Comparison of Methods for Demonstrating Passage of Time when Using Computer-Based Video Prompting

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Abstract: Two different video-based procedures for presenting the passage of time (how long a step lasts) were examined. The two procedures were presented within the framework of video prompting to promote independent multi-step task completion across four young adults with moderate intellectual disability. The two procedures demonstrating passage of the designated amount of time were: a) visual disappearance (counting down) of time on a color coded Time Timer while the video played and; b) a close-up view of the target step (e.g., substance boiling) while the video played. An adapted alternating treatments design, combined with a multiple probe across behaviors design with baseline, comparison, and final treatment conditions was used to compare the two procedures across three sets of tasks. Results indicate that gains were made by each participant when using both video procedures and that both procedures were equally effective in promoting completion of task steps requiring the passage of time.

Whereas video-based instruction has demonstrated potential for increasing skills and promoting independence, research involving isolation of video variables, in order to determine which components are most effective, with which users, is a relatively new focus of evaluation (Mechling & Collins, 2012). Ayres and Langone (2007) and Rayner, Denholm, and Sigalos (2009) suggested that further research was needed regarding which components of video technology or combinations of these components contribute to their effectiveness, and Ramdoss et al. (2012) suggested that researchers continue to evaluate the components of custom-made programs in order to inform decisions regarding their development.

To date, a limited number of studies have been performed to examine the effects of different component features of video technology. While the majority of these studies have evaluated the type of model used in the video (e.g., self, adult, peer, or subjective point of view modeling; Cihak & Schrader, 2008; Mason, Ganz, Parker, Burke, & Camargo, 2012; Van Laarhoven, Zurita, Johnson, Grider, & Grider, 2009), a small number of studies have evaluated other relevant variables of video technology. These studies have included use of voice over narration (Mechling & Collins, 2012; Smith, Ayres, Mechling, & Smith, 2013), screen size of the video presentation (Mechling, Ayres, Foster, & Smith, 2013), types of materials used in the video (Mechling, Ayres, Foster, & Bryant, 2013; Mechling, Ayres, Foster, & Bryant, in press), and task components (e.g., tasks requiring fine motor and gross motor skills: Mechling, Ayres, Purrazzella, & Purrazzella, 2012; Mechling & Swindle, 2012). A further task component, which is integral to many daily living and vocational tasks when presented through video technology, is the passage of time. An identified challenge, when developing video programs to prompt task completion is concretely presenting how long
a task step should last. During cooking tasks
this challenge can occur when: a) waiting for
a food item to cook on the stove, bake in the
oven, or heat in a microwave; b) waiting for an
ingredient to dissolve; or c) waiting for an
item to complete its resting or cooking time
(e.g., instant oatmeal, Lean Cuisine meal).
Traditional approaches for addressing this is-
issue, with or without video modeling, have re-
lied on use of a kitchen timer or digital timer
on the appliance (e.g., buttons/timer on a
microwave); however, this approach may
prove difficult for some persons to implement
due to the cognitive requirements of setting
an analog or digital timer to the exact minute
(Mechling & Collins, 2012; Mechling, Gast, &
Fields, 2008).
A related dilemma for those creating video
models is what to present on the video as time
passes on a kitchen timer (counts down) or
other presentation (i.e., showing a food item
cooking on the stove). Commercial products
such as Look and Cook by Attainment, Inc.
and limited studies (Mechling et al., 2008)
have approached this task by showing an adult
model, on the video, setting the timer to the
correct time (e.g., 1 minute) with voice-over
directions (e.g., “set the timer to one minute”)
followed by a video clip of the next step (as if
it were made in a fast forward motion) showing
the timer “dinging”, paired with the voice-
over directions, “wait for the timer to ding.”
There have been issues demonstrated with
this approach, related again to the cognitive
demands, when the participant does not un-
derstand that the latter step requires actually
waiting for his/her personal timer to ding
after one minute. Instead the participant
assumes that his/her personal timer should be
“dinging” and time should have already
passed since the video model is showing the
timer in the future tense (passage of one min-
ute). Mechling and Stephens (2009) found
the most frequent errors, when using video
prompting with students with moderate intel-
lectual disability, occurred when waiting on
the kitchen timer to “ding” and likewise
Mechling et al. (2008) found frequent errors
among participants when they were waiting
for the kitchen timer to cycle and activate
(“ding”).
Another option for demonstrating the pas-
sage of time is to show the finished product on
the video (e.g., grilled cheese sandwich
browned on one side) while providing the
voice-over directions, “wait for the bread to
brown.” Similar to the fast forwarding
method, this method requires the learner to
cognitively understand the amount of time
and the events required (e.g., bread gradually
starting to change color), but not concretely
presented in the video. Similar to video illus-
trations with a kitchen timer, errors among
users of video models have been found when
using this end product method. Evaluation of
commercially developed video recipes (Look
and Cook by Attainment, Inc.), found that
waiting for water to boil when cooking
mashed potatoes and waiting for pancakes to
brown contributed to a greater percentage of
errors (14.1%) when only the end product
was shown in comparison to custom-made
video prompts (1.5% errors) which modeled
the entire step while time was passing
(Mechling et al., 2013). The researchers con-
tributed this difference to how the concept for
passage of time was shown and that errors,
when using the commercial videos, were con-
tributed to inadequately displayed concepts
on the videos. Based on their results they rec-
commended that future researchers investigate
means to represent concepts such as waiting
for time to pass when using video models.
A final solution for the challenge of present-
ing passage of time on video may be the one
used by Mechling et al. (2013) in creating
their custom video prompts in which the video
continued to run while time passed. With this
procedure the camera is running and filming
the task while time is passing, (e.g., food item
is cooking, cycle on an appliance is running).
Although errors were not as frequent as wait-
ing on the timer to activate, Mechling and
Stephens (2009) found that the second most
frequently made error in their study was wait-
ing for food to boil while the video focused on
the pan of ravioli.
In each of the studies presented, evaluation
of the passage of time on the video was not the
focus of the study, but rather a reported con-
tributor to errors in the studies. Therefore,
work remains for investigating this compo-
nent part of video presentations in order to
increase the independent task performance
by persons with moderate ID. The purpose of
this study was to evaluate performance of stu-
dents with moderate ID when completing daily living tasks that required the task step of waiting as time passed. Specifically, passage of time was represented through video prompts while the camera continuously recorded: a) visual disappearance (counting down) of time on a color coded timer (Time Timer); or b) a close-up view of the target step (e.g., substance boiling, cleanser activating on a soiled area of clothing, soiled item soaking in dish water) while time passed.

Method

Participants

Four young adults, two males and two females, with moderate ID participated in the study. Each was enrolled in a high school transition program for young adults that met five days a week in a school administrative building.

Daniel was 21 years and 11 months of age at the conclusion of the study. He was diagnosed with Fragile X syndrome and a moderate intellectual disability with a full scale IQ score of 46 on the Wechsler Intelligence Scale for Children – Fourth Edition and a composite score of 46 on the Vineland Adaptive Behavior Scales. He spoke in complete sentences, but needed reminders to slow his speech and refrain from repeating himself. He exhibited impulsivity, distractibility, and anxiety. He told time on 5 minute intervals and was working on understanding passage of time.

Kelly was 20 years 8 months of age at the conclusion of the study. She was diagnosed with Down syndrome and a moderate intellectual disability with a full scale IQ score of 40 on the Wechsler Intelligence Scale for Children – Fourth Edition and a composite score of 40 on the Vineland Adaptive Behavior Scales. She continued to receive speech therapy in a small group setting working on: answering “wh” questions and add-on comments during conversations. She demonstrated dysfluency if pressured or anxious which was characterized as using word and part-word repetitions. She had difficulty reading analog and digital clocks.

Martin was 20 years and 4 months of age at the conclusion of the study. He was diagnosed with a moderate intellectual disability with a full scale IQ score of “less than 50” on the Bayley Scales of Infant Development II and a composite score of 55 on the Vineland Adaptive Behavior Scales. He spoke in complete sentences, but frequently mumbled and talked to himself although what he was saying was typically on topic (how he felt, descriptions of what he was engaged in). Loud noises and changes in his routine bothered him and were also topics of his conversations. His needs included staying on topic and making eye contact. He had limited math skills and recognized numerals to 10.

Tierra was 21 years and 2 months of age at the conclusion of the study. She was diagnosed with left hemiplegia and a moderate intellectual disability with a full scale IQ score of 45 on the Differential Abilities Scales and a composite score of 48 on the Vineland Adaptive Behavior Scales. She spoke in short one-two word sentences with articulation and phonological delays. Her needs included telling the passage of time because she did not keep track of time when involved in an activity.

Setting, Tasks and Materials

All baseline probe and instructional sessions took place in the kitchen area of the administrative building where the transition program operated. Three sets of tasks were identified and selected which required a step for allowing time to pass during the task. The three sets of tasks consisted of two tasks per set which contained a component step for waiting up to two minutes for something to occur within the task (i.e., powder dissolving in water). One set included cooking tasks in which ingredients were required to boil for two minutes. The two tasks within the cooking set were heating canned pasta dishes and canned soup on the stove top. A second set included soaking tasks in which materials were required to soak in a water solution for two minutes. The two tasks within the soaking set were cleaning a swimsuit and cooking pan. The third set included stain removal tasks in which liquid solutions dissolved stains for two minutes. The two tasks within the stain removal set were applying a laundry stain remover to a pair of shorts and a carpet cleanser on an area rug.

For the cooking tasks, the Campbell's soup cans and Chef Boyardee cans had easy open pop top lids. Students were provided choices
among soup types (i.e., chicken and noodle, chicken and rice) and pasta dishes (i.e., spaghetti and meatballs, ravioli) during cooking sessions. 

*Dawn* liquid dish detergent was mixed with water in the kitchen sink (using a drain plug) to soak the pan and *Woolite for all Delicates Laundry Detergent* was mixed with water in the same sink to soak a pair of men’s swimming trunks (Daniel and Martin) and a one piece women’s swimming suite (Kelly and Tierra). *Carbona 2 in 1 Oxy-Powered* carpet cleaner with a sponge applique was used to remove a stain from an 18 in. by 36 in. area rug and *SHOUT* spray remover was used to remove a stain from a pair of Levi shorts. The simulated stains were made using a black magic marker and coloring in a 3 in. by 3 in. circle drawn on the rug and pair of shorts. 

Materials for the cooking (boiling) tasks were kept in cabinets above and below the counters and materials for the soaking and stain removal tasks were kept in the cabinet below the sink. Spoons, cleaning cloth, and pot holders were kept in drawers.

**Equipment and Video Recordings**

Video prompting was used to deliver instruction for task completion. Video recordings, corresponding to task steps were inserted onto separate PowerPoint slides and shown on a Dell Latitude laptop computer. During the comparison and final treatment conditions, the laptop was placed on the counter between the stove and the sink. One exception to this positioning was applied during the rug cleaning. For the steps of rubbing the sponge and cloth on the rug, the instructor moved the laptop down onto the floor so the student could view the steps while cleaning the rug.

Students watched a video recording, completed the step, returned to the laptop and advanced the program to the next slide by “clicking” the mouse on a forward arrow icon positioned on the bottom right of each PowerPoint slide. Students could also complete steps simultaneously while the video played.

Video recordings were developed using a Sony HDR-CX160 Handycam and were made from a scene perspective of an adult model’s entire body or hands depending on the task step (i.e., video prompt turning the stove dials depicted only the model’s hand using the zoom feature of the camera). Voice-over descriptions of each step were provided by the person operating the video camera (i.e., “turn the stove dial to off”). Some steps were clustered together in one video clip (Table 1) to assist with the natural flow of the steps (i.e., turn on the water, fill the soup can with water, turn off the water). In order to receive credit for independent performance, students were required to complete all steps of the cluster.

**Passage of Time Video Recordings**

Waiting, while time passed during each task (i.e., waiting for two minutes while the soup boiled), was depicted and compared across two formats. In one format a *Time Timer* (Time Timer, LLC) was used in the videos and the camera focused on the timer as it ticked and the red area of the timer disappeared with the passage of time (Figure 1). In the other format the camera focused on the: (a) pan on the stove (boiling); (b) swim suit or pan in the sink (soaking); or (c) rug or shorts (stain removal) as time passed. For both formats the video continued to play as time passed. For each format of video and for each task, a voice over recording played at the beginning of the passage of time step and prompted the student to “wait one minute.” After one minute passed the voice over recording played again and said, “Wait one more minute.” At the completion of the two minutes the voice over recording said, “Go to next step” and the video stopped. For the cooking task, an additional step was added after one minute which
prompted the student to “Stir” the food item (video showed the adult model stirring) before the voice over prompt “Wait one more minute” played. For the soaking task, an additional step was added after one minute which prompted the student to “Swish” (video showed the model swishing the pan or swimsuit back and forth) before the voice over prompt “Wait one more minute” played. No additional steps were added to the stain removal tasks. When using the Time Timer format, the camera moved away from the timer, showed the swishing or stirring, and then returned to the timer. When using the video focusing on the item, the camera remained on: (a) the pan while the model stirred the canned soup or pasta; (b) the sink while the model swished the pan or swimsuit in the sink; or (c) the pair of shorts or rug. The Time Timer also emitted a “ticking” sound as time passed and the red area disappeared. At the end of 2 min the timer also emitted a “ding.” For the videos focusing on the item as time passed, the camera periodically moved to demonstrate to the user that the video was still playing. Students could also see the soup physically boiling and bubbles bursting in the water as the pan and swimsuit soaked. These features helped to indicate that the video was still playing.

Experimental Design

An adapted alternating treatments design (AATD) replicated across four students (Wolery, Gast, & Hammond, 2010) was combined with a multiple probe across behaviors design (Gast & Ledford, 2010) to examine the effects of the two formats: (1) Time Timer; and (2) close-up view of the target step; which were applied to demonstrate the passage of time required during multi-step task completion (i.e., soaking soiled clothing in water and detergent). The AATD compared the effectiveness of the two formats to demonstrate passage of time while the multiple probe design was used to demonstrate a functional relationship between the two passage of time formats, embedded within video prompting, and multi-task completion of students with moderate intellectual disability. The dependent variable was the percentage of steps completed independently across three sets of tasks (boiling, soaking, and stain removal) requiring the passage of time during task completion. The three sets of tasks were fundamentally different in order to evaluate the two procedures across task requirements. Within each of the three sets of tasks, the two passages of time formats with video prompting were applied to different, functionally independent tasks, equated for response difficulty (Wolery et al.) within each set (Table 1). Tasks within each set were matched by the number of steps, response topographies, and motor requirements (i.e., opening cans). The two formats for presenting the passage of time were counterbalanced across tasks and two pairs of students to control for possible effects of task variation (Table 2) and task presentation across sessions was counterbalanced to control for sequence effect.

Experimental conditions included a Baseline, Comparison, and Final Treatment phase across each of the three sets of tasks. The baseline condition served to evaluate student performance on each task prior to the comparison of the two passage of time video-based procedures and continued for a minimum of three sessions or until data stabilized across the two procedures within each set with no improvement.

The Comparison phase served to evaluate the two passage of time video-based procedures (Time Timer and video focusing on the task as time passed) and continued until behaviors of one intervention reached criterion level (Wolery et al., 2010). Criterion was defined as correctly completing 100% of the steps of a task for one session. If one task (procedure) reached criterion-level responding before the other task, the Comparison condition continued for 1.5 times the number of sessions it took the first procedure to reach criterion or until both procedures reached criteria. In addition, a minimum of five sessions was required per intervention and stable data with no improvement in level of performance was required prior to introduction of the Final Treatment condition (Wolery et al.). The Final Treatment condition evaluated each task within each set when the alternate of the two procedures was applied from that used during the comparison condition. In other words, if the student cooked soup with the Time Timer during the Comparison condi-
### TABLE 1

Task analysis and video prompting clusters for three sets of tasks, two tasks per set

<table>
<thead>
<tr>
<th>Boiling</th>
<th>Canned Soup</th>
<th>Canned Pasta</th>
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<tbody>
<tr>
<td>1. Get can from cabinet</td>
<td>1. Get can from cabinet</td>
<td>1. Get can from cabinet</td>
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<tr>
<td>2. Get pan from cabinet</td>
<td>2. Get pan from cabinet</td>
<td>2. Get pan from cabinet</td>
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<tr>
<td>5. Get oven mitt from drawer</td>
<td>5. Get oven mitt from drawer</td>
<td>5. Get oven mitt from drawer</td>
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<tr>
<td>6. Open soup can</td>
<td>6. Open pasta can</td>
<td>6. Open pasta can</td>
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<tr>
<td>7. Pour soup into pan</td>
<td>7. Pour pasta into pan</td>
<td>7. Pour pasta into pan</td>
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<tr>
<td>8. Turn on hot water, fill can, turn off</td>
<td>8. Put pan on front left burner</td>
<td>8. Put pan on front left burner</td>
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<tr>
<td>9. Put pan on front right burner</td>
<td>9. Turn stove dial to medium</td>
<td>9. Turn stove dial to medium</td>
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<tr>
<td>10. Turn stove dial to high</td>
<td>10. Put can and lid in trash</td>
<td>10. Put can and lid in trash</td>
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<tr>
<td>11. Put can and lid in trash</td>
<td>11. Wait one minute</td>
<td>11. Wait one minute</td>
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<tr>
<td>14. Wait one minute</td>
<td>14. Turn off stove dial</td>
<td>14. Turn off stove dial</td>
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<tr>
<td>15. Turn off stove dial</td>
<td>15. Put on oven mitt</td>
<td>15. Put on oven mitt</td>
</tr>
<tr>
<td>17. Pour soup into bowl</td>
<td>17. Put pan on back left burner</td>
<td>17. Put pan on back left burner</td>
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<tr>
<td>18. Put pan on back left burner</td>
<td>18. Take off oven mitt and put in drawer</td>
<td>18. Take off oven mitt and put in drawer</td>
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<td>19. Take off oven mitt and put in drawer</td>
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<table>
<thead>
<tr>
<th>Soaking</th>
<th>Pan</th>
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<tbody>
<tr>
<td>1. Put stopper in sink drain</td>
<td>1. Put stopper in sink drain</td>
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<tr>
<td>2. Get Woolite from cabinet</td>
<td>2. Get dishwashing liquid from cabinet</td>
</tr>
<tr>
<td>3. Open Woolite, fill cap, pour into sink</td>
<td>3. Open dishwashing liquid, squirt into sink</td>
</tr>
<tr>
<td>4. Turn on water, fill sink to mark, turn off</td>
<td>4. Turn on water, fill sink to mark, turn off</td>
</tr>
<tr>
<td>5. Put swimsuit into water and push to bottom</td>
<td>5. Put pan into water and push to bottom</td>
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<tr>
<td>7. Wait one minute</td>
<td>7. Wait one minute</td>
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<tr>
<td>8. Swish swimsuit in water</td>
<td>8. Swish pan in water</td>
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<tr>
<td>9. Wait one minute</td>
<td>9. Wait one minute</td>
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<tr>
<td>10. Remove stopper from sink, drain</td>
<td>10. Remove stopper from sink, drain</td>
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<tr>
<td>11. Turn on hot water, rinse swimsuit, turn off water</td>
<td>11. Turn on hot water, rinse inside of pan, rinse outside of pan, turn off water</td>
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<tr>
<td>12. Squeeze swimsuit and put on counter</td>
<td>12. Put pan on counter</td>
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<tr>
<th>Stain Removal</th>
<th>Laundry Stain Remover</th>
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<tbody>
<tr>
<td>1. Get rug shampoo from cabinet</td>
<td>1. Get SHOUT from cabinet</td>
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<tr>
<td>2. Shake container 3 times</td>
<td>2. Open SHOUT</td>
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<tr>
<td>3. Hold container facing down, squeeze, rub sponge down, up, down</td>
<td>3. Shake SHOUT container 3 times</td>
</tr>
<tr>
<td>4. Put shampoo in cabinet</td>
<td>4. Spray SHOUT 3 times on shorts</td>
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<tr>
<td>5. Wait one minute</td>
<td>5. Rub two sides of shorts together</td>
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<tr>
<td>6. Wait one minute</td>
<td>6. Put shorts down on counter</td>
</tr>
<tr>
<td>7. Get cloth from drawer</td>
<td>7. Close SHOUT and put in cabinet</td>
</tr>
<tr>
<td>8. Turn on water, wet cloth, squeeze, turn off</td>
<td>8. Wait one minute</td>
</tr>
<tr>
<td>9. Rub cloth down rug, up rug, down rug</td>
<td>9. Wait one minute</td>
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Dependent Variable and Data Collection

The dependent variable was the percentage of task and passage of time steps completed correctly. Some steps were clustered together in one video clip to assist with the natural flow of the steps. For example, when cleaning the area rug, the student advanced the program to a slide with the video recording which showed the water being turned on, wetting the cloth, squeezing the cloth, and turning off the water (Table 1). For the response to be scored as an independent performance, students were required to complete all steps of the cluster. A correct response was recorded if a step was initiated with 3 s of completion of the previous step (baseline) or video step (comparison and final treatment) and completed

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**TABLE 2**

Counterbalancing of tasks across pairs of students (Daniel and Kelly; Martin and Tierra). Percentage correct for completion of passage of time steps for each task session across participants and procedures

<table>
<thead>
<tr>
<th>Boiling</th>
<th>Soaking</th>
<th>Stain Removal</th>
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<tbody>
<tr>
<td><strong>Time Timer</strong></td>
<td><strong>Video Focus</strong></td>
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<td><strong>Video Focus</strong></td>
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<tr>
<td>Canned Soup</td>
<td>Canned Pasta</td>
<td>Swimsuit</td>
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<tr>
<td>Pan</td>
<td>Laundry Stain</td>
<td>Rug Shampoo</td>
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The student focused on the task during the Final Treatment condition. This condition served to determine if performance was influenced by the level of task difficulty or whether application of the alternative video-based passage of time procedure would influence performance.
within 60 s following initiation (all conditions). Students could also complete and/or initiate a step while the video prompt was playing. For the “waiting” steps while time passed (e.g., soup boiled for 2 min) a correct response was recorded if the student watched the video or stood nearby without engaging in any task behavior until increments of 1 min passed (total of 2 min). Steps for swishing the pan or swimsuit and stirring the canned soup and pasta were also inserted in between the 1 min increments of time passing.

If the student failed to initiate or complete a step correctly across any of the conditions, and the step was critical to the performance of subsequent steps (i.e., turning on the stove dial) the instructor blocked the student’s view and completed the step. Incorrect initiation or completion of non-critical steps (i.e., swish pan in sink) was ignored and students proceeded to the next step. One exception to this procedure was use of the oven mitt when pouring soup or pasta into the bowl. If the student did not initiate or complete this step correctly, the instructor physically prompted the student to put on the oven mitt for safety purposes. No other instructor prompts were provided for task completion.

Procedure

General procedure. Sessions were conducted individually, with only one student present in the kitchen, across all conditions. Sessions were conducted three days per week and only one task was completed each day, with the exception of Tierra during her last set (stain removal). Tierra exited the school program in order to take a full time job and two tasks were presented to her per day in order for her to complete the study. Students advanced through the three sets and conditions independently from the other students’ performance and mastery levels.

Baseline procedure. Before any video prompting began and after each comparison condition for a set of tasks was complete, the instructor conducted a minimum of three probe sessions for each student for any task which had not received video prompting instruction. Once a stable baseline level of performance was achieved, the student entered the comparison condition for the next set of tasks.

At the beginning of the session the instructor secured the student’s attention and gave a task direction (e.g., “Let’s clean the rug.”) and waited 3 s for the student to initiate the first (and subsequent) step and 60 s to complete the first (and subsequent) step. For gathering materials, the sequence of steps was not considered critical and steps were recorded as correct regardless of the order (e.g., obtaining the wooden spoon and oven mitts for cooking). The instructor verbally praised attention to the task on the average of every third step (VR3 schedule) and correct performance of steps on a VR3 schedule. At the end of the boiling tasks, students could also eat the prepared food.

Video prompting comparison condition procedure. During this condition the laptop computer was placed on the counter and the instructor started the PowerPoint program for the target task. The instructor secured the student’s attention and gave a task direction (e.g., “Let’s cook the soup.”) and activated the first video slide. Subsequent slides were activated by the student “clicking” the mouse on a forward arrow icon positioned on the bottom right of each PowerPoint slide. Video prompts played automatically when the slide appeared on the screen. Students were provided 3 s to initiate the step and 60 s to complete the step after the video prompt stopped. Students were also permitted to complete and/or initiate steps while the video prompt played as long as they completed the step within 60 s of the completion of the video. For the passage of time steps, correct responses were recorded if the student watched the video or stood nearby without engaging (waiting) in any task behavior. Delivery of reinforcement was identical to that used during baseline.

Final treatment procedure. When a student completed the Comparison condition with a set of tasks using the two video prompting interventions, each intervention was applied to the alternate task (e.g., Comparison condition Time Timer video-prompt applied to boiling soup; Final Treatment condition video focusing on the item applied to boiling soup). One session was conducted for each task using the alternate video prompting procedure and
sessions were conducted identically to those used during the Comparison condition.

**Interobserver Agreement and Procedural Reliability**

One of two university students collected data on the dependent measure across 68.7% of sessions, conditions, and participants (baseline: 52.7%, comparison: 79.8%, final treatment: 75%) for 63.1% of Daniel’s sessions (baseline: 40%, comparison: 79.4%, final treatment: 66.7%) for 64.4% of Kelly’s sessions (baseline: 43.5%, comparison: 76.7%, final treatment: 83.3%), for 73.2% of Martin’s sessions (baseline: 50%, comparison: 83.3%, final treatment: 100%) and for 75% of Tierra’s sessions (baseline: 76%, comparison: 80%, final treatment: 50%).

Interobserver agreement between the instructor and the reliability data collector was calculated on a session-by-session basis for each student by dividing the number of agreements on performance of each step by the number of agreements plus disagreements and multiplying by 100. Overall mean interobserver agreement was 98.9% (range = 85.7–100%). Mean interobserver agreement was 98.3% during the Baseline condition (Daniel: 98.3; Kelly: 99.1; Martin: 97.9%; Tierra: 98%), 99.1% during the Comparison condition (Daniel: 98.9; Kelly: 99.5; Martin: 99%; Tierra: 99.1%), and 100% during the Final Treatment condition.

The reliability data collector also collected procedural fidelity data on independent variables simultaneously with data on the dependent variables across 68.7% of the three conditions, participants and sessions. During these sessions the second observer recorded whether all procedural steps were completed correctly by the instructor which included: (a) delivering general task directions; (b) presenting the correct task in a counterbalanced format; (c) arranging materials on the counter and in the cabinets and drawers; (d) presenting the correct video (Time Timer or video focusing on the task); (e) waiting 5 s for initiation of task steps; (f) waiting 60 s for completion of task steps; (g) no delivery of prompts or cues (except for the wearing the oven mitt); and (h) blocking the student’s view when completing critical steps. Procedural fidelity was calculated by dividing the number of procedural steps completed correctly by the total number of procedural steps and multiplying by 100 (Billingsley, White, & Munson, 1980).

Mean procedural fidelity agreement across all procedural steps, conditions, and students was calculated to be 99.9% with a range of 97.1–100% (baseline: 99.96%; comparison 99.9%; final treatment 100%). Procedural errors occurred when the wooden spoon was not in the drawer (boiling, Comparison condition), the pan was not on the counter (soaking, Comparison condition), the sink stopper was not on the counter (soaking, Comparison condition), the PowerPoint slide skipped to the next slide before the video played (Baseline and Comparison condition), and the instructor waited more than 60 s for Daniel to complete a step (stain removal, Comparison condition).

**Social Validity**

Social validity data were collected at the completion of the last set of tasks using a short three question satisfaction teacher assessment. Satisfaction was measured by a 5-point Likert scale for the first two questions and one comparison question.

The participants in the study were also questioned regarding their preference between the two video prompting programs. Each was shown the video clip of the Time Timer used in the boiling procedure as well as the video clip focusing on the pan followed by asking each which one he/she liked to use best.

Results indicated that the two teachers preferred use of the Time Timer and verbally indicated they felt it was a more concrete demonstration. One teacher answered that she thought it might be more difficult to move the camera and create ways to concretely show that the video was still running if longer periods of time were demonstrated. Both teachers also indicated that it might be “boring” to watch the Time Timer “tic” if larger increments of time were used.

Results from interviewing the four students indicated that they preferred to watch the video focusing on the item. One student answered, “It doesn’t do anything” when referring to the Time Timer and one student said, “I
like watching the soup bubbles;” and “I like the soap bubbles popping” (soaking task).

**Results**

Figures 2–5 show the percentage of correct responses across all task steps including those for passage of time while Table 2 disaggregates the data for correct responses for the passage of time steps. Data from the figures indicate that both video procedures were effective in prompting students to complete task steps. Tierra was the only student who failed to reach criterion levels when using video
prompting. During the stain removal task with the rug she was unable to follow the video steps for lifting and bringing the brush and cloth back to the top of the rug. She failed to complete these steps when using the *Time Timer* video (comparison) and the video focusing on the task (final treatment).

Data from Table 2 indicate that both video procedures were equally effective for all four students to prompt them to wait for time to pass. Daniel was the only student who experienced difficulty in waiting while time passed and did so across both procedures. Over time, he increased his ability to wait and made no

Figure 3. Percentage of task and passage of time steps correctly completed by Kelly.
errors on the third set of stain removal tasks. Daniel was described as having anxious and impulsive behaviors prior to the study and continued to exhibit those behaviors during the initial sessions with the first two sets of tasks. He often sighed and made noises indicating he was annoyed when he had to wait for time to pass. He also tapped his fingers on the counter and his shoe on the floor while waiting. When he made errors he quickly advanced the program to the next slide before the two minutes (passage of time) were complete. Martin was the only other student who made any errors on the steps for passage of time. He did so when using the Time Timer on the first session of his first set (stain removal).

Discussion

This study was the first to evaluate video approaches for representing the passage of time when completing daily living tasks that re-
quire the user to wait for something to occur within a task. This may happen when the user is waiting for a product to: dry (e.g., nail polish); thicken (e.g., instant oatmeal); cool (e.g., microwave popcorn); activate (e.g., stain removal); boil (e.g., boiling eggs); or cook (e.g., French fries in the oven). Other video approaches such as showing the end product after time has passed (Mechling et al., 2013) or showing an adult model setting a timer followed by a video clip of the timer activating (as if it were made in a fast forward motion:}
Mechling et al., 2008; Mechling & Stephens, 2009) have been shown to be problematic for users who have cognitive challenges. Results from this study suggest that two approaches, video of time visually diminishing on a color coded Time Timer, and video focusing on the task (e.g., product thickening) are effective means to present the concept of time passing to students with moderate intellectual disability. Results further contribute to the identified need for researchers to address the isolation of video variables in order to determine which video components are most effective (Ramdoss et al., 2012; Rosenberg, Schwartz, & Davis, 2010). Because all the participants in this study were diagnosed with a moderate intellectual disability, it will be important for future studies to evaluate these procedures with additional students with varying disabilities such as autism as well as with other tasks.

Results of this study also support the notion that the quality of instructional materials such as video models is affected by the knowledge of the developers and their understanding of end users. Care was taken to move the camera while time was passing and the video was focusing on the task so that the participants could see that the video was still playing and had not paused at the end of the step. Likewise, voice over captions such as “Wait one more minute” were added for this same purpose. When using the timer, the same voice over captions were added in addition to the sound of the Time Timer ticking. Another feature which may be important to evaluate in future studies is the distance from the camera to the product being videotaped (e.g., soup in the pan while boiling). The current study focused on the pan, but included an image of the stove top. Zooming the camera angle closer to the product may provide additional information to the user.

A limitation of the study that bears mentioning is that the maximum passage of time presented on the videos was two minutes. While this amount of time was appropriate for the selected tasks, other cooking related tasks, for example, will require greater amounts of time to be represented. As shown in the current study, users such as Daniel, may become distracted, lose their attention, or become bored as the amount of wait time increases and is represented by these two procedures. More audio or visual prompts may be necessary for users who may be impulsive or impatient and/or when increments of time increase.

In conclusion, this study identified the need to concretely represent the concept of time passing when using video models to prompt independent task completion by persons with moderate intellectual disability and investigated two procedures for doing so. Future work remains to be done to identify the impact and relevance of individual video variables across participant characteristics and target behaviors.

References
Mechling, L. C., Ayres, K. M., Purrazzella, K., &


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