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Use of scripts and script-fading procedures and activity schedules to develop spontaneous social interaction in a three-year-old girl with autism

Autism entails serious deficiencies in communication and social behaviors. Individuals with autism, even those who have received intensive language intervention, are often viewed as lacking spontaneous language. In addition, some children with autism lack the ability of spontaneously seeking to share enjoyment, interests, or achievements with other people (e.g., a lack of showing, bringing, or pointing out objects of interest to other people).

The aim of the study was to use ABA teaching techniques such as script and script fading procedure and activity schedule to teach three-year-old girl with autism sponta-

neous social interaction and shape joint attention skills. The result shows that ABA techniques were very effective in teaching many verbal skills such as answering questions, making requests, initiating conversation and asking question. Comparison made after implemented teaching procedure shows her initiating of joint attention skill (IJA) is at the appropriate level for her age.

KEY WORDS

autism; activity schedules; script and script fading procedure; joint attention; initiating interactions

ORGANIZATIONS — 1: Institute for Child Development, Gdansk, Poland · 2: Princeton Child Development Institute, Princeton, USA

AUTHORS' CONTRIBUTION — A: Study design · B: Data collection · C: Statistical analysis · D: Data interpretation · E: Manuscript preparation · F: Literature search · G: Funds collection

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TO CITE THIS ARTICLE — Budzińska, A., Lubomirska, A., Wójcik, M., Krantz, P.J. & McClannahan, L. (2014). Use of scripts and script-fading procedures and activity schedules to develop spontaneous social interaction in a three-year-old girl with autism. *Health Psychology Report*, 2(1), 67–71. DOI: 10.5114/hpr.2014.42791

BACKGROUND

Autism is characterized by qualitative impairments in social interaction and communication and restricted, repetitive, and stereotyped patterns of behavior (DSM-IV, American Psychiatric Association, 2000). Impairments in social interaction include marked deficits in the use of nonverbal behavior such as eye-to-eye gaze. There may also be a lack of social reciprocity of facial expressions, body posture, and gestures. In addition, some children with autism do not spontaneously seek to share enjoyment, interests, or achievements with others (that is, they display deficits in joint attention, such as showing, bringing, or pointing out objects of interest to others).

Deficits in joint attention are among the earliest signs of autism in young children (Charman, 2003). Such deficits are typically evident before one year of age (Jones & Carr, 2004) and have been associated with difficulties in subsequent language development (Mundy, Sigman & Kasari, 1990).

Many studies indicate that joint attention skills may be necessary for the emergence of communication and it is important to ensure that newly acquired joint attention repertoires are functional – they are used in different settings and with different partners, and are emitted in a variety of ways (Stokes & Baer, 1977). In order to develop these skills, teaching must be conducted across a variety of stimuli until participants have acquired generalized repertoires (Reeve, Reeve, Townsend & Poulsom, 2007). In addition, to increase the likelihood of response generalization, children with autism must be taught to initiate bids for joint attention in a variety of ways.

PARTICIPANTS AND PROCEDURE

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One participant, Jane, began therapy at the Institute for Child Development in Gdansk in September 2012, at the age of 2 years and 10 months. She was the only child in a two-parent family. She attended the Institute's intervention program for 4.5 hours per day, 5 days per week. Jane met the DSM-IV-TR (APA, 2000) criteria for autism and autism had been diagnosed by outside agencies. Based on DSM-IV-TR criteria, she had deficits in communication and social skills and displayed stereotypic behavior. At a biological age of 2 years 10 months, she was tested using Schopler's (1990) Psycho-Educational Profile-Revised (PEP-R). Her developmental age score was 1 year, 3 months. The most significant deficits were in the areas of imitation (3 months), receptive language (11 months), expressive language (5 months) and fine motor skills (11 months). Prior to intervention, adaptive behaviors were evaluated (Vineland Adaptive

Behavior Scale, Second Edition, Sparrow, Cicchetti, & Balla, 2005). Jane's Adaptive Behavior Composite score showed that general adaptive functioning was low; she scored higher than less than 1% of similarly aged individuals in the Vineland-II norm sample. Her standard score for the Communication Domain was significantly lower than the median score for all of the Vineland-II domains.

The setting was a preschool and research center for children with autism. Sessions were conducted in a typical classroom furnished with desks, chairs, and bookcases, and in a corridor that contained bookcases and toys, a gym with sports equipment and toys, a toilet and a dining room; generalization sessions were held in all of these settings, but with different teachers.

EXPERIMENTAL CONDITIONS AND MEASUREMENT PROCEDURES

Research design. The study used an A-B design (Bailey & Burch, 2002). Phase A was baseline and Phase B was intervention.

Measurement. In the course of therapy, Jane's progress was recorded. The data were collected once a week and graphed as percentage correct responses. Each teaching level was considered completed if Jane achieved at least 80% correct, based on teaching and generalization measures. Data collection procedures were identical in each teaching step. At least once every three months, interobserver agreement (IOA) data were collected to determine whether the data recorded by two independent observers were congruent. Percentage interobserver agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. Mean interobserver agreement on the occurrence of correct responses was 96%.

Independent variables. Use of scripts and script-fading procedures (McClannahan & Krantz, 2005) is a strategy that has been applied to increase spontaneous language among individuals with autism. These procedures teach children to use written scripts or audiotaped recordings that provide models of appropriate language. As the learners begin to use scripted language in their interactions, scripted phrases or sentences are systematically faded from end to beginning. Scripts are embedded in the children's daily activity schedules.

An activity schedule is a set of pictures or words that cues someone to engage in a sequence of activities, perform tasks, or enjoy rewards (McClannahan & Krantz, 1999). Jane's activity schedule book contained several pages, each of which displayed one picture that showed an activity. Manual prompts were used to teach her to follow the activity schedule and point to textual cues or listen to recorded scripts

included in her schedule. Manual prompts were defined as manual assistance to display the desired response.

Dependent variables. Initiations to adults and children were defined as understandable statements or questions that were unprompted by teachers, that were directed to another person by facing him or her, and that were separated from Jane's previous vocalizations by a change in topic or a change in recipient of interaction. If Jane initiated and then immediately repeated the same sentence or question, the repetition was not counted as an initiation. Scripted initiations were those that matched the written or recorded script, with the exception that conjunctions, articles, prepositions, or pronouns could be altered or deleted (e.g., substituting "and" for "or"), and verb tense could be changed. For example, "I play" was coded as a scripted initiation, although the script read "Let's play".

Unscripted initiations were verbal productions that differed from the script by more than conjunctions, articles, prepositions, pronouns, or changes in verb tense; the sentence "Look, I have a fireman's hat" was scored as unscripted because the noun "fireman's hat" did not occur in the script. A response was defined as any contextual utterance (word, phrase, or sentence) that was not prompted by the teacher (McClannahan & Krantz, 2005).

Baseline. Prior to teaching, baseline measures of target responses were obtained. During this time, teachers did not use prompts and did not reward Jane or provide feedback. Baseline measures were obtained by the instructor who would teach most frequently (2 hours and 15 minutes per day), using materials selected for the teaching process.

Teaching. We taught Jane to follow a daily activity schedule that included a series of social interactions. Every response sequence in her daily activity schedule was scored correct if all of the following components appeared: (1) taking a symbol of activity from the schedule; (2) approaching a teacher who stood in different parts of the room; (3) visually attending to the conversation partner; (4) giving a picture or symbol of an activity to the teacher, or saying a script; (5) waiting for the teacher's comment; (6) engaging in the activity with a teacher.

When verbal competence expanded, we taught Jane additional social interactions, using scripts and script-fading procedures. These included (1) making requests for objects, activities, or help in completing a task; (2) polite statements such as "Hello", "Thanks", and "Excuse me"; (3) initiating mutual activities, such as coloring, drawing, or molding from Play-Doh; or (4) initiating conversation with other persons; and (5) asking questions about unknown objects, pictures, activities, or persons.

If Jane did not follow the activity schedule, or did not use the scripts to which the teacher manually

guided her, then graduated guidance, delivered from behind, was used to help her complete the sequence of activities pictured in her activity schedule, in the order in which photographs were presented, and use the scripts, both recorded and written. Prompts were faded in frequency and intensity as rapidly as possible (Cooper, Heron & Heward, 1987).

Generalization. For each type of task, generalization data were collected with a person who did not take part in teaching, and nouns that were not used during teaching were presented. Generalization data were collected prior to and after teaching.

RESULTS

During baseline, Jane did not initiate interaction, nor did she display any spontaneous verbal interaction during any school day. When activity schedules and scripts and script-fading procedures were introduced, she learned to initiate bids for joint attention.

Making requests. As a result of teaching, Jane requested objects, activities, and help in completing tasks. During baseline she made no requests, but in 12 months she learned 27 requests. In Step 1, she learned two one-phoneme requests: "o" for "open" and "daj" for "give". In Steps 2 to 6, she learned 22 two-word requests (e.g., "pomóż mi" for "help me"; and "daj sok" for "give me juice"). In Step 7 she acquired 3 four-word requests (e.g., "Czy mogę się po-bawić?" for "May I play?", and "Czy możesz mi dać?" for "Can you give me?"). When generalization was assessed with another person who never participated in teaching, Jane achieved 80% to 100% correct.

Polite statements. Baseline was 0%. In 12 months, Jane learned 12 polite statements. In Steps 1 to 4 she learned 8 one-word statements (e.g., "Dzięki" for "Thanks" and "Przepraszam" for "Excuse me". In Step 5 she learned 4 two-word sentences (e.g., "Sto lat" for "Happy birthday"). Generalization was assessed with another person and she achieved 80% to 100% correct.

Initiating mutual activities. During baseline, Jane did not initiate any mutual activities. In 12 months, she learned 6 initiations. In Steps 1 to 4, she learned 4 single-word initiations (e.g., "Chodź" for "Come" and "Gramy" for "Let's play"). In Step 5, she learned 2 simple sentences (e.g., "Chodź ze mną" for "Come with me"). Generalization was assessed by independent observers, and she achieved 80% to 100% correct.

Initiation and continuation of conversation. Jane's baseline score was 0% correct. In 12 months she learned 37 conversation initiations. In Step 1 she used syllables. She learned 8 sounds (e.g., "hop" for "jumping", "a" for "car", and "pi" for "drink"). In Steps 2 to 4 she learned 24 single words (e.g., "bawię" for "I am playing", and "lala" for "doll"). In Step 5 she learned to continue conversation after teachers' comments – she said a simple sentence, "lubię..." for

"I like (activity)". In Step 6 she learned 4 two to four word sentences (e.g., "Pobaw się ze mną" for "Play with me"). When generalization was assessed with a person who did not participate in teaching, she scored 80% to 100% correct.

Asking questions about unknown objects. During baseline, Jane did not ask any questions. In Steps 1 to 4, she learned to ask "Co to?" for "What's this?" when she saw an unknown object, picture or situation. In Step 5 she learned to ask a longer question, "Co to jest?" for "What is this?" when encountering objects or events that were unknown to her. Generalization was assessed when she was working with a new teacher, and she achieved 80% to 100% correct responses.

We assessed Jane's functioning levels at the beginning of treatment and after 12 months, using the PEP-R Test (Schopler, 1990). Figure 1 shows PEP-R scores before intervention. At the beginning of treatment Jane's developmental age was much lower than her chronological age. Figure 2 shows PEP-R Test results after 12 months of intervention; Jane's develop-

mental age was the same as her chronological age – both developmental age and chronological age scores were 49 months.

After 15 months of therapy, we conducted an analysis of Jane's spontaneous verbal interaction with adults and other children, during 4.5 hours at the treatment center and kindergarten. Initiating interaction was assessed during independent play, and during organized tasks in small group sessions, individual instruction, tasks in regular kindergarten, mealtime, and transitions between rooms. Holding time constant, we compared Jane's initiations with the number of initiations made by a typically developing boy and a typically developing girl of the same age, who attended regular kindergarten. We selected these children because our observations suggested that they represented an average level of verbal and social competencies (see Table 1).

The data show that Jane initiated more interactions than two typically developing children of the same age; the differences were especially marked between Jane and a typically developing girl.

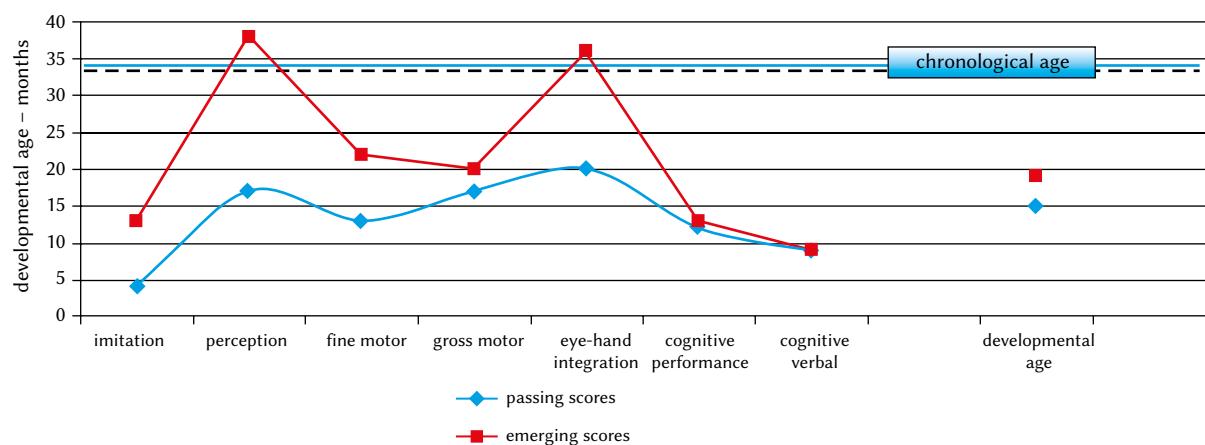


Figure 1. PEP-R scores before intervention.

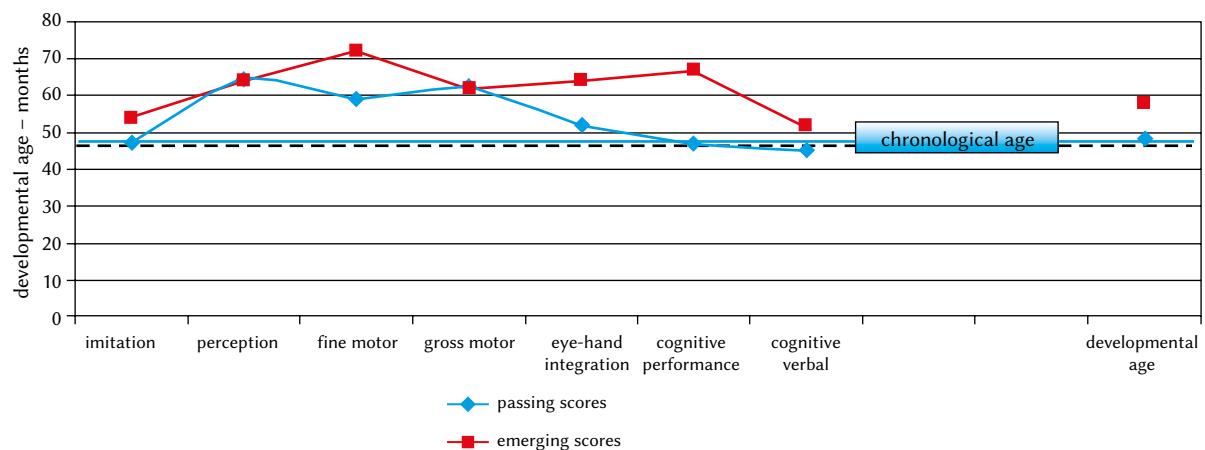


Figure 2. PEP-R scores after 12 months of intervention.

Table 1

Number of spontaneous social interactions displayed by Jane and by two typically developing 4-year-old

Number of spontaneous social interactions	Jane	Girl	Boy
Directed toward adults	80	5	44
Directed toward other children	120	78	97

DISCUSSION

At the beginning of intervention, Jane presented no appropriate verbal or social behavior, did not imitate sounds or name objects, did not follow others' gaze, and did not notice others' responses, or changes in her environment. Further, she did not initiate interaction with others, nor did she bring objects to others or point to objects of interest. In short, she had no joint attention skills, and she frequently engaged in stereotypy. The results of the PEP-R Test showed that her developmental age score was lower than her chronological age score.

Jane's intensive, daily therapy was based on applied behavior analysis (ABA), which focused on shaping verbal and social behavior. Skill deficits were primarily addressed using scripts and script-fading procedures and activity schedules. Teaching episodes were brief and concise. After twelve months of intervention, her developmental age scores increased and were comparable to her chronological age. She initiated social interaction with others about new or unfamiliar objects and events, about new people, and about topics of interest to her. Anecdotal observation indicated that her verbal repertoire includes previously taught conversation skills. Social validity measures showed that her spontaneous social interactions were comparable to those of two typical peers. Presently, the differences between Jane and typically developing children are that her interactions are limited to one or two sentences, although children her age typically continue interaction using three or four sentences. Our future research will focus on using scripts and script-fading procedures to build more and longer sentences used in conversation.

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