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Gabrielle Lee  
glee329@uwo.ca

Jianjun Cheng

Sheng Xu

Hua Feng

Zheqi Guo

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Gabrielle T. Lee, Jianjun Chen, Sheng Xu, Hua Feng, and Zheqi Guo

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### Abstract

The purpose of this study was to investigate the effects of a self-monitoring intervention on the independent completion of dishwashing for three boys with autism (age 6, 7, and 8) in China. The self-monitoring intervention included visual task analysis, in vivo modeling, self-recording, video self-feedback, and reinforcement. A multiple probe across subjects design was used. Prior to the study, the children had limited or no dishwashing skills, nor did they receive any training on self-monitoring. All three children acquired dishwashing and performed the task independently without supervision one week after the intervention. Their parents were very satisfied with this intervention.

**Key Words:** self-monitoring, daily living skills, visual supports, autism, China

## Effects of Self-Monitoring Intervention on Independent Completion of a Daily Living Skill for Children with Autism in China

Independence in daily living skills is one of the most important goals in the education and treatment for young children with disabilities, including children with autism spectrum disorder (ASD). ASD is a neurodevelopmental disorder defined by deficits in reciprocal social communications and rigid patterns of repetitive behaviors with or without cognitive impairments (American Psychiatric Association, 2013). As a result of impairments associated with ASD, many affected individuals do not acquire functional daily living skills in the natural environment unless these skills are specifically taught. The lack of independent daily living skills typically creates social stress and burden for their families due to the amount of time and effort involved in completing or assisting with daily routine tasks (Koegel et al., 1992). Thus, it is extremely important to establish independence in daily living skills as early as possible.

When teaching daily living skills, it is necessary to minimize dependence on the instructor for task completion in order to promote independent functioning in the individual's daily life. Interventions that promote independent task completion are thus preferred options, such as visual supports, video-based instruction, and self-management.

### **Visual Supports**

Visual supports or self-instructional strategies with self-monitoring have been developed to teach independent completion of complex tasks for individuals with ASD or other developmental disabilities in various applied settings. For example, picture prompts have been used for teaching independent completion of complex vocational or daily living skills to adolescent students or young adults with ASD and/or intellectual disabilities in the school setting (Ganz & Sigafoos, 2005; Wacker & Berg, 1983; Wacker, Berg, Berrie, & Swatta, 1985). The

researchers also reported that acquired skills were maintained one to four months after training. Pierce and Shreibman (1994) incorporated picture prompts in a self-management package to teach basic daily skills to children with ASD and found that these children not only acquired independent daily living skills, but also completed tasks without adult supervision in clinical and home settings. Checklists with pictures or script prompts were also effective for individuals with intellectual disabilities to self-monitor vocational task completion in school or work settings (Agran et al., 2005; Minarovic & Bambara, 2007; Rouse, Everhart-Sherwood, & Alber-Morgan, 2014). Visual supports are applicable to most individuals who are able to follow at least one-step instructions.

### **Video-based Instruction**

In addition to visual activity schedules and checklists, video-based instructions offer another form of instructional support to minimize instructor-delivered prompts as well as facilitate independent task completion of complex skills. Researchers have utilized video modeling to teach individuals with ASD independent completion of daily living skills in applied settings (Bereznak, Ayres, Mechling, & Alexander, 2012; Charlop-Christy, Le, & Freeman, 2000; Shipley-Benamou, Lutzker, & Taubman, 2002). Video models included either peers (Bereznak et al., 2012; Charlop-Christy et al., 2000) or student self-models (Shipley-Benamou et al., 2002). These findings indicate that children can acquire complex chained skills with visual self-instruction strategies appropriate to their needs and ability levels. The children also need to have an observational learning repertoire to benefit from video-based instruction. Research to date has provided evidence on several ways to incorporate video-based instruction to teach self-help skills. However, none of the above-mentioned studies used videos for self-evaluation or self-feedback to improve self-help skills for children with ASD.

## **Self-Management**

Self-management is an established evidence-based intervention (National Autism Center, 2015; Wong et al., 2015) and a pivotal behavior for further skill development in children with ASD (Koegel, Koegel, Harrower, & Carter, 1999). Because self-management requires a set of particular skills, the components in self-management packages typically consist of self-monitoring, self-observation, self-recording, self-evaluation, and self-reinforcement (Carr, Moore, & Anderson, 2014). Researchers have also incorporated visual supports in self-monitoring to promote independence for individuals with ASD or other developmental disabilities. For example, Cihak, Wright, and Ayres (2010) used self-modeling pictures in self-management training to increase student on-task behavior, while Delano (2007) employed self-modeling videos to teach self-monitoring of writing for teenage students with ASD in general education classrooms. Deitchman, Reeve, Reeve, and Progar (2010) reported that video self-feedback was effective to improve social initiations for children with ASD. Pierce and Shreibman (1994) implemented a picture-based self-management intervention to teach daily living skills to children with ASD in a clinical setting and generalized it for the home setting. Specifically, they used pictures of daily living tasks to prompt task completion. The children in their study learned to follow new picture sequences across tasks and settings and maintained the new skills when the instruction was removed during follow-up probes.

The existing evidence suggests various forms of visual supports combined with self-management were effective to increase independence for individuals with ASD. Although most of the self-management studies were conducted in school or clinical settings, empirical evidence also supports the use of visual supports or in conjunction with self-management in the home setting. For example, Lui, Moore, and Anderson (2014) employed a parent-implemented self-

management program to teach young children with ASD to follow directions in completing daily routines at home. Shrestha, Anderson, and Moore (2013) used video modeling from the participant's view point combined with chaining to teach several self-help skills to a pre-school-aged child with ASD at home. Some researchers implemented self-management interventions to improve self-help skills in the clinical setting and then probed generalization and/or maintenance of acquired skills at the participants' homes (Pierce & Schreibman, 1994; Shipley-Benamou et al., 2002).

Dishwashing is one of the most frequent activities of daily living that maintains sanitation in a household and can lead to a potential vocational task for the future. It is also one of the many important daily living skills for self-care to promote independence. When children learn to complete the task independently, it can relieve the burden and stress on their caregivers (Koegel et al., 1992). Current literature suggests the possibility to incorporate visual supports into self-management to teach independent completion of dishwashing as a daily routine to children with ASD (Carr et al., 2014).

Although visual supports and self-management are established interventions for individuals with ASD in western cultures, such evidence-based practices have very limited empirical evidence with Chinese samples (Clark & Zhou, 2005; Liu et al., 2011). The prevalence of ASD in China is estimated close to 1% as reported in western countries, meaning approximately at least 13 million individuals with ASD (Sun, Allison, Matthews, et al., 2013; Wong & Hui, 2008). However, services for families of children with ASD are sparse and almost exclusively provided for young children prior to school age (McCabe, 2013). The needs of families of older children with ASD continue to be unmet. Self-management is one potential option that does not require continuous professional resources while providing necessary support

to increase independent functioning for individuals with ASD. Prior to adopting an intervention for a wider implementation, it is imperative to empirically validate the use of self-management for children with ASD in China.

In response to the gaps in the literature and in practice, the present study utilized a self-monitoring intervention to increase independent task completion of dishwashing at home for three elementary-aged children with ASD in China. The purpose of the present study was to teach three young children with ASD to self-monitor their dishwashing activity after each meal/snack and to evaluate the independent completion in the home setting. A self-monitoring instruction involving picture task analysis, in vivo modeling, self-recording, video self-feedback, and reinforcement was developed. The visual supports included in this study consisted of visual task analysis and video self-feedback during self-monitoring. The video self-feedback is a relatively novel utilization of video-based instruction in a self-monitoring intervention. Follow-up probes were conducted to evaluate the maintenance of independent dishwashing after meals in the home setting. Social validity based upon the parents' satisfaction and acceptance of this intervention was obtained.

## **Method**

### **Participants**

Three male children (Jia, Yi, and Bei, pseudonyms) diagnosed with ASD participated in this study. They were recruited through the website of a university affiliated autism treatment center for children with ASD in a major inland city in China. Parental consent was obtained prior to the study. These children all received their diagnosis from physicians using the Chinese version of Childhood Autism Rating Scale (CARS; Schopler, Reichler, & Renner, 2002) and the diagnostic criteria of *Diagnostic and Statistics Manual for Mental Disorders* (DSM-IV)



(American Psychiatric Association, 1994). These children were selected to participate in this study because their parents considered dishwashing one of the most important skills among all daily routines and indicated a desire for their children to learn this particular skill. The parents reported that they intended to teach dishwashing but did not know how. They also expressed their stress and frustration having to complete this task for their children on a daily basis.

Jia was 6 years old at the time of the study. He was diagnosed with autism and had an IQ score 69 from the Chinese version of *Wechsler Intelligence Scale for Children*, 4<sup>th</sup> edition (Wechsler, 2003), indicating a mild intellectual disability. His verbal communication skills included requesting, asking and answering simple questions, and following verbal directions. He could label common items and their functions, as well as read/write Chinese characters and numbers. As for self-help skills, he was toilet trained, practiced appropriate table manners, and could dress as well as groom himself (e.g., tooth brushing, showering). He did not clean up his room, wash his dishes, or do laundry. His parents wanted him to learn some simple household chores.

Yi was 8 years old at the time of the study. He had a diagnosis of ASD but his IQ score was not reported in his profile. He had verbal communication skills to express his needs. His reading level was equivalent to the first grade and could comprehend concepts of comparison, spatial relations, and time. He also had basic self-help skills, such as using the toilet, grooming, showering, and dressing himself. His parents reported that they had to constantly remind Yi to complete his daily living activities, such as morning and bedtime routines. Yi did not know how to clean the house, doing laundry, and washing dishes.

Bei was 7 years old at the time of the study. He was diagnosed with autism with no IQ score reported. His reading level was equivalent to typical children at his age. He also had

adequate comprehension of the concepts of comparison, spatial relations, and time. He also had appropriate functional communication and basic social conversations, including retelling stories and answering questions about the stories he heard. In the area of self-help skills, he was toilet trained and could feed himself, but he needed assistance or supervision with step-by-step verbal directions to complete tasks of dishwashing, cleaning, grooming, and schoolwork.

### **Settings and Materials**

The study took place in the kitchen in the home environment with the presence of the instructor and one of the parents. Jia's intervention was conducted in the autism center due to his family relocation at that time, but the maintenance probes were conducted at Jia's new home. The parents observed the instruction and videotaped some sessions conducted at home but were not involved in any of the instruction throughout the study.

The materials used included the dishwashing equipment (i.e., bowls, sponges, and liquid dish soap), a dishwashing task analysis booklet, a self-management recording form, and a camcorder to record the target student washing a bowl for self-recording. The task analysis booklet contained eight sequenced pictures with a step number at the top right corner and Chinese texts (same as in Table 1) appropriate to the children's reading level on the bottom of each picture. This booklet could be opened into a long strip for display or folded into the size of one picture (15 cm x 25 cm). The same pictures were also used in the self-recording form for the participants to record their completion of each step. The eight steps of task analysis included getting dish soap and sponge, rinsing inside of the bowl and scour leftovers, pouring detergent on the sponge, using the sponge to scour inside of the bowl, using the sponge to wash outside of the bowl, rinsing inside of the bowl, rinsing outside of the bowl, and placing the bowl on the

dishrack. See Table 1 for the self-recording form (pictures omitted) used by the participants in this study.

### **Experimental Design**

The study utilized a multiple probe across participants design, consisting of a baseline, an intervention condition with two main phases (instruction of dishwashing and instruction of self-monitoring), and a follow-up maintenance condition conducted one week after the mastery criterion for self-monitoring was reached for each participant. Dishwashing with picture task analysis was taught to 87.5% accuracy (7 out of total 8 steps) on independent dishwashing for three consecutive probe trials prior to the introduction of self-monitoring instruction. Self-monitoring instruction was divided into sub-phases of instruction on self-recording with assistance and independent self-recording with thinning schedule of reinforcement in the sequence of 1:1, 1:3, 1:7, and eventually self-delivery of reinforcement. The criterion for reinforcement schedule thinning was 87.5% agreements (7 out of total 8 steps) for three consecutive probe trials. The intervention ended when each participant achieved the mastery criterion for self-reinforcement in self-monitoring. One week following the completion of intervention, maintenance probe trials were conducted at the children's homes.

### **Procedure**

**Baseline.** The materials for dishwashing were set up at the kitchen sink. The dishwashing task analysis booklet was unfolded into eight pictures and displayed on the shelf approximately 2 cm from the sink, facing the participant. After each meal/snack, each participant was given the verbal direction, "Follow the steps in the pictures and wash your bowl." After the participant completed washing a bowl, the instructor gave verbal praise (e.g., "Good listening") without any other instruction.

**Intervention.** The intervention condition consisted of two main phases: a) dishwashing instruction: washing bowls and b) self-monitoring instruction: self-recording of the individual's dishwashing from video tapings. Initially, only dishwashing instruction was introduced. Instructional trials were conducted five times throughout the day, following breakfast, lunch, and in-between meal snacks. To create more opportunities for the children to wash their bowls, they were given snacks and meals in a bowl. The children were asked to wash a bowl for each instructional trial. Under the intervention condition, a probe trial without any instruction was conducted after dinner to test the child's skill acquisition.

In the beginning of a session, two sets of materials for dishwashing were prepared for the instructor to provide modeling for dishwashing. After giving the verbal direction, the instructor pointed to the first picture (e.g., "This is Step 1: get soap and sponge"). The instructor then provided modeling and asked the student to perform the same task. If the participant did not perform the step accurately, the instructor provided physical assistance and repeat the same step until the participant could perform this step independently. The next step was then presented with the same procedure. As each participant could independently perform the first two steps in the dishwashing sequence, only gestural prompts (pointing to the picture) with minimum verbal directions (e.g., rinse inside) were provided on steps performed inaccurately. The purpose of fading instructor prompts was to shift the stimulus control from the instructor to the pictures for independent task completion. The instructor then delivered the reinforcer pre-specified by the participant immediately upon the completion of dishwashing task. In the beginning instructional sessions, each trial lasted approximately 20 minutes due to required guidance for dishwashing or self-monitoring procedure. Session duration reduced to fewer than 10 minutes as the children acquired the skills with relatively high accuracy.

The self-monitoring data recording form (Table 1) was introduced when each participant achieved 87.5% accuracy (7 out of 8 steps) in the entire chain of dishwashing for three consecutive probe trials under the intervention condition. The procedure of self-monitoring consisted of a training phase followed by an independent recording phase. The independent self-recording phase was further divided into sub-phases with gradual thinning of reinforcement schedules.

During the self-monitoring training phase, the instructor first asked the participant to choose their preferred reinforcer and then gave verbal directions on how to record the steps of completion in the form by (a) videotaping the child's completion of the dishwashing task, b) the instructor and participant observing the videotaping on each step, c) evaluating the accuracy of each step, d) recording the accurate steps with a smiley face sticker while ignoring inaccurate or omitted steps by leaving the recording space blank, e) counting how many accurate steps completed, f) checking point-to-point agreements on accurate steps between the instructor's and the participant's recordings, and g) determining the obtainment of the reinforcer. If the instructor's and participant's recordings had 100% agreement, the participant immediately obtained the reinforcer at the end of the trial. If any disagreement occurred, both the instructor and participant immediately reviewed the videotape, observed those particular steps, and obtained agreements for all steps before the child obtained the reinforcer. The instructor also provided feedback for each disagreement to explain the requirements or missing components for accurate completion.

When the agreement between the instructor and participant achieved 75% (6 out of 8 steps) for one probe trial, the child then moved to the independent self-monitoring phase. In the independent phase, the child independently performed the entire dishwashing task and self-

recorded the accuracy with the data recording form. The video recording was set on a tripod by the instructor in the morning available for videotaping the sessions. During this phase, the instructor provided in-person supervision for two trials out of a total of five instructional trials per day. The instructor also randomly selected a videotape from three unsupervised trials per day to check the agreement. When any disagreement occurred, the instructor and children watched the video and recorded steps of accuracy again. If the agreement was lower than 50% (4 out of 8 steps) for three consecutive trials (either from direct or video observations), the participant was moved back to the training phase with the presence of the instructor in every trial until a 75% agreement was reached. The child was reinforced according to the instructor specified schedule of reinforcement based on the percentage of agreement on accurate steps of task completion.

During the independent self-recording phase, video self-feedback was removed, and the student used the visual tasks analysis on the recording sheet to self-record the accurate steps of task completion. Once the participant reached criterion on agreements, the instructor informed the child prior to the instructional trials (e.g., “You did great. This time you have to get three smiley faces to exchange for extra music time.”) After the dishwashing task was completed, the child self-recorded his own task completion, informed the instructor whether he achieved the goal by showing the data recording form, and then obtained the pre-specified reinforcer. The reinforcement schedule was determined based on the percentage of accuracy in the dishwashing task. The density of reinforcement schedule was thinned systematically according to the pre-determined criterion. The initial schedule was one reinforcer to each step of accurate completion (1:1), and when the child achieved 87.5% agreement for three consecutive probe trials, the reinforcement schedule was thinned to one reinforcer to three steps of accurate completion (1:3). The schedule was thinned to 1:7 and then to self-delivery of reinforcement when agreement

achieved 87.5% for two consecutive probe trials.

During the phase of self-delivery of reinforcement, the participant pre-specified one item or activity with amount or time prior to the onset of each trial and self-delivered the reinforce, if the criterion was achieved (87.5% accurate dishwashing task completion plus 87.5% accurate self-recording). The intervention was completed when the child achieved the criterion for self-reinforcement for three consecutive probe trials.

**Follow-up maintenance.** Follow-up maintenance trials were conducted one week following the mastery of dishwashing and self-monitoring. The procedure was identical to the baseline, except that the children were not provided with any verbal direction or supervision. The instructor set up the camcorder on a tripod and recorded the follow-up trials for the purpose of data recording but did not stay with the children to supervise their dishwashing. The self-recording form was placed on the counter next to the sink within the child's eyesight for them to record their task completion during follow-up trials.

## **Response Definitions**

### **Interobserver Agreement and Treatment Integrity**

All instructional and probe trials were videotaped. A graduate student who was naïve to the purpose of this study served as the second observer to record data independently and separately from the experimenter. The agreement was assessed 33% of the total probe trials distributed evenly across conditions for each child. The percentage of agreement was calculated using the smaller number of agreement divided by the larger number of agreement and multiplied by 100. The agreement ranged from 87.5% to 100% with a mean of 98.2% for

accuracy of dishwashing completion and ranged from 75% to 100% with a mean of 96.4% for accuracy of child self-recording.

To assess treatment integrity, the observer watched the videos of instructional trials and used a checklist to score the implementation of each trial: a) preparation of materials, b) accurate verbal directions on dishwashing, c) appropriate prompts for dishwashing, d) appropriate verbal praises or corrections for dishwashing, e) reviewing the video with the child on each step, f) appropriate instruction in recording accurate task completion of each step, g) checking data with the child on each step, and h) appropriate praise for data recording. Integrity was calculated by dividing the number of correctly implemented steps by the total number of steps examined, and then multiplied by 100. Treatment integrity was assessed 33% of the total trials under the intervention condition evenly distributed across the dishwashing instruction phase and the self-monitoring phase. Treatment integrity was 100% for all trials assessed.

### **Social Validity**

Social validity was measured by the parent's evaluation and report regarding satisfaction and acceptability of this training program. A parent evaluation form with 12 items rated with a Likert scale from 1 to 5 (strongly disagree, disagree, neutral, agree, strongly agree) created by the experimenters was used (Table 2). These evaluation items included the appropriateness of the experimenter, instructional materials, training times, locations, reinforcers, instructional prompts, self-recording and self-reinforcement procedures, verbal prompts, gestural prompts, and overall satisfaction about the self-monitoring program.

## **Results**



Figure 1 depicts the percentage of correct responses for completing dishwashing and self-recording in each step for the three children during their daily probe trials across all conditions. During baseline, Jia followed visual task analysis of dishwashing and completed with 25% (2 steps) accuracy, Yi completed 0% to 12% (one step) accurately, while Bei did not complete any steps accurately during baseline probe trials. All children did not use the self-recording form during baseline.

Under the intervention condition, one probe trial without any instruction was conducted at the end of the day to test each child's acquisition of the target skills (data shown in Figure 1). The procedure used during this trial was identical as in the baseline probe trials. All three children reached accurate dishwashing completion starting from low levels gradually reaching 100% accuracy. The mastery criterion for dishwashing was 100% accuracy in probe trials for three consecutive days. Jia, Yi, and Bei achieved the mastery criterion on dishwashing in 23, 12, and 11 days, respectively.

During the self-recording instruction phase, Jia and Bei had a low level of agreement, while Yi had a mid-level agreement initially. Jia and Yi achieved the first 75% agreement on the 4<sup>th</sup> day and Bei on the 3<sup>rd</sup> day. During the independent self-recording phase, Jia, Yi, and Bei reached the criterion on self-reinforcement in 12, 10, and 12 days, respectively. Jia started with a low level of agreement on self-recording (25%) with increased accuracy in the following probe trials and reached criterion performance in a total of 16 days. He continued to maintain accuracy at a relatively high level for both dishwashing and self-monitoring during maintenance probe trials at home. Yi's performance of self-recording was initially at the mid-level (50%), steadily increased to a high level and reached mastery on the 14<sup>th</sup> day of the intervention. Bei's first

probe on self-recording was at 37% agreement but reached a high level of mastery on the 15<sup>th</sup> day.

For Jia, the thinning of reinforcement density from 1:1 to 1:3 occurred on the 8<sup>th</sup> day, from 1:3 to 1:7 on the 11<sup>th</sup> day, and from 1:7 to self-reinforcement on the 14<sup>th</sup> day during the self-monitoring phase. Yi was at a 1:1 ratio of reinforcement from day 1 to day 6; 1:3 ratio from day 7 to day 8; 1:7 ratio from day 9 to day 11; and self-reinforcement from day 12 to day 14. Bei was at a 1:1 ratio for seven days, 1:3 for three days, 1:7 for two days, and self-reinforcement for three days.

Data on maintenance showed that all children maintained the skills of dishwashing and self-monitoring at a high level of accuracy one week following the mastery of dishwashing and self-monitoring skills at home. Yi and Bei maintained both dishwashing and self-monitoring at 100% accuracy. Jia's self-monitoring was at 100% agreement while dishwashing was 100% and 87%. All children independently completed dishwashing and self-monitoring within 15 minutes after dinner with any adult instruction or supervision during maintenance probes.

The parents of the participants completed the satisfaction survey questions (Table 2). The average ratings on the 12 items ranged from 4.75 to 5, with a mean of 4.9 for all items. The children's parents were very satisfied with the procedures and results of this self-monitoring intervention. The parents also reported that their children continued to use a self-recording form to record their dishwashing completion after each meal and obtain reinforcement after task completion without adult supervision, even after the study was completed. The parents of Yi and Bei reported that they created similar forms for their children to self-monitor their daily living activities or other household chores, such as morning/bedtime routines and mopping the floor.

## Discussion

This study used a self-monitoring intervention to improve and maintain independent completion of dishwashing tasks for three children with ASD in the home setting. The self-monitoring intervention contained visual task analysis with pictures and scripts, verbal instructions, in vivo modeling, video self-feedback, and reinforcement. The results indicated that all three children improved dishwashing, acquired self-monitoring, and maintained both skills at a high level without supervision one week following the completion of the intervention. Results of the social validity survey indicated that all parents were highly satisfied with this intervention. This study extended current literature on self-management by adding video self-feedback as one of the components during instruction. This use of visual task analysis is an additional strength to increase agreements and to decrease verbal prompts, especially during schedule thinning. Results of this study also indicated clinical significance that all three children maintain independent completion of dishwashing one week after the intervention in their own homes without adult supervision.

The ultimate goal of this intervention was to teach the children independent task completion using self-monitoring. After skill building on dishwashing, the results of self-monitoring acquisition were consistent with previous findings that picture prompts presented in the form of step-by-step task analysis were effective to establish independent task completion of complex skills (Pierce & Schreibman, 1994; Wacker & Berg, 1983; Wacker et al., 1985). The study extended Deitchman et al's (2010) video self-feedback procedure in increasing social interactions by using the same procedure for children to self-record their accuracy of dishwashing, which strengthened their self-monitoring repertoire. The three children required 14 to 16 sessions to reach criterion performance on self-monitoring (90% agreements and accurate

delivery of reinforcement) for an eight-step dishwashing task. It may require more sessions for them to acquire a more complex task, so it is probably practical to start self-monitoring intervention with a less complex skill with the fewest steps in task analysis.

During follow-up maintenance probes, self-monitoring was not withdrawn completely. The children continued using the self-recording form (Table 1) to record their task completion and self-deliver reinforcement without picture tasks analysis booklets and video recordings for self-feedback. This was similar to Agran et al (2005b), where the children continued to use the checklist for monitoring task completion. The present study also suggested that the self-recording form continued to function as an important visual support for independent task completion. It is important to examine whether the children would maintain independent task completion without self-monitoring during follow-up maintenance in future research.

Several components were involved in the children's acquisition of dishwashing and self-monitoring, including a) use of visual (pictures and texts) task analysis booklet, b) video footage of children themselves performing the task for self-recording on accurate task completion, c) a data recording form with smaller pictures and texts from the booklet, and c) gradual schedule thinning until self-reinforcement. Visual task analysis as an antecedent presentation to prompt chained responses may have facilitated skill acquisition without relying on others' verbal or physical guidance. Self-recording from watching themselves in the videos possibly aided the children's acquisition of self-evaluation. Recording the accuracy of task completion from videos also could strengthen accurate task completion and make self-corrections on inaccurate steps. As Pierce and Shreibman (1994) pointed out, it is possible that young children were more likely to rely on visual supports (e.g., pictures, videos) than verbal instructions only. However, the design of this study did not allow component analysis. It is necessary for future researchers to conduct

component analysis to test which component of self-monitoring is responsible for a particular target behavior.

According to the children's parental follow-up reports one month after the completion of study, all children continued to perform independent dishwashing as a daily routine. It was possible that the self-monitoring intervention established a daily routine of dishwashing after each meal for the children in the home setting. The parents of the three children were very impressed that their children learned to wash their own bowls after each meal without their reminders or supervision on a daily basis after the study was concluded. Of the three children, only Jia was trained at the autism center and the acquired skills were generalized to his home. Additionally, Yi and Bei's parents also reported that they created similar forms and observed their children using the self-recording forms for other daily activities or homework completion. Future studies may examine the effects of self-monitoring across different daily living skills at home or other settings.

Limitations of this study included that a) the experimental control for self-recording was not well established, b) the instruction was time and labor intensive, c) generalization probes were not conducted, and d) the social validity for children was not obtained. The introduction of self-recording instruction for the second and third participants should be based on a pre-determined criterion achieved by the previous participant in a staggered fashion with sufficient overlaps between baseline and intervention conditions across participants in order to achieve rigorous experimental control.

The dishwashing skills could have been established during pre-experimental sessions. The instruction of dishwashing in conjunction with self-monitoring requiring intensive

professional efforts and clinical judgements seemed time and resource consuming. Although a simplified instructional procedure for the parents to implement was considered, the parents in our study did not feel ready to receive such training and implement the procedures at home. Thus, parent education sessions on the importance of their roles on their children's intervention and knowledge of ASD may be necessary prior to training in Chinese culture. Once parent training is acceptable, professional effort may be further reduced. Future researchers should consider parent education sessions to establish acceptability of parent training and design a training program with professional supports, such as in-home visits or consultation.

During the skill building sessions, we only instructed the children to wash bowls but observed that the acquired skill was generalized to wash spoons and chopsticks they used for meals or snacks. It is necessary to systematically probe generalized dishwashing skills with other types of dishes during and after the skill building sessions. In addition, the selection of daily living skills as targets should also include other types of daily living skills based on the need of each child in order to further evaluate the generalized use of self-monitoring across daily activities. The follow-up maintenance should be experimentally assessed beyond one week measured in this study.

Social validity could also expand to survey the parent's perceived stress before and after the intervention, as well as the feasibility and acceptability of parent-implemented self-monitoring at home. It is also important to assess intervention satisfaction in the procedure and outcomes for the children participating in this study.

Given the supports from the self-management literature for children with ASD (Wong et al., 2015), particularly studies conducted in the home setting (e.g., Lui et al., 2014; Pierce &

Schreibman, 1994; Shipley-Benamou et al., 2002; Shrestha et al., 2013), our preliminary findings that Chinese children with ASD learned to use self-monitoring for dishwashing without supervision at their own homes are encouraging. The short-term maintenance effect obtained in this study suggested that self-monitoring was a promising intervention to promote independent functioning for families of older children with ASD in China. The implications of this study are particularly significant due to the limited resources for families of children with ASD in China. Once the self-monitoring skills are acquired, adult supervision can be eliminated or minimized. The increased level of independence for children will also have the potential to mitigate the burden for caregivers of children with ASD in China.

Table 1

*Self-recording form (child version). Pictures (not appeared in table) are provided along with the description of each step.*

| Number  | Tasks  | Smiles |
|---|--|--------|
| <b>1</b>  | Get dish soap and sponge                     |        |
| <b>2</b>  | Rinse inside of the bowl and scour leftovers |        |
| <b>3</b>  | Pour detergent on the sponge                 |        |
| <b>4</b>  | Use the sponge to scour inside of the bowl   |        |
| <b>5</b>  | Use the sponge to wash outside of the bowl   |        |
| <b>6</b>  | Rinse inside of the bowl                     |        |
| <b>7</b>  | Rinse outside of the bowl                    |        |
| <b>8</b>  | Place the bowl on the dishrack               |        |
| <b>Note :</b> Put a smiley face if you achieve a goal. If not, do not put anything. |  |        |
| I'm a little helper.  |  |        |
| I've finished the job! This time I got _____ smiles!                                |  |        |



Table 2.

*Parent satisfaction survey questions*

|   |           |
|---|-----------|
| Your Name:  | Date:     |
| <p>The purpose of this survey is to collect information about your evaluation of this study. Please provide your feedback by checking one of the ratings. Your feedback is appreciated.</p> <p>Rating Scale: 1= strongly disagree 2= disagree 3= neutral 4= agree 5= strongly agree</p> |           |
| 1. The instructor had adequate skills to teach my child.  | 1 2 3 4 5 |
| 2. The content of instruction was appropriate for my child.   | 1 2 3 4 5 |
| 3. Instruction time and location were adequate.   | 1 2 3 4 5 |
| 4. The reinforcers used were appropriate.   | 1 2 3 4 5 |
| 5. The self-monitoring was appropriate for my child.  | 1 2 3 4 5 |
| 6. Self-recording was appropriate for the dishwashing task  | 1 2 3 4 5 |
| 7. Video self-feedback was appropriate for my child   | 1 2 3 4 5 |
| 8. Self-reinforcement was appropriate for my child  | 1 2 3 4 5 |
| 9. The schedules of reinforcement were appropriate for my child   | 1 2 3 4 5 |
| 10. Verbal directions used during instruction were appropriate  | 1 2 3 4 5 |
| 11. Gestural prompts used were appropriate  | 1 2 3 4 5 |
| 12. I am satisfied with the entire self-monitoring program  | 1 2 3 4 5 |

## References

- Agran, M., Sinclair, T., Alper, S., Cavin, M., Wehmeyer, M., & Hughes, C. (2005). Using Self-Monitoring to Increase Following-Direction Skills of Students with Moderate to Severe Disabilities in General Education. *Education and Training in Developmental Disabilities, 40*(1), 3–13.
- American Psychiatric Association (Ed.). (1994). *Diagnostic and statistical manual of mental disorders: DSM-IV*. Washington, DC.: Author.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (DSM-5®)*. Washington, D. C.: Author.
- Bereznak, S., Ayres, K. M., Mechling, L. C., & Alexander, J. L. (2012). Video self-prompting and mobile technology to increase daily living and vocational independence for students with autism spectrum disorders. *Journal of Developmental and Physical Disabilities, 24*(3), 269–285. <https://doi.org/10.1007/s10882-012-9270-8>
- Carr, M. E., Moore, D. W., & Anderson, A. (2014). Self-management interventions on students with autism: A meta-analysis of single-subject research. *Exceptional Children, 81*(1), 28–44. <https://doi.org/10.1177/0014402914532235>
- Charlop-Christy, M. H., Le, L., & Freeman, K. A. (2000). A comparison of video modeling with in vivo modeling for teaching children with autism. *Journal of Autism and Developmental Disorders, 30*(6), 537–552.
- Cihak, D. F., Wright, R., & Ayres, K. M. (2010). Use of self-modeling static-picture prompts via a handheld computer to facilitate self-monitoring in the general education classroom. *Education and Training in Autism and Developmental Disabilities, 45*(1), 136–149.

- Clark, E., & Zhou, Z. (2005). Autism in China: From acupuncture to applied behavior analysis. *Psychology in the Schools, 42*(3), 285–295. <https://doi.org/10.1002/pits.20079>
- Deitchman, C., Reeve, S. A., Reeve, K. F., & Progar, P. R. (2010). Incorporating video feedback into self-management training to promote generalization of social initiations by children with autism. *Education and Treatment of Children, 33*(3), 475–488.
- Delano, M. E. (2007). Improving written language performance of adolescents with Asperger syndrome. *Journal of Applied Behavior Analysis, 40*(2), 345–351. <https://doi.org/10.1901/jaba.2007.50-06>
- Ganz, J. B., & Sigafos, J. (2005). Self-monitoring: Are young adults with MR and autism able to utilize cognitive strategies independently? *Education and Training in Developmental Disabilities, 40*(1), 24–33.
- Koegel, L. K., Koegel, R. L., Harrower, J. K., & Carter, C. M. (1999). Pivotal response intervention I: Overview of approach. *Research and Practice for Persons with Severe Disabilities, 24*(3), 174–185. <https://doi.org/10.2511/rpsd.24.3.174>
- Koegel, R. L., Schreibman, L., Loos, L. M., Dirlich-Wilhelm, H., Dunlap, G., Robbins, F. R., & Plienis, A. J. (1992). Consistent stress profiles in mothers of children with autism. *Journal of Autism and Developmental Disorders, 22*(2), 205–216. <https://doi.org/10.1007/BF01058151>
- Liu, J., Ma, H., He, Y.-L., Xie, B., Xu, Y.-F., Tang, H.-Y., ... YU, X. (2011). Mental health system in China: history, recent service reform and future challenges. *World Psychiatry, 10*(3), 210–216.

- Lui, C. M., Moore, D. W., & Anderson, A. (2014). Using a self-management intervention to increase compliance in children with ASD. *Child & Family Behavior Therapy, 36*(4), 259–279. <https://doi.org/10.1080/07317107.2014.967613>
- McCabe, H. (2013). Bamboo shoots after the rain: Development and challenges of autism intervention in China. *Autism, 17*(5), 510–526.  
<https://doi.org/10.1177/1362361312436849>
- Minarovic, T. J., & Bambara, L. M. (2007). Teaching employees with intellectual disabilities to manage changing work routines using varied sight-word checklists. *Research and Practice for Persons with Severe Disabilities (RPSD), 32*(1), 31–42.
- National Autism Center. (2015). *Evidence-based practice and autism in schools* (2nd ed.). Randolph, MA: Author.
- Pierce, K. L., & Schreibman, L. (1994). Teaching daily living skills to children with autism in unsupervised settings through pictorial self-management. *Journal of Applied Behavior Analysis, 27*(3), 471–481. <https://doi.org/10.1901/jaba.1994.27-471>
- Rouse, C. A., Everhart-Sherwood, J. M., & Alber-Morgan, S. R. (2014). Effects of self-monitoring and recruiting teacher attention on pre-vocational skills. *Education and Training in Autism and Developmental Disabilities, 49*(2), 313.
- Schopler, E., Reichler, R. J., & Renner, B. R. (2002). *The childhood autism rating scale (CARS)*. Western Psychological Services Los Angeles.
- Shiple-Benamou, R., Lutzker, J. R., & Taubman, M. (2002). Teaching daily living skills to children with autism through instructional video modeling. *Journal of Positive Behavior Interventions, 4*(3), 166–177. <https://doi.org/10.1177/10983007020040030501>

- Shrestha, A., Anderson, A., & Moore, D. W. (2013). Using point-of-view video modeling and forward chaining to teach a functional self-help skill to a child with autism. *Journal of Behavioral Education, 22*(2), 157–167. <https://doi.org/10.1007/s10864-012-9165-x>
- Sun, X., Allison, C., Matthews, F. E., Sharp, S. J., Auyeung, B., Baron-Cohen, S., & Brayne, C. (2013). Prevalence of autism in mainland China, Hong Kong and Taiwan: a systematic review and meta-analysis. *Molecular Autism, 4*, 7. <https://doi.org/10.1186/2040-2392-4-7>
- Wacker, D. P., & Berg, W. K. (1983). Effects of picture prompts on the acquisition of complex vocational tasks by mentally retarded adolescents. *Journal of Applied Behavior Analysis, 16*(4), 417–433. <https://doi.org/10.1901/jaba.1983.16-417>
- Wacker, D. P., Berg, W. K., Berrie, P., & Swatta, P. (1985). Generalization and maintenance of complex skills by severely handicapped adolescents following picture prompt training. *Journal of Applied Behavior Analysis, 18*(4), 329–336. <https://doi.org/10.1901/jaba.1985.18-329>
- Wechsler, D. (2003). *Wechsler Intelligence Scale for Children® - Fourth Edition*. San Antonio, TX: Psychological Corporation.
- Wong, C., Odom, S. L., Hume, K. A., Cox, A. W., Fettig, A., Kucharczyk, S., ... Schultz, T. R. (2015). Evidence-based practices for children, youth, and young adults with autism spectrum disorder: A comprehensive review. *Journal of Autism and Developmental Disorders, 45*(7), 1951–1966. <https://doi.org/10.1007/s10803-014-2351-z>
- Wong, V. C. N., & Hui, S. L. H. (2008). Epidemiological study of autism spectrum disorder in China. *Journal of Child Neurology, 23*(1), 67–72. <https://doi.org/10.1177/0883073807308702>