

# Improving the Performance of a Young Child with Autism during Self-Care Tasks Using Embedded Song Interventions: A Case Study

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**ABSTRACT:** The collaboration of music therapists, occupational therapists, and classroom teachers can provide innovative, effective, and evidence-based interventions that support independence in basic self-care tasks for young children with autism. This case study investigated the effectiveness of adding songs embedded in ongoing classroom routines as structural prompts to increase the independence of a 3-year-old boy with autism during multi-step self-care tasks (i.e., hand-washing, toileting, and cleaning up). The effectiveness of the musical versus verbal presentations of the task sequence were compared using an alternating treatment design replicated across three tasks. The teacher effectively embedded both forms of the presented sequencing in the ongoing classroom routines and results indicated that the implementation of both forms of the intervention were successful in increasing the child's independent performance for each task though task-specific differences were noted.

When considered from a purely technical perspective, the performance of basic self-care tasks seems concrete and self-explanatory (Frank & Stein, 2000). These tasks are embedded in everyday routines, follow a relatively predictable sequence to completion, and typically require few materials or tools. However, examined contextually and from the perspective of the performer, these same tasks take on individual meaning and importance and are orchestrated to meet the unique needs of the individual in terms of habits, preferences, and social roles. The performance of self-care tasks facilitates both the independence of the individual (Christiansen, 2000; Kellegrew, 1998) and the inclusion of that individual in a social context or group. In a Western culture in which independence

is highly valued, the ability to perform self-care tasks, indeed, reflects an important aspect of the "self" as separate and sufficient. At the same time, our society has cultural norms about cleanliness and appearance, and while those norms may vary within smaller segments of that society, adherence to those norms is among the expectations people have for others in order to attain or maintain group membership or acceptance (Christiansen & Baum, 2005). In addition, health standards for child care, preschool, and school are provided by state and national licensing bodies. For instance, teaching proper hand-washing techniques is part of the National Health Education Standards and consequently part of the preschool health and hygiene curriculum (Fanjul & Ball, 1995; Joint Commission on Health Education Standards, 1995). Therefore, the ability of a child to learn and refine performance of simple self-care tasks holds meaning not only for the child but also for the adults who provide care for that child, including parents, other family members, and teachers.

Children express unique aspects of their identity in the way in which they enact preferences within the performance of self-care tasks (e.g., "I only want the blue toothpaste!"), and in the outcomes (e.g., the striped t-shirt with the flowered shorts). As the child develops skills and independence in the performance of self-care tasks, the patterns of activity and social participation change not only for that child but for the adults as well (Kellegrew, 1998, 2000). Adults change their roles, their use of time, the type and amount of assistance they offer, and their own perception of meaning in the activity. For the adults, the independence of the child not only reflects valued learning but also frees the adult to engage in other activities during the time that previously had been spent in assisting the child. For many children and adults, the changes in a child's self-care performance typically follow a natural process from being an occupation primarily of the adult as caregiver to a co-occupation as the child begins to perform tasks with less help to an event which is largely the occupation of the child. Each step toward independent self-care represents a milestone, which is expected and valued (Rogoff, 1993).

For children with autism and their parents, teachers, and other adult caregivers, however, this change in occupational process often does not occur naturally (Kellegrew, 2000), and is affected by a number of factors, including the following:

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This study is part of a series of single case studies investigating embedded music therapy interventions for the inclusion of young children with autism spectrum disorder within a community-based Family and Child Care Program and is based on the first author's doctoral dissertation completed at the University of Witten-Herdecke, Germany.

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- **Motivation/Meaning:** Children with autism may not find value inherent in the self-care task itself or in its outcome. They are unlikely to be motivated to perform the task simply to please an adult or to conform to a social standard among their peers due to deficits in their abilities to relate to others (Spitzer, 2003).
- **Habits/Performance Patterns:** Preference for predictable routines and rituals and restricted interests may interfere with establishing new routines (American Psychiatry Association, 2000).
- **Communication:** Communication deficits may make it difficult for the child to understand the actual task, the sequence of steps to perform it, and the words that accompany or describe it. These communication deficits may also make it difficult for them to express their own needs and preferences easily within the context of performing that self-care task (Boswell & Gray, 2005).
- **Sensory Processing:** Difficulty processing sensory information may interfere in a number of ways, including either sensory seeking or avoidance behaviors in response to sensory input within the environment or inherent in the task, difficulty attending to relevant information, and praxis problems. Sensory processing difficulties may also interfere with efforts to teach self-care tasks. For instance, a child may vehemently resist the hand-over-hand (i.e., putting a hand on the child's hand in order to facilitate an action) assistance offered in an effort to teach the child how to turn the water on and off at the sink during hand-washing routines (Baranek, 1998; Dunn, 1997; Rogers, Hepburn, & Wehner, 2003).
- **Variability of Performance:** In addition, fluctuations and inconsistencies in child capacities, adult responses, and contextual demands influence both task performance and trajectories of progress (Christiansen & Baum, 2005; Wolery, 2000).

Adults parenting and working with children with autism, then, must often maintain the intensity of their caregiver role in the completion of self-care tasks for longer periods of time than those involved with typically developing children (Werner DeGrace, 2004). While greater independence of the child from the adult (and vice versa) may be possible, it is not often that this occurs without intentional intervention and regular, embedded opportunities for practice (Kellegrew, 1998).

Research and clinical applications show that songs can transmit and be used to assist children with memorization of a sequence of information (Enoch, 2001; Gfeller, 1983; Jellison & Miller, 1982; Wolfe & Horn, 1993) and to teach them to manage self-help skills (Gervin, 1991; Michel, 1976; Nordoff & Robbins, 1992). Donna Williams, herself diagnosed as having autism as a child, used songs to accomplish daily life tasks involving a sequence of steps. She suggests using music in the following way:

If someone listens, for example, to the song *Insy-Winsy-Spider*, you can use this tune and write some of your words to the chords of this song and sing simple lessons. The lessons

can be anything you wanted to teach from the different steps involved in going to the toilet to getting out a snack to eat or having a bath. Things like washing hands, order of dressing, emotional expressions and how they feel, whatever involves a simple lesson or sequence, can be put to music. Verses can be added later as the songs are picked up and gradually lessons can be expanded upon (1996, p. 298).

Based on this research regarding music therapy interventions, the experience, and clinical reasoning of the music therapist and occupational therapist, it was hypothesized that using songs to cue or prompt a sequence might be a successful way for a child with autism to participate more independently in selected multi-step self-care routines. Further it was hypothesized that the classroom teacher could learn and apply song interventions successfully in ongoing classroom routines.

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The remainder of this article illustrates the use of embedded song interventions in collaboration with occupational therapy interventions for a young child with autism to improve his performance of basic self-care routines. Both therapists used a collaborative consultative model of service delivery, supporting a classroom teacher to embed intervention strategies into regular classroom routines. The method of the study, including a summary of the rationale and context for the intervention, materials and staff development activities, and design of the study, is presented.

## Method

### *Participants*

Andy and his classroom teacher were the primary participants in this study. At the time of the intervention, Andy was a 3-year, 2-month-old European-American boy enrolled in an inclusive university-affiliated child care program. An external agency (Division of Treatment and Education of Autistic and related Communication-handicapped CHildren [TEACCH], Department of Psychiatry) had diagnosed him with Autism Spectrum Disorder (ASD) using the Psychoeducational Profile-Revised (PEP-R), Autism Diagnostic Observation Schedule (ADOS), Vineland Adaptive Behavior Scales, Childhood Autism Rating Scale (CARS), clinical observation, and parent interviews. Andy met the criteria for Autism Disorder as outlined in the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders* (1994).

Andy was a lively and humorous child with strengths in early academic concepts, including the ability to identify

numbers and letters prior to age two and to label when they were in sight or in direct imitation of an adult. He demonstrated interest and spontaneous engagement in activities involving music, including singing, dancing, and listening to music. However, he demonstrated functional deficits in communication, social interaction, and daily living skills. When unable to express his needs, Andy became frustrated and exhibited behaviors such as whining, fussing, jumping up and down, or pulling on adults. Andy also had difficulty attending to language unless it involved a familiar song or physical routine. When enjoying a game or activity, Andy accepted other children playing nearby. He watched his peers and sometimes imitated their play. Often, however, he liked to play on his own with his preferred toys (e.g., puzzle, books, shape sorters, peg boards). On some occasions, Andy exhibited self-stimulating behaviors such as hand flapping, and he needed maximal assistance to complete basic activities of daily living.

The child was selected for participation in this study on the suggestion of his classroom teacher, his occupational therapist, and his parents based on his diagnosis of ASD; interest in, and positive response to, singing; and his difficulties with multiple-step tasks such as hand-washing, cleaning up, and toileting.

#### *Client Description*

Targeted outcomes for Andy, documented in his Individualized Education Program, were in the areas of communication, socialization, play, and self-care. These outcomes had been determined based on parent priorities and the input of an interdisciplinary intervention team. Hand-washing, toileting and clean up activities were targeted as specific self-care tasks in need of intervention, based on teacher and parent input, frequency of opportunities for practice within classroom and home routines, and the consensus of the team that it was likely that, provided with appropriate intervention, Andy could become more independent in these activities in a reasonable period of time.

A review of relevant literature regarding toilet training (Bainbridge & Myles, 1999; Cicero & Pfadt, 2002), teaching of hand-washing (Kramer, 1978; Quenville, 1980; Rumfelt-Wright, 2001), and strategies during cleaning up times (Alger, 1984; Furman, 2001) was used to inform the intervention process. Strategies put in place, based on occupational therapy consultation and carried out by teachers in the classroom, included those typically used to support young children with autism in transitions and multiple-step tasks, such as the use of structure and predictable routines (Bailey & Wolery, 1992; Boswell & Gray, 2005), the use of objects as transition cues, and the use of visual supports (Boswell & Gray, 2005; Bryan & Gast, 2000; Fanjul & Ball, 1995; Quill, 2000; Wheeler, 1998) in the form of sequenced picture cues for the steps of each task. After 4 weeks of intervention, these strategies had yielded some positive changes in Andy's ability to perform daily self-care routines in the classroom, but it was determined by the intervention team that these routines were still problematic for him and that greater independence was possible.

Consultation with the on-site music therapist (first author) then occurred. The addition of music therapy interventions to the strategies already in place (which continued) provided an opportunity not only to enhance the range of evidence-based interventions in place for Andy but also to collect data on this intervention in the form of a single case study.

#### *Client Baseline*

Preliminary observation by the music therapist indicated that Andy was very responsive to music and musical activities. According to his classroom teacher, Andy transitioned and managed parts of specific multiple-step tasks when she sang to him during classroom routines, while in the absence of the song, he demonstrated inappropriate behaviors such as stiffening his legs and body, flapping his arms, whining, or trying to escape.

At the time intervention planning began, washing hands (Task #1) was an already familiar routine for Andy. He transitioned to the sink easily when teachers sang to him but was not able to follow the sequence of hand-washing independently. He was able to rub his hands under the running water when prompted by his teacher. All other steps were performed by the teacher or by using the hand-over-hand technique.

Andy had started toilet training (Task #2) 4 weeks before intervention planning began. His teacher started to prompt him to transition to the bathroom at a scheduled time. No task analysis of the steps of toileting had been determined at that time. Andy wore diapers and had urination accidents on a daily basis. He met some of the prerequisite skills for toilet training, including the ability to sit for a few minutes, to imitate, and to follow simple directions. He needed maximal assistance to manage his clothing for toileting. Andy's mother requested a "potty song" to accomplish the new task. The authors did not find a sophisticated song among the existing children songs following the single steps of toileting.

Andy was already familiar with the activities involved in the clean up routine (Task #3). When the pre-composed clean up song was sung to him, he started to clean up his toys and materials. If the teacher did not sing, he did not engage in clean up, or he demonstrated inappropriate behaviors when assisted to complete the task.

#### *Teacher Description*

Andy's classroom teacher had a baccalaureate degree with certification in early childhood education and had taught young children in an inclusive setting for 3 years. She had no prior experience with music therapy interventions but had incorporated the use of music into the classroom routine. For Andy, singing was employed by his teachers as a motivator to use words and actions when he wanted to repeat an activity he enjoyed. For example, he had to say "wheels" to ask for a repetition of the song "The Wheels On The Bus Go Round And Round" (Traditional). To improve his language skills, songs like "Swing Low, Sweet Chariot" (Traditional) were used to work on sounds, imitation, and direct language production during pauses in singing. Activity songs such as "Ring Around

The Rosy" (Traditional) and "Row, Row, Row Your Boat" (Traditional) were used to create opportunities to interact with peers. The classroom teacher participated in the study based on her schedule and classroom activities.

### Setting

The intervention was conducted in Andy's classroom in an inclusive university-affiliated child care program. In addition to Andy, there were six other children, ages 2 to 3 years old, enrolled in the class. Peers included both males and females from different ethnic groups. Four of the children were typically developing and one peer had special needs. The classroom peers participated in the identified multiple-step tasks simultaneously as part of the classroom routine. According to contemporary practice in early childhood education settings (Sandall, McLean, & Smith, 2000), teachers were trained and supported by specialists to embed specific interventions in ongoing classroom routines and activities.

Daily classroom schedule and predictable routines as well as clear visual information were set in place to allow Andy to function most independently during classroom routines (Cryer, Harms, & Riley, 2003; Marcus, Schopler, & Lord, 2001; Schopler, Brehm, Kinsbourne, & Reichler, 1971). Hand-washing occurred several times during the child care day. A sequence of pictures showing the multiple steps of hand-washing (Fanjul & Ball, 1995) was attached to the wall behind the water tap and visible to all children. All of the children in Andy's classroom went to the toilet at scheduled times throughout the day and whenever necessary, and every child went to the bathroom after breakfast. The classroom curriculum allowed free play after breakfast and before circle time. Children engaged in different play areas by themselves or with others. To cue the children to finish their play activity and transition to circle time, a song for cleaning up toys and materials was used.

### Materials

The pre-existing routines and songs used by the teachers within the classroom were valued and incorporated into the intervention. To initiate each task, Andy's teacher used transition objects such as a bottle of soap for hand-washing, a diaper for toileting, and the toy in use for cleaning-up. For the hand-washing task, the teacher used the familiar tune "Row, Row, Row Your Boat" with lyrics appropriate to the steps of hand-washing. Adding new words to a familiar tune is often referred to as the "Piggybacking" technique. For toileting, an original song ("Let's Go Potty," as outlined in Fig. 1) was written by the first author, conveying the demands of the 10-step procedure required for Andy's toilet training. For training purposes and empowerment of the teacher as the primary provider of the intervention, the song was recorded on a CD with the classroom teacher on vocals and distributed to Andy's parents. The pre-composed tune "Clean up!" by Barney and Friends (1992) was used for cleaning up toys and materials after play activities (Task #3). This song was part of an established classroom routine for cleaning up prior to the study.

### Staff Development Activities

The goals, strategies, and procedures of the intervention were identified and discussed in collaboration with the classroom teacher. Specific instructions regarding how the classroom teacher should involve and prompt Andy during the intervention were given and demonstrated to the teacher prior to the intervention. Instructions addressed the following topics:

- The appropriate use of transition objects;
- How to sing the songs or speak the words during the tasks by using an engaging voice and facial expression, and looking at the child;
- How to prompt Andy and how much support to give by singing or saying each step, pointing to the next step, and then using the hand-over-hand technique; and
- How to follow Andy's tempo and give him enough time to respond to each step by pausing or slowing down in the music.

During the intervention, the teacher and the music therapist consistently collaborated in evaluating Andy's progress.

### Design

Data were collected using an alternating treatment design (ATD), which has been shown to be effective in the rapid comparison of the efficacy between two interventions (Alberto & Troutman, 1995; Barlow & Hayes, 1984; Holcombe, Wolery, & Gast, 1994). In this study, a song intervention (Condition A), which followed the steps of each of the three selected tasks by using songs, was compared to a lyric intervention (Condition B), which followed the steps using words only. Condition A (song) and Condition B (lyrics) alternated day by day and were replicated over the three identified multiple-step tasks. Both conditions used the same wording; the song condition merely added a melodic component. Table 1 provides a description of multiple-step tasks and wording. The alternation of the treatment order replicated across tasks was implemented to minimize any learning or order effects associated with receiving the song intervention (Condition A) or lyric intervention (Condition B) first.

### Measurement

Six categories of behaviors were measured for each step of each multiple-step task through direct observation using event recording. Definitions of the categories coded for each step of each multiple-step task are outlined in Table 2. Data were recorded once a day on hand-washing (before breakfast), toileting (after breakfast), and cleaning up (before the morning circle time). The observation time started as soon as Andy and his teacher were ready to perform the first step of each task and ended as soon as the teacher went through all the steps of each task. In the lyric intervention the classroom teacher repeated the verbal prompts two times for each step in each task whereas in the song intervention, she only sang the song once.

# Let's Go Potty!

Words and music  
by Petra Kern

Latin Feel ♩ = 120

Am7 Dm7 G7

Teach - er brings the di - a - per, oh what does this  
Climb - er the step and and clap, clap, clap, get rea dy for your  
Now get up and hold your shirt, and wait for the dia per ex -

4 CM7 B° Am7 Dm7 G7 F7

mean? potty. Teach - er brings the di - a - per, oh what does this  
pert? Use your hands and pull your pants, get down a - nd dy to

8 Swing E7 Dm7 G7 CM7

mean? Let us go to the pot - ty right now,  
pee, pee, pee in the pot - ty right now,  
flush! Flush, flush, flush to make it splash.

11 Dm7 G7 CM7 Clap

Child's name kno - ws how!  
Child's name kno - ws how!  
Child's name kno - ws how!

13 Dm7 G7 CM7 1. 2. Dm7 G7 CM7 B°

Let us go to the pot - ty right now,  
Pee, pee, pee in the pot - ty right now,  
Flush, flush, flush to make it splash. Child's name kno - ws how!  
Child's name kno - ws how!

17 3. Dm7 G7 D♭7 C

All done! What fun!

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Figure 1. Transcript of the song "Let's Go Potty!," written for Andy, addressing the demands of his toileting routine while in the classroom.

Informed consent for study participation was obtained from the parents and classroom teachers. Data were collected for 17 days for the hand-washing task, 11 days for the toileting tasks, and 10 days for the clean up activities. Because of the frequency of the hand-washing routine in the classroom, Andy's difficulty with this task was most prominent for intervention purposes. Both intervention and data collection for the hand-washing task were, therefore, initiated prior to intervention and data collection for the other two tasks.

Agreement between the scores on the subject's performance from two reliability observers (i.e., the first author and an educational specialist consultant to the preschool setting) was calculated prior to the reliability data collection phase to establish a level of agreement greater than 85%. Reliability checks were then carried out on an average of 44.7% of total observations for each multiple-step task and during both conditions by coding videotaped segments for each target behavior. The overall interobserver agreement was 96% (range: 79.2–100%) of the trials.

### Results

Results of this study indicate that the number of steps Andy was able to perform increased for each condition and for each

multiple-step self-care task. The song intervention was more effective than the lyric intervention for the hand-washing and clean up procedures whereas for toileting, the lyric intervention was slightly more effective than the song intervention. The effects of the song intervention versus the lyric intervention are described in more detail below.

*Hand-washing.* Andy's hand-washing performance was observed 9 days for the song intervention and 8 days for the lyric intervention, alternating day by day. The top panel of Figure 2 presents the number of independent steps of the hand-washing routine completed correctly and independently by Andy in both conditions of the study. In the song intervention condition, Andy's performance was constant at a high level. On the majority of days, Andy completed 5 steps of the 7 step routine (71% of the task) independently. Except on day 1 and day 11, he performed only three steps (43% of the task), and on day 9, he performed six steps (86% of the task) of the routine. The steps Andy completed independently were not predictable (i.e., some days he turned the water on, while on others he completed other steps of the routine independently). In the lyric intervention condition, Andy's performance increased steadily but started at a lower level than the song

Table 1  
Sequence of Steps Identified for Each Multiple-Step Task

	Task #1	Task #2	Task #3
Steps	Hand-washing	Toileting	Cleaning up
1	Turn the water on	Get up (get up from play; diaper used as cue to transition to the bathroom)	Get up and get ready to clean up
2	Wet your hands	Walk to the toilet	Pick up a toy/material
3	Get the soap	Climb (climb up a step to the toilet)	Put it away
4	Wash your hands	Pants down (lower the pants)	Pick up a toy/material
5	Rinse your hands	Sit down (sit down on toilet)	Put it away
6	Turn water off	Pee (urinate)	Go where directed by teacher
7	Dry your hands	Get up (get up)	—
8	—	T-Shirt up (participate in redressing, while teacher wipes him off and puts the diaper on)	—
9	—	Pants up (redress)	—
10	—	Flush (flush the toilet)	—

intervention condition. Initially, he completed two steps independently, but after 10 days of intervention, Andy's performance was at the same level as the song intervention condition and appeared consistent as evidenced by three consecutive sessions with five independent steps. On the last day of the lyric intervention condition, his performance dropped to four independent steps. Overall, Andy performed 66% (approximately 4.6 of 7 steps) of the hand-washing task under song intervention conditions, and 57.1% (approximately 4 of 7 steps) under lyric intervention conditions.

**Toileting.** Andy's independent toileting performance was observed 6 days for the lyric intervention and 5 days for the song intervention, alternating day by day. The middle panel of Figure 2 depicts the number of independent steps of the toileting procedure that Andy completed correctly and independently during the song and lyric phase of the study.

In both conditions, little change was observed. Andy's independent performance ranged from 3 to 5 independent steps out of the 10 step routine (30–50% of the task). The steps Andy completed independently in both conditions were mostly walking to the bathroom, sitting down, and getting up from the toilet seat. In the lyric intervention condition, Andy's performance was slightly higher and more stable than the song intervention condition. The song intervention condition was quite variable and decreased over time. Overall, Andy performed 38.2% (approximately 3.8 of 10 steps) of the toileting task under lyric intervention conditions, and 32% (approximately 3.2 of 10 steps) under song intervention conditions.

**Clean up.** Andy's clean up performance was observed for 5 days for the song intervention and for 5 days for the lyric

Table 2  
Definitions of Categories Coded for Each Step for Each Multiple-Step Task

Category	Definition
Did it	The subject performed the action by himself. His teacher did not need to (or did not) provide any support that helped the subject to perform the target behavior. It was an independent performance by the child.
Did not do it	The subject did not perform the correct step or needed to be prompted more than once.
Did it with a prompt	The subject responded correctly, but only after receiving a physical prompt (i.e., the teacher put her hand on the subject's elbow in order to facilitate a step) to do so.
	Visual prompts (e.g., soap bottle, diaper and toy/material) were not recorded as a prompt. After the first time through the song, or after two times saying the step, a prompt could be provided. If the subject needed to be prompted more than one time, it was evaluated, as "Did not do it."
Negative Verbalization Yes/No	Yes: The subject displayed any verbal behavior that was not appropriate. This included screaming or whining. No: The subject displayed appropriate verbal behavior.
Escapes	The subject displayed any physical behavior that was not acceptable. This included running away, flopping to the floor, or pulling away.
Number of times	The number of times the child displayed any of the negative or positive verbalizations was counted.
Skipped the part	The subject or his teacher skipped a step (e.g., the subject was already "up," or "go where directed by teacher" was not requested).

intervention, alternating day by day. The bottom panel of Figure 2 shows the number of independent steps of the clean up routine that Andy completed correctly and independently in both conditions of the study. In the song intervention condition, Andy's performance was very consistently at a high level. Under this condition, Andy completed 4 steps of the 6-step routine (66.6% of the task) independently in all of the sessions. The steps Andy completed independently were "pick up a toy/material" and "put it away," completing these two steps twice. In the lyric intervention condition, Andy initially had only one independent response, which was "put it away." His independent performance was variable but increased to song intervention level (four steps) once on day 6. However, immediately afterwards it dropped to two independent steps, which were "pick up something" and "put it away." Overall, Andy performed 66.6% (4 of 6 steps) of the clean up task under song intervention conditions, and 36.7% (approximately 2.2 of 6 steps) under lyric intervention conditions.

## Discussion

Both the song and lyric interventions were beneficial for all selected multiple-step tasks. However, contextual issues, in-

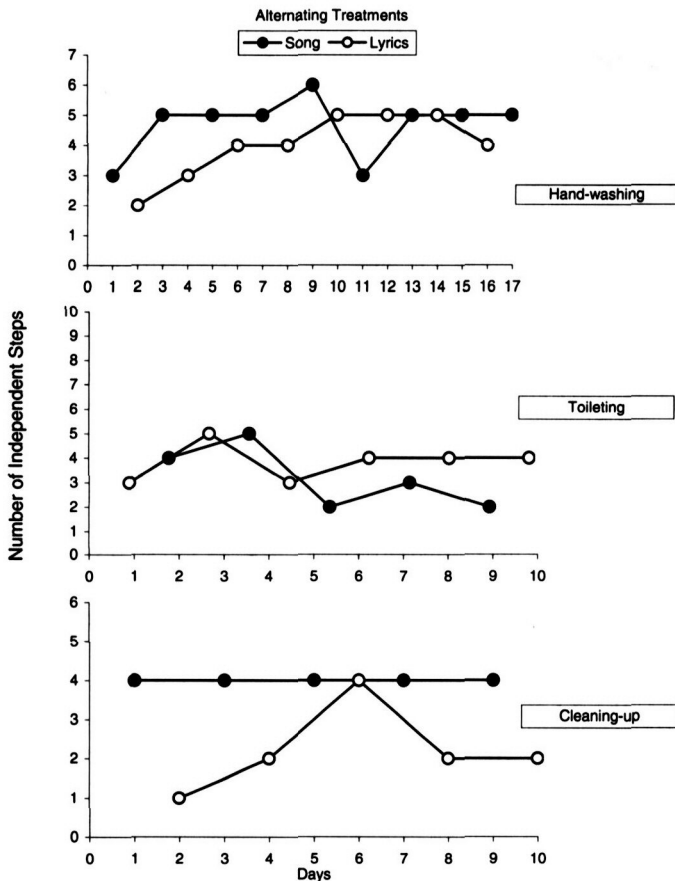


Figure 2. Number of independent steps correctly performed by Andy for hand-washing, toilet training, and cleaning up.

cluding frequency and intensity of intervention, the complexity and novelty of the task, and the inevitable variation in performance that occurs for children with autism yielded differences in specific results among the three targeted tasks.

***Both the song and lyric interventions were beneficial for all selected multiple-step tasks. However, contextual issues, including frequency and intensity of intervention, the complexity and novelty of the task, and the inevitable variation in performance that occurs for children with autism yielded differences in specific results among the three targeted tasks.***

The results of the multiple-step hand-washing task show that Andy's independent performance increased during both conditions. Learning occurred as soon as either form of the routine was implemented. In the beginning of the study, Andy only accomplished one step out of the routine independently (rubbing his hands). As the intervention progressed, Andy learned each step of the hand-washing routine, yet he was not always able to do the same ones or do them in order.

In spite of the short intervention phase (11 days), Andy

made some progress in learning parts of the toileting procedure. Andy learned and performed all steps of the toileting routine, except step 8 (assisting the teacher to re-dress by holding his shirt up). During both conditions, he performed a maximum of 5 steps of the 10 step toileting routine simultaneously. The complexity and novelty of both the toileting procedure and the unique song may have been overwhelming for Andy. However, as suggested in the literature (Bailey & Wolery, 1992; Boswell & Gray, 2005), this intervention established an individualized toileting routine for Andy. It can be seen as a starting point for his toilet training. This way, a bathroom routine will be in place when Andy is ready for self-initiated toileting.

Singing the clean up song (Barney and Friends, 1992) clearly resulted in higher independent performance than the verbal presentation of the sequencing. In all of the "song" sessions, Andy completed 4 steps of the 6-step routine independently. The familiarity of this song to Andy and his classmates, and the frequency with which it was used in the classroom likely had an influence on this result. Also, the learning and use of this song by the other children as a cue about expected behavior created a social or group context for performance that wasn't present in the other two tasks. Andy was already noticing his peers and, at times, imitating their play, so the socially constructed aspects of this task may have facilitated Andy's response to the song as part of the routine. It should be noted that steps 1 ("Get up!") and 6 ("Get up and go to where the teacher wants him to go") were almost never required. The reason for that was twofold: (1) most of the time Andy was next to the area where his toys belonged and did not need to get up in order to clean them up, and (2) his teacher never asked him to go anywhere after cleaning up because the class was waiting for the arrival of two other classmates before starting circle time activities. Therefore, Andy accomplished all steps for cleaning up expected by his teacher as she was singing to him.

In summary, the results of this study suggest that the clinical use of song interventions is more effective than use of lyric interventions for some daily living activities. The cleaning up task, represented by a familiar pre-composed song (Barney and Friends, 1992) and the existence of an established routine was most effective in accomplishing the task. The intervention for hand-washing, which combined a familiar, pre-composed song and individualized lyrics ("Row, Row, Row, Your Boat" with words altered to hand-washing), was more effective in the song presentation than the verbal presentation. The intervention for toileting, which combined a novel song ("Let's Go Potty!" by first author) and a novel routine was less effective in the song presentation than the verbal presentation of the routine. These findings are to some extent similar to those reported by Wolfe and Horn (1993) who investigated the impact of combining spoken and sung stimulus inputs using familiar and unfamiliar songs with typically developing preschool students. Results indicated that familiar and sung materials promote greater learning than unfamiliar songs or spoken words.



Overall, songs can be effective for sequential learning for children with autism within inclusive classroom routines. The teacher was able to successfully implement the song intervention in spite of the short amount of training time, the novelty of implementing music therapy interventions, and the demanding classroom setting. The song intervention was relatively easily implemented by the teacher within the daily classroom routine and was not more time-consuming than giving verbal prompts. As previously suggested by Kramer (1978) and Brownell (2002), using songs for repeating classroom routines might be more pleasant and motivating for children and staff than giving verbal reminders throughout the child care day. It is however important to note that the consultation of music therapists and occupational therapists is crucial to the success of the intervention.

**Limitations of the study:** There are limitations imposed by the experimental design. The intervention was only implemented for one participant, so generalization of the results to other children should be undertaken with caution. Moreover, it cannot be assumed from this study that other teachers are willing or able to implement song interventions. The ATD used to evaluate whether the song intervention or the lyric intervention was more effective may have interfered with the child's learning process. It may have been confusing for Andy that the song was sung on one day and not on others. However, the ATD was used because it is an effective and rapid means of evaluating the efficacy of one treatment over another.

**Future implications and clinical applications:** The use of familiar songs and/or melodies and use of the "Piggybacking" technique may offer additional or alternative support for improving the self-care performance of young children with autism. Because music is a natural part of children's lives, it may be used to motivate and enliven engagement in challenging tasks, including activities of daily living. Teachers, therapists, and other professionals working with children diagnosed with autism may want to consider including music in daily routines and collaborating with music therapists to develop innovative approaches to designing intervention for young children. Also, future research directions should include investigation of whether teaching of an individualized (not precomposed) song prior to its use in intervention eliminates the potentially distracting feature of song novelty and whether this individualized song is more effective than a pre-composed song or the "Piggybacking" technique.

### Conclusion

Despite the apparently mundane and concrete characteristics of routine self-care tasks, the ability of a child to complete these tasks as independently as possible has significance and meaning not only for the child but also for adult caregivers. When the potential for that independence is impeded by disability, it is important for music therapists to approach intervention with both tenacity and imagination, including consultation and collaboration with professionals in other disciplines. This case illustrates how the expertise and creativity of

both an occupational therapist and a music therapist contributed to an intervention that improved the ability of a young child with autism to engage more independently in selected self-care tasks. The authors hope that this will inspire not only more clinical collaboration between music therapists and occupational therapists but also further research efforts between these two disciplines.

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