

Impact of an Instructional Manual on the Implementation of ABA Teaching Procedures by Parents of Children With Angelman Syndrome

Abstract

This study examined the impact of a training manual on the correct implementation of ABA teaching procedures by mothers of four children with Angelman syndrome, a neurogenetic disorder associated with severe cognitive, speech, and motor impairments. Parents were instructed to teach new functional skills to their children, prior to and after being given a copy of the manual. Data were collected on the following parent behaviours: setting up the teaching environment, promoting on-task behaviour, implementing discrete teaching trials, and prompting and reinforcing correct responses. Although the overall trend was for increased competency scores after exposure to the training manual, individual differences in parental response patterns were evident.

There is growing recognition of the importance of parental participation in intervention programs that are based on the principles of applied behaviour analysis (ABA) for children with autism and developmental disabilities (Johnston et al., 2007). Parents are a continuous and guiding force in the lives of their children and can play a pivotal role in their ongoing learning and development. Parental involvement, among other things, helps to ensure children's behavioural gains are generalized to the home and elsewhere and are maintained over time. One way to maximize the benefits of intervention is to train parents to implement ABA teaching procedures with their children. Many skills training programs combine an educational component (using written and verbal instructions) with opportunities for parents to try out and refine their newly acquired teaching skills through "hands on" learning experiences. Parents often report improvements in their quality

Authors

Jane Summers¹
and
Elise Hall²

¹McMaster Children's Hospital, Hamilton Health Sciences and McMaster University

²McMaster University

Correspondence

Jane Summers
jsummings@hhsc.ca

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of life and self-efficacy following their participation in skills training programs (Feldman & Warner, 2002).

The need for active parental involvement in intervention programs is particularly important in the case of children with severe intellectual disabilities since they develop skills at a slower rate than children with less severe intellectual disabilities and have more pervasive and persistent deficits (Barclay et al., 1996). Remedial efforts are most successful when they are carried out over extended periods of time, focus on the development of basic learning and functional skills, and are implemented across people and environments.

Angelman syndrome (AS) is a rare neurogenetic disorder that is caused by the lack of function of the maternal copy of the UBE-3A gene on chromosome 15 and is associated with severe intellectual disability, lack of speech development, motor dysfunction, happy demeanour and seizure disorder (Williams et al., 2006). Children with AS typically lack many skills that could help them function more independently, such as basic communication, imitation, play, and self-care skills (Summers & Pittman, 2004). For this reason, a pilot study was undertaken to evaluate the effectiveness of ABA-based intervention approaches for teaching functional skills to children with AS (Summers & Szatmari, 2007). A secondary aim of the ABA study was to increase parents' knowledge of instructional approaches so they could continue to teach skills to their children after the study had concluded. As a first step toward developing a parent training program, an instructional manual was created. The present investigation seeks to assess the impact of this instructional manual on the correct implementation of ABA teaching procedures by the parents of the children in the study.

Method

Participants and Setting

Four children with AS (three females and one male) and their mothers participated in the study. The mothers had all completed post secondary education, and two of them were employed outside the home. The children were between 4.6 and 9.6 years of age, and all lived at home with both their parents. They had all undergone genetic testing to establish a diagnosis of AS and exhibited classic features of the syndrome including lack of speech, motor impairments, attentional problems, and happy demeanour. Three children had a maternal deletion of 15q11-q13, and the fourth child had a mutation of the maternal UBE-3A gene. The deletion positive children all had a seizure disorder that was being treated with anti-convulsant medications, while the child with the gene mutation did not. Three of the four children were integrated into classes with typically developing children and received individualized support from an Educational Assistant. The fourth child was in a segregated classroom with a low teacher-to-student ratio.

The children had been participating in ABA sessions for a minimum of 3 months and a maximum of 2.5 years. Parental involvement was variable and had consisted primarily of observing portions of therapy sessions. Parents had not been provided any written material about ABA teaching strategies, nor had they received any formal training prior to the study. They all consented to participate in an undergraduate thesis project to study the impact of a skills training manual on their ability to instruct their children using ABA-based teaching approaches. The study received approval by the McMaster University Research Ethics Board.

Parent Training Manual

A parent training manual was developed specifically for this study (Summers, 2006). The manual contained information about the learning and behavioural characteristics of children with AS, followed by a brief overview of applied behaviour analysis (ABA). Other topics included using positive reinforcement, choosing appropriate skills to teach, giving effective instructions, and implementing techniques such as shaping, chaining, and prompting. Ideas were offered about structuring the environment and organizing material to make teaching

sessions run as smoothly and efficiently as possible. Sample teaching programs were also provided. A more detailed description of the content of the manual is provided in Table 1.

Dependent Measure

The dependent measure in this study was parental competency in implementing ABA teaching procedures with their children. The skills and behaviours that comprise this competency are modified from Fovel (2002) and appear along with the scoring criteria in Table 2 [page 29].

Table 1. Topics Covered in Parent Training Manual

<i>Content Areas</i>	<i>Specific Issues</i>
What is Angelman syndrome?	<ul style="list-style-type: none"> • genetic causes • common features of children with AS • children's learning and behavioural characteristics
What is applied behaviour analysis?	<ul style="list-style-type: none"> • background information
Considerations when choosing skills to teach	<ul style="list-style-type: none"> • skills should be functional, realistic and can be used to develop more complex skills
Key skills to teach	<ul style="list-style-type: none"> • attention, responding to simple instructions, imitation and matching • communication skills (PECS and signs) • play and self-care skills
Phases of teaching	<ul style="list-style-type: none"> • baseline • skill building (acquisition) • mastery • generalization and maintenance
Positive reinforcement	<ul style="list-style-type: none"> • definition • different types of reinforcers • how to select potential reinforcers • how to use positive reinforcement effectively
Prompts and other teaching techniques	<ul style="list-style-type: none"> • definition and purpose • different types of prompts • prompting hierarchy • task analysis • desensitization • shaping and chaining
Components of a teaching program	<ul style="list-style-type: none"> • operational definition • program goal • target responses • teaching and prompting procedures • criteria for mastery and generalization

Table 2. Parent Skill Competency Checklist and Scoring Criteria

<i>Parent behaviour</i>	<i>Items that represent the criteria for correct performance</i>	<i>Score</i>			
1. Sets up teaching materials and environment	• materials and reinforcers are accessible	2	1	0	N/A
	• table and chairs are positioned correctly	2	1	0	N/A
	• teaching area is kept organized and as free from distraction as possible	2	1	0	N/A
Total behaviour score = (total score/total possible score) x 100					
2. Ensures child is attentive and stays seated during session	• praises child for staying seated during session	2	1	0	N/A
	• praises child for paying attention during session	2	1	0	N/A
	• prompts child to stay seated if needed	2	1	0	N/A
Total behaviour score = (total score/total possible score) x 100					
3. Implements discrete teaching trials	• materials are placed in proper position for teaching trials	2	1	0	N/A
	• ensures child is attentive before giving instructions	2	1	0	N/A
	• instructions are brief, clear and appropriate for teaching task	2	1	0	N/A
	• instructions are not repeated	2	1	0	N/A
Total behaviour score = (total score/total possible score) x 100					
4. Uses appropriate prompts	• prompt was given after child did not respond on a teaching trial	2	1	0	N/A
	• when prompt was used, it brought about correct responding	2	1	0	N/A
Total behaviour score = (total score/total possible score) x 100					
5. Reinforces correct responses	• correct response was followed by praise	2	1	0	N/A
	• praise was accompanied by tangible reinforcer	2	1	0	N/A
Total behaviour score = (total score/total possible score) x 100					
Explanation of scores:					
2 - behaviour is observed most or all of the time					
1 - behaviour is observed sometimes					
0 - behaviour is rarely observed or not observed at all					
N/A - behaviour is not applicable for the situation					

Design

A pre-post design was used for the study. Pre- and post-intervention observation sessions occurred in the families' homes in the same locations in which the therapy sessions took place.

In the baseline (pre-intervention) condition, parents were instructed to select and teach a new functional skill to their child. For Children 1 and 2, this consisted of following receptive instructions; for Child 3, manipulating playdoh; and for Child 4, receptive identification of pictures. The teaching sessions lasted about 5-10 minutes and parents were not provided any specific feedback about their performance during this time. Afterward, they were given the parent training manual to read and were told to use it as a reference guide for practice teaching sessions with their children if they wished. After approximately 1 week, a follow-up observation was scheduled. Immediately prior to the teaching session, each parent was given an opportunity to ask questions about the ABA teaching approaches from the manual and was instructed to teach the same skill as before.

Parents' performance in each behavioural domain in the competency checklist was coded from videotapes of teaching sessions by a trained therapist who was not associated with the study. A second trained therapist who was also not involved with the study independently coded the videotapes to determine inter-observer agreement. Within a given behavioural domain, each item was assigned a score of 2 (behaviour was observed most or all of the time), 1 (behaviour was observed sometimes), 0 (behaviour was rarely observed or not observed at all) or N/A (behaviour was not applicable for the situation). A percent correct score was obtained for each skill domain by adding the scores together and dividing by the maximum possible score and then

multiplying the resulting number by 100. Non-applicable items did not count in the scores.

Reliability

Reliability data were collected by having a second therapist watch videotapes of the pre- and post-intervention sessions and independently assign a numerical score for each item on the competency checklist. Inter-observer reliability was obtained by comparing the scores by the two therapists for each item on the competency checklist and an agreement was counted when their scores matched. A percentage score was obtained by dividing the number of agreements by the number of agreements + disagreements, and multiplying the resulting number by 100. Mean inter-observer agreement was 85.3% across all domains on the skill competency checklist and for specific domains as follows: 83% for sets up the environment, 92% for promotes on-task behaviour, 82% for implements discrete teaching trials, 75% for uses appropriate prompts and 92% for reinforces correct responses.

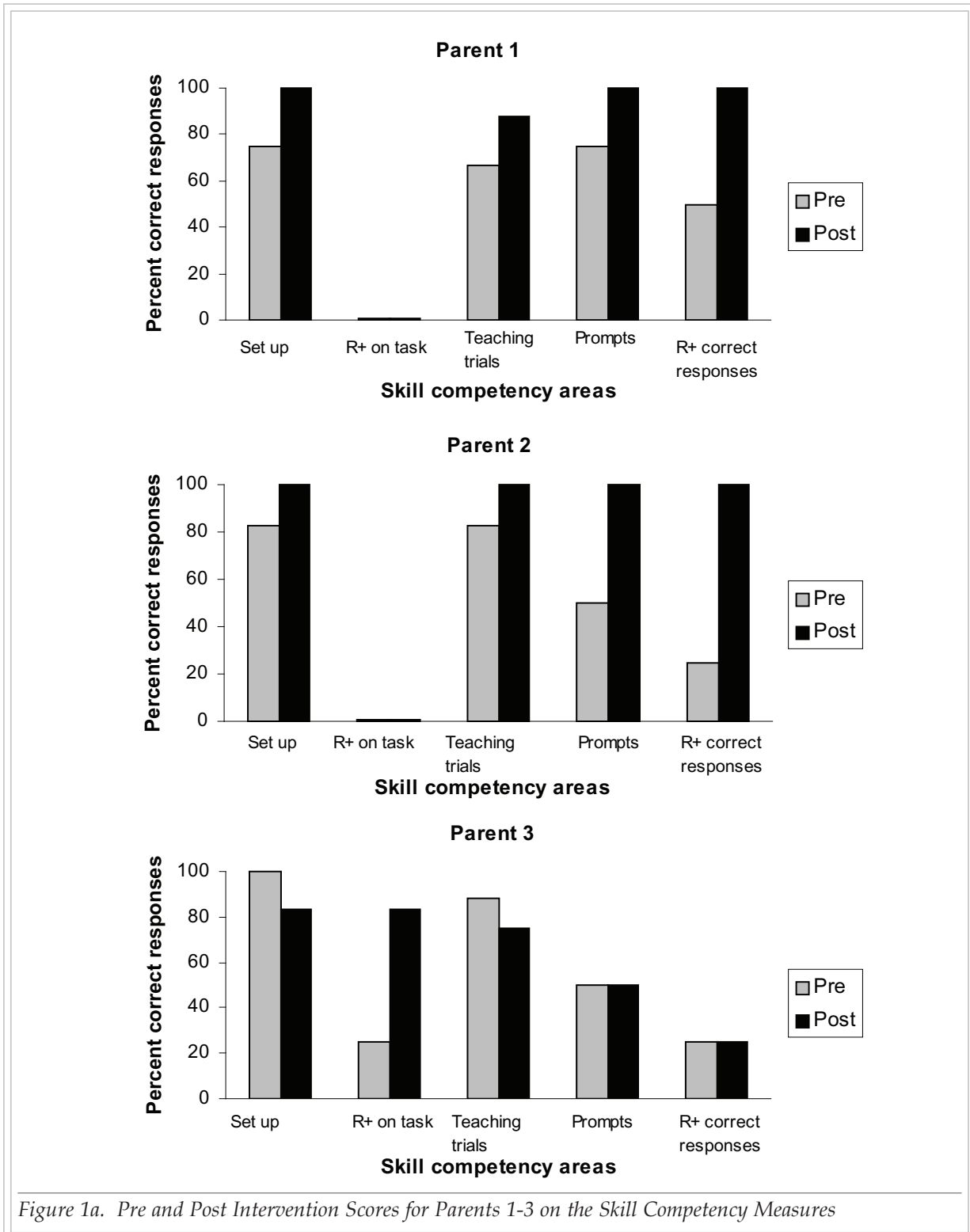
Results

Parents' competency scores were higher on average across all skill areas after exposure to the instructional manual. Mean pre- and post-intervention competency scores for the four children, respectively, were as follows: sets up materials and environment (82.5% vs. 91.5%), promotes on-task behaviour (10.5% vs. 25%), implements discrete teaching trials (78.3% vs. 84.5%), uses prompts appropriately (43.7 vs. 62.5%), and reinforces correct responding (37.5% vs. 68.7).

More specific information is available upon examining individual parental response patterns in Figures 1a and 1b [pages 31 and 32]. Parents 1 and 2 showed improvements across all skill areas with the exception of

promoting on-task behaviour. The scores of Parent 4 did not change at all. Parent 3 was the only one to show improvement in the area of promoting on-task behaviour.

However, her scores in the other skill domains either remained unchanged from baseline or were lower during the post-intervention observation.



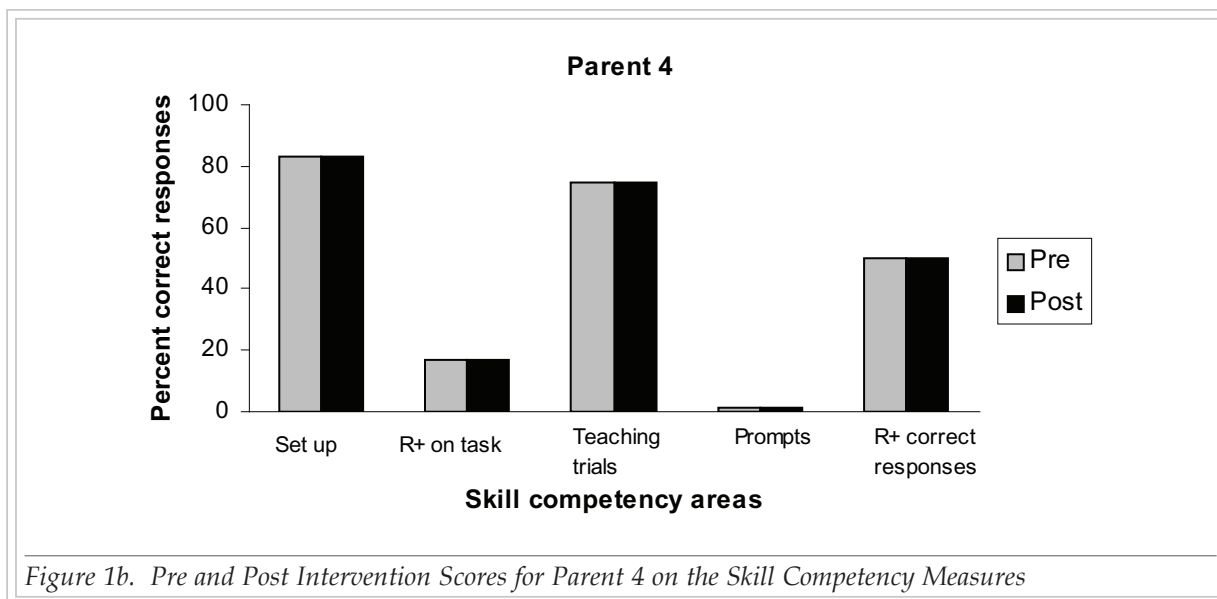


Figure 1b. Pre and Post Intervention Scores for Parent 4 on the Skill Competency Measures

Discussion

The impact of a skills training manual on the correct implementation of ABA teaching procedures by parents of children with Angelman syndrome was variable. Parents demonstrated relatively well-developed teaching skills in the area of setting up the environment and implementing discrete teaching trials prior to intervention; consequently, these skills showed the least improvement after intervention. The largest post-intervention gains were obtained in the area of reinforcing correct responses, while prompting and promoting on-task behaviour showed a moderate degree of improvement.

Differences were evident in parental response patterns. Two parents showed improved responding in four of five domains after receiving the manual. Another parent's scores did not change, and the remaining parent had mixed results. The fact that the latter parent's child engaged in disruptive behaviour during the post-treatment observation session may have had a bearing on the results and points to the need to include management of problematic behaviour in

parent training programs in addition to teaching skill building procedures. The one set of skills that proved to be most difficult for parents to implement was in relation to promoting "on-task" behaviour (appropriate sitting and attending) during teaching sessions. Only two of the four parents received a score in this domain at all and, of these two parents, only one showed improved skill levels during the post-treatment observation. Thus it appears to be the case that written instructions may be better suited for teaching some ABA skills whereas other skills may require a more comprehensive approach such as modelling and supervised practice in order to be learned successfully. In keeping with the example that was outlined by Lerman, Swiezy, Perkins-Parks, and Roane (2000), parent training could begin with a generic, low-cost approach such as providing written instructions and after an evaluation of parental competency in implementing ABA procedures, directing more costly individualized resources to address specific skills that failed to meet a performance criterion.

Although the parents in this study did not receive explicit instruction in the implementation of ABA teaching

procedures prior to the introduction of the skills training manual, they did have informal opportunities to observe therapists working with their children during the home-based sessions and may have picked up skills incidentally. This situation may account for the finding that they were relatively proficient in some skill areas at baseline. A different picture may have emerged, however, if their skill levels were assessed prior to the commencement of the children's therapy sessions or if therapy had not occurred in their homes. Future research should include directly teaching parents to implement the skills that are outlined in the instructional manual.

A major limitation of the present study is its small sample size. The results are promising and warrant a follow-up study involving a larger sample of parents of children with AS. Another limitation is the mothers were relatively well educated and all came from two-parent households. They were also highly motivated to learn teaching techniques due to a lack of ABA-based services for their children. These factors may be associated with positive outcomes and limit the generalizability of the findings to parents from different backgrounds and situations. Also, data were not collected on child responses during teaching trials, thus providing a measure of the effectiveness of parents' teaching skills. Other issues that remain to be addressed include studying the impact of adding other components to the training package on parents' correct implementation of ABA teaching procedures as well as the generalization and maintenance of these skills. It would be helpful to evaluate whether parent training increases parents' self-efficacy in relation to teaching functional skills to their children and has a positive effect on family quality of life.

Parents of children with Angelman syndrome have indicated a clear need for information about their children's education and prospects (van den Borne et al., 1999), but there is very little syndrome-specific information at this time to help guide them. Fortunately, the field of applied behaviour analysis offers a well-researched and empirically validated methodology for teaching skills to children with severe intellectual disabilities, which includes children with AS. Studies involving the parents of children with autism spectrum disorders (some of whom have severe intellectual disabilities) have reported they can become competent therapists for their children, and can even train others in the implementation of ABA procedures (Symon, 2005). This "spread of effect" (Symon, 2005) is of particular importance for children with a rare disorder like AS when access to trained staff is limited by reasons such as distance from treatment centres or when demand for ABA services exceeds the supply of knowledgeable providers (Koegel, Symon, & Koegel, 2002). By empowering parents of children with AS with knowledge and skills regarding ABA approaches, they should be in a better position to advocate effectively for their children and play an active and successful role in their ongoing skills development.

References

- Barclay, A. G., Drotar, D. D., Favell, J., Foxx, R. M., Gardner, W. I., Iwata, B. A., et al. (1996). Definition of mental retardation. In J. W. Jacobson & J. A. Mulick (Eds.), *Manual of diagnosis and professional practice in mental retardation* (pp. 13-53). Washington, DC: American Psychological Association.
- Feldman, M. A., & Werner, S. E. (2002). Collateral effects of behavioural parent training on families of children with developmental disabilities and behavior disorders. *Behavioral Interventions*, 17, 75-83.

- Fovel, J. T. (2002). *The ABA program companion: Organizing quality programs for children with autism and PDD*. New York: DRL Books.
- Johnston, C. R., Handen, B. L., Butter, E., Wagner, A., Mulick, J., Sukhodolsky, D. G., Williams, S., Swiezy, N. A., Arnold, L. E., Aman, M. G., Scahill, L., Stigler, K. A., McDougle, C. J., Vitiello, B., & Smith, T. (2007). Development of a parent training program for children with Pervasive Developmental Disorders. *Behavioral Interventions*, 22, 201-221.
- Koegel, R. L., Symon, J. B., & Koegel, L. K. (2002). Parent education for families of children with autism living in geographically distant areas. *Journal of Positive Behavior Interventions*, 4, 88-103.
- Lerman, D. C., Swiezy, N., Perkins-Parks, S., & Roane, H. S. (2000). Skill acquisition in parents of children with developmental disabilities: Interaction between skill type and instructional format. *Research in Developmental Disabilities*, 21, 183-196.
- Summers, J. (2006). *Teaching functional skills to children with Angelman syndrome*. Unpublished manual. Available from the author.
- Summers, J., & Pittman, D. (2004). Angelman syndrome. In D. Griffiths & R. King (Eds.), *Demystifying syndromes: Clinical and educational implications of common syndromes associated with persons with developmental disabilities* (pp.161-187). New York: NADD Press.
- Summers, J., & Szatmari, P. (2007). Pilot study to explore the feasibility of ABA-based intervention approaches for children with Angelman syndrome and autistic symptomatology. Manuscript submitted for publication, McMaster Children's Hospital, Hamilton Health Sciences and McMaster University.
- Symon, J. B. (2005). Expanding interventions for children with autism: Parents as trainers. *Journal of Positive Behavior Interventions*, 7, 159-173.
- Van den Borne, H. W., van Hooren, R. H., van Gestel, M., Rienmeijer, P., Fryns, J. P., & Curfs, L. M. G. (1999). Psychosocial problems, coping strategies, and the need for information of parents of children with Prader-Willi syndrome and Angelman syndrome. *Patient Education and Counselling*, 38, 205-216.
- Williams, C. A., Beaudet, A. L., Clayton-Smith, J., Knoll, J. H., Kyllerman, M., Laan, L. A., Magenis, R. E., Moncla, A., Schinzel, A. A., Summers, J. A., & Wagstaff, J. (2006). Angelman Syndrome: Updated consensus for diagnostic criteria. *American Journal of Medical Genetics*, 140A, 413-418.

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