizant & Wetherby, 1987). By making a thorough functional analysis of these behaviors, Ozonoff, Dawson & McPartland (2002) cited in Lovannone et al. (2003) identified five major functions of problem behaviors:

(1) To indicate confusion and need for assistance;
(2) To satisfy various needs or ti express various emotional states;
(3) To escape from a certain task;
(4) To indicate the need for predictability or violation of routine;
(5) To receive something or to demand social involvement;
(6) To receive or avoid several sensory inputs.

Garside & colab. (2000) emphasized the fact that in such situations the right way to begin an interpretation of these behaviors is to take into account that the child does not have any efficient techniques of managing the situation and special attention must be given to the context, environment and nevertheless the consequences in order to determine the real cause and function of the problem behaviors (Ozonoff, Dawson & Mcpartland, 2002). Within this explanatory approach, Almasoud (2011) offers a detailed analysis of the main triggers of problem behaviors and the way these situations can be successfully managed. Taking into consideration that many of the ASD persons are overly sensitive due to certain environmental stimuli, many research studies revealed that environmental factors may trigger the display of problem behaviors (Jackson, 2011), such as hitting or covering one's ear, destroying things, hurting someone or sensory exploration of objects (Kranowits, 1998). Moreover, the learning environment might have a negative impact over the way children with autism behave. Therefore, the arrangement of the classroom, of the furniture and other decorative or learning objects, the unpredictable changes in the school routine, the lack of clear commands and structure for solving different tasks, too low or too high parental or teacher expectancies or the poor structuring of the time and environment might be other factors that favor manifestation of the oppositional defiant behavior (Lavannone et al., 2003; Clements, 2005; Ashdown & Jones, 2008). However, the unacceptable social behaviors were predominantly observed to appear in the cases in which the children could not easily access efficient methods of

expressing their needs and the people around them gave a whole new meaning to the way they behaved (Ozonoff, Dawson & Mcpartland, 2002; Lavannone et al., 2002).

The noninvasive approaches concerning the management of problem behaviors are starting to be more and more accepted as a "good practices" example in the case of ASD individuals (Wetherby, Schuler & Prizant, 1997). Within this context it is essential to create a much friendlier environment through the elimination of barriers and factors that may favor the appearance of unacceptable social behaviors which should also have the same functions (Paley, Stirling & Wakefield, 2008). Thus many research studies confirmed that teaching a child to use functional communication means (verbal language, manual signs, communication through objects or images) reduces the problem behaviors (Durand, Berotti & Weiner, 1983).

The present study investigates the existing relation between the language developmental stage and the display of problem behaviors, as a way to express rejection, in the case of 3 children with autism that benefited from a form of therapy based on language and communication stimulation method addressed to children with autistic spectrum disorders (LCSMA, Dascăl Crișan, 2012).

DESCRIPTION OF THE METHOD

Launched in 2007 under the name of "The intervention technique for stimulating the communication in autism" (Dascăl Crisan, 2007), the method was subjected to various content changes, being currently known as LCSMA, respectively the Language and Communication Stimulation Method in Autism (Dascăl Crișan, 2012). The method can be defined as the result of a coherent combination of several intervention procedures and strategies dispersed across various research studies, complemented with new elements where gaps were found. Therefore the elaborated method is based on the Receptive Language Stimulation Method (Bricher & Bricher, 1972), PECS (Picture Exchange Communication System; Bondy & Frost, 1983), VIA (Visual Augmentative Communication, Siegel, 2003) and a series of ABA (Applied Behavioral Analysis) techniques. Moreover, the devised method incorporated strategies for stimulating the communication skills of preverbal children recommended by Schuler, Prizant & Wetherby (1997) or strategies for stimulating the communication skills of children in the more advanced stages of language acquisition developed by Prizant, Schuler, Wetherby & Rydell in 1997. Thus an attempt was made to elaborate a comprehensive approach can be applied for all ASD children, despite of their communication and language acquisition stage development, of their learning pace, their developmental stage or their current and future needs.

Holding a strong theoretical background regarding the domain of cognitive-behavioral therapies as well as the research on language and communication of ASD children, the method is addressed to those individuals who display a lack of interest towards speech significance or are unable to utilize speech in a functional manner. Based on the principle of gradually increasing the complexity of tasks and implicitly of communication behaviors, LCSMA is built upon three main progressive levels, each of them consisting of a series of behavioral sequences based on the Chaining technique (Table 1).

Table 1. Phases and steps of LCSMA (Dascăl Crișan, 2012)

Phases	**Description of the phases**
Phase 1: Acqusition of early intentional communication and receptive language behaviors	*1.1. Early intentional and anticipatory behaviors.* *1.2. Replacing the ideosyncratic (unconventional) communication and problem behaviors with conventional communication behaviors.* *1.3. Receptive language stimulation.* *1.4. Teaching verbal labels for common objects and practicing simple actions with those objects.* *1.5. Objects differentiation.* *1.6. Complex verbal instructions.*
Phase 2: Communication using 3-D objects	*2.1. Communication by the use of symbols of natural shape and size.* *2.2. Discrimination among symbols.* *2.3. Expanding the communication area.* *2.4. Transition from communication using natural size symbols to communication using miniature symbols.* *2.5. Associating the miniature object with the right picture.*
Phase 3: Communication using pictures	*3.1. Vocabulary expansion and formulating simple sentences.* *3.2. Formulating complex sentences.* *3.3. Initiation and maintaining simple conversations.* *3.4. Making spontaneous comments and descriptions.* *3.5. Acquisition of conversational skills and strategies.*

RESEARCH QUESTIONS

In which stage of language development do problem behaviors decrease significantly?

Variable no. 1 (V1): communication skills developmental stage language developmental stage (intentional, unconventional, conventional, communication through tangible and intangible symbols, the stage of language)

According to the manual that included the description of the Communication Matrix assessment instrument, Rowland (1996; 2005) defines the language developmental stages the following way:

➢ ***The intentional stage*** is the phase in which the child becomes aware of the fact that his behavior serves him to get a response from his partner, but even though he controls his own behavior, the communication intent is not yet clear to him. Under these conditions the familiar persons interpret his behaviors (body movements, facial expressions, vocalizations or gaze) and respond accordingly to his needs;

➢ ***The unconventional*** is the phase in which the child uses clearly and intentionally his pre-symbolic (this does not involve any symbol) an unconventional behaviors (which are not socially acceptable the older the child gets) with the clear purpose of sending a message to his partner (body movements, vocalizations, facial expressions and simple gestures);

➢ ***The conventional communication stage*** is the phase in which the child uses conventional pre-symbolic behaviors (tolerated socially and used together with vocal emissions) to consciously send a message and let his needs known and fulfilled (manual gestures, conventional gestures, vocal intonations);

➢ ***The stage of communication through tangible symbols*** is the phase in which the child uses various communication means that are very much alike with its referents. These include pictures, objects, iconic gestures, vocalizations and vocal intonations;

➢ ***The stage of communication through intangible symbols*** is the phase in which the child uses communication means that are defined by a low physical resemble to their referents (verbal language, manual signs, written words, Braille language and others);

➢ ***The language*** is the phase in which the child connects two or more symbols (tangible or intangible) according to a set of grammar rules.

Variable no. 2 (V2) problem behaviors (harmful or self-harmful behavior, such as biting, pinching, scratching, hitting using hands or legs, screaming, property damaging, flapping hands or fingers, swinging, running back and forth, placing their hands over their ears etc.

Q2. Is LCSMA efficient for reducing the problem behaviors used to convey rejection?

Independent Variable (IV): LCSMA

Dependent Variable (DV): problem behaviors

METHODOLOGY

Participants

The participants in the present study were 3 pre-school children diagnosed with autism spectrum disorder (2 boys with PDD-NOS and a girl with pervasive developmental disorder), aged between 3 years and 3 months and 3 years and 10 months, with a mean of 3 years and 6 months. The selection was made according to the following criteria, which are also present in the participation letter addressed to the children's legal custodians.

1. Preschoolers aged 3 to 6 years old;
2. Children diagnosed with ASD;
3. Nonverbal children or children who did acquired functional communication skills;
4. Availability for participating in the study for a period of 4 years.

Over the intervention period the children underwent a special school education program and their inclusion in the current research was made according to a consent form signed by their family or legal custodians and an implementation agreement signed by the institution.

Assessment instruments

In order to identify the way in which the two variables (the language developmental stage and the problem behaviors) correlate within the present research we used the Communication Matrix (Rowland, 1996; 2005). This is an assessment instrument designed to give an accurate picture of the way the child communicates on one hand, and to structure the necessary environment with the purpose of setting the appropriate objectives for the personalized interventions programs on the other hand.

The items are organized according to seven levels of communication skills and four communication functions (refusal, demand, social interaction, offering / sharing information). Moreover, the Communication Matrix integrates any type of communication behavior, including body movements, facial expressions, visual gaze, gestures or other AAC means. They are divided into nine categories, so that some of them are included in more categories whereas others are found in just one category.

Scoring. The instrument allows for both a qualitative and quantitative interpretation of results. From a quantitative point of view, the communication behaviors are converted into percentages on each category of skills, so that in the end we have a general score for each level. There is a maximum of 80 points granted, corresponding to the set of 80 communication skills assessed across the seven developmental stages (the 80 cells of the profile) for the complete individual developmental profile of each child. Thus, 0 points are granted for the

lack of a certain behavior, 1 point for emerging behaviors and 2 points for consolidated behaviors. In the case of communicative behaviors that correspond to refusal function, there are 3 skills assessed across the 7 developmental stages, which match the 7 cells of the profile. Therefore, the maximum score that can be obtained by the participants range between 0 and 14 points. Moreover, there are a series of behavioral displays assigned to each skill, according to the language developmental stage. These displays are calculated in percentages, so that in the end the percentage of challenging behaviors can be calculated from the total behaviors displayed by each participant.

Validity. Since no other communication skills assessments cover the range of behaviors that the Matrix does, it is not possible to make a meaningful comparison to other instruments: scores on instruments that emphasize speech and do not include alternatives to speech would not be expected to be similar to Matrix scores. (Rowland, 2012)

Construct Validity Study (2011).Ten national experts in the field of communication disorders in severe/multiple disabilities were identified and requested to complete a construct validity survey anonymously online. All agreed to participate. Primary professional employment categories of the respondents were: clinical service provider (4), university teacher (4), and researcher (2). Six had doctoral degrees and the remaining four had Master's degrees. Five were speech-language pathologists. Six respondents were very familiar with the Matrix and four were quite familiar with it. The survey contained the 24 questions from the Matrix. Participants were asked to rate the clarity and relevance of each of the 24 items/questions on a 3-point scale (0 = not at all clear/relevant; 1 = somewhat clear/relevant; 2 = relevant/clear; 3 = very relevant/clear). The mean relevance score across items was 2.8; the mean clarity score across items was 2.7. (Rowland, 2012)

Reliability. Since the Matrix is not a test, but a direct observational tool/behavioral inventory, it does not lend itself to traditional estimates of inter-rater reliability. Since the development of the parent version of the Matrix, data have been collected from both parents and educators of individuals participating in our projects. The Pearson's product-moment correlation between parent and professional scores on the Matrix for a sample of 19 children with a variety of severe and multiple disabilities was .926 ($p<.01$, 2-tailed), an extremely high rate of concordance between two independent assessments of the same individual.

Inter-rater reliability between professionals. Parker (2009) evaluated inter-observer reliability on Matrix scores based on viewing videotapes and written data on three children with vision impairment and developmental disabilities; she reports a mean of 90% agreement. A study of inter-rater reliability was conducted in 2011 reports an average 83% agreement on mastered skills between pairs of participants, based on their scores for each of the 80 cells of the Matrix profile. (Rowland, 2011)

Research design, the intervention procedure

The investigative procedure is based on a multiphase single subject experimental design (ABAB type), grounded on three longitudinal case studies carried out over a four year period. According to the methodology that this research approach involves, the present study has the following structure: The first phase consists in assessing the skills and competences of the participants in the current study with the purpose of collecting the information and data for establishing the baseline level. The instrument used within this phase was the Communication Matrix (Rowland, 1996). In order to gather conclusive data, we used both the observation of children during their free play and instructional activities and discussions with the school personnel (teachers, psychologists, and psychopedagogues). The main investigative methods employed within the first stage of the research consisted of tests, observation, interviews, analysis of medical records and semi structured interviews.

The second phase of the study consisted of the multiphase experiment. Within this stage the study involved the implementation of AAC intervention programs based on LCSMA and monitoring the obtained results through regular evaluations every year throughout the four years.

The intervention followed two directions, respectively within a structured environment (school class, specialized offices and home) and within a non-structured environment (street, community). The instructional sessions and the ones including the generalization of communicative behaviors were conducted by an interdisciplinary team that included a psychopedagogue, a speech therapist, a psychologist, a teacher and family members. In order to provide optimal conditions for the instructional procedure, each member of the team had a clear established role regarding his or her tasks and responsibilities. Moreover, of high importance was the collaborative and consensual relationship among the team members.

The third phase of the study consists of the final assessment aimed at determining the efficiency of the method used. It included analyzing the results obtained from the participants in the study over the four-year intervention, by comparing the baseline data with the ones indicated at the end of the study.

Data analysis and interpretation

Table 2 summarizes the results obtained by the 3 participants of the study during the 4 years of intervention. The results obtained indicate that during inferior stages of language development the children displayed a high frequency of challenging behaviors, which significantly reduced as soon as they acquired communication skills that correspond to more advanced stages. According to baseline data, one of the participants (P2) showed an improvement that corresponds to intentional communication stage, another one (P1) acquired

unconventional communication skills and P3 developed communication competences that are specific to conventional communication. Moreover, from the total displays expressing refusal, two of the participants (P2 and P3) show a high percentage of challenging behaviors (63%-90%).

Table 2. Results obtained by the three participants over the four-year study

Stage of assessment	Baseline		Assesment 1		Assesment 2		Assesment 3		Final assesment	
Variable participants	V1	V2	V1	V2	V1	V2	V1	V2	V1	V2
P1	7	41%	12	7%	14	5%	14	0%	14	0%
P2	4	63%	8	56%	11	18%	14	9%	14	2%
P3	6	90%	7	58%	9	22%	10	20%	10	12%

During the four years of intervention based on LCSMA, the evolution of the participants was different, both regarding the acquisition of communicative behaviors used with the purpose of expressing refusal and the frecquency with which problem behaviors appeared with this purpose. Thus ***the first participant (P1)*** diagnosed with DDD-NOS, showed a significant evolution regarding the acquisition of functional communication skills (Figure 1). Therefore, at the beginning of the study P1 showed a primary level regarding the acquisition of communication skills, yet at an emergent level, which was the reason why he obtained a score of 7 points for the refusal function. The qualitative analysis of the data showed that 41% of the entire behavioral repertoire used by the boy (body movements, facial expressions, vocal emissions, simple gestures) consisted of challenging behaviors (hand flapping, unusual legs movements, tantrums, pinching, throwing objects, destroying objects). According to LCSMA protocol, the functional analysis of each challenging behavior contributed to gaining new accurate information regarding the function / purpose of these conducts. According to the collected data, it was shown that the boy displayed these behaviors with the purpose of conveying certain messages that included: (1) refusal of an object, food, action, person; (2) refusal of getting involved into more exhausting or uniteresting tasks; and (3) discomfort felt when his routines were violated. Given this information, the aims of the intervention followed 2 directions: (i) teaching the child to adopt more socially acceptable and implicity more conventional behaviors which hold a similar function as the challenging behaviors do and (ii) the extinction of challenging behaviors. The alternatives to the communicative behaviors set out for the child were selected according to the developmental stage, potential and communicative needs of the child. Thus the intervention was focused both on the acquisition of verbal communication skills (emissions,

vocalizations) an the development of augmentative and alternative communication competences (simple gesture - denial through nodding, time-out signal for indicating the end of an action; communication using 2D and 3D tangible symbols).

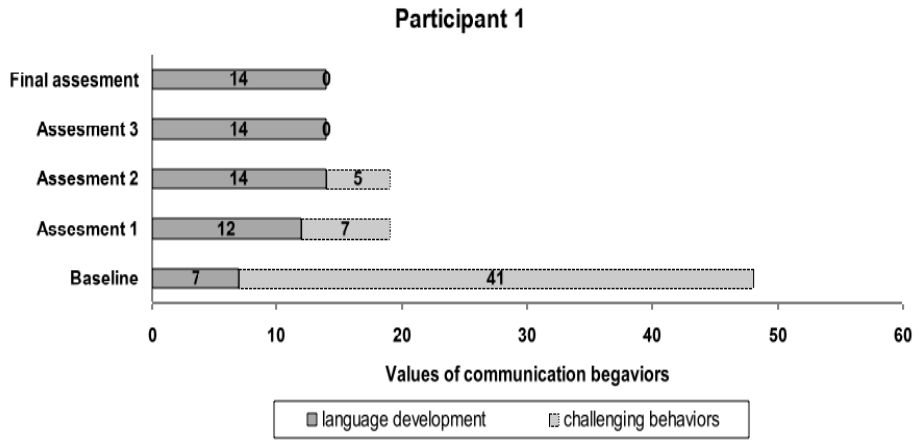

Figure 1. Progress of Participant 1 in acquiring communication skills compared to the display of problem behaviors

In accordance with the graphic representations of the data obtained (Figure 1) it can be noticed that after the first year of intervention P1 acquired a set of symbolic communicative behaviors (vocalizations, gestures, manual signs, communication through tangible symbols - communication cards) which facilitated a better interaction of the child with the people around him. The acquisition of these communication behaviors that were easy to decode by the social partner also facilitated the decrease of challenging behaviors displayed by the child during the first year of intervention. According to the obtained data, the rate of challenging behaviors display reduced from 41% to 7% out of the total behaviors used for communicative purposes. The conclusions of the behavioral analysis indicate that the boy resorts to tantrums only in the case he feels frustrated for not being able to make himself understood by the people around him by using the familiar communication means. Once he was taught to use various message correction or reinforcement strategies through AAC and simultaneously resort to more advanced communication skills (communication through chaining more symbols based on a grammar rule), the challenging behaviors were entirely eliminated, regardless of the context or the persons with whom he interacted. Therefore, starting with the second year of intervention, the child reached the most advanced language developmental stage (with a

score of 14 points), which determined a reduction of challenging behaviors to 5% regarding the messages that were meant to convey refusal and further their extinction, during the third year of intervention.

According to the obtained data, it was shown a significant reduction of challenging behaviors once the child reached the symbolic communication stage, which is more accessible to the social partners. In conclusion, in the case of the first participant in the study, LCSMA proved to be efficient, both for the acquisition of functional communication skills used with the purpose of conveying refusal and for the extinction of challenging behaviors displayed by the child for this purpose.

Similar results were obtained in the case of the second participant, who had also been diagnosed with PDD-NOS, although in this case the evolution of the child is much slower (Figure 2).

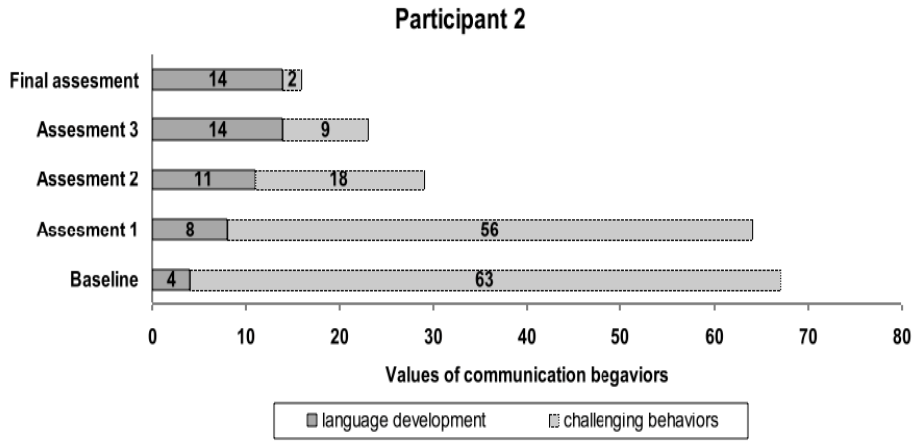

Figure 2. Progress of Participant 2 in acquiring communication skills compared to the display of problem behaviors

According to baseline results, the developmental stage of communication skills of P2 in the beginning of the study corresponded to intentional communication stage (with a score of 4 points), and 63% of the total behaviors displayed with the purpose of conveying refusal consisted of challenging behaviors (pinches, bites or hits the social partner, pushes, throws away things unwanted things, throws tantrums). According to the information provided by the respondents, the refusal of food or of an activity was expressed by the child by means of: crying, shouting or unusual body movements (turns his head in the opposite direction, rejects food, spits up or throws away the food). Even though during one year of intervention the child showed some progress, reaching the conventional

communication stage (communication through vocalizations, manual signs, simple gestures), which meant being granted 8 points on refusal function, 56% of the communicative behaviors displayed still proved to challenging behaviors, out of the total behaviors displayed. The functional analysis of these behaviors indicated that P2 resorted to this category of manifestations in the case he could not make himself understood by the social partner. Under these conditions, the aims of the intervention for the first year consisted of teaching the child to practice certain symbolic communication behaviors (verbal language reinforced by communication through tangible and abstract symbols). Moreover, the child was prompted for using some correction strategies in the cases in which his messages were not rightly decoded by the social partner and simultaneously use AAC means to reinforce the significance of his message. The benefits of this therapeutic approach are pointed out starting with the second year of intervention. Once the symbolic communication stage was reached (the child communicates using tangible symbols and vocalizations), the challenging behaviors reduced significantly from 56% in the previous level to 18%. Additionally, it was noticed that the challenging behaviors were gradually eliminated from the child's behavioral repertoire, as soon as he reached the most advanced stage of communication, which is the language stage. While after three years of intervention the display of challenging behaviors reduced to 9%, after four years of therapy their manifestation rate significantly decreased to 2%.

Therefore, based on the results obtained we can conclude that the display of challenging behaviors reduced significantly beginning with the symbolic communication stage. Moreover, the obtained data allows us to confirm the efficiency of LCSMA in the case of P2, both regarding the acquisition of communication skills with the purpose of conveying refusal and regarding the reduction of challenging behaviors.

While in the case of the participants diagnosed with PDD-NOS the results were promising, in the case of the third participant, who was diagnosed with pervasive developmental disorder, the data are somehow different, if we were to analyze them based on his evolution (Figure 3). However, keeping in mind the aim of the present research, the results obtained by P3 indicate a certain similarity. According to the graphical representation of results, it can be noticed that in the beginning of the study the girl was using communicative behaviors specific to unconventinal stage (with a total score of 6 points), although 90% of her behavioral repertoire consisted of challenging behaviors (tantrums, standing on the tips of her toes and spreading her arms, aggressiveness towards the partner, self-harm). Moreover, it was noted that she showed a slower evolution during the four years of intervention, which was also determined by her cognitive impairment. The significant reduction of challenging behaviors was seen starting with the second year of therapy, when P3 acquired and subsequently

consolidated her symbolic communication skills (second assessment – total score of 9 points; final assessment – total score of 10 points). Under these conditions, a significanr reduction of the challenging behaviors displayed was noticed, from 58% during the first year of intervention, to 22% during the second year of intervention and 12% after four years of intervention.

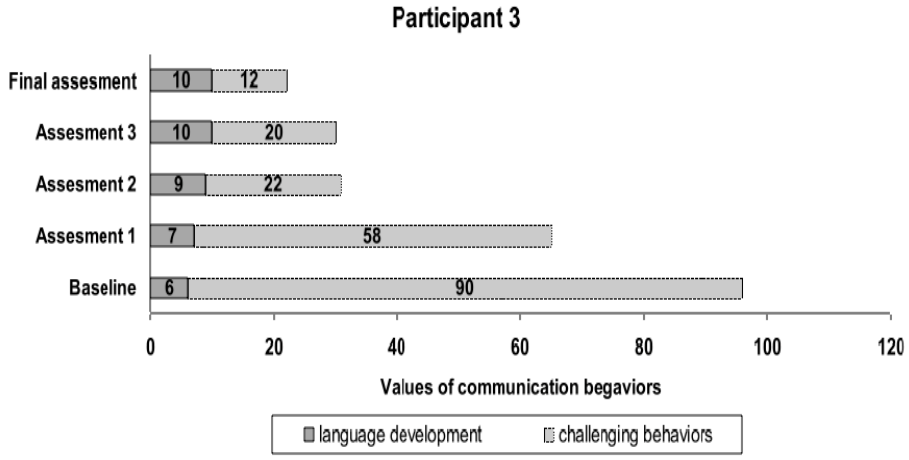

Figure 3. Progress of Participant 3 in acquiring communication skills compared to the display of problem behaviors

Therefore, based on the results obtained, LCSMA proved its efficiency in the case of the third participant, regarding the acquisition of communication skills with the purpose of conveying refusal, concomitant to a significant reduction of challenging behaviors used starting with reaching the stage of communication through tangible symbols.

CONCLUSIONS AND DISCUSSIONS

LCSMA proved its efficiency in the case of the three participants included in the present study through: (1) acquisition of functional communication skills to convey messages that involve refusal and (2) decrease in the frequency of displaying challenging behaviors (aggressive and self-harm behavior – hitting, biting, pinching, spitting; emission of certain articulate and inarticulate sounds etc.). According to the obtained results, at the end of the study carried out over a period of four years, all the 3 participants reached the symbolic communication stage although the acquisitions on the superior level are different (two of the

participants, P1 and P2 reached the language stage and P3 reached the stage of communication using tangible symbols). The cognitive impairment is also an important variable to take into consideration when designing the path that the child should take throughout the intervention. The more severe the impairment, the more limited the representation and symbolic capacities. This fact was noted in the case of the third participant, where the evolution in acquiring functional communication skills through AAC means was much slower, requiring a detailed sequencing of the targeted behaviors. Despite these conditions, it was noticed that once these communication behaviors were acquired and consolidated, the frequency of displaying challenging behaviors reduced significantly. Therefore, symbolic communication proved to be a essential stage for the development of functional communication skills. Moreover, the improvement of competences regarding the use of AAC which are based on augmented input and output methods or a combination of both, provided the children the opportunity to use representations and symbols to convey messages, through offering a tangible, concrete support. These new acquisitions acted like immediate reinforcements provided to the child by the social partner, since they satisfied the communication needs that the child expressed within the process of social interaction. The results of the present study showed that starting with the symbolic communication stage (through tangible and concrete symbols) and subsequently reaching the most advanced level, the language level, the frequency in using challenging behaviors is significantly reduced.

Moreover, the type of disorder included in ASD category plays an important role both regarding the evolution of communication skills and the frequency in displaying challenging behaviors. While the language development was faster and the rate of challenging behaviors was lower in the case of the participants diagnosed with PDD-NOS, once the children acquired functional communication skills, it was noticed that children diagnosed with pervasive developmental disorder showed rigidity and perseverance in displaying challenging behaviors, even though he had been taught and acquired the competences for using AAC means. In accordance to the obtained results, after the four years of intervention, the two participants diagnosed with PDD-NOS (P1 and P2) reached the highest stage of language development on refusal function, according to Communication Matrix, whereas P3, who was diagnosed with pervasive developmental disorder reached the symbolic communication stage through tangible communication means (2D and 3D tangible symbols). Additionally, in the case of the participants diagnosed with PDD-NOS, the rate of challenging behaviors decreased significantly from 63% to 2% in the case of P2 and from 41% to 0% in the case of P1. In the case of the participant diagnosed with pervasive developmental disorder, the frequency of displaying challenging behaviors reduced significantly from 90% to 12%, which indicates the existence of

this category of conducts within child's behavioral repertoire in case he wants to convey refusal. This fact also indicates both a poor transfer capacity of information from one context to another and a cognitive rigidity in using certain behaviors considered by the child as functional, regardless of the consequences (the fact that his communication needs are not satisfied).

The functional analysis of challenging behaviors, difficult or maladaptive displayed by the three participants indicated the fact that they are used with the purpose of conveying to others messages regarding: (1) refusal of an object, food person or situation; (2) refusal of getting involved in exhausting or uninteresting tasks; (3) discomfort felt when the routines are violated. Additionally these behaviors became more severe when the frustrations amplified due to the children's incapacity of making themselves understood by the social partners using the communication means at their disposal.

Once the function or meaning of the problem behaviors was identified, the intervention aimed at providing more functional means of communication, but also accesible and accepted by the persons involved (simple gestures, manual signs, communication through two- and three-dimensional tangible and intangible symbols). Thus once the functional communication competences were achieved through AAC and/or verbal language, the externalizing behaviors reduced significantly from the conventional communication stage on, a fact that could be seen at all participants level. The acquisitions specific to this stage facilitated the effectiveness of the communication process, a fact that led to the diminishing of the frustration and discomfort felt by the children as a result of not being able to express their needs properly towards the people around them.

Limitations of the current study

Choosing the case studies as a research method represents a first limitation of the present investigation. Consequently, the obtained results have no statistical value and therefore cannot be generalized. For this reason it is recommended a continuation of the present research in the way that it includes a more statistically significant sample. Moreover, the comparison of the obtained results with the ones collected from a control group would make the study more valuable.

Another intrinsic limitation consists of the maturation effect. Therefore throughout carrying out the experiment the participants were subjected to their biological and psychological developmental process. Under these conditions the differences showed after repeated testing may be attributed to some extent to maturation and not just to the experimental manipulation of the independent variable.

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