

Received: 23.01.2012
Accepted: 28.06.2012

A – Study Design
B – Data Collection
C – Statistical Analysis
D – Data Interpretation
E – Manuscript Preparation
F – Literature Search
G – Funds Collection

PROMOTING THE GENERALIZATION OF VERBAL BEHAVIORS IN AUTISTIC CHILD

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SUMMARY

Background:

One of the most important deficits characteristic of autistic children is little or no skill in generalizing learned concepts. Research conducted by specialists involved in Applied Behavior Analysis (ABA) has shown that the process of generalization does not take place spontaneously, but must be programmed by the person in charge of teaching.

Case study:

We are describing an autistic child administered for the educational and therapeutic programs were oriented towards all spheres in which deficits occurred. We used an AB model to analyse the results in each phase, where A was the baseline measurement, and B showed the changes in behavior that had taken place under the influence of our therapeutic intervention.

Conclusions:

It can be inferred from our data that only the properly planned method of teaching and checking for generalization of learned concepts makes it possible to elicit normal verbal behaviors from autistic children. Teaching should be programmed in such a way that the child undergoing therapy should be able, after completion of the teaching in specific training conditions, to handle new situations.

Key words: Applied Behavior Analysis, learning, generalization, reinforcement

INTRODUCTION

Children with autism either do not speak at all when therapy begins (in about 50% of cases) or use speech in a stereotyped manner. Even if they acquire certain verbal skills, they very seldom use speech in order to communicate, and the words they use often do not have the correct meaning. This happens because one of the most important deficits characterizing autistic children is the possession of little or no skill in generalizing learned concepts (Haring, Kennedy, Adams & Pitts-Conway, 1987). This means that autistic children can display considerable knowledge, in specific circumstances and in the presence of people they know, using material with which they have become familiar in the course of teaching; for example, they can answer many questions or describe objects in their immediate surroundings. After the sessions are over, however, autistic children seem not to understand the simplest directives and do not make use of the knowledge they have acquired in the course of teaching. These problems have prompted researchers involved in Applied Behavioral Analysis (ABA) to look for effective methods to promote generalization. The foundation for this research has been the analysis of the behavior of normally developing children, whose knowledge is not only the effect of direct teaching; rather, information about the world around them is acquired by forming classes of responses. In conducting therapy for children with autism, it is necessary to teach principles that will allow the proper verbal response to appear in various kinds of situations. It would take a lifetime to teach every single case, so children with autism, like their normally-developing peers, should create categories to which particular objects or events can be assigned.

Representatives from many therapeutic orientations have argued that the generalization of acquired skills is a process that should occur spontaneously and cannot be taught. Research conducted by specialists involved with ABA, however, has shown that the process of generalization does not take place spontaneously, but must be programmed by the person doing the teaching (Rincover & Koegel, 1975, Baer, Wolf & Risley, 1968).

A well-planned therapeutic program, apart from the choice of tasks adapted to the child's level of functioning and the selection of appropriate therapeutic techniques, should contain a description of training for generalization. We can speak of generalization when a behavior learned in a particular place by a given group of people using certain materials occurs in natural surroundings. A response has been generalized if it appears in conditions other than the training conditions, in the presence of different people, and persists after the teaching process has been completed.

Several types of generalization have been described in the literature: generalization of the stimulus, generalization of the response, and persistence over time:

- Generalization of the stimulus consists in transferring acquired skills from one environment to another, in which the teaching process had not previously taken place (Hamilton, 1966; Rincover & Koegel, 1975).

- Generalization of the response shows that the application of reinforcements and the appropriate teaching techniques makes it easier for children to create classes of responses (Baer & Guess, 1971; Fygetakis & Gray, 1970).

We speak of persistence over time when the behavior is observed after teaching has been concluded.

The properly planned training of generalization is one of the most important elements of an overall program aimed at the development of verbal behaviors.

Techniques used to promote generalization

Before introducing a particular task, the therapist should consider carefully what kind of changes in behavior are expected. This analysis should include:

- a description of the behavior to be taught;
- all situations in which the particular behavior should appear after the teaching process has been completed;
- all the behaviors of other persons that would enable the learned behavior to persist over time.

The next steps make it possible to plan the process of generalization (Baer, 1981):

- Step 1. A list of all desired changes of behavior;
- Step 2. A list of all situations, conditions, places, and persons in whose presence the desired behavior should occur;
- Step 3. A list of behaviors that should be exhibited by all persons who are engaged in therapy or who are affected by the learned behavior.

Numerous scientific publications have also described the basic principles facilitating the process of generalizing learned behaviors. Training conducted in accordance with the following rules leads to rapid and complete generalization of learned responses. There are six such rules:

1. *Search for natural reinforcements.* A response which is not reinforced will disappear after a certain time. The only behaviors that should be subjected to therapeutic interventions are those which, after the conclusion of teaching, will be reinforced by the environment in which they naturally occur. In other words, the new behavior should be functional, i.e. leading to reinforcements in the environment in which the given person functions on a daily basis.
2. *Teach a sufficient number of examples.* While planning the process of generalization, the target response should be taught in different situations and places. It is also essential to teach various forms of the target behavior. This principle is implemented by teaching a certain number of examples and verifying that this number is sufficient to produce generalization. The number of examples that should be taught depends on such factors as the type of behavior to be learned, the teaching procedures in use, the possibility of displaying the target behavior in different circumstances, the natural forms of reinforcement, and the history of reinforcing generalized behaviors.
3. *Identity the stimuli.* It is highly likely that the learned response will occur in the presence of a stimulus similar to the stimulus in the presence of which rein-

forcement has occurred. The more a certain stimulus resembles the training stimulus, the greater the probability that the target response will appear. Planning generalization in different conditions and situations entails the identification of stimuli that are important for a given environment and have an impact on the behavior being learned. If some sort of physical stimulus from the natural environment of the person can be included in the learning, the probability increases that the response will be generalized.

4. *Use various methods to train.* One of the ways of generalizing the target response is to introduce as many changes as possible during the learning process, and to acknowledge many forms of the same behavior as correct.
5. *Use the proper reward system.* Generalization of behavior is facilitated by introducing a varied scheme of reinforcement and the rule of delayed reward. A behavior that is reinforced every time it occurs is more resistant to extinction. A response that is maintained by sporadic reinforcements will continue to appear many times after the last reinforcement has been received. Baer (1981) described the principle of delayed reward, according to which a behavior will persist over time if the place in which reinforcement occurs is often changed, and the reward is not given immediately after task performance and in the place in which the target behavior occurred, but rather is administered after some time, in another situation.
6. *Teach the pupil to provide reinforcements independently.* The ability to self-reinforce creates the opportunity to generalize the target behavior in different conditions and in all its proper forms. In Baer's opinion, however (1961), the skill of self-reinforcement may not be sufficient to maintain a behavior, since this skill itself should be subjected to a generalization process.

All programs oriented towards developing areas in which deficiencies occur, including programs that involve passive or active speech, should contain a description of the generalization and the criteria for considering the task accomplished. Every exercise that has been mastered will not be forgotten if it will serve as a component of more and more complex tasks, or when it will be put to use by the pupil in daily life.

The purpose of our research was to find effective methods in Applied Behavior Analysis that could be used to promote the generalization of tasks learned by a five-year-old boy with autism during the training of speech. For the analysis of results in each of the three phases described below we used an AB research model (Bailey & Burch, 2002), in which "A" refers to the baseline measurements, while "B" shows the changes that have taken place under the influence of our therapeutic interventions. In both phases, A and B, the data were collected in two ways. In phase A, the data were collected:

1. at the place where the teaching took place, by the person conducting the daily therapeutic sessions, and using the material with which the teaching was done;
2. using material selected to check for generalization, which was later not shown to the pupil in the course of teaching, in a place other than the venue of daily therapy, with persons who were not conducting training sessions.

In phase B:

1. The material used for teaching was presented each time during the training of speech.
2. After the child had mastered a particular task (performance at the level of 90-100%), the level of generalization was checked, using the same material for generalization as during phase A, in a place other than the venue of daily therapy, by persons the child did not know.

If the generalization trials (2) were on the same level as the teaching trials (1), the task was regarded as having been mastered, and became a constituent element of a more difficult program.

While conducting the baseline measurements in phase A, the therapist did not prompt the child, or reward him, or provide any feedback, either in the conditions during which the training was to be conducted or in the conditions in which generalization was checked.

If an analysis of the data collected at baseline indicated that the pupil did not possess certain verbal skills, therapeutic intervention was commenced to teach the pupil this skill. Such necessity was indicated both by the data from teaching and from the attempts to check for generalization.

During therapy the child's progress was recorded. Data were collected once a week and entered into a graph showing the percent of correct responses. If the pupil obtained a score of 90% or higher in the teaching trials, further trials were conducted to check the level of generalization for this particular skill. The methods used to collect data on generalization to conclude each step were identical to those used to gather data at baseline. The data on generalization were entered on a graph twice: during baseline, before teaching was commenced (phase A) and again after its completion (phase B), in respect to all three phases of teaching described below. In the case of phase 3, an additional measurement of the level of generalization was performed once a week, along with the measurement of progress from the teaching.

Every three months (or sometimes more often) data was collected from Inter-Observer Agreement (IOA), that is, the comparability of data recorded by two independent observers. The IOA was from 90% to 99% for each measurement made.

CASE STUDY

Chris was born in November of 2006, and entered therapy at the Institute for Child Development in Gdansk in March of 2010, at the age of 3 years and 3 months. He comes from a broken family, and has a healthy brother two years older than he. The children are being raised by a single, unemployed mother.

When Chris was admitted to the Institute, he was found to have significant deficits in the social and communicative spheres, along with numerous incorrect behavior patterns. Based on the diagnostic criteria of DSM-IV-TR, the following deficits were found:

1. qualitative impairment in social interaction, as manifested by
 - 1.1. marked impairment in the use of multiple nonverbal behaviors such as eye-to-eye gaze (Chris did not look at persons to whom he spoke, or when they spoke to him) and facial expression (Chris did not respond with a smile when others smiled at him);
 - 1.2. failure to develop peer relationships appropriate to developmental level (Chris did not seem to notice other children playing in the room; he never initiated interactions with them and did not respond to any invitation to play addressed to him by other children);
 - 1.3. a lack of spontaneous seeking to share enjoyment, interests, or achievements with other people (Chris never showed or brought objects of interest to other people, nor did he invite them to join in his play);
 - 1.4. lack of social or emotional reciprocity (Chris did not notice the emotions of other people; he did not react when someone else cried or rejoiced in his presence);
2. qualitative impairments in communication as manifested by:
 - 2.1. lack of the development of spoken language (at admission to the program Chris did not speak; he did not communicate his needs or imitate sounds. He did not compensate for the lack of speech with other forms of communication);
 - 2.2. lack of varied, spontaneous make-believe play or social imitative play appropriate to developmental level (Chris typically played in the same, stereotyped way. Attempts by other persons to join in his play or to change the rules were met by crying and screaming. He did not observe or imitate other children or adults);
3. restricted repetitive and stereotyped patterns of behavior, interests, and activities, as manifested by at least one of the following:
 - 3.1. encompassing preoccupation with one or more stereotyped and restricted patterns of interest (Chris always played in the same way; he did not use toys in accordance with their intended purposes, but amused himself in an inappropriate manner, e.g. he touched his face with musical toys);
 - 3.2. apparently inflexible adherence to specific, nonfunctional routines or rituals (Chris had a very limited menu, and required the objects in the room to be arranged in exactly the same way);
 - 3.3. stereotyped and repetitive motor mannerisms (e.g., hand or finger flapping or twisting, or complex whole-body movements);
 - 3.4. persistent preoccupation with parts of objects.

In March of 2010, just before beginning therapy, Chris was tested with Schopler's Psycho-Educational Profile – Revised (PEP-R). His biological age at that point was 3 years and 3 months, while his developmental age was evaluated at 1 year and 1 month, and his development scale at 1 year and 7 months. During the examination he performed two tasks in the cognitive domain (sorting two different elements and looking for a hidden object), and no tasks involving active speech. One task in each sphere was evaluated as promising: naming digits in active speech and performing routine activities in cognitive activities.

Fig. 1 shows the results from the PEP-R conducted in March of 2010.

Individual therapy in the Institute for Child Development in Gdansk, Poland (Polish: Instytut Wspomagania Rozwoju Dziecka, IWRD) was commenced in March 2010. The educational and therapeutic programs were oriented towards all spheres in which deficits occurred. The therapy lasted 4.5 hours a day and was continued at home by Chris's mother.

Fig. 2 shows the number of educational programs in which Chris participated from March to July of 2010. In these first months of therapy he had 34 educational programs.

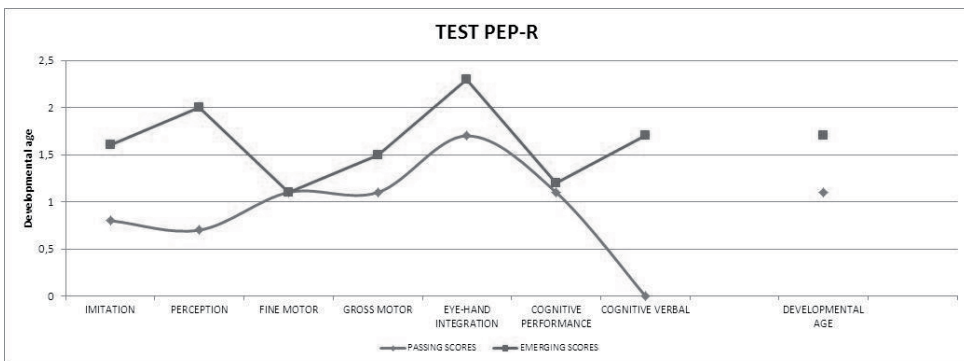


Fig. 1. Results from the subscales of Schopler's PEP-R test: imitation, perception, fine motor, gross motor, eye-hand integration, cognitive performance, cognitive verbal, developmental score and developmental age

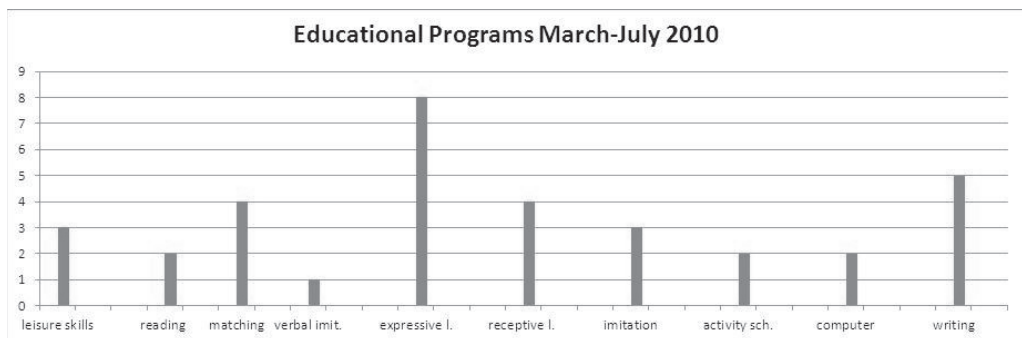


Fig. 2. The number of programs in the first months of learning oriented towards developing particular deficit areas: leisure skills, reading, matching, verbal imitation, expressive language, receptive language, imitation, activity schedules, computer, writing

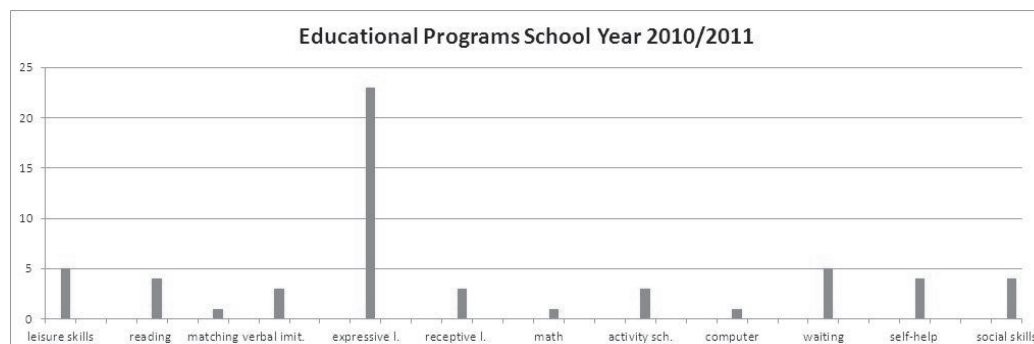


Fig. 3. The number of programs in the school year 2010-2011 oriented towards developing deficit areas: leisure skills, reading, matching, verbal imitation, expressive language, receptive language, math, activity schedules, computer, writing, self-help skills, social skills

Fig. 3 shows the number of programs in which Chris participated during the subsequent year of therapy, 2010/2011. The total number of programs rose to 60, and particular emphasis was placed on the development of active speech.

The goal of our research was to demonstrate the application of various teaching techniques to promote generalization and create classes of responses. The creation of these classes was examined on the basis of programs developing active speech. The methods of checking for generalization of a particular program have been described in three phases of therapeutic interventions, presented below.

Phase One: learning to name objects, actions, and persons, and to specify the functions of objects and categories

Goal – learning to name objects, actions, and persons, and to specify the functions of objects and categories.

Training material – five objects from each of the concepts being taught.

Generalization – checked at baseline and at the end of the teaching, using objects other than those used during teaching. For example, to teach the concept *teddy bear* (a one-syllable word in Polish, *miś*), teddy bears of different sizes were used, while during the process of checking for generalization of the concept, a teddy bear was presented that Chris had seen only once before, during the baseline examination. Generalization was checked by persons who had not taken part in the teaching, in places other than those where Chris had been taught. During the trials to check the level of generalization, the therapist did not prompt the subject or provide any rewards for the correct responses.

Teaching method – during therapeutic sessions the instructor presented the training material and asked, “What is this?”, or “What does it do?”, or “What is it for?” In order to teach this skill, the instructor used the Discrete Trials technique, which involves creating the appropriate training situation. Each session consisted of the following steps:

- presentation of the stimulus;
- the child’s response; if the response was correct, the child was rewarded according to an individualized motivation system (with a concrete reward: a treat, a toy, or a token);
- a brief pause between the consequence and the presentation of the next stimulus;
- if there was no response or incorrect performance of the exercise, the instructor provided verbal prompts.

The teaching was done by various people and in various places.

Phase Two – learning to describe objects and photographs

Goal – learning to describe objects and photographs, and maintaining over time the concepts learned in the first step.

Training material – the objects and pictures that were learned in the first step were used to learn description.

Generalization – checked with two sets of objects. The objects and pictures used during generalization 1 and generalization 2 were seen by the pupil only during the baseline examination. After the lessons on learning to describe had been completed, the therapist conducted generalization 1, which was checked on objects and pictures analogous to the training materials, but not identical to those used in the teaching sessions. For example, if a picture of a fish was used in teaching, a picture of another fish was used for generalization. Then the generalization 2 trials were conducted: the therapist showed the pupil another object belonging to one of the categories learned, but different from those used in teaching or in generalization 1. For example, if a picture of a fish was used for teaching, a picture of a dog was used for generalization 2. As in the case of generalization 1, generalization was checked by persons unknown to the child and in new places. During the trials to check the level of generalization, the therapist did not prompt the subject or provide any rewards for the correct responses.

Teaching method – in the course of describing objects the pupil named the object, specified its function, and indicated the category to which it belonged. As in step 1, the instructor used the Discrete Trials method. The teaching was done by different persons and in different places.

Despite the diversified way of teaching, Chris generalized only the description of objects to objects in the same category, i.e. generalization 1, but he could not describe newly presented objects or pictures within the learned categories, i.e. generalization 2. This means that he did not understand the principle according to which the objects belonging to a certain class should be described. This conclusion prompted the therapists to change both the method of teaching and the method of checking the level of generalization of the concepts.

Phase Three: learning the principle of describing objects and pictures

Goal – maintaining over time the skills learned in the previous steps, and teaching Chris to create classes of responses with the larger concepts – categories.

Training material – the skill of describing objects and pictures was developed within such categories as vessels, furniture, and fruits.

Generalization – as in step 2, checked on two sets of objects by different persons and in new places. As in the previous steps, during the trials to check the level of generalization the therapist provided no prompts. The trials for generalization 1 were conducted throughout the entire teaching process, in each training session, from the moment the task was commenced until it was finished, and the data were entered systematically into a graph. Generalization 2 was checked after the child had mastered the task and passed the trials from generation 1. For both generalization 1 and generalization 2, objects were used that belonged to the learned categories, but were other than the training materials; for example, if a teakettle was used for teaching, then a frying pan was used for generalization 1, and a pot for generalization 2.

Teaching method – The therapist taught Chris to describe objects according to the general rule of naming the object, its function, and the category to which it belonged. While describing pictures the child was asked to name the person in the picture and specifying what activities they were performing. As in the previous steps, the instructor used the Discrete Trials method. The teaching was done by different persons and in different places.

RESULTS

Phase One

In March of 2010 programs oriented towards the development of active speech were implemented.

Table 1 presents the sets of objects, the naming of which was taught using Discrete Trials Training (DTT), and a description of the sets for checking generalization.

Fig. 4 shows the tempo at which Chris acquired the skill of naming particular sets of objects and pictures. An analysis of the data shows that the teaching had been planned in the right way, since Chris generalized the skills he had learned during individual therapy. This is indicated by comparing the generalization data at baseline (BL), where the results were at a very low level (from 0% to 20%) and after teaching had been completed, where the results ranged from 80% to 100%.

Table 2 presents the sets of activities whose names were taught in individual therapeutic sessions using DTT.

Fig. 5 shows Chris's progress in learning to name the particular sets of activities. In the case of each step, generalization at baseline was at a very low level, while the trials checking generalization for each learned step reached a level from 90% to 100%

Table 1. The sets of objects whose names were to be learned using Discrete Trial Training and a description of the generalization sets.

Phase	Educational program	Teaching set	Generalization	Starting date	Completion date
1	Naming pictures/photographs, objects	Step 1. Naming objects: ball, table, shoe, teddy bear, fish	New persons and places: another ball, table, shoe, teddy bear, fish	March 2010	March 2011
		Step 2. Naming objects: camera, chair, book, sandwich, cap	New persons and places: another camera, chair, book, sandwich, cap		
		Step 3. Naming objects: dog, egg, ear, eye, apple	New persons and places: another dog, egg, ear, eye, apple		
		Step 4. Naming objects: plate, eraser, teakettle, fork, banana	New persons and places: another plate, eraser, teakettle, fork, banana		

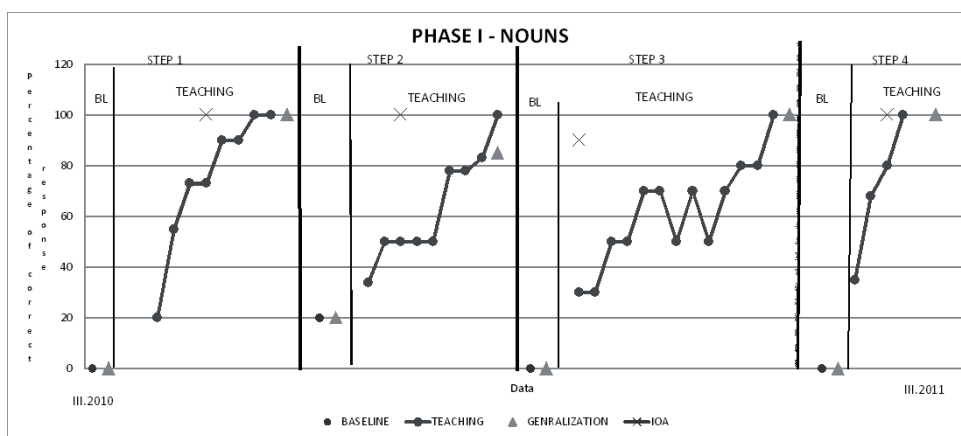


Fig. 4. Percentage of baseline responses and the change of behavior following the implementation of therapeutic procedures in Phase I. Four teaching steps: naming objects and pictures

Table 3 shows the steps taken to develop the skill of recognizing and naming people. The method of checking generalization is also presented.

Fig. 6 shows the learning curve for the skill of recognizing people. At baseline Chris did not recognize or name persons even from among those nearest to him. The generalization trials, using photographs other than those used during teaching, showed that Chris had learned to name people from his immediate environment.

Table 4 describes the steps involved in learning to recognize objects from a given category and the methods of checking for generalization of each learned set.

Fig. 7 presents the tempo with which Chris acquired the skill of specifying the category to which a given object belongs. The data on the graph show the desired changes in respect to the sets used to check the level of generalization.

Table 2. Sets of activities whose names were to be learned in individual therapeutic sessions using DTT

Phase	Educational program	Teaching set	Generalization	Starting date	Completion date
1	Naming actions	Step 1. Naming actions: eats, sleeps, reads, washes, draws	New persons and places, other pictures with actions: eats, sleeps, reads, washes, draws	April 2010	April 2011
		Step 2. Naming actions: builds, combs, dresses, arranges, watches	New persons and places, other pictures with actions: builds, combs, dresses, arranges, watches		
		Step 3. Naming actions: cooks, writes, cuts out, smears, dances	New persons and places, other pictures with actions: cooks, writes, cuts out, smears, dances		
		Step 4. Naming actions: draws a picture, cuts out with scissors, writes in a notebook, puts together a puzzle	New persons and places, other pictures with actions: draws a picture, cuts out with scissors, writes in a notebook, puts together a puzzle		

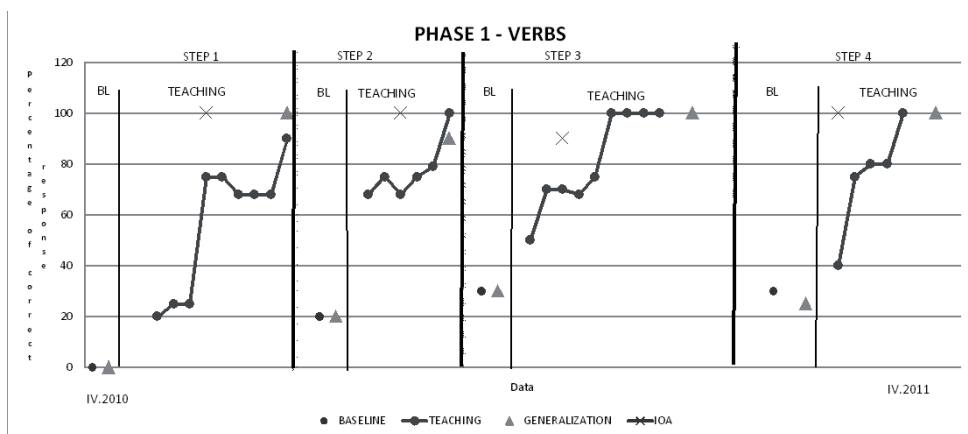


Fig. 5. Percentage of baseline responses and the change of behavior following the implementation of therapeutic procedures in Phase I. Four teaching steps: naming actions

Phase Two

The goal of Phase Two was to maintain the skills learned in Phase One. The concepts mastered in the previous step became part of the educational programs oriented towards developing the skills of describing objects and pictures.

Table 5 shows the sets of object, pictures, and scripts used while teaching the skill of describing objects and pictures, as well as the sets for generalization.

Table 3. Steps allowing Chris to develop the skills of recognizing and naming people, and the method of checking for generalization

Phase	Educational program	Teaching set	Generalization	Starting date	Completion date
1	Naming persons	Step 1. Naming persons: Mom, Dad, Igor, Grandma, Grandpa	New persons and places, other pictures of Mom, Dad, Igor, Grandma, Grandpa	October 2010	May 2011
		Step 2. Naming persons: Luke, Max, Matt, Simon, Peter	New persons and places, other pictures of Luke, Max, Matt, Simon, Peter		

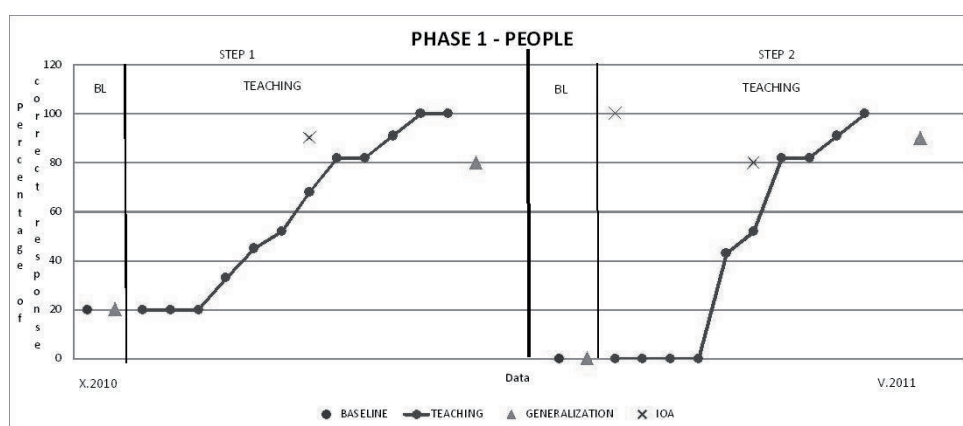


Fig. 6. Percentage of baseline responses and the change of behavior following the implementation of therapeutic procedures in Phase I. Two teaching steps: naming persons

Table 4. Steps involved in teaching the pupil to recognize objects from a given category, and means of checking generalization in each learned set

Phase	Educational program	Teaching set	Generalization	Starting date	Completion date
1	Specifying the category to which an object belongs	Step 1. Specifying objects within the categories of tableware, fruits, furniture, school supplies	New persons and places, other objects from the categories of tableware, fruits, furniture, school supplies	September 2010	May 2011
		Step 2. Specifying objects within the categories of vegetables, toys, clothing, beverages	New persons and places, other objects from the categories of vegetables, toys, clothing, beverages		

Fig. 8 shows Chris's progress in learning to describe objects and pictures. An analysis of the data indicates that Chris passed the set for generalization 1 presented after each step had been completed. It turned out, however, that when

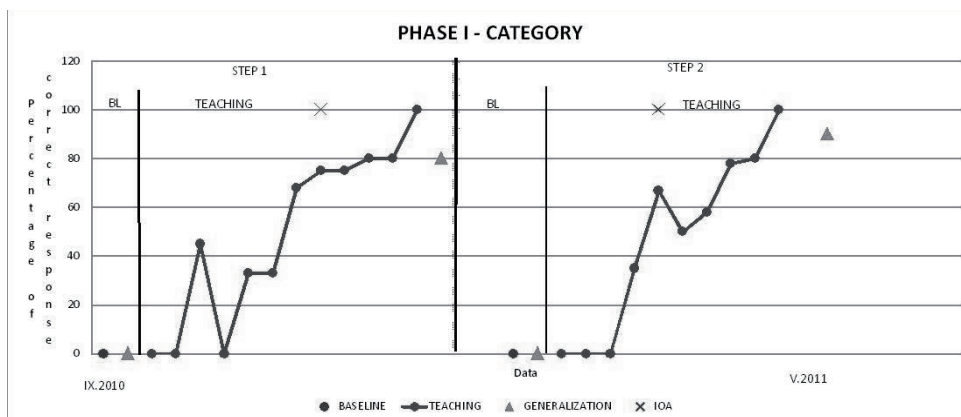


Fig. 7. Percentage of baseline responses and the change of behavior following the implementation of therapeutic procedures in Phase I. Two teaching steps: specifying the category to which an object belongs

Table 5. Sets of objects, pictures, and scripts used when teaching the skill of describing objects and pictures, and generalization sets

Phase	Educational program	Teaching set	Generalization 1	Generalization 2	Starting date	Completion date
2	Describing objects and pictures	Step 1. Describing 3 objects: "That's a shoe, I put it on my foot." "That's a fish, it swims in the water," and "That's a camera, it makes pictures."	New persons and places, another fish, shoe, camera	New persons and places, another object from the given category: cap, dog, telephone	Oct. 2010	Sept. 2011
		Step 2. Describing 3 objects: "This is a book, it has pictures, This is a table, and I'm sitting at the table," "This is a sandwich and I'm eating it."	New persons and places, another book, table, sandwich	New persons and places, another object from the given category: ball, bed, banana		

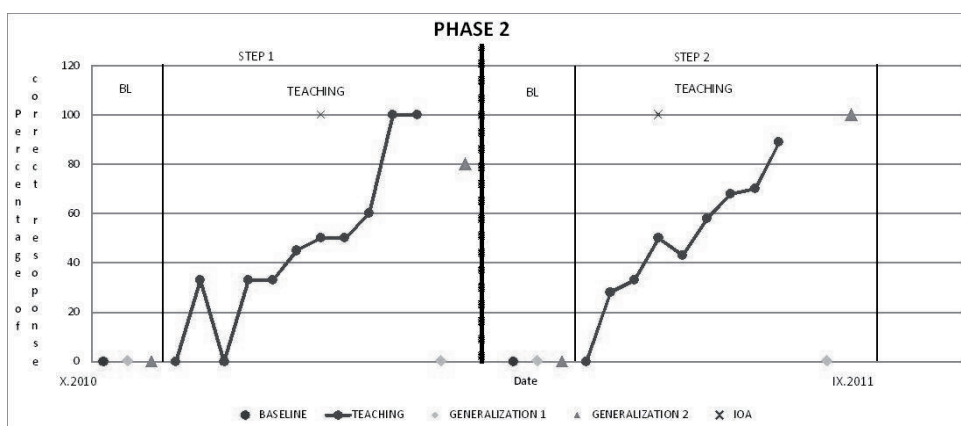


Fig. 8. Percentage of baseline responses and the change of behavior following the implementation of therapeutic procedures in Phase I. Two teaching steps: describing objects

generalization 2 was checked, Chris was unable to describe the present objects correctly.

Phase Three

Table 6 presents the sets used to teach the skill of describing objects from a given category and the sets of objects chosen to check generalization 1 and 2.

An analysis of the data provided on Fig. 9 indicates that in this learning phase generalization had been planned in the right way: Chris was able, after completing the training, to describe new objects correctly from the category learned during the training sessions.

Table 6. Sets used to teach the skill of describing objects from a given category, and sets of objects used to check generalization 1 and generalization 2

Phase	Educational program	Teaching set	Generalization 1	Generalization 2	Starting date	Completion date
3	Learning to describe objects	Learning the principle of description, which must contain the name of the object, its function, and the category to which it belongs. Learned utterances: "This is a teakettle. In the teakettle we boil water. A teakettle is a vessel." "This is a chair. A chair is for sitting. A chair is furniture." "This is an apple. I am eating the apple. An apple is a fruit."	New persons and places, other objects from the categories of vessel, furniture, food	New persons and places, objects from the categories of vessel, furniture, food other than those used in generalization 1	January 2011	April 2011

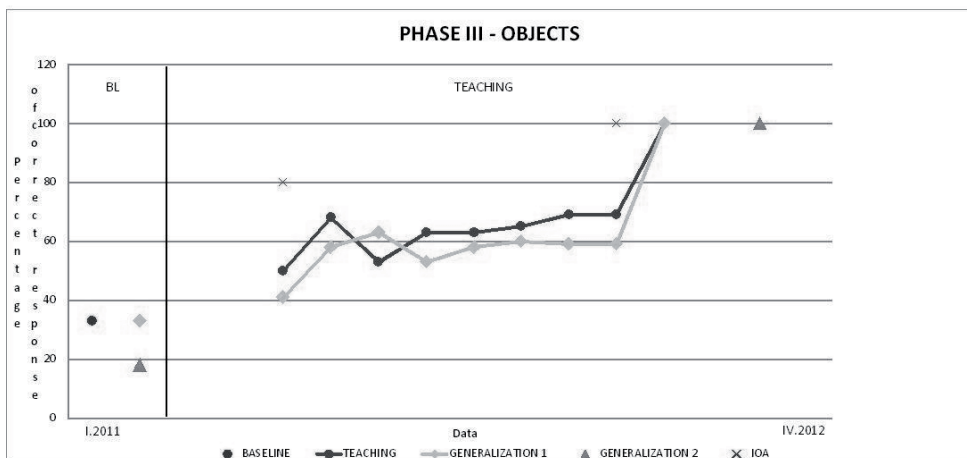


Fig. 9. Percentage of baseline responses and the change of behavior following the implementation of therapeutic procedures in Phase I. One teaching step: describing objects

Table 7. Description of the sets taught during individual therapy sessions, in order to develop the skill of describing pictures, and the sets from generalization 1 and generalization 2 used to check the degree of generalization of the learned concepts

Phase	Educational program	Criteria for passing	Generalization 1	Generalization 2	Starting date	Completion date
3	Learning to describe pictures	Learning to describe pictures: naming the persons in the picture and telling what they are doing. Learning utterances: "That's my friend Luke, he is drawing a picture." "That's my friend Matt, he's cutting with scissors." "That my friend Max, he's writing in his notebook."	New persons and places, other pictures showing other persons known to the child, performing other actions with which the child is familiar	New persons and places, other pictures showing persons known to the child, performing other actions with which the child is familiar, other than those used in generalization 1	January 2012	May 2012

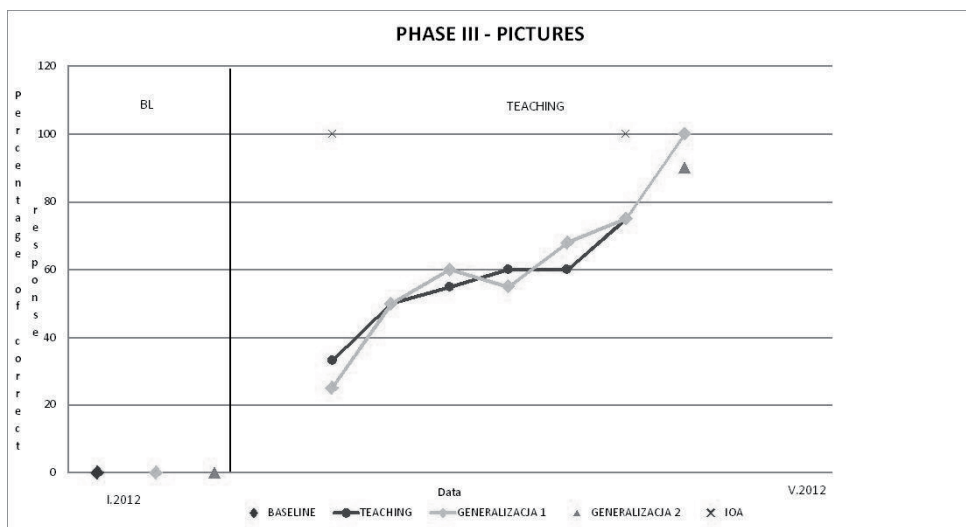


Fig. 10. Percentage of baseline responses and the change of behavior following the implementation of therapeutic procedures in Phase I. 1 teaching step: describing pictures

In each step, three objects were described. After each training session a fourth object was presented. During this presentation no verbal prompts were given.

Table 7 contains a description of the sets taught during individual therapy sessions, with the intention of developing the skill of describing the picture, along with the sets from generalization 1 and 2, used to determine whether or not the concepts learned had been generalized.

The data presented in Fig. 10 show that Chris had generalized the skill of describing pictures, and had understood the principle that allows the utterance to be correctly formulated when a new stimulus is seen.

In each step three pictures were described. After each session a fourth picture was presented, during which time nonverbal prompts were given.

DISCUSSION

An analysis of the data reported here shows that only a very carefully planned manner of teaching and checking for generalization of learned concepts makes it possible to teach proper verbal behaviors to autistic children (see also: Markiewicz and Pachalska 2007). During the teaching of the three phases described here, when specifying baseline (phase A) for each of the steps to be learned, data were gathered in two ways:

- from the training material, by persons participating in the teaching, in the child's classroom;
- from material used to check for generalization, by persons the child did not know, and in various places.

If the data from both measurements showed that Chris did not possess the verbal skills specified in the given program, teaching was commenced. The persons conducting the therapy gathered data once a week, using training material, and entered the data on a graph (phase B). After Chris had mastered a given program using the training material, the level of concept generalization was checked. For this purpose persons he did not know again presented the same set of objects for generalization as used when data was collected at baseline, and the data were entered into the graph. If the generalization data placed in the range from 80% to 100%, the teaching of the next step could be commenced.

An analysis of the data from Phase One of the teaching - naming objects, activities, persons, and categories - shows that the speech training had been conducted in the correct manner, since the results from the generalization trials conducted after the teaching were similar to those achieved during the teaching, and by the same token much higher than the data obtained at baseline. This means that the teaching of an appropriate number of examples, conducted by various persons and in various places, enabled generalization of the learned concepts and the appearance of normal verbal reactions in natural situations.

The data from Phase Two show that Chris, after completing each step of the speech program, had generalized the skill of describing objects analogous to those which had been used during the speech training, as shown by the data from generalization 1. He was unable, however, to describe other objects in the same category than those which had been presented to him during the teaching, as shown by the data from generalization 2. The teaching method conducted by several different therapists – using several examples of the same object and several objects within one category – was not sufficient for Chris to understand the general principle allowing him to identify new objects within a given category.

These conclusions prompted the therapists to change the methods used to teach and check for generalization of the concepts. Objects from generalization 1 were presented during each therapeutic session. During the generalization 1 trials, the therapist did not prompt, but only reinforced the proper verbal reactions (on the graph, the data are marked as a separate learning curve). If Chris did not learn to describe correctly the presented object from generalization 1, the therapist returned to the training material and conducted teaching sessions with prompts and reinforcements, after which the object from generalization 1 that Chris had previously been unable to describe was presented again. The task was continued until Chris could correctly describe both those objects which had been used in the teaching and those for which he had never received any prompting (generalization 1). If the data from generalization 1 were on a level from 80% to 100%, generalization 2 trials were performed. An analysis of the data from the generalization 1 and 2 trials indicates that the teaching in phase 3 was conducted correctly. Chris learned the principle according to which objects can be defined as belonging to a given category. After completion of the teaching he could properly describe new objects belonging to a previously learned group of objects.

In the research described here, the goal of teaching was to maintain over time the skills the child had acquired, and to teach him to create response classes – categories of concepts – that would enable him to respond correctly when confronted with new, unknown objects.

The results of our research show that it is necessary, in planning teaching, to take into account all the factors described in previous scientific research and to conduct systematic analysis of the data collected during therapy. Each autistic child should be treated individually. The therapeutic program should be oriented towards developing the areas where deficits occur, using known teaching techniques. Nevertheless, the success of the therapeutic interventions conducted is determined by well planned generalization. Autistic children will not be able to make use of the skills acquired during teaching if the therapist does not teach them how they should react in different places or situations, in the presence of new people or when confronted with new objects. Well-planned teaching should be continued until the data from the generalization trials are on the same level as the trials from the completed teaching (Markiewicz and Pachalska 2007; Pachalska et al 2012).

Our research shows that the degree of difficulty of the generalization trials should be increased as the child makes progress. The therapist should plan the teaching in such a way that the child undergoing therapy can deal with new situations after completion of teaching in specific training conditions. Bearing in mind the sentence written by Galen Alessi (1987), "One lifetime is not enough to teach every correct response," the therapeutic program should be established in such a way that the autistic child will be able over time to assign a given object, event, or person to a particular group and response class, and proceed according to the meaning they ascribe to the given phenomenon.

In conducting therapy for autistic children, it should be borne in mind that the principles we have described for promoting the generalization of learned concepts do not pertain only to speech, but to all developmental spheres (Pachalska and Łukaszewska 2012). In constructing therapeutic programs all areas where deficits occur should be included, and the situations, places, and events that cause the child the most difficulty should be analyzed. Based on this analysis, the therapist should program the teaching in such a way that after the completion of the given task, the child can manage different aspects of daily life independently, without external help. It should also be remembered that a therapeutic program should constitute a coherent whole, the tasks to be mastered within a given category should be a constituent element of more difficult programs from the given sphere, and at the same time should serve to help improve the child's functioning in other areas where deficits occur.

CONCLUSION

It can be inferred from our data that only the properly planned method of teaching and checking for generalization of learned concepts makes it possible to elicit normal verbal behaviors from autistic children. Teaching should be programmed in such a way that the child undergoing therapy should be able, after completion of the teaching in specific training conditions, to handle new situations.

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