

Abstract

According to estimates from the Centers for Disease Control, approximately 1 in 36 children in the United States are diagnosed with autism spectrum disorder (ASD). Additionally, there are over 5.4 million adults in the United States who have ASD. Nearly half of these individuals are unemployed and report feelings of loneliness, depression, peer rejection, as well as difficulties with social communication skills. To evaluate the effectiveness of behavior skills training with video modeling for increasing communication skills, a multiple baseline across participants design was implemented with three high school students and one college student with ASD. The study was conducted in the participants' preferred settings, ensuring a naturalistic and individualized approach for each participant. Visual analysis demonstrated a functional relationship, and Tau-U effect size analyses revealed a very large effect across all participants. The research findings, future direction, and practical implications for supporting neurodivergent individuals in inclusive settings are discussed.

Keywords: autism, ADHD, behavioral skills training, video modeling, social communication skills, Tau-U effect size

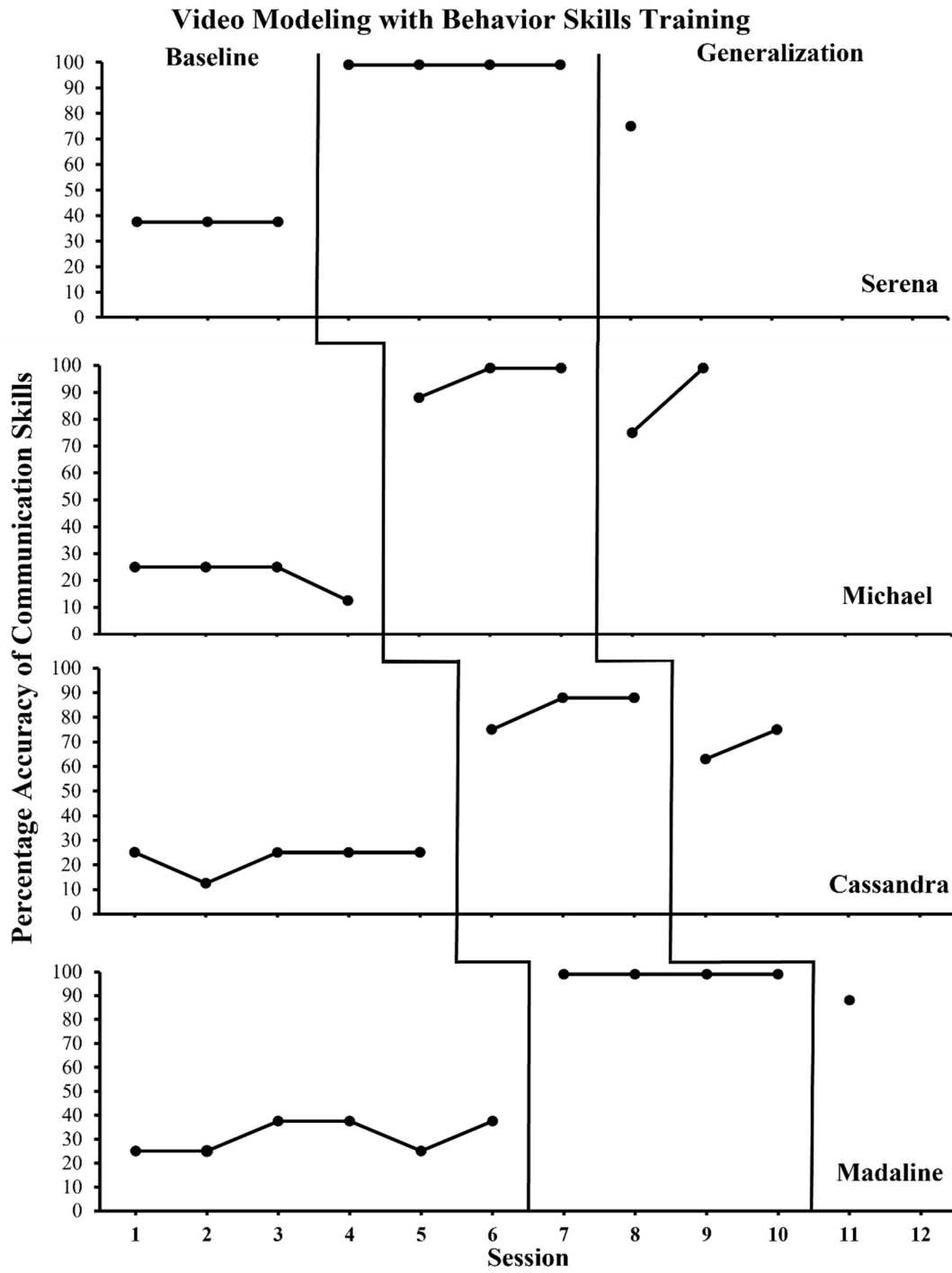


Table 1*Participant Demographic Information*

Information	Serena	Michael	Cassandra	Madeline
Age	17	15	21	15
Sex	Female	Male	Female	Female
Education Level	College	High School	High School	High School
Ethnicity	Mexican American	African American	Mexican American	Mexican American
Diagnoses	ASD, Dysgraphia	ASD, ADHD	ASD, ADHD	ASD

Table 2.

Communication Skills Task Analysis

Step	Description
<p>1. Approaching: The participant approaches a person who is not busy or is available to communicate with, or a person approaches the participant</p>	<p>The participant walks up to or stands next to the target person, and the same applies to a person approaching the participant.</p>
<p>2. Engage in appropriate Body Orientation and is within Proximity Measure</p>	<p>The participant must orient their upper body towards the person being conversed with and within the proximity measure (i.e., 5 feet or closer).</p>
<p>3. Initiating conversations: The participant initiates a conversation with a greeting, question, or topic</p>	<p>Any occurrence of vocal initiations (within the conversational tone level) directed toward another person, not including the data collector or participant’s self.</p>
<p>4. Waiting: Waits for the listener to respond</p>	<p>Waiting is defined as the participant not interrupting the other person and waiting until after they finish speaking to respond.</p>
<p>5. Responding: Engages in a conversational response</p>	<p>The participant responds to a speaker's question or statement (not themselves or the data collector) in a conversation (within the conversational volume) directed toward the person they are conversing with.</p>
<p>6. Waiting: Waits for the listener to respond</p>	<p>The participant waits appropriately for a person to respond and does not interrupt their response(s).</p>
<p>7. Closure Statement: This was defined as the participant making a closing statement that signals the end of the conversational exchange.</p>	<p>The participant ends the conversation with closure after one conversational exchange (e.g., “bye” or “Thank you”)</p>
<p>8. Walking away: This was defined as the participant walking at least an arm's length away from the other person after making a closing statement within 10 seconds of that statement.</p>	<p>Either the participant or the other person walked away from the area of the conversation.</p>

Table 3

Participant Social Validity Questionnaire

Questions					
My social skills have gotten better after finishing the study	1	2	3	4	5
I am better at talking to people and standing up for myself	1	2	3	4	5
Watching the videos helped me get better at starting conversations	1	2	3	4	5
I feel good about how much better I got at talking to others by the end of the study	1	2	3	4	5
I think the training will help me when I go out in the community	1	2	3	4	5
I liked watching the video models before having the conversations	1	2	3	4	5
The video models made me feel good about how I talk to others	1	2	3	4	5
The video models helped me talk to more people	1	2	3	4	5
I want to watch more videos like these to learn new things	1	2	3	4	5
I want to make new friends at school or in my community	1	2	3	4	5
I think the videos helped me talk to people in the community better than without the videos	1	2	3	4	5
I never felt embarrassed watching the video models around other people in public	1	2	3	4	5
The therapist explained the rules and the videos in a way that I could understand.	1	2	3	4	5
The therapist gave me clear advice that helped me improve my communication skills	1	2	3	4	5

Note. 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

Table 4*Parent Social Validity Questionnaire*

Questions					
My child's social skills have improved	1	2	3	4	5
My child's communication/self-advocacy skills have improved	1	2	3	4	5
My child's communication improved after the video training	1	2	3	4	5
My child has made progressed at the end of the study	1	2	3	4	5
This training will help my child in real-world community interactions and settings	1	2	3	4	5
My child enjoyed watching the video before starting their conversations	1	2	3	4	5
Video models helped my child feel confident in their communication	1	2	3	4	5
Video models helped my child socialize better in the community	1	2	3	4	5
My child would like to watch more videos like these in the future to learn new skills.	1	2	3	4	5
My child seems more interested in interacting with and making new friends	1	2	3	4	5
I think the video models helped my child improve their ability to socialize	1	2	3	4	5
My child never felt embarrassed watching the videos in the community	1	2	3	4	5
The therapist provided instructions very clearly to my child	1	2	3	4	5
The therapist provided my child with constructive feedback	1	2	3	4	5

Note. 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

References

- Autism and Developmental Disabilities Monitoring Network Surveillance Year 2020 Principal Investigators; Centers for Disease Control and Prevention (CDC). (2023). Prevalence and characteristics of autism spectrum disorder among children aged 8 years - Autism and Developmental Disabilities Monitoring Network, 11 sites, United States, 2020. *Morbidity and Mortality Weekly Report: Surveillance Summaries*, 72 (2), 1–14. PMID: 36952288
- Bross, L. A., Travers, J. C., Huffman, J. M., Davis, J. L., & Mason, R. A. (2021). A meta-analysis of video modeling interventions to enhance job skills of autistic adolescents and adults. *Autism in Adulthood*, 3(4), 356-369. <https://doi.org/10.1089/aut.2020.0038>
- Bross, L. A., Travers, J. C., Munandar, V. D., & Morningstar, M. (2019). Video modeling to improve customer service skills of an employed young adult with autism. *Focus on Autism and Other Developmental Disabilities*, 34(4), 226–235. <https://doi.org/10.1177/1088357618805990>
- Bross, L. A., Travers, J. C., Wills, H. P., Huffman, J. M., Watson, E. K., Morningstar, M. E., & Boyd, B. A. (2020). Effects of video modeling for young adults with autism in community employment settings. *Career Development and Transition for Exceptional Individuals*, 43(4), 209–225. <https://doi.org/10.1177/2165143420941488>
- Cannella-Malone, H. I., & Schaefer, J. M. (2017). A review of research on teaching people with significant disabilities vocational skills. *Career Development and Transition for Exceptional Individuals*, 40(2), 67-78. <https://doi.org/10.1177/2165143415583498>

- Clearinghouse, W. W. (2012). What works clearinghouse. *Internet site: [http://ies. Ed. Gov/ncee/wwc](http://ies.ed.gov/ncee/wwc)*.
- Cooper, J. O., Heron, T. E., & Heward, W. L. (2020). *Applied behavior analysis*. Pearson.
- Cox, A., & AFIRM Team. (2018). *Video modeling*. Chapel Hill, NC: National Professional Development Center on Autism Spectrum Disorder, FPG Child Development Center, University of North Carolina.
- Dietz, P. M., Rose, C. E., McArthur, D., & Maenner, M. (2020). National and state estimates of adults with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, *50*, 4258 - 4266. <https://doi.org/10.1007/s10803-020-04494-4>
- Drifke, M. A., Tiger, J. H., & Wierzba, B. C. (2017). Using behavioral skills training to teach parents to implement three-step prompting: A component analysis and generalization assessment. *Learning and Motivation*, *57*, 1-14. <https://doi.org/10.1016/j.lmot.2016.12.001>
- Dowdy, A., Peltier, C., Tincani, M., Schneider, W. J., Hantula, D. A., & Travers, J. C. (2021). Meta-analyses and effect sizes in applied behavior analysis: A review and discussion. *Journal of Applied Behavior Analysis*, *54*(4), 1317-1340. <https://doi-org.libweb.lib.utsa.edu/10.1002/jaba.862>
- Ellingsen, R., Bolton, C., & Laugeson, E. (2017). Evidence-based social skills groups for individuals with autism spectrum disorder across the lifespan. *Handbook of social skills and autism spectrum disorder: Assessment, curricula, and intervention*, 343-358

- Gelbar, N. W., Smith, I., & Reichow, B. (2014). A systematic review of articles describing the experience and support of individuals with autism enrolled in college and university programs. *Journal of Autism and Developmental Disorders, 44*, 2593 - 2601.
<https://doi.org/10.1007/s10803-014-2135-5>
- Gilson, C. B., & Carter, E. W. (2018). Video-based instruction to promote employment-related social behaviors for high school students with intellectual disability. *Inclusion, 6*(3), 175-193. <https://doi.org/10.1352/2326-6988-6.3.175>
- Hankla, M. E., Kohn, C. S., & Normand, M. P. (2018). Teaching college students to pour accurately using behavioral skills training: Evaluation of the effects of peer modeling. *Behavioral Interventions, 33*(2), 136–149. <https://doi.org/10.1002/bin.1509>
- Hood, S. A., Luczynski, K. C., & Mitteer, D. R. (2017). Toward meaningful outcomes in teaching conversation and greeting skills with individuals with autism spectrum disorder. *Journal of Applied Behavior Analysis, 50*(3), 459-486. <https://doi.org/10.1002/jaba.388>
- Kirkpatrick, M., Rehfeld, D. M., Akers, J. S., Rivera, G., & Sulak, T. N. (2021). Using behavioral skills training with preservice teachers in the university classroom. *Behavioral Interventions, 36*(1), 145-158. <https://doi.org/10.1002/bin.1764>
- Kearney, K., Brady, M., Bennett, K., Joseph, B., & Dukes, C. (2022). Using Covert Audio Coaching to Teach “Small Talk” to a College Student with Intellectual and Developmental Disabilities. *Journal of Inclusive Postsecondary Education, 3*(2).
<https://doi.org/10.13021/jipe.2021.2928>

- Koegel, L. K., Carter, C. M., & Koegel, R. L. (2003). Teaching children with autism self-initiations as a pivotal response. *Topics in language disorders, 23*(2), 134-145.
- LaBrot, Z. C., Radley, K. C., Dart, E., Moore, J., & Cavell, H. J. (2018). A component analysis of behavioral skills training for effective instruction delivery. *Journal of Family Psychotherapy, 29*(2), 122–141. <https://doi.org/10.1080/08975353.2017.1368813>
- Leaf, J. B. (Ed.). (2017). *Handbook of social skills and Autism spectrum disorder: Assessment, curricula, and intervention*. Springer. DOI 10.1007/978-3-319-62995-7
- Lipkin, P. H., Okamoto, J., Council on Children with Disabilities and Council on School Health, Norwood Jr, K. W., Adams, R. C., Brei, T. J., ... & Young, T. (2015). The Individuals with disabilities education act (IDEA) for children with special educational needs. *Pediatrics, 136*(6), e1650-e1662. <https://doi.org/10.1542/peds.2015-3409>
- Lyons, G. L., Huber, H. B., Carter, E. W., Chen, R., & Asmus, J. M. (2016). Assessing the social skills and problem behaviors of adolescents with severe disabilities enrolled in general education classes. *American Journal on Intellectual and Developmental Disabilities, 121*, 327–345. <http://doi.org/10.1352/1944-7558-121.4.327>
- Mason, R. A., Rispoli, M., Ganz, J. B., Boles, M. B., & Orr, K. (2012). Effects of video modeling on communicative social skills of college students with Asperger syndrome. *Developmental Neurorehabilitation, 15*(6), 425-434. <https://doi.org/10.3109/17518423.2012.704530>

- Migliore, A., Timmons, J., Butterworth, J., & Lugas, J. (2012). Predictors of employment and postsecondary education of youth with autism. *Rehabilitation Counseling Bulletin, 55*(3), 176-184. <https://doi.org/10.1177/0034355212438943>
- Miltenberger, R. G. (2016). *Behavior modification: Principles and procedures*. Cengage Learning.
- Miltenberger, R. G., Zerger, H. M., Novotny, M., & Livingston, C. P. (2017). Behavioral skills training to promote social behavior of individuals with autism. *Handbook of social skills and autism spectrum disorder: Assessment, curricula, and intervention, 325-342*.
- Newman, L., Wagner, M., Knokey, A. M., Marder, C., Nagle, K., Shaver, D., & Wei, X. (2011). The Post-High School Outcomes of Young Adults with Disabilities up to 8 Years after High School: A Report from the National Longitudinal Transition Study 2 (NLTS2). NCSER 2011-3005. *National Center for Special Education Research*.
- Nuernberger, J. E., Ringdahl, J. E., Vargo, K. K., Crumpecker, A. C., & Gunnarsson, K. F. (2013). Using a behavioral skills training package to teach conversation skills to young adults with autism spectrum disorders. *Research in Autism Spectrum Disorders, 7*(2), 411-417. <https://doi.org/10.1016/j.rasd.2012.09.004>
- Parker, R. I., Vannest, K. J., & Davis, J. L. (2011). Effect size in single-case research: A review of nine nonoverlap techniques. *Behavior modification, 35*(4), 303-322. <https://doi.org/10.1177/0145445511399147>

- Parker, R. I., Vannest, K. J., Davis, J. L., & Sauber, S. B. (2011). Combining nonoverlap and trend for single-case research: Tau-U. *Behavior therapy, 42*(2), 284-299.
<https://doi.org/10.1016/j.beth.2010.08.006>
- Peña Jr, H., Gilson, C. B., Kwon, D., Morissette, L., & Du, Z. (2024). Using Video-Based instruction to increase employment-related social behaviors for college students with intellectual and developmental disabilities. *Journal of Inclusive Postsecondary Education, 5*(2). <https://doi.org/10.13021/jipe.2024.3492>
- Pennington, R. C., Bross, L. A., Mazzotti, V. L., Spooner, F., & Harris, R. (2021). A review of developing communication skills for students with intellectual and developmental disabilities on college campuses. *Behavior Modification, 45*(2), 272-296.
<https://doi.org/10.1177/0145445520976650>
- Pugliese, C. E., White, B. A., White, S. W., & Ollendick, T. H. (2013). Social anxiety predicts aggression in children with ASD: Clinical comparisons with socially anxious and oppositional youth. *Journal of Autism and Developmental Disorders, 43*(5), 1205-1213.
- Qi, C. H., Barton, E. E., Collier, M., & Lin, Y. L. (2018). A systematic review of single-case research studies on using video modeling interventions to improve social communication skills for individuals with autism spectrum disorder. *Focus on Autism and Other Developmental Disabilities, 33*(4), 249-257.
<https://doi.org/10.1177/1088357617741282>

- Roux, A. M., Shattuck, P. T., Rast, J. E., Rava, J. A., & Anderson, K. A. (2015). National Autism Indicators Report: Transition into Young Adulthood. Philadelphia, PA: Life Course Outcomes Research Program, A.J. Drexel Autism Institute, Drexel University.
- Schall C., Brooke V., Wehman P., Palko S., Brooke A., Ham W., Carr S., Gerhardt P. (2014, July). *Community based functional skills assessment for transition aged youth with autism spectrum disorder* [Scholarly project]. Virginia Commonwealth University Autism Center for Excellence.
<http://www.vcuautismcenter.org/documents/FinalCommunityAssessment711141.pdf>
- Steinbrenner, J. R., Hume, K., Odom, S. L., Morin, K. L., Nowell, S. W., Tomaszewski, B., ... & Savage, M. N. (2020). Evidence-based practices for children, youth, and young adults with autism. *FPG child development institute*.
- Stocco, C. S., Thompson, R. H., Hart, J. M., & Soriano, H. L. (2017). Improving the interview skills of college students using behavioral skills training. *Journal of Applied Behavior Analysis*, 50(3), 495-510. <https://doi.org/10.1002/jaba.385>
- Ledford, J. R., & Gast, D. L. (Eds.). (2018). *Single case research methodology: Applications in special education and behavioral sciences*. Routledge.
- Vannest, K. J., & Ninci, J. (2015). Evaluating intervention effects in single-case research designs. *Journal of Counseling & Development*, 93(4), 403-411.
<https://doi-org.libweb.lib.utsa.edu/10.1002/jcad.12038>
- Vannest, K.J., Parker, R.I., Gonen, O., & Adiguzel, T. (2016). Single Case Research: web-based calculators for SCR analysis. (Version 2.0). <https://singlecaseresearch.org/>

- Ward-Horner, J., & Sturmey, P. (2012). Component analysis of behavior skills training in functional analysis. *Behavioral Interventions*, 27(2), 75-92. <https://doi-org.libweb.lib.utsa.edu/10.1002/bin.1339>
- Wehmeyer, M. L. (2020). The importance of self-determination to the quality of life of people with intellectual disability: A perspective. *International Journal of Environmental Research and Public Health*, 17(19), 7121. <https://doi.org/10.3390/ijerph17197121>
- Whirley, M. L., Gilson, C. B., & Gushanas, C. M. (2020). Postsecondary education programs on college campuses supporting adults with intellectual and developmental disabilities in the literature: A scoping review. *Career Development and Transition for Exceptional Individuals*, 43(4), 195–208. <https://doi.org/10.1177/216514342092>
- Whittenburg, H. N., Taylor, J. P., Thoma, C. A., Pickover, G. S., & Vitullo, V. E. (2020). A systematic literature review of interventions to improve work-related social skills of individuals with autism spectrum disorder. *Inclusion*, 8(4), 320-334. <https://doi.org/10.1352/2326-6988-8.4.320>
- Whittenburg, H. N., Xu, Y., Thoma, C. A., Schall, C., & Ham, W. (2023). Effects of behavioral skills training with video modeling and in situ training on workplace conversational skills of students with autism. *Focus on Autism and Other Developmental Disabilities*, 38(3), 188-198. <https://doi.org/10.1177/10883576221127971>
- Zink, H. H., Van Norman, E. R., & Klingbeil, D. A. Multiple baseline and multiple probe design studies targeting academic skills: Trends over time in effect sizes. *Psychology in the Schools*. <https://doi.org/10.1002/pits.23120>

Appendix A. Task Analysis Data Sheet

Task Analysis for Communication Skills

Participant:
Date(s):

Session Number:
Reliability Coder:

Directions: For each session the behavior is practiced, record if the step is observed (+) or not (-). Mark (N/O) if there were no opportunities to perform the step. Write the session number on the first box of each column.

Weeks 1-4:

Steps of Communication Skills									
Participant approaches or is approached by a person	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O
Participant engages in body orientation/proximity	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O
Participant initiates the conversation (greeting, question)	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O
Participant waits for the other person to respond	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O
Participant engages in a conversational response	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O
A participant waits for the other person to respond	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O
Participant or other person ends the conversation	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O
Participant leaves the area and walks away	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O
Percentage of Steps Correct for Each Session:									

Weeks 4-8:

Steps of Communication Skills									
Participant approaches or is approached by a person	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O
Participant engages in body orientation/proximity	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O
Participant initiates the conversation (greeting, question)	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O
Participant waits for the other person to respond	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O
Participant engages in a conversational response	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O
Participant waits for the other person to respond	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O
Participant or other person ends the conversation	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O
Participant leaves the area and walks away	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O
Percentage of Steps Correct for Each Session:									

Observational Notes:

Appendix B. Treatment Fidelity Data Sheet

Treatment Fidelity Data Sheet for Discrete Trial Teaching

Participant:
Date(s):

Session Number:
Reliability Coder:

Criteria						
The therapist transitions the client to the table	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O
The implementor ensures all materials (iPads, notebooks, data sheets, fidelity sheets) are set up and ready before beginning BST	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O
The therapist begins providing instructions	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O
The therapist instructs the client to watch the video models	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O
The therapist initiates and roleplays the conversational skills with the client before data collection begins	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O
The therapist provides feedback after roleplaying. The therapist asks the client if they want to roleplay again or if they are ready for conversations	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O
The therapist instructs when the participant can begin their conversations in the natural environment	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O
The therapist observes the client having a conversation with another person and takes data on the data sheet/Catalyst	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O
The therapist instructs the client when to return to the table/secluded area	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O
The therapist provides feedback after the data collection session within the natural environment	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O	+ - N/O
Percentage of Fidelity						

Observational Notes: