
A Social–Behavioral Learning Strategy Intervention for a Child With Asperger Syndrome

Brief Report

MARJORIE A. BOCK

ABSTRACT

This study examined the effect of a social-behavioral learning strategy intervention (Stop–Observe–Deliberate–Act; SODA) on the social interaction skills of one middle school student with Asperger syndrome (AS). More specifically, the study investigated the effect of SODA training on the ability of one student with AS to participate in cooperative learning activities, play board games, and visit his peers during lunch. A multiple-baseline-across-settings design was used to analyze social behavior without SODA (baseline) and with SODA (intervention) during seventh-grade English, lunch, and activity periods. Maintenance probes occurred twice a month for 2 months following the completion of intervention activities. The participant benefited from the SODA intervention: He presented an increased percentage of time spent learning cooperatively, playing board games, and visiting during lunch when SODA training began. When SODA training was discontinued, he maintained high performance across all study conditions, nearly matching that of a peer without disabilities. Moreover, the participant presented long-term memory of SODA 2 months after maintenance.

Bill's social profile exhibits one of the primary features of Asperger syndrome (AS): social interaction deficits (American Psychiatric Association, 2000). These deficits occur across the life span and include an inability to engage in age-expected interactions, such as play or large-group instruction (Myles & Simpson, 2003), and challenges in understanding the social customs associated with dating and other age-expected interactions. This confusion regarding social customs continues through adulthood (Happé, 1991). Thus, it is not unusual to find adults with AS who experience high levels of social isolation and frustration (Cesaroni & Garber, 1991).

Yet individuals with AS go to extraordinary lengths to make sense of these social customs. Barry, a young adult with AS, developed an elaborate system to select girls to date (Happé, 1991). He observed that many gentlemen his age dated more than one girl at a time and tended to date each for 1 to 2 years. Consequently he calculated the mean, or average, number of girls each of his male acquaintances dated at any one time as well as the mean duration of each relationship. Based on his calculations, he decided that he would date two girls at the same time and that he would date them each for approximately 1.5 years.

Clearly, individuals with AS are poor incidental social learners (Myles & Simpson, 2003). This may be due, in great part, to the significant deficits in executive function (EF) that they present (Joseph & Tager-Flusberg, 2004; Ozonoff, 1998; Pennington & Ozonoff, 1996). Klin and Volkmar (2000) noted that findings from neuropsychological studies of persons with AS supported the difficulties they have in (a) inhibiting

BILL, A MIDDLE SCHOOL STUDENT, LISTENS AS his English teacher reads a section of *Huckleberry Finn* to the class. He occasionally interrupts her to share information about NASA, space, or space travel. She reminds him to listen as she reads. A few of his peers look at him and snicker. As the students leave class, they say goodbye to Ms. Jones or ask her if she will be at the football game that evening. Bill tells Ms. Jones when NASA is flying another spaceship to the International Space Station and then leaves the class.

irrelevant responses, (b) modifying their behavior based on environmental feedback, (c) extracting rules from experience, and (d) differentiating essential from nonessential information. In short, persons with AS rely on ineffective thinking strategies to process information. Consequently, the deficits in EF presented by persons with AS lead to an inability to effectively process information.

Thus, studies supporting the EF deficits of children with AS raise several questions. First, can children with AS learn new thinking strategies that will effectively guide their information processing during social interactions? If so, will children with AS generalize the use of these strategies to new social interactions? And finally, will these strategies facilitate effective problem solving when children with AS experience novel social events?

The preceding questions are not unique to studies investigating the information processing abilities of persons with AS. In fact, the literature is replete with studies that investigate the information processing abilities of children with and without disabilities. The data from these studies indicate that children exhibiting thinking strategy production deficits due either to developmental immaturity or to various cognitive deficits can learn and use effective thinking (or learning) strategies (Alley & Deshler, 1979; Bock, 2000; Salend, 1998). Learning strategy instruction is one way to accomplish this (Salend, 1998). Through such instruction, these children learn a set of rules that will guide their information acquisition, manipulation, integration, storage, and retrieval (Alley & Deshler, 1979). Furthermore, learning strategy instruction can teach these children to monitor their thinking processes and select effective (rather than ineffective) thinking strategies (Bock, 2000; Salend, 1998).

Stop–Observe–Deliberate–Act (SODA; Bock, 2000) is a social-behavioral learning strategy developed for children and adolescents with AS. It provides a set of rules meant to help these youngsters attend to relevant social cues, process these cues, and select specific social skills that they will use as they participate in a social activity. When using SODA, these youngsters learn to **Stop**, **Observe**, **Deliberate**, and then **Act**. The first three SODA steps (i.e., S, O, and D) include between three and five self-talk questions or statements. These guide the information processing of the children and adolescents who use SODA. The final step (i.e., A) helps these children or adolescents develop a specific list of things they will say and do when participating in the social activity. Figure 1 presents the SODA Strategy in detail.

The purpose of the current study was to replicate and extend learning strategy research investigating the effects of social-behavioral learning strategy training on the social interaction skills of an adolescent with AS (Bock, 2000). The current study replicated prior research by (a) using the same social-behavioral learning strategy (i.e., SODA), (b) implementing the SODA intervention with an adolescent with AS, (c) using a SODA story and teaching script derived from the

real-life experiences of the participant for training sessions, and (d) implementing strategy training in the inclusive middle school attended by the participant. The current study extended prior research by (a) comparing the participant's social behavior with that of a peer without disabilities before, during, and following training, and (b) teaching the participant to use SODA across three social activities he encountered daily at school.

METHOD

Participants

One middle school student with AS, Bill (see Note), and one nondisabled peer participated in this study. Bill was 12 years 4 months of age at the beginning of the study. He was the only child in a middle-income family. He and his family lived in a rural community in the Northern Plains region of the United States. An independent child psychiatrist diagnosed

SODA Strategy



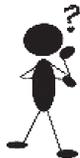
Stop:

1. Where should I go to observe?
2. What is the room arrangement?
3. What is the routine or schedule?



Observe:

1. What is/are _____ doing?
2. What is/are _____ saying?
3. What happens when _____ say(s) and do(es) these things?



Deliberate:

1. What would I like to do?
2. What would I like to say?
3. How will _____ feel when I do and say these things?
4. How will _____ act when I do and say these things?
5. Why will _____ act this way?



Act:

When I go to _____ I plan to

- (a)
- (b)
- (c)
- (d)

FIGURE 1. General overview of the SODA strategy.

Bill with AS (American Psychiatric Association, 2000) prior to study participation. Bill's nonverbal IQ fell within the typical range, and he met the *Diagnostic and Statistical Manual of Mental Disorders—Fourth Edition (DSM-IV;* American Psychiatric Association, 1994) criteria for lack of gross language developmental delay. Bill had no known history of previous or current psychiatric or neurological disorders aside from AS. At the time of the study, Bill did not receive prescribed medications. Furthermore, for 1 year prior to the study, Bill received social skill instruction in the *mind-reading* intervention model (Howlin, Baron-Cohen, & Hadwin, 1999) for approximately 2½ hours a week. Immediately preceding his participation in the study, he scored 96% on the informal mind-reading assessment activities associated with this intervention model (Howlin et al., 1999), indicating that he had the ability to understand others' minds. The other participant was a male peer without disabilities from Bill's class. This peer was selected at random and served as the control participant for this study.

Setting and Interventionists

Study activities took place in the middle school attended by Bill and were implemented by the special educator, Kathy, and Bill's general education teacher, Sarah, both of whom worked with him daily. Kathy held a master's degree in special education, had completed special training on how to effectively teach students with AS, and had taught students with AS for 4 years. Kathy helped the author create Bill's SODA story and teaching script. She taught Bill SODA and collected data three times a day during seventh-grade English, lunch, and activity period. Sarah held a bachelor's degree in English education. She had taught middle school students for 15 years.

Research Design

A multiple-baseline-across-settings design (Kazdin, 1982; Tawney & Gast, 1984) was used to analyze Bill's social behavior without SODA (baseline) and with SODA (intervention) during seventh-grade English, lunch, and activity period. The condition sequence was as follows: cooperative learning baseline (A1), cooperative learning SODA training (B1); activity period baseline (A2), activity period SODA training (B2); and lunch period baseline (A3), lunch period SODA training (B3). Maintenance probes occurred twice a month for 2 months following the completion of intervention activities.

Dependent Measures and Data Collection

The dependent measure for Bill consisted of three planned replacement behaviors taught through SODA. The replacement behaviors were to (a) participate in cooperative learning activities with peers in a cooperative learning group for the du-

ration of the cooperative learning activity during English; (b) play a board game (e.g., checkers, Clue™, Scrabble™, Monopoly™) with one or more peers for the duration of the activity period; and (c) visit one or more peers while eating lunch for the duration of lunch period.

Participation in cooperative learning activities was said to occur when Bill (a) sat with his cooperative learning group, (b) listened to his group members, (c) provided information relevant to the learning activity, and (d) helped create or present the group's final project. Board game playing was operationalized as follows: when Bill (a) sat at a table with one or more peers, (b) helped set up the game board, (c) played the game following the rules, and (d) helped put the game away. Finally, Bill visited peers during lunch when he (a) sat at the lunch table with one or more peers, (b) listened to his peers' conversation while eating lunch, (c) shared relevant information or posed relevant questions as he listened to his peers' conversation, and (d) used appropriate social skills while eating his lunch (e.g., used a napkin, took his tray to the dump station).

Before the study began, the author trained Kathy and Sarah to record all instances of the replacement behaviors (i.e., as presented by Bill and his peer) to a criterion of at least 90% accuracy over three consecutive sessions. They used stopwatches to document the duration of time that Bill and his peer spent (a) participating in cooperative learning activities during English, (b) playing board games with one or more peers during activity period, and (c) visiting one or more peers during lunch. Kathy and Sarah recorded data for both Bill and his peer. They started their stopwatches (one stopwatch for each student) when the student began the replacement behavior and stopped them when the student walked away from his peers or did not present the criteria used to define each replacement behavior. Once the study began, they collected data during each English class, each activity period, and each lunch period across all phases. Because the duration of the data collection sessions varied during the study, the total duration of the replacement behavior for each session was converted to a percentage of time per session, so that the data could be compared across sessions.

As dependent measures, the replacement behaviors were clearly defined and objectively observed. Therefore, it was deemed appropriate for Kathy to collect the data, although she was not blind to the purpose of the study. Sarah was blind to the purpose of the study.

Interobserver Reliability

The author collected interobserver reliability data on the replacement behaviors for 50% of the sessions, selected at random, across all phases. Interobserver reliability was determined by calculating the scores for these sessions and counting the number of agreements between the two observers divided by the number of agreements plus disagreements multiplied by 100 (Kazdin, 1982; Tawney & Gast, 1984). The

mean interobserver reliability across all study phases was 91%.

Procedural Reliability

The author gathered procedural reliability data once during each study phase using a study procedure checklist. Procedural reliability was determined by dividing the number of correct steps by the total number of correct and incorrect steps and multiplying by 100 (Kazdin, 1982; Tawney & Gast, 1984). The mean procedural reliability across all study phases was 98%. Deviations from the study procedures were brought to Kathy's attention, and a review of the procedural protocol followed.

Procedure

Before the study began, the author collaborated with Kathy to write Bill's SODA stories (i.e., one for seventh-grade English, one for lunch period, and one for activity period). Each SODA story incorporated the SODA strategy shown in Figure 1. Furthermore, each included self-question and self-answer statements. Whereas the self-question statements came from the SODA strategy, the self-answer statements were individualized for Bill. Finally, as shown in Figure 2, the SODA stories were written in first person and described the specific social-behavioral difficulties that Bill presented during seventh-grade English, lunch, and activity period.

Once the SODA stories were written, Kathy and the author created a teaching script for each. The script contained questions meant to teach Bill the specific SODA components (e.g., Stop, Observe, Deliberate, and Act) and the self-questions and self-answer statements associated with each. The script also contained questions meant to verify how Bill's teachers and peers would feel and act when he acted as described in the SODA story. The script contained questions meant to solicit other ideas regarding how Bill might act during seventh-grade English, lunch period, or activity period. Furthermore, the script contained questions to help Bill identify how his teacher and peers would feel and act if he decided to do or say one of these other things. Finally, the script contained specific directions regarding how Kathy should react to Bill's correct and incorrect responses.

Consequently, the teaching script included questions and statements like the following:

- What does the D in SODA represent?
- Yes, the D represents Deliberate.
- Please look at the SODA strategy. What does the D in SODA represent?
- What 5 questions do you ask yourself when you deliberate?
- That's right, you ask yourself _____.

- In this short story, what did you decide to do during activity period?
- That's right, you decided to do _____.
- How do you think Ms. Jones and the other students will feel if you do and say these things?
- That's right, Ms. Jones and the other students will feel happy if you do and say these things.
- What other things could you say and do?
- How do you think Ms. Jones and the other students will feel if you say and do this?
- Why do you think Ms. Jones and the other students will act this way?

Phase A: Baseline. Kathy and Sarah recorded baseline data across all three settings (i.e., seventh-grade English, lunch period, and activity period) once a day. If Bill bothered his teachers or the other students during baseline, he received corrective, verbal feedback (e.g., "Bill, please go back to your cooperative learning group to work on the assignment"). No other interventions occurred during this phase.

Phase B: SODA Intervention. Immediately before seventh-grade English (the first period of the day for Bill), lunch period, and activity period (the first period after lunch each day for Bill), Bill read the SODA story. When he finished reading the story, he raised his hand to discuss it with Kathy. Using the SODA teaching scripts, Kathy and Bill discussed the story. As soon as they finished discussing the story, Bill went to English, lunch period, or activity period. Kathy and Sarah continued to record data across all three settings once a day during the SODA intervention phase.

Phase C: Maintenance. Kathy and Sarah collected data twice a month across all three settings for 2 months after Bill completed the SODA training activities.

Postintervention Assessment

Two months following maintenance phase completion, the author interviewed Kathy and Bill to evaluate the social validity, or overall usefulness, of SODA. Figure 3 contains the specific interview questions the author used.

RESULTS

As Figure 4 shows, the mean percentages of time Bill spent learning cooperatively, playing games, and visiting at lunch during baseline fell at or below 19.0%. They increased

SODA Teaching Script: Introduce the student to this activity by saying, "SODA is a strategy some people use to figure out what to do and say when they are confused. The following short story shows how you can use SODA to figure out what to do and say when you go to activity period. Please read the story silently and raise your hand when you are finished so we can talk about it."

SODA: Making Sense of Activity Period

Directions: Read the following story silently. When you are finished raise your hand to let your teacher know you are ready to discuss the story.

Sometimes when I go to activity period, I get into trouble and I am sent to the principal's office. Ms. Jones, my activity period teacher, tells me that I should stay in the principal's office until I am "willing to get along with the other students." This confuses me because I am *always willing* to get along with the other students. During activity period, I talk with all the other students. I talk about NASA, space, and space travel. Sometimes, they stop playing their game and ask me a question about space travel. Sometimes, they tell me to leave them alone. Sometimes, they ask me to go away. I leave when they ask me to leave. I go to another student and talk about space travel. I think I am getting along with the other students during activity period, but then Ms. Jones sends me to the principal's office. When I go back to activity period, I'm going to use **SODA** to help me figure this out.

When I enter my homeroom for activity period, I will **Stop**. I will then ask myself, "**Where should I go to observe?**" (*I will sit at my desk to observe.*) I will ask myself, "**What is the room arrangement?**" (*I will notice if there is any change in the room arrangement.*) Finally, I will ask myself, "**What is the routine?**" (*I will look at the board in the front of the room to see what games or activities Ms. Jones has planned for today.*)

I will then **Observe**. While observing, I will ask myself, "**What are Ms. Jones and the other students doing?**" (*I will watch Ms. Jones and the other students to see what they are doing. Ms. Jones may be showing us what games we will play today. The students may be deciding who they want to play with and what game they want to play. The students may be reading the game directions.*) I will then ask myself, "**What are Ms. Jones and the other students saying?**" (*I will listen to Ms. Jones and the other students to hear what they are saying. Ms. Jones may be asking who wants to play Clue. The students may be saying what they want to play. The students may be talking about other things, like the basketball game or their favorite music group.*) I will also ask myself, "**What happens when Ms. Jones and the other students say and do these things?**" (*Ms. Jones may smile and thank the students, who form groups and begin playing their game right away. The students may smile and laugh as they play their games.*)

I will then **Deliberate** about my observations. To help me deliberate, I will ask myself, "**What would I like to do?**" (*I now realize that we go to activity period to play games. I would like to play a game with Joe.*) I ask myself, "**What would I like to say?**" (*I now realize that we can visit as we play games. Joe likes to visit about NASA, space, and space travel. I would like to visit with Joe about NASA, space, and space travel as we play a game.*) I will ask myself, "**How will Ms. Jones and the other students feel when I do and say these things?**" (*They will feel happy.*) I will ask myself, "**How will Ms. Jones and the other students act when I do and say these things?**" (*They will let me join a group and play a game. They will not tell me to leave them alone. I will not be sent to the principal's office.*) Finally, I will ask myself, "**Why will Ms. Jones and the other students act this way?**" (*They want to play games and visit during activity period. They want me to do this too. That's why they won't tell me to go away.*)

After I have completed my deliberations, I will decide how I will **Act** during activity period. I can now see that when I walk around the room talking to the other students about NASA, space, and space travel during activity period, they cannot play games or visit with each other. This makes them mad. Then they ask me to go away and leave them alone. Then Ms. Jones sends me to the principal's office. If I play a game and visit about things that interest the other students, they will feel happy and want me to stay and play the game with them. When I go to activity period I plan to

1. walk up to Joe and ask what game he wants to play today;
2. tell Joe that I want to play that game too and ask if I can play the game with him;
3. listen to Joe and his friends talk about cars they like during the game;
4. talk about cars I like during the game;
5. talk about how space travel has led to improvement in these cars over recent decades; and
6. help Joe put the game away at the end of the period.

FIGURE 2. Example of SODA story prepared for Bill (activity period).

markedly the first day he participated in SODA training. Furthermore, he maintained high levels of performance over 2 months after he finished SODA training. He showed a gain of 62.23% from baseline ($M = 10\%$) to SODA intervention ($M = 72.23\%$) during the cooperative learning condition. Similarly, he showed a gain of 64.85% from baseline ($M = 14.71\%$) to SODA intervention ($M = 79.56\%$) during the game-playing condition. He showed a gain of 48.58% from baseline ($M = 5.17\%$) to SODA intervention ($M = 53.75\%$) during the visiting-at-lunch condition. Bill's peer showed high percentages of time learning cooperatively, playing games, and visiting-at-lunch during baseline (i.e., 95.00%, 97.14%, and 75.92%, respectively). His performance level was sustained across all study phases.

Social Validity

Bill answered interview questions 1 through 5 (see Figure 3) accurately. He indicated that he continued to use SODA, as Kathy had taught him, because it helped him make sense of what his teachers and peers said and did during English, activity period, and lunch. Furthermore, Bill indicated that he had tried to use SODA in other classes at school. Kathy rated SODA as a highly effective intervention for Bill. She based her evaluation on the data collected during the study. She said she would use SODA with Bill again due to its benefit for him and its ease of implementation.

DISCUSSION

Bill benefited from the SODA intervention. He presented an increase in the percentage of time spent learning cooperatively, playing board games, and visiting during lunch as soon as SODA training began. When SODA training was discontinued, he maintained high percentages of time learning cooperatively, playing board games, and visiting during lunch. In fact, he presented small gains in the mean performance levels across the intervention and maintenance phases for each study condition. Finally, Bill showed long-term memory (Bruning, Schraw, & Ronning, 1995) of SODA 2 months after maintenance. His long-term memory included both declarative knowledge recall of the SODA components and self-questions or self-statements and procedural knowledge recall regarding the actual ongoing use of SODA (Anderson, 1993; Squire, 1987; Woltz, 1988). Based on the information Bill provided in the follow-up interview, his procedural knowledge recall extended beyond the study conditions to other classes throughout the school day.

Perhaps the most interesting outcome of this study is that it provides evidence that SODA training may lead to improved social-behavioral problem solving by adolescents with AS. Prior to SODA training, Bill had learned how to understand the mental states of others during weekly social skills instruction derived from the mind-reading intervention

Student

1. SODA is a strategy you learned this year. What four things does SODA tell you to do?
2. What three questions do you ask yourself when you stop?
3. What three questions do you ask yourself while you observe?
4. What five questions do you ask yourself while you deliberate?
5. What action did you take when you followed SODA?
6. Have you continued to use SODA? Why or why not?
7. If you have continued to use SODA, please share (a) when you have used it; (b) how you have used it; and (c) how well, in your opinion, it worked.
8. Are there other ways you might consider using SODA? Why or why not?
9. Overall, what is your opinion of SODA?

Teachers

1. Overall, how effective was SODA for your student(s)? On what do you base this evaluation?
2. Please share your thoughts about how SODA could be taught more effectively.
3. Will you use SODA with this student(s) again? If so, how? If not, why not?
4. Overall, what is your opinion?

FIGURE 3. Postintervention interview questions for participants and their teachers.

model (Howlin et al., 1999). Furthermore, his performance on the informal mind-reading assessment activities immediately preceding study participation indicated that he had both the declarative and procedural knowledge recall to use these skills in the social situations he encountered on a daily basis at school. Yet prior to SODA training, Bill did not use these skills to help him navigate these challenging social situations. This may not be all that surprising. Frith (2003) noted that with specific, intensive instruction, adolescents with AS can learn how to understand the mental states of others; however, as Frith (2003) noted, the resulting theory of mind is neither intuitive nor automatic. Thus, its use in daily social situations is limited and insufficient for typical social communication and social-behavioral problem solving.

The results from the current study suggest that SODA may teach adolescents with AS who have learned how to understand the mental states of others to use metacognitive processes, or learning strategies, that facilitate social commu-

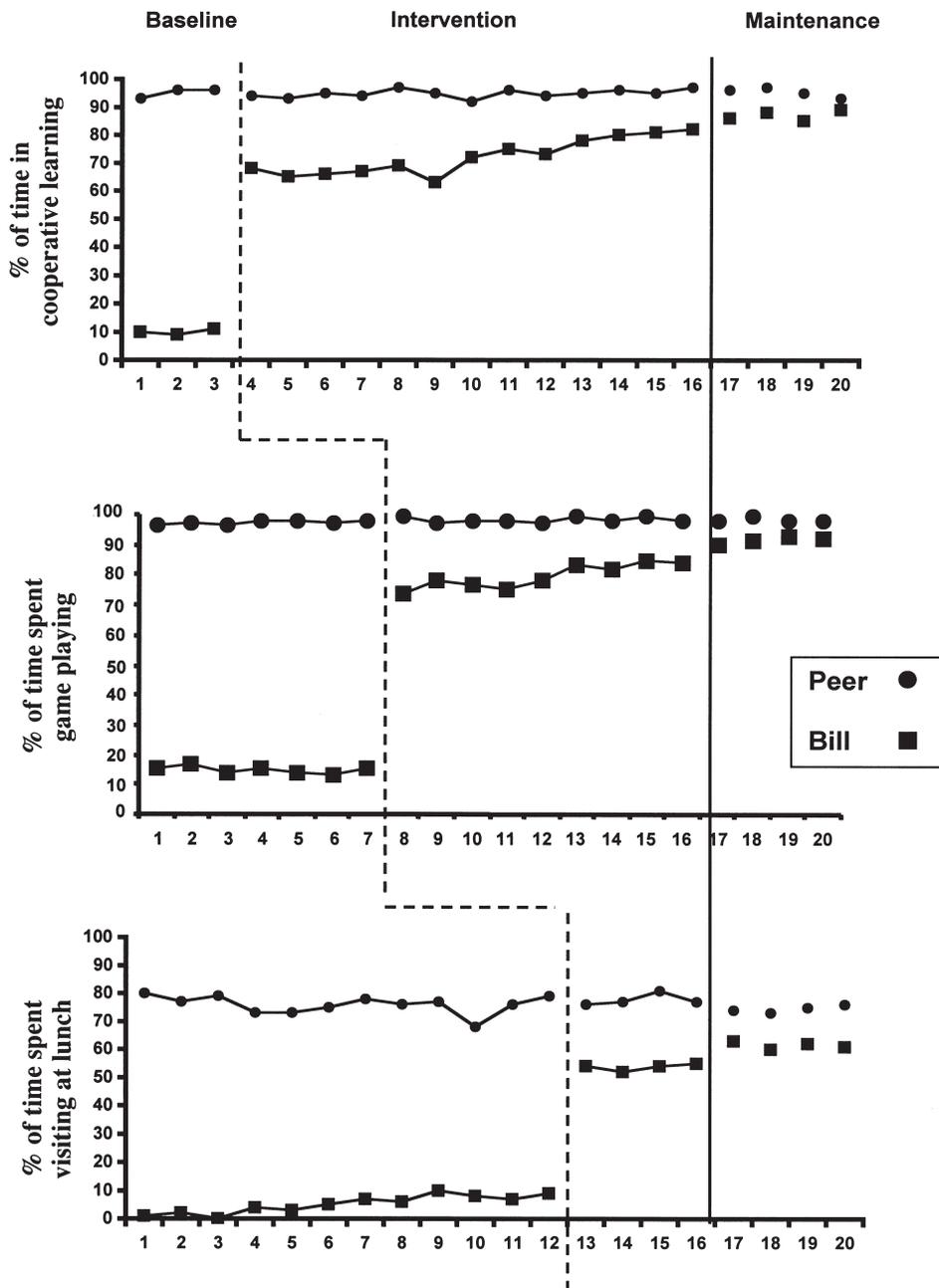


FIGURE 4. Percentage of time Bill and his peer spent learning cooperatively, playing games, and visiting at lunch during baseline, intervention, and maintenance conditions.

nication and social-behavioral problem solving. There are several limitations to this study. First, as a single-subject study, its results must be limited to the study participant. Thus, numerous replications producing similar results are needed to verify the generality of findings for other adolescents with AS (Kazdin, 1982; Tawney & Gast, 1984). Second, future researchers should include generalization probes over several months following intervention to confirm intervention effects over an extended period of time (Kazdin, 1982; Tawney

& Gast, 1984). Third, future research should examine the requisite skills (e.g., mind-reading) needed to benefit from SODA. ■

MARJORIE A. BOCK, EdD, is an associate professor in the Department of Special Education, Associated Colleges of Central Kansas. Address: Marjorie A. Bock, Associated Colleges of Central Kansas, Department of Special Education, 210 S. Main St., McPherson, KS 67460; e-mail: marjorie@acck.edu

NOTES

1. I thank the participant's teachers for their help with this study. I also thank the participant, from whom I learned a great deal during this study.
2. Names of participants and teachers have been replaced throughout by pseudonyms.

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