Using an Animated Cartoon Hero in Video Instruction to Improve Bathroom-Related Skills of a Student with Autism Spectrum Disorder

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Abstract: The present study investigated the effectiveness of video hero modeling (VHM) for building four bathroom-related behaviors of an elementary-aged student with autism spectrum disorder. In the VHM intervention, the participant watched a video immediately before going to the bathroom he typically used. In the video, an animated face of a cartoon hero with which the participant was preoccupied and an adult who pretended he was the hero appeared in the bathroom. While the adult (whose head was not shown in the film) engaged in the target behavior, the animated cartoon hero explained that the adult was hero and showed how the student had to behave. A multiple baseline across behaviors demonstrated that VHM interventions contributed to improving the four target behaviors. However, for one target behavior, the video hero praising (VHP) intervention seemed necessary to evoke a correct response in a stable manner.

Self-care skills (e.g., using the bathroom, changing clothes, brushing teeth) are important for independent functioning because they are used every day and relatively frequently (Farlow & Snell, 2000). Therefore, those skills are generally prioritized as targets to teach and typically included in the individualized education program (IEP) for lower functioning students with autism spectrum disorders (ASD).

To teach those skills, instructional technologies developed in connection with applied behavior analysis (ABA) are often used, such as response and stimulus prompting, prompt fading, chaining, shaping, token economy, and self-management, all recognized as evidence-based practices (Alberto & Troutman, 2013). Not all students with ASD are responsive to these traditional skill-building strategies, however. Occasionally, the steps necessary to engage in self-care skills are seen as aversive by students with ASD (Geiger, Carr, & LeBlanc, 2010), who, therefore, may try to escape or avoid and seek more enjoyable stimuli. In addition, when teachers provide prompting (e.g., verbal, model, or physical), students may exhibit aggressive or self-injurious behaviors in order to escape from or avoid the nonpreferred activity and access a preferred activity as soon as possible (Geiger et al., 2010). To promote learning, therefore, it is important to develop a strategy that makes the target activities enjoyable and valuable to the student (McLaughlin & Carr, 2005). One of the strategies that have the potential to make engaging in self-care skills enjoyable and valuable to students with ASD is video hero modeling (VHM) (Ohtake, 2015; Ohtake, Takeuchi, & Watanabe, 2014).

VHM involves showing a video in which a character with which the student is preoccupied engages in the student’s target behavior immediately before the student has to exhibit the behavior. The term “being preoccupied” here means that the student interacts with a given character very intensely and for a significant portion of the time in a
variety of forms, including, but not limited to, talking about the character, playing with a representation of the character, collecting related memorabilia, or pretending he is the character (Gagnon, 2001).

Preoccupation with a hero or special interest is a hallmark of students with ASD (Gagnon, 2001; Winter-Messiers, 2007). By watching a VHM, the student may be motivated to engage in the target behavior because doing so results in following the hero’s wish or being like the hero, which is generally enjoyable or valuable to the student (Ohtake et al., 2014). In this sense, VHM is motivating by enhancing the value of the consequence contingent on engaging in the target behavior and, at the same time, reducing the value of the consequence contingent on escaping from or avoiding the activity or rejecting teacher prompting (Laraway, Snyderski, Michael, & Poling, 2003).

To date, a limited number of studies have examined the effectiveness of VHM in improving the self-care skills of students with ASD. Among the existing research, Ohtake et al. (2014) applied VHM to an elementary-aged student with ASD whose target behavior was keeping his buttocks covered during urination. The VHM intervention was introduced after a video self-modeling intervention was found not to evoke the target behavior. In the VHM intervention, the student watched a video in which an animated tyrannosaurus (i.e., his hero) appeared next to him with its buttocks covered in his pants during urination. The VHM intervention was introduced after a video self-modeling intervention was found not to evoke the target behavior. In the VHM intervention, the student watched a video in which an animated tyrannosaurus (i.e., his hero) appeared next to him with its buttocks covered in its pants during urination. Results showed that the student exhibited the target behavior in a stable manner after the VHM was introduced. In addition, his performance was maintained for more than 2 months. Furthermore, when the student engaged in the correct response, he told his teacher, “I am tyranno.” This comment was interpreted to show that he had a visual image of the hero in mind when he engaged in the task and that being like the hero was valuable to him.

Despite these promising results, however, the study demonstrated a behavior change contingent on introducing VHM only once. Therefore, the functional relationship between VHM and behavior change was not demonstrated in a conclusive or convincing manner. Considering the weakness of the study, Ohtake (2015) followed up with another study in which VHM was applied sequentially in a time-lagging manner to three target behaviors of an elementary-aged student with ASD. The target behaviors consisted of drying hands, folding clothes, and reading lunch menus out loud in an appropriately articulated manner.

In the VHM intervention, the participant watched VHMs, in which the Masked Rider Wizard® (his hero) exhibited a correct response accompanied by matching descriptions expressed by the hero immediately before the student had to engage in the target behavior. Results indicated that unequivocal improvement of each target behavior was observed only when VHM was introduced and the student met the criterion of all the target behaviors within a short period of time. Similar to the findings of Ohtake et al. (2014), when the participant engaged in the third target behavior (i.e., reading menus aloud), he made a comment (“I will do like Wizard”) to his teacher, implying that being like the hero was valuable to him. Considering the potential of this intervention, further research is needed to determine the extent to which the VHM strategy is applicable to students with ASD.

In the process of developing the VHM, Ohtake (2015) and Ohtake et al. (2014) wore single colored gloves and sleeves and manipulated a realistic-looking representation (figure) of the student’s hero engaging in the target behavior in front of the same colored wall. After filming the scene, the authors used video-editing software to make the color transparent and overlapped it with a scene of the natural setting where the student was required to exhibit the target behavior.

The drawback to this process is that not all heroes or special interests are readily available as realistic-looking figures. For example, the hero may be a cartoon character from a TV program for which no realistic-looking representation is commercially available. To extend the applicability of the VHM strategy, alternative methods are needed, as explored in the present study. Specifically, this study investigated the effectiveness of VHM in improving
bathroom-related behaviors of an elementary-aged student with ASD.

Method

Participant

The participant was Shinnosuke, a 12-year-old male student with ASD enrolled in the elementary school division of a special school for students with intellectual disabilities. The student’s IQ scores were not available, but his developmental age was 4 years and 5 month in cognitive/language domains and 4 years and 1 month in the adaptive/social domains, according to the Kyoto Scale of Psychological Development (KSPD; Ikusawa, Matsushita, & Nakase, 2002) – a measure commonly used in Japan to provide estimates of the developmental age of children with disabilities. Shinnosuke used a complete sentence to convey past, current, and future events to a communication partner.

To control his impulsiveness and aggressiveness, Risperidon and Concerta® had been administered starting one year before the start of the study. When Shinnosuke was forced by his teacher to do something he did not want to do, he often shouted out, hit, and kicked the teacher. At age 10, he received video self-modeling interventions to improve his listening behavior and object counting. Although he watched the videos with more than 90% of the time, the target behaviors did not improve.

Before starting the study, informed consent was obtained from Shinnosuke’s mother. The authors informed Shinnosuke’s main teachers of the purpose, methods, expected results of the study, and any possible negative effects of the VHM strategies on participants’ emotions. One of the teachers, in turn, explained the same information to Shinnosuke’s mother. In addition, hero modeling videos were shown to her.

Participant’s Hero

Shinnosuke’s two main teachers (one male and one female) identified as his hero Mr. Takumi Fujiwara (hereafter referred to as Mr. Fujiwara), the main character of a popular Japanese TV cartoon program, “Initial D.” To determine the degree of Shinnosuke’s preoccupation with his hero, the authors developed the Attitudes Toward the Hero Questionnaire (hereafter referred to as AHQ) on the basis of the literature related to special interests (Gagnon, 2001; Uechi, 2011). As shown in Table 1, the AHQ consisted of 15 items divided into five subcategories, “Talking about the hero” (3 items), “Imitating the hero” (4 items), “Accessing to the hero” (4 items), “Playing with the hero” (3 items), and “Duration of the student’s interest in the hero” (1 item).

The male main teacher was asked to rate all items, with the exception of the “Duration of the student’s interest in the hero,” using a Likert-type scale ranging from 0 (“not at all”) to 3 (“very much”). For “Duration of the student’s interest in the hero,” the teacher was asked to choose “yes” if the student’s interest had lasted for 6 months or more and “no” if less than 6 months. The average score was 2.71 (range 2 to 3), meaning that almost all the items were scored as “very much.” Additionally, the teacher noted that the level of Shinnosuke’s preoccupation had lasted for at least 6 months.

Target Behaviors

Four bathroom-related behaviors were selected as targets to teach: Drying Hands, Arranging Shoes, Covering Buttocks, and Tucking Shirt. “Drying Hands” was defined as using a handkerchief to dry the top and underside of the hands for 5 seconds after washing hands. “Arranging Shoes” was defined as taking off indoor shoes and placing them on shoe-shaped marks in a parallel manner before putting on bathroom slippers. “Covering Buttocks” was defined as pulling down only the front part of the pants, leaving the buttocks covered during urination. “Tucking Shirt” was defined as putting the lower part of the undershirt into the pants after urination so that no part of the undershirt is visible. All the behaviors took place and were required in the bathrooms in Japanese schools.

Shinnosuke had not acquired the four bathroom-related behaviors, which were recognized as important by his main teachers during an hour-long meeting. Although the behaviors occurred sequentially within a bathroom event, starting with Arranging Shoes, and followed by Covering Buttocks, Tucking Shirt, and Drying Hands, the teaching order was not consistent with the actual time se-
The relative importance of the behaviors and the ease with which Shinnosuke was acquiring them were considered in deciding the teaching order.

Prior to the present study, the male main teacher taught the four target behaviors using verbal, gestural, model, as well as physical and picture prompts. However, these strategies had not been effective. The teacher found it difficult to provide the prompts because Shinnosuke rejected them by ignoring or running away or sometimes shouting, hitting, or kicking the teacher as he tried to present the prompts. According to a functional assessment interview (O’Neill et al., 1997), Shinnosuke’s rejection behaviors were thought to be maintained by him escaping from aversive activities and accessing preferred play.

**Setting**

A bathroom closest to Shinnosuke’s home-room was utilized for observation of the target behaviors. All 18 students in the elementary division used the bathroom, typically, one or two students at the same time as Shinnosuke. At the entrance, six pairs of shoe-shaped marks were placed on the floor to help the students understand where they were supposed to put on their indoor shoes. Six pairs of bathroom slippers were placed in six colored squares in the same area. The bathroom included three urinals, three toilet bowls, and one sink.

**Data Collection**

The second author videotaped all the target behaviors twice a week for seven months, with the exceptions of Day 32 and 33 when a video camera was not available. The data on his performance were collected via hand-written notes. The teacher stood 3 m away from the participant while videotaping. Although Shinnosuke occasionally looked at the camera or talked to her, his behaviors did not seem to be

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**TABLE 1**

**Items in the Attitudes Toward the Hero Questionnaire**

<table>
<thead>
<tr>
<th>Attitudes Toward The Hero</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talking about the hero</td>
</tr>
<tr>
<td>- The student talks about the hero.</td>
</tr>
<tr>
<td>- Once beginning to talk about the hero, the student persists in the same topic.</td>
</tr>
<tr>
<td>- The student initiates the conversation by picking up the topic related to the hero.</td>
</tr>
<tr>
<td>Imitating the hero</td>
</tr>
<tr>
<td>- The student pretends he or she is the hero.</td>
</tr>
<tr>
<td>- Once beginning to pretend to be the hero, the student continues to do so.</td>
</tr>
<tr>
<td>- The student shows off pretending he or she is the hero to obtain the attention of others.</td>
</tr>
<tr>
<td>- The student is delighted when the teacher uses the hero’s name to call him or her.</td>
</tr>
<tr>
<td>Accessing to the hero</td>
</tr>
<tr>
<td>- The student collects goods related to the hero (e.g., toy, stationery).</td>
</tr>
<tr>
<td>- The student wants to keep his or her belonging related to the hero with him or her.</td>
</tr>
<tr>
<td>- When the teacher shows an item related to the hero with the student, he or she excitedly reacts to the item.</td>
</tr>
<tr>
<td>- The student shows off an item related to the hero to obtain the attention of others.</td>
</tr>
<tr>
<td>Playing with the hero</td>
</tr>
<tr>
<td>- The student plays with toys related to the hero.</td>
</tr>
<tr>
<td>- Once a toy related to the hero is given to the student, he or she continues to play with it.</td>
</tr>
<tr>
<td>- The student plays with toys related to the hero with others.</td>
</tr>
<tr>
<td>Duration of the student’s interest to the hero</td>
</tr>
<tr>
<td>- The student is interested in the hero for at least 6 months.</td>
</tr>
</tbody>
</table>

*Note.* The male main teacher was asked to pick up the hero preferred the most by the student. For each item, the teacher circled the number that he thought best represented the level of the participant’s attitudes toward the hero.
influenced by him being observed. He typically used the bathroom before lunch (around 11:45 a.m.) and before dismissal circle time (around 2:30 p.m.). The bathroom time before lunch was targeted for observation. The second author assigned one of the four ordinal scores (level 0 to 3) to each behavior in the bathroom to quantify Shinnosuke’s performance. The definition of each score for each of the four target behaviors is listed in Table 2.

**TABLE 2**

<table>
<thead>
<tr>
<th>Target Behavior</th>
<th>Level</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drying Hands</td>
<td>3</td>
<td>Dry top and under sides of his hands for 5 seconds</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Dry a part of his hands for 5 seconds</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Dry a part of his hands for less than 5 seconds</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>Did not dry any part of his hands</td>
</tr>
<tr>
<td>Arranging Shoes</td>
<td>3</td>
<td>Place his own shoes on the shoe-shaped marks in a parallel manner</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Place his own shoes on the shoe-shaped marks in a non-parallel manner or place his own shoes out of the shoe-shaped marks in a parallel manner</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Place his own shoes out of the shoe-shaped marks in a non-parallel manner</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>Enter the bathroom without changing his shoes</td>
</tr>
<tr>
<td>Covering Buttocks</td>
<td>3</td>
<td>Cover the buttocks in the pants</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Cover the buttocks in the underpants but pulling the pants under the buttocks</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Cover the buttocks in the underpants but pulling the pants under the knees</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>Expose the buttocks</td>
</tr>
<tr>
<td>Tucking Shirt</td>
<td>3</td>
<td>Tuck the shirt in the pants</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Tuck more than half part of the shirt in the pants</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Tuck less than half part of the shirt in the pants</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>Did not show any tucking behaviors at all</td>
</tr>
</tbody>
</table>

**Materials**

*Hero modeling video.* In the hero modeling video, Mr. Fujiwara (a cartoon character) served as a model, who engaged in each of the four target behaviors.

It was extremely time consuming to look for scenes in which Mr. Fujiwara engaged in Drying Hands, Arranging Shoes, Covering Buttocks, and Tucking Shirt in the available TV stories. Additionally, no realistic-looking figure of Mr. Fujiwara was commercially available. Therefore, we had to come up with procedures that were different from those used by Ohtake (2015) and Ohtake et al. (2014) to develop the hero modeling videos in their studies. The following are the general procedures used to develop the video clips in the present study.

**Step 1.** Using a video camera (Canon iVIS HF M43®), the second author videotaped the first author engaging in each of the target behaviors in the bathroom that Shinnosuke typically used at school. The video included only the part of the first author’s body, below the neck. The video clip was downloaded to a personal computer (Panasonic CF-S10®) and saved in MTF format (hereafter referred to as Video Clip 1).

**Step 2.** Again using the video camera, the first author filmed a scene of a story from “Initial D” where Mr. Fujiwara talked to somebody, with his face zoomed up. The video clip was downloaded to the personal computer and saved in MTF format. Specifically, it was downloaded to the layer of the composition window of the Adobe® After Effect® software, and using the rod brush function of the software, the animated face of Mr. Fujiwara was cut off from the video clip. The 5 s video clip, where only Mr. Fujiwara’s animated face was filmed, was saved in AVI format (hereafter referred to as Video Clip 2).

**Step 3.** Video Clip 1 was downloaded to the second layer of the composition window of the Adobe® After Effect®. In the meantime, Video
Clip 2 was downloaded several times to the parts of the first layer of the same window, where the lines read by the pseudo-voice of Mr. Fujiwara were to be inserted (see Table 3). The composite video clip, which looked as if Mr. Fujiwara appeared in the bathroom and his “replicated” body (i.e., the first author) engaged in the target behavior, was saved in AVI format (hereafter referred to as Video Clip 3).

**Step 4.** The voice of Mr. Fujiwara was developed by Toshiba ToSpeak®, a free voice-synthesizing software that allows users to make a selected voice read typed sentences. Using the software, the first author typed the lines (see Table 3) of Mr. Fujiwara, chose a voice most similar to the hero’s voice, and made the voice read the lines. The voice descriptions were recorded by Audacity (a free voice-editing software) and saved in WAV format (hereafter referred to as Voice Clip 1).

**Step 5.** Video Clip 3 was downloaded to the first layer of the composition window of Corel® Video Studio®, another video-editing software, with Voice Clip 1 downloaded to the voice layer of the same window. Using the zooming function, the first author zoomed up the area where Shinnosuke’s attention was needed (e.g., buttocks covered by pants). In addition, using the painting function, the author placed a red circle around the area. The edited video clip was saved in AVI format in a compact disc. Duration of the completed hero modeling videos was around 1 min.

**Hero praising video.** In this video, the hero appeared in the bathroom, watched Shinnosuke engage in the target behavior, and praised performance. The following are the general procedures used to develop this series of videos.

**Step 1.** The correct behavior exhibited by Shinnosuke was filmed during the VHM phase. The video clip was then downloaded to the personal computer and saved in MTS format (hereafter referred to as Video Clip 4).

**Step 2.** Video Clip 4 was downloaded to the second layer of the composition window of the Adobe® After Effect®, Video Clip 2 (i.e., Mr. Fujiwara’s animated face) was downloaded several times to the first layer of the same window at the places where the lines read by Mr. Fujiwara were to be inserted. The combined video clip, which looked as if Mr. Fujiwara appeared in the bathroom where Shinnosuke was engaging in the target behavior at the same time, was saved in AVI format (hereafter referred to as Video Clip 5).

**Step 3.** As described above when discussing the VHM, the authors activated Toshiba ToSpeak® to make Mr. Fujiwara’s pseudo-voice read the predetermined lines (see Table 4). The voice descriptions were recorded by Audacity and saved in WAV format (Voice Clip 2).

**Step 4.** Video Clip 5 was downloaded to the first layer of the composition window of Corel Video Studio® with Voice Clip 2 downloaded to the voice layer of the same window. As for

<table>
<thead>
<tr>
<th>Time Line</th>
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</tr>
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<tbody>
<tr>
<td>0:00-0:07</td>
<td>Shinnosuke, let’s watch Mr. Fujiwara put his shoes on the shoe marks neatly.</td>
</tr>
<tr>
<td>0:07-0:10</td>
<td>First, watch Mr. Fujiwara.</td>
</tr>
<tr>
<td>0:10-0:20</td>
<td>Mr. Fujiwara put his shoes exactly on the shoe marks. This is the way of Mr. Fujiwara.</td>
</tr>
<tr>
<td>0:20-0:26</td>
<td>Let’s watch Mr. Fujiwara put his shoes on the shoe marks neatly once more.</td>
</tr>
<tr>
<td>0:30-0:35</td>
<td>Mr. Fujiwara put his shoes exactly on the shoe marks. This is the way of Mr. Fujiwara.</td>
</tr>
<tr>
<td>0:35-0:43</td>
<td>Now, it is your turn, Shinnosuke. Put your shoes on the marks as Mr. Fujiwara did.</td>
</tr>
<tr>
<td>0:43-0:45</td>
<td>Mr. Fujiwara will watch you doing well.</td>
</tr>
</tbody>
</table>

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<th>Lines Narrated by Mr. Fujiwara</th>
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</thead>
<tbody>
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<td>0:00-0:05</td>
<td>Shinnosuke, let’s watch Shinnosuke cover the buttocks in the pants during urination.</td>
</tr>
<tr>
<td>0:05-0:12</td>
<td>Great, Shinnosuke! You cover the buttocks in the pants. You are Mr. Fujiwara!</td>
</tr>
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</table>

**Table 3**

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the VHM, a red circle was placed on the area where Shinnosuke needed to pay attention using the painting function. The edited video clip was saved in AVI format on the same compact disc as the VHM. Duration of the completed hero praising videos was 10–15 s.

Research Design

A multiple baseline design across behaviors was utilized to demonstrate a functional relationship between VHM and behavior change. The four target behaviors, which were considered independent (unlikely covariate) from each other in terms of behavior change but occurring sequentially within a short period of time, were selected (i.e., Arranging Shoes → Covering Buttocks → Drying Hands → Tucking Shirt) (Cooper, Heron, & Heward, 2007). If the only baseline to which the VHM intervention was introduced changed immediately after the intervention was introduced, it was considered unlikely that confounding factors that otherwise might threaten internal validity were involved in improving the target behavior (Cooper et al., 2007).

Procedure

**Baseline.** During baseline, the male main teacher was asked to behave as he usually did. Typically, the teacher did not provide any response prompts to Shinnosuke. No video interventions were conducted in this condition.

**Video hero modeling (VHM).** For five days a week, the male main teacher set up a DVD player (AVOX® DVD Video, ADP-701AB) on Shinnosuke's desk, asked him to come the desk, and started the hero modeling video 5 min before Shinnosuke typically went to the bathroom in the morning. While watching the video, if the teacher felt it was appropriate, he commented on the filmed behavior (e.g., “Mr. Fujiwara wiped the palms very well.”). The hero modeling video was not presented during bathroom time in the afternoon.

In the bathroom, the male teacher provided a reminder of the video (e.g., “Be like Mr. Fujiwara?”) and verbal praise (e.g., “You are like Mr. Fujiwara”) as deemed appropriate. Otherwise, the condition was identical to baseline.

**Baseline 2.** For Drying Hands, the second baseline was introduced following the VHM phase to determine if Shinnosuke’s performance was maintained even when VHM was withdrawn. For Covering Buttocks, the second baseline was also introduced even though Shinnosuke’s performance did not reach to the highest level (Level 3). This withdrawal was implemented because on Day 21, considering Shinnosuke’s clumsiness with regard to using his fingers and hands, the male teacher felt that covering the buttocks in the underpants (i.e., level 2) but not in the pants (i.e., Level 3) would be sufficient.

Between Day 21 and 22, there was an 18-day winter break. Additionally, VHM was not implemented on Day 22 because the male main teacher was sick and the female main teacher was too busy to take over his role. Despite the long non-treatment period, Shinnosuke independently covered the buttocks in the underpants (i.e., Level 2) on Day 22. Furthermore, the male teacher witnessed him cover the buttocks in the underpants independently for two consecutive school days between Day 22 and Day 23, on which formal observation by the second author was not scheduled. Based on these observations, the male teacher wanted to redefine covering the buttocks in the underpants (not in the pants) as an interim target behavior, and the level of Shinnosuke’s performance was thought to be maintained without VHM. Consequently, VHM was intentionally terminated starting on Day 23.

**Video hero praising (VHP).** For Drying Hands, Arranging Shoes, and Covering Buttocks, VHP interventions was also implemented, in which a hero praising video was presented in the same manner as in VHM. For Drying Hands, the VHP phase followed the second baseline. This decision was made on the basis of a request from the teacher indicating that Shinnosuke would be pleased and more motivated if he watched a video in which Mr. Fujiwara praised Shinnosuke engaging in the target behavior. For Arranging Shoes, the VHP phase immediately followed the VHM phase because VHM did not evoke Level 3 performance in a stable manner. Finally, for Covering Buttocks, the VHP phase followed the second baseline phase. As described below in the Results section, Shinnosuke independently covered the buttocks in the pants (i.e.,
Level 3) on Day 28 and 29 without direct instructions. According to the male teacher, between Day 27 and Day 28, the back of the pants was unexpectedly caught in the top of the buttocks when Shinnosuke attempted to pull his pants down. To stabilize the “beyond expectation” level of performance, VHP was introduced from Day 30.

Maintenance. For Drying Hands and Arranging Shoes, the maintenance phase was introduced following the VHP phase. This phase was identical to the baseline phase.

Inter-Rater Reliability

A trained graduate research assistant served as the second rater for the target behaviors. Watching 30% of the videos filmed by the second author (the first rater) across phases and behaviors, she independently assigned a score (0 to 3) to each target behavior. When both raters assigned the same score to the same target behavior, an agreement was noted. Conversely, when both raters assigned different scores to the same behavior, a disagreement was noted. Finally, a reliability score was computed by dividing the total number of agreements by the total number of agreements and disagreements and multiplying by 100. Specifically, the reliability scores for Drying Hands, Arranging Shoes, Covering Buttocks, and Tucking Shirt were 90%, 90%, 100%, 89%, respectively.

Treatment Fidelity

Video presentation. The second author checked at least once a week to see if the male teacher presented the correct video at the designated time (i.e., 5 minutes before going to the bathroom). It was determined that the teacher presented the video correctly at all times.

Attention to the video. The second author videotaped Shinnosuke watching videos at least once during VHM and VHP across four target behaviors, with the exception of the VHP phase for Arranging Shoes and the VHM phase for Covering Buttocks due to schedule conflicts. She utilized a 5-s momentary time sampling procedure to measure the extent to which Shinnosuke attended to the video. A + was recorded when his gaze direction was toward the video and a – was recorded when his gaze direction was toward something other than video. The mean percentage of Shinnosuke attending to the VHM with 96.3% (range, 80.0% to 100%) and 96.3% (range, 88.9% to 100%) to the VHP.

Teacher interaction in the bathroom and during video watching. The male teacher was allowed to behave as he usually did in interacting with Shinnosuke in the bathroom and while watching the video. This “informal” approach was employed because it was not acceptable to the culture of the teachers in the elementary division to strictly control teacher behavior according to an experimental protocol.

To determine the extent to which the male teacher interacted with Shinnosuke in the bathroom, the occurrence of response prompts, verbal reminders, and verbal praise was recorded for each target behavior for every observation day, with the exception of Day 32 and 33 when a video camera was not available. For example, if response prompts and verbal reminders were observed once or several times but verbal praise was not observed at all for an event of Drying Hands, a + was recorded in each space for response prompts and verbal reminders and a – was recorded in the space for verbal praises in Drying Hands column on the data sheet. “Response prompt” was defined as a teacher behavior occurring during or after Shinnosuke engaging with a task, with the intention of evoking the target behavior. Response prompt included verbal, gestural, model, and physical prompts. “Verbal reminder” was defined as a verbal teacher behavior occurring within 1 minute before Shinnosuke engaging with a task and referring to the hero (e.g., “Be like Mr. Fujiwara”). Finally, “verbal praise” was defined as positive verbal feedback presented within 1 min after Shinnosuke engaging with a task (e.g., “Great, You are like Mr. Fujiwara”). The first author analyzed the data using the videos filmed by the second author.

Figure 1 shows when and for which behavior each type of teacher interaction was provided across session dates. In general, response prompts (P) were not provided across behaviors, with the exception of Drying Hands. Verbal reminders (R) were provided...
during the first three days in the VHM phase for Arranging Shoes, sporadically across phases for Drying Hands, rarely for Covering Buttocks, and not used at all for Tucking Shirt. Finally, verbal praise (C) was sporadically used for Drying Hands and Covering Buttocks, rarely for Arranging Shoes, and not used at all for Tucking Shirt.

Similarly, the second author measured the extent to which the male teacher interacted with Shinnosuke while he watched videos. Watching the same videos as in the attention analysis, she employed a 5-s partial interval recording procedure in which a + was recorded for the interval when a comment was observed and a – was recorded when no comment was observed. A comment was defined as a teacher’s verbal behavior, with or without gestures, describing the content of the video (e.g., “Look, Mr. Fujiwara is drying palms”). During the VHM presentation, the male teacher made comments, on average, 12.1% of the time (range, 0% to 50%). During the VHP presentation, he made comments, on average, 7.4% of the time (range, 0% to 22.2%).

Social Validation Interview

Two weeks after completing the data collection, the authors interviewed for 20 min the male teacher who implemented the video presentation to obtain his thoughts and feelings about the VHM and VHP interventions. Specifically, the teacher was asked to respond to an open-ended question, “What are your thoughts and feelings about the video hero interventions?”

Results

Figure 1 shows Shinnosuke’s performance across the four target behaviors, further discussed below.

Drying Hands

Shinnosuke typically dried a part of his hands for less than 5 s (i.e., Level 1). Immediately after introducing the VHM intervention, he dried all parts of his hands for at least 5 s (i.e., Level 3) on 4 out of 5 days. At the same time, the remaining three baselines (i.e., Arranging Shoes, Covering Buttocks, Tucking Shirt) were stable at low levels, indicating that it was unlikely that any factors other than VHM contributed to the improvement of Drying Hands. According to the male teacher, Shinnosuke exhibited a correct response during every afternoon bathroom time when he did not watch the video immediately before going to the bathroom. When the VHM intervention was withdrawn from Drying Hands and the new VHM intervention was introduced to Arranging Shoes (the second target behavior), his performance on Drying Hands dropped to Level 2 but improved to Level 3 the next day.

During VHP, Shinnosuke stayed at the highest level of performance, with the exception of Day 20 when the VHM intervention was initiated for Covering Buttocks (the third target behavior). After VHP was withdrawn, he continued to exhibit correct responses for more than 2 months, with the exception of Days 25, 30, and 31. It should be noted that Day 30 was the first day of introducing the VHM intervention to Tucking Shirt (the fourth target behavior).

Arranging Shoes

Shinnosuke typically placed his shoes away from the shoe marks in a nonparallel way (i.e., Level 1). When VHM interventions were implemented, his performance improved to Level 2 or 3; that is, he put his shoes on the shoe marks in either a nonparallel or a parallel way. In contrast, the remaining two baselines (i.e., Covering Buttocks, Tucking Shirt) were stable at Level 0. This means that it was unlikely that any factors other than VHM were involved in the behavior change of Arranging Shoes.

When VHP interventions were initiated, Shinnosuke exhibited Level 3 performance for 2 consecutive days. Even after the VHP interventions were withdrawn, Shinnosuke continued to exhibit the highest level of performance, with the exception of Day 31, for more than two months. He also exhibited Level 3 performance in the afternoon, according to the male teacher.

Covering Buttocks

Shinnosuke always pulled his pants down to his ankles during baseline. On the first day of
the VHM phase, he voluntarily asked the male main teacher to help him cover his buttocks before urination. The teacher provided Shinnosuke with model and physical prompts to help him engage in the target behavior (i.e., Level 0). On the second day of the intervention phase, Shinnosuke independently covered his buttocks in the underpants but pulled his pants down to his knees (i.e., Level 2). According to the male teacher, Shinnosuke showed the same level of performance during every afternoon bathroom time as in the morning. During the second baseline phase, he kept his performance at Level 2. When the behavior change of Covering Buttocks was confirmed, the remaining baseline (i.e., Tucking Shirt) was stable at the lowest level, indicating that it was unlikely that any factors other than VHM contribute to the behavior change. On Days 28 and 29, Shinnosuke independently covered the buttocks in the pants without any direct instructions. During the VHP phase, Shinnosuke’s performance was stable at Level 3. At the same time, according

Figure 1. Taro’s performance levels on four target behaviors across different phases. There was an 18-day winter break between Day 21 and 22. Thirteen data points were missing in the baseline for Tucking Shirt because there were no opportunities to tuck (e.g., student wore no shirt that needed to be tucked). Other missing data in Drying Hands, Covering Buttocks, and Tucking Shirt were due to the other students blocking the observer’s view or due to observation of other students. BL = baseline, VHM = video hero modeling, VHP = video hero praising, P = prompt, R = verbal reminder, C = verbal praise.
to the male teacher, Shinnosuke covered his buttocks in the pants every afternoon bathroom time.

**Tucking Shirt**

Shinnosuke never attempted to tuck his shirt into his pants during baseline. Once the VHM intervention was introduced, he tucked in both the front and the back of his shirt without any prompts. According to the male teacher, Shinnosuke exhibited a correct response in the afternoon when he did not watch the hero modeling video immediately before going to the bathroom.

**Social Validation Interview**

During the interview, the male teacher emphasized that the VHM and VHP interventions changed the nature of engaging in the targeted bathroom-related activities for Shinnosuke from aversive to valuable stimuli. The teacher felt that Shinnosuke changed his performance because he wanted to be like the hero and attributed his wish to be the hero to the innovative idea of using the animated face and pseudo-voice of Mr. Fujiwara overlapped on a video in which an adult (without face) pretended he was Mr. Fujiwara and modeled the target behavior in the familiar bathroom. In addition, the teacher pointed out that the red circle and the zoomed-up function used to provide visual clarity in the videos promoted Shinnosuke to pay attention to the salient behavior that he had to imitate.

**Discussion**

The present study investigated the effects of VHM on the bathroom-related behaviors of an elementary-aged student with ASD. A multiple baseline across behaviors demonstrated that VHM contributed to improving the four targeted behaviors. This finding is consistent with those of previous VHM studies (Ohtake, 2015; Ohtake et al., 2014), indicating that VHM is effective in improving self-care skills of elementary-aged students with ASD. In addition, this finding extended the results of these studies by showing that compositing the animated face of a cartoon character into an adult modeling video (without face) with descriptions narrated by a pseudo-voice of the hero offers an alternative to developing a VHM when a realistic-looking representation of the hero in the form of a figure or doll is not available.

With respect to Arranging Shoes, Shinnosuke’s performance was improved to the highest level when VHM was replaced by VHP. In the VHM study conducted by Ohtake (2015), VHP interventions were used after the participant reliably exhibited the target behavior under the VHM condition. In this regard, VHP was used in the previous study as overtraining. In contrast, the present study introduced VHP when correct responses for Arranging Shoes were not exhibited in a consistent manner. Given that a perfect score was observed consistently only after VHP was initiated, VHP may be used as alternative to VHM when VHM is not successful in evoking a correct response in a constant manner.

While watching the video, Shinnosuke directed his gaze toward the video in almost 100% of the instances observed. In addition, he occasionally shared his attention between the video and his teacher with smile. Furthermore, Shinnosuke told his mother what he had watched in VHM and VHP when she picked him up after school, suggesting that he positively and willingly participated in the VHM and VHP interventions.

Before the VHM intervention was initiated, Shinnosuke rejected the male teacher’s prompts in the bathroom and exhibited challenging behaviors, especially when the prompting was not quickly terminated. According to the interview with the teachers, Shinnosuke’s main goal was to shorten bathroom time as much as possible because he looked forward to free play afterwards. Thus, he viewed the teacher’s prompt to elicit a correct response as highly aversive because prompting delayed access to the preferred activity.

Interestingly, on Day 20, Shinnosuke asked his teacher to help him cover his buttocks in the pants, implying that the aversiveness of the teacher’s prompts was canceled out by the VHM interventions, which in turn increased Shinnosuke’s willingness to behave like his hero. As described in the Results section, the male teacher strongly agreed with this inter-
pretation of the change in Shinnosuke’s behavior.

Further, anecdotal data indicate that after the initiation of the VHM for Drying Hands, on five observation days, before leaving the bathroom, Shinnosuke rearranged bathroom slippers, other than the ones he had used, that were not properly lined up. This behavior, which was neither targeted nor included in the VHM, may be viewed as a case of response generalization; that is, “unprogrammed changes in similar behaviors when a target behavior is modified” (Alberto & Troutman, 2013, p. 406).

It may be hypothesized that the response generalization occurred because watching VHM made Shinnosuke believe that Mr. Fujiwara was always watching his behaviors in the bathroom and that he would be happy if Shinnosuke replicated good behavior. However, it is unknown why the remaining three target behaviors were not evoked after the VHM was introduced to the baseline of Drying Hands.

When the VHM intervention was introduced to the baseline of Arranging Shoes, Covering Buttocks, and Tucking Shirt, Shinnosuke’s performance of Drying Hands dropped to a lower level. However, the drop was recovered soon, the next observation day or the day after. It is unknown why only Drying Hands was influenced by adding a new skill. One explanation involves the degree of effort needed for each target behavior. For example, Drying Hands might require more effort than Arranging Shoes or Covering Buttocks. Also, a behavior requiring a great deal of effort to be executed might be more vulnerable to deterioration than one needing less effort when a new task is added as a target to be learned.

Anecdotal data indicate that Shinnosuke not only exhibited the target behaviors but also imitated the body postures and movement of the model in the VHM. Additionally, he talked to the male teacher or the other teachers about the content of the video while engaging in the corresponding task. For example, on Day 8, he said, “Mr. A (teacher’s name), I saw Mr. Fujiwara on the video,” and on Day 15, “Mr. Fujiwara said, ‘I am happy to see you doing well.’ ” This information could be viewed as evidence that Shinnosuke had a visual image of the hero engaging in the target behavior while performing the same task and that being like the hero was valuable to him (Ohtake et al., 2014).

Several limitations to this study should be noted. First, the male teacher provided verbal reminders (e.g., “Be like Mr. Fujiwara”) the first day of the VHM intervention for Drying Hands, Arranging Shoes, and Covering Buttocks. In addition, on some occasions, the male teacher commented on the VHM. The verbal reminders and teacher comments may partly be responsible for changing the target behaviors. Second, observations were conducted in the specific bathroom (i.e., the one closest to Shinnosuke’s classroom) at a specific time (i.e., around 11:45 a.m.). Although the male main teacher informed the authors of Shinnosuke’s performance in the afternoon, actual observation at those times was not conducted following a rigorous procedure. Third, because Shinnosuke graduated from the elementary division, maintenance data were not collected for Covering Buttocks and Tucking Shirt.

Finally, this study included only one participant who had high scores across domains in the AHQ. Thus, it is unknown whether a student who has a profile different from Shinnosuke’s would be similarly responsive to the VHM intervention. Intuitively, students whose scores on “Imitating the hero” are high would be viewed as more likely to be responsive to the VHM intervention because they are thought to be highly motivated to be like the hero. In fact, the participant in Ohtake (2015), who was responsive to the VHM intervention, made believe he was the Masked Rider Wizard® (his hero). Although the AHQ was not applied to that participant, he would most likely have obtained a high score on that subcategory. Future research is needed to investigate the relationship between students’ profiles on the AHQ and the effectiveness of the VHM intervention after the AHQ has been demonstrated to be psychometrically validated.

References


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