The Role of Video-Modelling in Combination with CAPSI in Procedural and Didactic Knowledge Acquisition

by

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Abstract

With the increase in e-learning systems being used for varying populations and source materials (Wang, 2014), research is beginning to emerge on maximizing the effectiveness of such systems. Video modelling has been shown to be effective in teaching behavioural interventions to individuals with developmental disabilities and autism spectrum disorder (Hong et al., 2016); however, little research is available on teaching behavioural interventions with video modelling in combination with e-learning systems such as the computer-aided personalized system of instruction (CAPSI). There are two viewing formats of video modelling – point-of-view (POV) and third-person perspective (TPP). The purpose of this study was to first determine which of these two formats is more effective in teaching a behavioural intervention both didactically and procedurally, and second, to use that viewing format to compare the effectiveness of (a) CAPSI in combination with a self-instructional manual (SIM) and the more effective viewing format of video modelling with (b) the same video modelling demonstration and SIM in the absence of CAPSI in teaching a behavioural intervention, again, both didactically and procedurally. To accomplish this, two experiments were carried out. The first experiment, utilizing a modified reversal design with embedded alternating treatments, compared the relative effectiveness of POV versus TPP in teaching discrete trials teaching (DTT) methodology both didactically and procedurally. Results showed that the effectiveness of POV and TPP were similar but somewhat task dependent. Therefore, a video model demonstrating a DTT session was created combining both POV and TPP components. The second experiment, through a group design, compared the effectiveness of CAPSI, the SIM, and the video model versus the video model and SIM alone. Using a *p*-value of .05 to test for statistical significance, results from Experiment 2 showed no statistically significant difference between groups, suggesting that

CAPSI and a video model does not add anything in terms of effectiveness when compared to a self-instructional manual plus a video model when teaching DTT both didactically and procedurally. Implications of the results and ideas for future research are discussed.

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The Role of Video-Modelling in Combination with CAPSI in Procedural and Didactic Knowledge Acquisition

Recently, there has been an insurgence of e-learning systems (i.e., technologically based teaching systems) appearing in university and college classrooms (Wang, 2014). A subset of e-learning systems is that of interactive computer training systems (ICTSs), which incorporate self-instructional manuals (SIMs) or texts and a variety of other interventions (e.g., modelling procedures, integrated quizzes, opportunities for self-practice) to present a training package to its learners. The advent of these ICTS have minimized the need for in-vivo (i.e., in-person) instruction by a teacher (Arnal et al., 2007; Nosik & Williams, 2011; Thiessen et al., 2009). Due to the cost efficiency and increased accessibility implicit in ICTSs (Ghavifekr & Rosdy, 2015), established and effective ICTSs are becoming more attractive to both researchers and teachers to deliver instruction in both the research lab and classroom.

Computer-Aided Personalized System of Instruction (CAPSI)

The computer-aided personalized system of instruction (CAPSI) is an established, effective, and socially valid (Svenningsen, Bottomley & Pear, 2018; Svenningsen & Pear, 2011; Pear & Novak, 1996) ICTS modelled after Fred Keller's (1968) Personalized System of Instruction (PSI). CAPSI, based on behavioural principles, involves allowing learners to study material at their own pace with explicit end-goals while stressing mastery learning (i.e., requiring the demonstration of sufficient comprehension of materials learned prior to progressing to further units). It was developed by Drs. Witold Kinsner and Joseph Pear (1988) as a web-based program serving as a stand-alone teaching medium. CAPSI facilitates the typical *Personalized System of Instruction* sequence of events online: presentation of a text broken down into units, independent study of the course material, the administration of a unit test upon the completion of studying

each unit of material, and providing for students to review their peers' work after demonstrating mastery (i.e., an arbitrary accuracy criterion as set by the instructor).

In its use, instructors and researchers are able to use CAPSI to teach any SIM or text with substantial research demonstrating CAPSI's effectiveness in teaching a wide variety of source material (Hu et al., 2012; Scherman et al., 2015; Svenningsen, L., Bottomley, S., & Pear, J.J., 2018; Svenningsen & Pear, 2011). Moreover, instructors are able to upload text and video files into CAPSI to supplement the main SIM or text. In its initial set-up, instructors or researchers typically proceed as follows: instructors create a pool of short answer or short essay questions per unit of material, enter them into CAPSI, and upon a student requesting a unit test following studying a unit of material, CAPSI randomly selects a specified number of questions (e.g., three) and presents them to the student in the form of a unit test. Answers to each unit test are then entered into a textbox-like interface in the program by the student or participant. Following the unit test's submission, they are then graded by the instructor or researcher to allow for the students' or participants' progress in the course or study.

As instructors and researchers have control over the length and difficulty of questions being administered within each unit test, CAPSI researchers (e.g., Crone-Todd, Pear, & Read, 2000) have looked to Benjamin Bloom's taxonomy of learning (1956), which has been recently revised (Anderson et al., 2000; Crone-Todd, Pear, & Read, 2000), to help shape the development of questions leading to higher-order thinking. Bloom's Taxonomy has become a common tool to determine the probable effectiveness of teaching interventions (Doyle, Hungerford, & Cruickshank, 2014). The taxonomy is divided into six levels, aiming to operationalize the form of behaviour required to answer questions at varying learning levels. The taxonomy is applied during question development for both instructors and researchers. Typically, the level of question

administered is not explicitly stated to the learner. In its utilization, researchers and instructors are able to work towards maximizing the effectiveness of CAPSI's teaching of both lower order and higher order skills.

With the effectiveness of CAPSI having been demonstrated in a variety of classrooms and teaching a variety of different populations and source materials, current research on CAPSI has focused on finding strategies to maximize its effectiveness both as a stand-alone teaching medium and in combination with other teaching interventions (e.g., videos, role-playing) (Hu et al., 2012; Thomson et al., 2012; Wightman et al., 2012; Young et al., 2012). As behaviour modelling has been previously established as an effective intervention in teaching (Bandura, 1977; Charlop et al., 1983), uploading videos of modelled behaviours into CAPSI may serve to increase CAPSI's effectiveness in teaching.

Video modelling

Albert Bandura's (1977) research into social learning theory has helped to establish behavioural modelling as an effective method of teaching. Therefore, investigators looked to determine the parameters of where and how behavioural modelling is effective in teaching new behaviours. In-vivo modelling has been implemented successfully to teach a variety of skills with both typically developing individuals (DiGennaro et al., 2007; Pence et al., 2012; Sarokoff & Sturmey, 2004) and individuals diagnosed with a developmental disability or autism spectrum disorder (ASD) (Charlop et al., 1983). However, the requirement of in-person, trained professionals to deliver modelling interventions is challenging due to its costs and shortage of trained professionals (Pollard et al., 2014). A more cost-effective and flexible method of providing a modelling demonstration is needed.

Video modelling began to emerge as a training method in the 1990s as an alternative to in-vivo modelling (Wilson, 2013). It is defined as the presentation of a model acting out a targeted behaviour facilitated by video-based technology. Video modelling can be created and distributed with minimal resources, can be readily individualized to a particular student or participant, incurs approximately one-third of the cost of creating an in-vivo model, and was reported in a study by Alberto et al. (2005) to take less effort to create as compared to static picture cues (Charlop-Christy et al., 2000; Gena et al., 2005; Wilson, 2013). Therefore, as video modelling consequently eliminates the need for time-consuming and labour-intensive in-vivo modelling, it may be a more practical option for modelling interventions in teaching.

Support for video modelling. Substantial research has been conducted to determine if video-modelling is an effective teaching tool in combination with SIMs with promising results (Arnal et al., 2007; Kratochwill, 1989; Severtson & Carr, 2012; Thomson et al., 2012; Wightman et al., 2012; Young et al., 2012). Video modelling has been shown to be effective in training a variety of skills to both typically developing individuals and individuals with ASD in home, clinical, and school settings (Charlop-Christy et al., 2000; Gena et al., 2005; Hong et al., 2016; Shukla-Mehta, 2010; Wilson, 2013). Additionally, DiGennaro-Reed et al. (2010) found that treatment integrity (i.e., ensuring that a treatment is carried out in the way it was planned to be carried out) of managing challenging behaviour in individuals with developmental disabilities significantly increased following the use of video modelling in teaching. The participants in the study also graded the use of video modelling as being socially appropriate and valid (i.e., an acceptable and feasible teaching strategy to implement in daily life). Moreover, research has begun to focus on video modelling in training workers and parents to implement behavioural interventions with individuals with ASD and developmental disabilities with success (Catania et

al., 2009; Collins et al., 2009; Lavie & Sturmey, 2002; Macurik et al., 2008; Moore & Fisher, 2007; Neef et al., 1991).

Considerations for maximizing video modelling effectiveness. Components of video modelling should be considered when aiming to maximize its effectiveness in teaching. Available research on the number of modelling demonstrations required for effective teaching, and the effects of viewing format of video-modelling will be discussed in this section.

Variety of potential therapist-client interactions. Moore and Fisher (2007) found that video modelling was effective in teaching both didactic and procedural knowledge of a functional analysis procedure (i.e., direct manipulation of variables controlling behaviour to determine the function of a specific behaviour). However, the video modelling demonstrations were found only to be effective if the videos consisted of multiple examples of possible therapist and client interactions. Therefore, future research involving video modelling should utilize videos in which a wide range of potential therapist-client interactions are demonstrated.

Video format of video model. A meta-analytic study completed by Mason et al. (2013) compared two different formats of video modelling: point-of-view (POV) and third-person perspective (TPP) video modelling. POV video modelling is the presentation of a scene from a learner's point of view to attempt to make the view as similar to what the learner would see if he or she performed the targeted skill. Kouo (2018) proposed POV as an effective viewing format for a video model as it decreases extraneous stimuli for the observer which provides a clearer view for imitation. Conversely, TPP involves capturing both teacher and student in each frame, typically from a perpendicular direction. That is, with POV the student views trials from the perspective of him/herself as the person engaging in the targeted behaviour, whereas with TPP the student views trials as though watching them from the perspective of an onlooker. Mason et

al. (2013) found that POV is more effective at teaching individuals with ASD or developmental disabilities independent living skills as compared to TPP; however, no research is available comparing the effectiveness of POV with TPP when used with typically developed adult populations.

CAPSI in Combination with Other Teaching Interventions

CAPSI has been established as an effective, stand-alone teaching medium (Pear & Kinsner, 1988; Pear & Novak, 1996;). However, researchers are beginning to look at additive components to maximize CAPSI's effectiveness in teaching. Research pertaining to its use in combination with other teaching tools is as follows.

CAPSI and Self-Instructional Manuals (SIMs). SIMs may be used independently or in combination with an ICTS such as CAPSI. However, the use of an ICTS has the added benefit of allowing instructors to closely monitor each student's performance and to provide feedback as needed. Nevertheless, research so far has not demonstrated that CAPSI is more effective than SIMs when used on their own (Oliveira et al., 2012).

CAPSI and Video Modelling. Although **s**ubstantial research is available demonstrating the effectiveness of combining SIMs with video-modelling (Arnal et al., 2007; Boris et al., 2013; Boris et al., 2016; Kratochwill, 1989; Severtson & Carr, 2012; Thomson et al., 2012; Wightman et al., 2012; Young et al., 2012), little research is available testing the combination of CAPSI and video modelling. Specifically, only two studies – Hu et al. (2012) and Arnal et al. (2013) - were found evaluating CAPSI's effectiveness in combination with video modelling in teaching individuals to implement behavioural interventions. Hu et al. (2012) tested CAPSI's effectiveness in teaching the Assessment of Basic Learning Abilities (ABLA), an assessment aiming to operationalize skill level in a variety of basic learning skill areas, to university students

in combination with video modelling. The researchers found all participants improved from baseline in both knowledge and skill acquisition tested during the post-intervention and follow-up phases. Additionally, the video modelling demonstrations were deemed socially valid by each student, with the demonstrations being identified as the most useful component of the training package. Arnal et al. (2013) conducted a study to determine CAPSI's effectiveness in teaching individuals to conduct preference assessments in combination with a SIM and video modelling. The researchers found all participants demonstrated statistically significant improvement adding support for the use of CAPSI as a teaching medium in combination with video-modelling.

Research Gaps

The literature suggests that: (a) CAPSI is effective in promoting didactic and procedural knowledge acquisition; (b) behavioural modelling, both in-vivo and video, is effective in teaching varying skills with both typically developing populations and individuals diagnosed with developmental disabilities or ASD; (c) video modelling is more cost-effective and efficient than in-vivo modelling; and (d) CAPSI is effective in combination with video-modelling and SIMs. However, research is lacking on comparing CAPSI in combination with a video model and SIM versus the SIM and video model in teaching procedural and didactic knowledge, and on the format (POV or TPP) of video modelling that is most effective for individuals learning to implement behavioural interventions.

To start to fill this gap, two experiments were conducted. The purpose of the first experiment was to identify which format of video modelling is more effective in teaching typically-developed adults to learn to implement behavioural interventions (i.e., POV versus TPP). With Mason et al. (2013) demonstrating the increased effectiveness of POV video

modelling versus TPP video modelling when used with individuals diagnosed with a developmental disability or ASD, it was hypothesized that POV would also be more effective in teaching individuals of the typically developing population. Since Kouo (2018) demonstrated limited maintenance of skills taught via POV, a follow-up phase was added to the study to test this finding. Once the more effective video model format was determined, the second experiment was completed aiming to compare (a) CAPSI in combination with the more effective video-modelling format (i.e., POV, TPP, or a combination of the two) with (b) a SIM in combination with the same video model in teaching individuals to implement discrete trials teaching (DTT) methodology with children or adults with ASD. DTT was selected as the skill to be learned for both experiments as it is an effective and common teaching format for children with ASD (Fazzio & Martin, 2011). However, any skill could have theoretically been selected as the purpose of this study was to compare CAPSI's and a SIM's over-arcing relative effectiveness in teaching when combined with a video model, not necessarily their effectiveness in teaching a specific methodology.

Method - Experiment 1

Participants

Twelve psychology undergraduate students from the University of Manitoba participant pool were recruited for Experiment 1. The participant pool consists of undergraduate students currently enrolled in Introduction to Psychology, a pre-requisite course for advanced psychology study. Participation in research accounts for 8% of the undergraduates' final grade; however, participation can be waived by performing an alternative academic task such as writing a final exam. Those who choose to participate must earn 16 credits, with each credit equivalent to a half

percent of the final grade. As Experiment 1 was expected to take approximately 2.5 hours to complete, the participants received 5 credits for total completion of the study – 1 credit per half hour of participation. Each student's pre-existing procedural knowledge of DTT was tested via an application test at baseline. Exclusion criteria were in effect including: achieving higher than 75% on the application test administered during the baseline phase and indicating a high school grade average of 91-100%. These specific exclusion criteria were chosen to attempt to avoid outliers in the final data which may have had a significant effect due to the smaller sample size used for the study. Out of the twelve participants recruited, one participant's data had to be excluded due to his high school grade average being above 91%. Of the remaining 11 participants, only one did not complete all phases of the experiment. Participants were asked to attend all sessions conducted at either the University of Manitoba in the Duff Roblin building or at St. Amant, a treatment centre close to the University of Manitoba in a testing office or research room depending on the preferences of the participants recruited.

As this Experiment employed single case methodology, few participants were required to demonstrate strong, specific changes at the individual level. Half of the participants received one order of treatment delivery while the other half received the other order of treatment.

Materials

The materials utilized in Experiment 1 are listed in Table 1 – see the indicated appendices for further details. Both a POV and a TPP video recording of each section of a typical DTT trial (i.e., preparing for a teaching session [PTS], the presentation of a single trial [PT], responding to the students' responses [RSR], and data collection [DC]), were recorded (see Table 2) with video 1's PTS and RSR recorded in POV while the PT and DC components were recorded in TPP, and

video 2's PTS and RSR recorded in TPP while the PT and DC components were recorded in POV.

Table 1
Materials used for Experiment 1

Material	Corresponding Appendices
Consent form	–
Demographics form	Appendix A
DTT instructions and data sheet	Appendix B
Pencil	–
PI checklist	Appendix C
3 Role-play scripts for confederate	Appendices D, E, F
3 edibles for use as reinforcers	–
POV video model	–
TPP video model	–
Video recorder	–
Computer to play video files	–
Discrete Trials Teaching Evaluaion Form (DTTEF) (Fazzio, D. et al., 2007)	Appendix G

Note. The dashes under the Experiment 1 column signify no corresponding appendix for the specific material listed.

Table 2
Division of DTT manual by section with its corresponding acronym and page numbers

DTT Section	Acronym
Preparing for teaching session	PTS
Presenting trial	PT
Responding to student responses	RSR
Data collection	DC

Design

As seen in Table 3, Experiment 1 used a modified reversal design with embedded alternating treatments involving interchanging treatments during the intervention phase (i.e., POV and TPP video model viewing formats). The interventions were purposely not dependent on a particular stimulus condition (e.g., time of day); therefore, all phases except for the follow-up phase were conducted in a single day. Each of the interventions were conducted an equal number of times in the intervention phase and were counterbalanced across participants. This meant that Participant 1 was exposed to POV video modelling first followed by TPP video modelling while Participant 2 was exposed to TPP video modelling first followed by POV video modelling. This pattern was extended for all participants in the study.

Table 3
Video model viewing format of each section of a DTT trial presented to Experiment 1 participants

Participants	Preparing to teach a session	Presenting Trial	Responding to Student Responses	Data Collection
1,3,5,7,9,11	POV	TPP	POV	TPP
2,6,8,10,12	TPP	POV	TPP	POV

Note. POV refers to point-of-view video modelling format while TPP refers to third-person-perspective video modelling format. As defined in Table 2, preparing to teach a session, presenting trial, responding to student responses, and data collection refer to the four sections of a typical DTT trial.

Procedure

Upon recruitment, each participant met with the primary researcher who presented them with a consent form and provided, via a pre-determined script, a brief introduction to the experiment (see Appendix C). The consent form stated that each participant was to complete all portions of the experiment within one and a half weeks on two separate days: the baseline, intervention, and post-intervention phases on the first day and the follow-up phase approximately one week later. Upon giving consent, the participant was provided a demographics form and was allowed up to 10 minutes to complete it. The participant was then provided a form containing abbreviated instructions for teaching three gross-motor imitative tasks employing DTT methodology and a data collection sheet (see Appendix B). Participants were allowed 10 minutes to read the instructions and to gather any materials they choose to use to run the session (e.g., a pen for data collection).

Baseline. When the participant was ready to begin, he or she then attempted to teach a confederate (i.e., actor role-playing a child who does not communicate vocally) how to imitate

three gross motor actions (i.e., raising arms, clapping, and placing hands on the table) using DTT methodology. The participant was given a maximum of 15 minutes to conduct 12 trials with the confederate who followed a script describing how he or she should respond to each teaching trial (see Appendix D). The participant was asked to role-play the session with the confederate and to tell the researcher when they felt they had accomplished their task. When the participant deemed the session completed, he or she informed the researcher who then ended the baseline session. The role-play session was video recorded and graded by the researcher using the DTTEF (see Table 1 and Appendix G) at a later date. Following completion of the role-play, the intervention phase was initiated.

Intervention. Upon completion of the baseline, each participant was asked to watch in order a video model of each of the four components of a DTT trial (see Table 2). Each component was recorded in both POV and TPP and was alternated in its presentation (see Table 3). This meant that there were two final versions of the video model. Video 1 included PTS and RSR recorded in POV while PT and DC components were recorded in TPP. Video 2 included PTS and RSP being recorded in TPP while the PT and DC were recorded in POV. Half of the participants watched video 1 while the other half watched video 2. Each of the videos depicted two different presentations of a trial, with the confederate in the video responding in a different way in each presentation. The videos were approximately five minutes long. The participants were not allowed to rewind any portions of the video and were asked to only pause the video in the case of needing to use the bathroom or if an emergency arose. Following watching the video to completion once, the intervention was completed.

Post-Intervention. The post-intervention phase was a repetition of the baseline phase, with the participants receiving the same single page of instructions to run a DTT imitation

session and having them role-play the session with a confederate. The participants, upon receiving the instruction sheet, were again allotted 10 minutes to look over the instructions and to prepare any needed materials (i.e., pen for data collection and three reinforcers for use when praising correct responses, available on their working surface). When the participants were ready, they then again attempted to teach the confederate the same three gross motor imitative tasks as in baseline in 12 trials using DTT methodology. Similarly, the confederate followed a script (see Appendix E) describing how he or she should respond to the participants' behaviours (i.e., a correct response, an incorrect response, or no response). Upon completion, the participants were reminded of their scheduled follow-up session one week following the completion of the post-intervention phase.

Follow up. This phase consisted of an identical repetition of the post-intervention phase.

Upon completion of the experiment, the participants each received five participation credits.

Video Recording and Grading

All procedural tests of the participants were video recorded and scored via the DTTEF by the researcher to determine each participant's accuracy in utilizing DTT. Grading involved viewing the participants' recorded application tests and checking off correct or incorrect implementation of each of the 22 steps on the DTTEF. The total number of correct responses of the participant were divided by the total number of possible responses to produce a percentage of correct responses. Each section of the DTT session (i.e., PTS, PT, RSR, and DC – see Table 2) was graded individually. Additionally, several research session introductions (e.g., greeting the participant, administering the consent form and demographics form) and closings (e.g.,

reminding the participant of future research session dates) were recorded, viewed, and graded by a research assistant for procedural reliability purposes.

Inter-Observer Agreement (IOA)

Independent research assistants were recruited and trained on the use of the DTTEF by the primary researcher. Prior to independently grading application test videos, IOA was calculated on the grading of several practice participants and IOA was found to be at 64% via adding up the total number of agreements between the research assistant and researcher and dividing that total by the number of agreements plus disagreements. Reliability was found to be at its lowest when baseline videos were being graded. Thus, the primary researcher developed a list of rules for DTTEF use attempting to reduce some of the ambiguity in its use as it pertains to significantly variable performances on DTT. The primary researcher then trained the research assistants on the novel rules when utilizing the DTTEF and IOA performance was recalculated and found to be 84%. As this agreement rating was higher than 80%, typically regarded as acceptable in accordance with traditional inter-observer agreement guidelines (Kazdin, 2011), the research assistants were then permitted to grade application tests independently.

Upon study commencement, the primary researcher coded each of the participants' videos to maintain confidentiality of the participants' identities. The primary researcher graded all of the application test videos, while research assistants re-graded 30% of them. IOA was found to be 82% for the application videos.

Procedural Reliability (PR)

The primary researcher followed a script when running each research session (see Appendix C). Thirty percent of sessions were either video recorded or attended by an additional observer and scored for procedural reliability by a research assistant according to a procedural

reliability checklist. An acceptable procedural reliability score was set at 80% or higher. PR for this experiment was determined by the number of correct responses completed by the researcher matching those indicated on the PR checklist. Utilizing this calculation, PR was found to be 87% over the entirety of the experiment due to slight variations of wording for steps one, six, seven, and eight accounting for the 13% deduction in PR.

Results - Experiment 1

As shown in Figure 1, participants tended to improve more notably for PTS recorded in POV while similar improvement was seen in PT, RSR, and DC components, with the results favoring TPP albeit not significantly statistically. POV was initially hypothesized to be more effective in teaching the DC component as the entire data sheet and what is written on it was seen in the video model while conversely, what the actor in the video model wrote during data collection was not actually legible in the TPP version. Nevertheless, both POV and TPP resulted in similar improvement on the DC component. An exception to this was for participant 1 who did not record any data for any phase of the study. Approximately 75% of the participants' showed a modest improvement on RSR following the intervention; however, the other 25% actually decreased in accuracy following the intervention suggesting that it was the component RSR itself rather than the viewing format which produced such variable results (for example, see Figure 2). Additionally, maintenance of the behaviour learned was shown to be variable across participants, with 25% of participants actually improving from post-intervention to the follow-up phase, while the remaining participants showed moderate to more substantial decreases in accuracy (for example, see Figure 2).

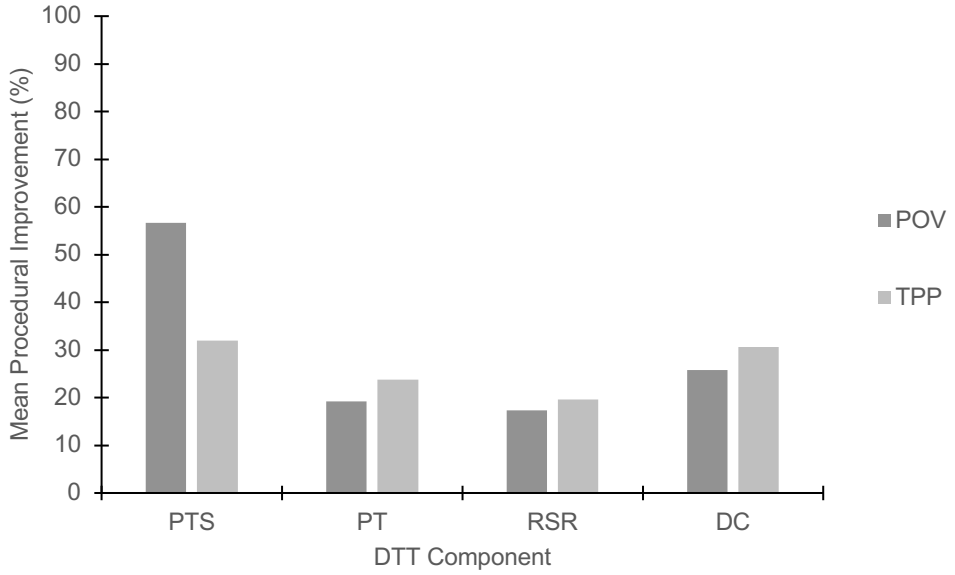

Figure 1. Mean procedural accuracy improvement on DTT components following watching a video model in either POV or TPP viewing formats.

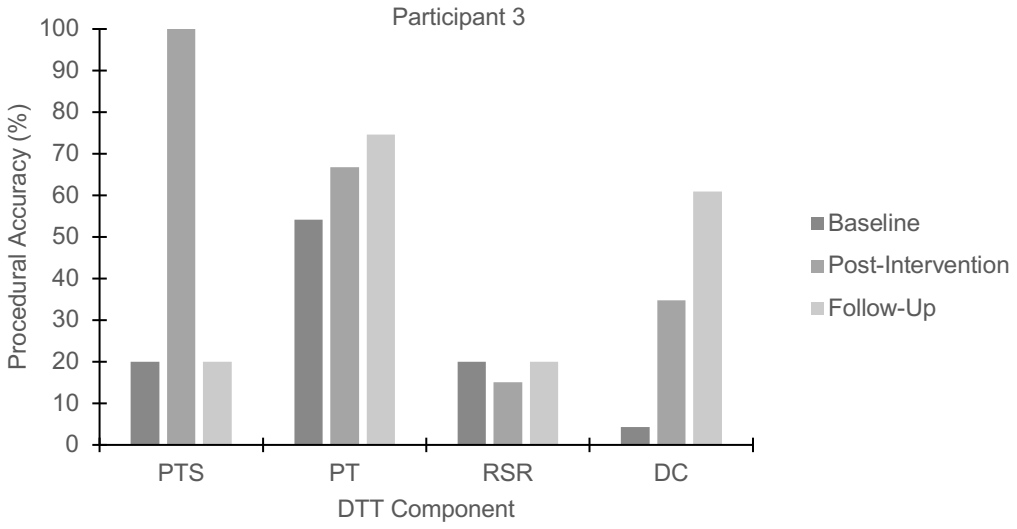

Figure 2. Sample participant data demonstrating decrease in procedural accuracy following intervention on RSR component of DTT and increase in accuracy from post-intervention phase to follow-up phase.

Table 4
Mean improvement of participants' procedural accuracy per intervention received from baseline to post-intervention phase

Participant	POV	TPP
1	9.4%	17.3%
2	33.0%	7.3%
3	37.5%	21.5%
5	61.3%	38.6%
6	24.5%	25.0%
7	31.9%	8.8%
8	17.2%	42.7%
9	28.8%	9.4%
10	8.0%	5.0%
11	53.1%	67.8%
12	29.8%	49.0%
MEAN	30.4%	26.6%

Performance data on each component of the DTT trial was graphed indicating procedural accuracy change across phases. The data were both visually analyzed as is common practice in alternating treatment designs (Kazdin, 2011), and were analyzed statistically via Welch's *t*-test. As seen in Table 4, mean improvement was similar for both POV and TPP interventions, with participants showing an average of 30.4% improvement following the POV intervention, slightly higher than the average 26.6% improvement following the TPP intervention. Additionally, almost half (i.e., 5) of the participants showed greater improvement following receiving the TPP

intervention while the other half (i.e., 6) showed greater improvement following the POV intervention. Welch's *t*-test was used to test the hypothesis that the mean improvements of each group are identical. This test was chosen due to it being more robust than the Student's *t*-test in not requiring equal variances or sample sizes between groups when still under the assumption of normality. Using a *p*-value of .05 to test for significance, the data resulted in a *p*-value of .90 with a standardized effect size of .037 indicating there was no statistically significant difference between POV and TPP scores.

Discussion – Experiment 1

This experiment aimed to identify whether POV or TPP video model viewing formats were more effective in teaching typically-developed populations DTT. Initially, it was hypothesized that individuals would show greater improvement following receiving the POV intervention as previous research demonstrated POV produced greater improvement in procedural accuracy in individuals with developmental disabilities or autism. However, results from Experiment 1 indicated that both were similarly effective – 30.4% improvement for POV and 26.6% improvement for TPP. Statistical analysis demonstrated no significant differences between the interventions; however, visual analysis of each participant's data suggested patterns of the differing video formats' efficacy being tied to the particular task being taught. POV was seen to be more effective at teaching the PTS component of DTT, while both interventions were similarly effective at teaching the PT and DC components. Conversely, neither intervention was more than modestly effective at teaching RSR.

Limitations

The videos used in this study were created using previous research findings to maximize their effectiveness in teaching (e.g., showing multiple demonstrations within each video of potential teacher and student interactions). However, a limitation of this study pertained to what the video model themselves modelled. For example, numerous participants, regardless of having watched a video model demonstrating the difference between what a correct trial looks like versus what an error trial looks like, would still record any trial requiring a prompt from the instructor as an error and subsequently would conduct an error trial immediately following the initial trial. However, in reality, trials resulting in a correct response from the participant regardless of whether it was prompted, should be marked as correct. Therefore, those participants might have benefited from watching additional modelled scenarios demonstrating explicit correct responses with and without prompts, and error trials with and without prompts. This finding should be ameliorated prior to allowing such video models to be used in teaching individuals to implement DTT because if teachers continued to mark prompted responses as incorrect, the number of trials being conducted with students would at minimum double, both increasing the number of responses the student would be required to perform (i.e., increasing response effort of the student to receive reinforcement), as well as minimizing the amount of reinforcement the student would actually receive as students being taught using DTT only receive tangible and exuberant reinforcement (i.e., praise) following correct responses. Therefore, as two to five scenarios demonstrating potential teacher-student interactions were presented in the video models shown to the participants in this study, it is recommended that future research expand upon the number of potential teacher-student interactions in video models shown to participants.

Implications and Future Research

Determining that both POV and TPP are effective viewing formats for teaching typically-developed adult populations adds to the literature on both POV and TPP video modelling in teaching behavioural interventions. Additionally, as both POV and TPP's effectiveness in teaching was suggested to be somewhat task dependent (e.g., POV being more effective at teaching PTS), it would be beneficial for future research to look to identifying the specific components of a task lending to a video model format being more effective in teaching to ensure video models created are created in such a way to maximize their efficacy in teaching.

Introduction – Experiment 2

Experiment 2 was proposed to test the efficacy of two separate teaching mediums (i.e., CAPSI and a SIM versus a SIM alone) in combination with the more effective video model in teaching DTT. However, since the results of Experiment 1 showed no statistically significant difference between POV and TPP in teaching DTT to individuals from a typically-developed population, creating the most effective version of the video model fell to splicing together different DTT components in different viewing formats, determined via visual analysis of the data at the individual level. Therefore, Experiment 2 was carried out aiming to determine which teaching medium was more effective in translating both didactic and procedural knowledge when used in combination with a video model.

Method - Experiment 2

Participants

Nineteen psychology undergraduate students from the University of Manitoba's participant pool were recruited for Experiment 2. As Experiment 2 was expected to take approximately six hours to complete, the participants each received 12 credits, one credit per half hour of participation. The exclusion criteria, protocol for administering credits, and locations available for running sessions were identical to those in Experiment 1 with the additional stipulation that they had not participated in Experiment 1. Out of the 19 participants, all completed the baseline and post-intervention phases of the study while only 13 participants returned to complete the follow-up phase, producing a 31.6% attrition rate for the follow-up phase of this study. Attrition occurred equally between groups (i.e., 3 participants from the CAPSI group and 3 participants from the SIM group did not complete the follow-up phase).

Materials

All materials used in Experiment 2 are shown in Table 5. Pertaining to the use of the DTT manual, only select pages were required to be read because of the time constraints placed on research involving individuals from the participant pool. With the abbreviated manual, it was expected that full completion of the baseline, intervention, post-intervention, and follow-up phases would take approximately five hours to complete. It was estimated that if it was a requirement to read the entire manual, the time needed to complete all phases of the study would surpass the maximum 16 participation credits.

Table 5
Materials used for Experiment 2

Material	Corresponding Appendices
Consent form	–
Demographics form	Appendix A
DTT instructions and data sheet	Appendix B
Pencil	–
PI checklist	Appendix H
3 Role-play scripts for confederate	Appendices D, E, F
3 edibles for use as reinforcers	–
Video model with POV and TPP components	–
Video recorder	–
Computer to play video files	–
Discrete Trials Teaching Evaluaion Form (DTTEF) (Fazzio, D. et al., 2007)	Appendix G
3 written tests	Appendices I, J, K
Written test answer keys	Appendices L, M, N
Username and password for capsiresearch.org	–
DTT SIM (Fazzio, D., & Martin, G., 2011)	–

Note. The dashes under the Experiment 2 column signify no attached appendix for the specific material listed.

Design

A between-subjects group design was used for Experiment 2, with nine participants placed in the CAPSI group and ten participants placed in the SIM group. All phases except for the follow-up phase were run in a single day.

Procedure

As in Experiment 1, each participant was given a consent form and was allowed to read through it to provide his or her written consent prior to progressing. Upon providing their signatures, the participants were administered the demographics form.

Baseline. Following completing the demographics form, either a written test or the application test was administered. The administration of each test was alternated per participant (e.g., Participant 1 completed the written test first followed by the application test while Participant 2 completed the application test first followed by the written test). Additionally, three versions of the written tests with questions of equivalent difficulty as determined by Bloom's Taxonomy were created. The order in which the tests were administered was randomized across participants. The written test consisted of five short-answer questions pertaining to the administration of a DTT session. Each participant was given a maximum of 15 minutes to complete the written test. The application test portion was identical to the application test administered in Experiment 1. Each participant received abbreviated instructions for teaching gross motor imitative tasks while employing DTT methodology, and he or she was asked to run such a session with a confederate role-playing a child with ASD. The participants were given a maximum of 15 minutes to teach 12 gross motor imitation trials. Upon the conclusion of both the written and application tests, the baseline phase was completed and the participants were then placed in either the CAPSI group or the SIM group. CAPSI group participants were given a

CAPSI username, password, website link, and a hard-copy DTT manual with instructions detailing which pages to read, while the SIM group participants were given only the DTT manual and the same instructions detailing which pages were to be read.

Intervention. The intervention phase began immediately upon completion of the baseline phase. SIM group participants were told to read each unit of material as per the instructions for reading the DTT manual. Once completed, they were asked to tell the primary researcher who would then show them a video model pertaining to the unit of material just read. The participants were not allowed to rewind any portions of the video and were asked to only pause the video in the case of needing to use the bathroom or if an emergency arose. This procedure was repeated for all four sections of the DTT manual. Upon reading all four units and watching all four video models, the intervention phase for the SIM group participants was completed.

CAPSI group participants were asked to study each unit of material as per the instruction sheet, and once they read the specific pages, they were asked to log into the CAPSI program to complete a unit test. Each unit test consisted of three questions pertaining to the unit of material just studied. Upon submission of each unit test by the participant, the primary researcher immediately graded the test and submitted the result. If the participant received a "pass", they then were asked to watch a video model demonstrating the skill taught in the DTT unit just studied. The video model was made available solely contingent on receiving a "pass" on the corresponding CAPSI unit test. Identical to the SIM group, CAPSI participants were not allowed to rewind any portions of the video and were asked to only pause the video in the case of needing to use the bathroom or if an emergency arose. If the participant received a "re-study" on his or her CAPSI unit test, the participant was asked to re-study the material and to then request an additional unit test for grading. Following its grading, if the participant received a "pass", he or

she would then watch the video model of the DTT component just studied. If the participant received another "re-study", he or she was asked to again re-study the material and to request an additional test. This process continued until the participant received a "pass". After the participants completed all four CAPSI unit tests and watched the four video models, the intervention phase was complete for these participants.

Post-Intervention. The post-intervention phase began immediately upon the completion of the intervention phase. This phase was a repetition of the baseline phase; that is, the administration of a different written knowledge test and the completion of an application test with the confederate following a different script. Following both tests, the post-intervention phase was complete, and the participants were reminded of their follow-up phase appointment booked a week following to conclude the experiment.

Follow up. The follow-up phase was a repeat of the post-intervention phase except for each participant receiving a different version of the written knowledge test, and the confederate following a different script for the application test (see Appendix F).

Upon completion of the follow-up phase, the individual's participation in the experiment was complete and they each received 12 credits.

Inter-Observer Agreement

The research assistants for Experiment 1 were used for IOA purposes in Experiment 2. Eighty percent was once again used as the criterion indicating strong IOA. IOA was again calculated by dividing the total number of agreements by the number of disagreements plus agreements. A third of the CAPSI unit tests, written tests, and procedural tests were graded by a research assistant to determine IOA. IOA was 91.7% for the CAPSI unit tests, 91.6% for the written tests, and 88.4% for the application tests.

Procedural Reliability

A third of the set-ups and conclusions of study sessions with participants were either video recorded or attended by an additional observer who graded the progress of the experimental session using the procedural reliability checklist (see Appendix I). Procedural reliability was found to be 85% across Experiment 2 sessions.

Results - Experiment 2

Figure 3 shows didactic knowledge improvement for both the SIM and CAPSI groups across all phases of Experiment 2. The SIM group showed an average increase in didactic knowledge of 42.1% as compared to the CAPSI group's average improvement of 32.4%. However, the SIM group decreased in accuracy at the follow-up phase while interestingly, CAPSI participants actually increased in accuracy from post-intervention to the follow-up phase. Following running a Welch's *t*-test on both groups' improvement and using a *p*-value of .05 to determine significance, no statistically significant difference was found to exist between groups as the *p*-value produced was .23 with a standardized effect size of .59.

Figure 4 shows procedural knowledge improvement for both the SIM and CAPSI groups across all phases of Experiment 2. The SIM group showed an average increase in procedural knowledge of 29.6% compared to the CAPSI group's average improvement of 39.5%. Regarding maintenance, the CAPSI group showed modestly greater maintenance of the behaviour learned, with higher follow-up scores as compared to the SIM group. Comparing procedural knowledge gains to didactic gains, there were greater procedural knowledge gains for both groups as compared to didactic, with the CAPSI group showing approximately 50% more improvement in procedural as compared to didactic improvement. Additionally, the results suggest that

participants demonstrated a stronger baseline performance on procedural applications of DTT knowledge as compared to didactic applications (i.e., completing written tests). Welch's *t*-test produced a *p*-value of .27 with a standardized effect size of .52 meaning that no statistically significant difference existed between the SIM and CAPSI groups; however, the differences in maintenance, and degree of improvement as compared to didactic improvement are still notable. Overall, the results from Experiment 2 showed that CAPSI, in combination with a SIM and video model, is similarly effective in teaching DTT as a SIM with a video model alone.

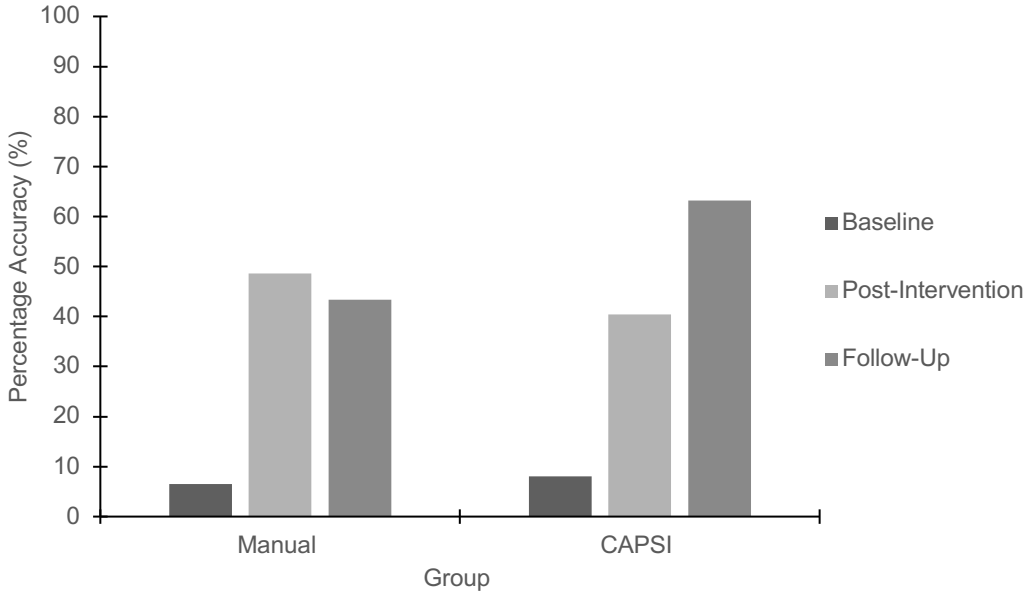

Figure 3. Mean didactic knowledge improvement on DTT as measured by a written-knowledge test for both CAPSI and SIM participants.

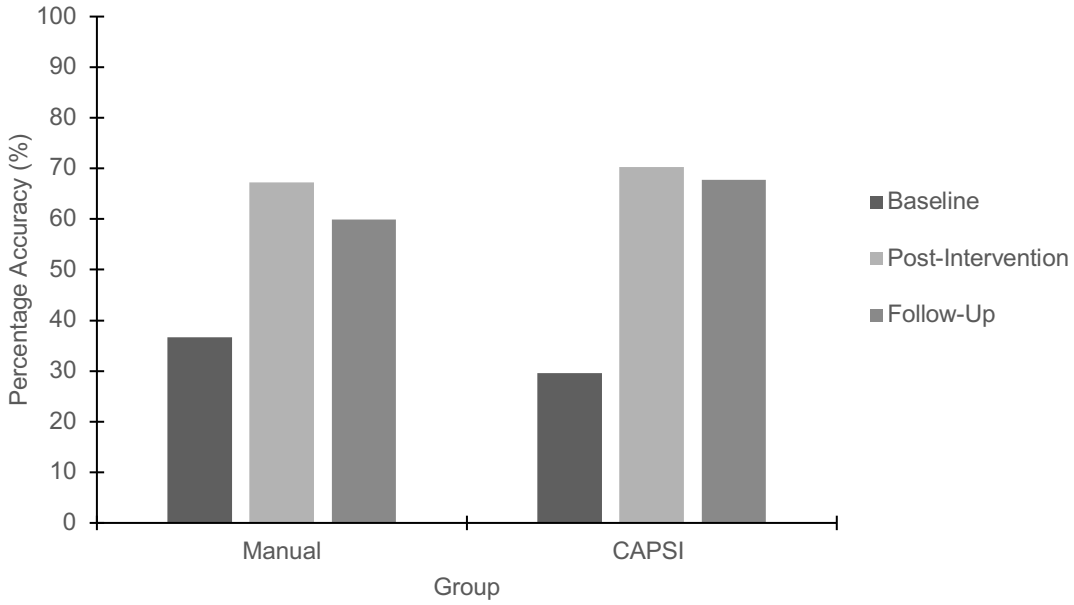

Figure 4. Mean procedural knowledge improvement on teaching a DTT Imitation trial for both CAPSI and SIM participants.

Discussion – Experiment 2

Results of Experiment 2 showed that both CAPSI and SIM groups improved in both procedural and didactic knowledge with no statistically significant difference between, suggesting that adding CAPSI to a SIM and video model does not demonstrably improve either didactic or procedural learning of DTT. However, several differences were noted between groups, including improvement in the CAPSI group's didactic accuracy from post-intervention to the follow-up phase as seen in Figure 3, and in the comparison of didactic and procedural knowledge improvement (see Figures 3 and 4) with participants demonstrating greater baseline performances and higher accuracy improvement from baseline to post-intervention for procedural knowledge demonstrations. These differences will be discussed in greater detail here.

From post-intervention to follow-up phases in research, many participants showed a decrease in accuracy of both procedural and didactic knowledge learned in a study's

intervention. However, for CAPSI participants' didactic knowledge (see Figure 3), their accuracy actually improved from post-intervention to the follow-up phase. Looking to the individual participants' data, three participants from both the SIM and CAPSI group dropped out of the study following completing post-intervention. However, the individuals from the CAPSI group demonstrated some of the least accurate written test performances at baseline and post-intervention, possibly skewing the results. Following the attrition, their data no longer affected the results to such an extent, producing a jump in accuracy for the group. This finding (i.e., the lowest scoring participants dropping out of the study) was not present for the SIM group participants.

Baseline scores are historically low for both procedural and didactic knowledge tests; however, baseline procedural tests often produce lower scores than didactic tests. Interestingly, all participants demonstrated higher procedural accuracy as compared to didactic accuracy when tested at baseline. This finding may be due to the participants' previous exposure to teaching, with instructors having modelled effective teaching behaviours. Conversely, the participants were probably less likely to have encountered the learning principles guiding the instructor's teaching behaviours. Therefore, the participants would have been exposed to procedural teaching methods, which may have shared inadvertent similarities to DTT methodology, while they were not privy to the didactic knowledge directing such teaching methods.

Additionally, previous CAPSI research guiding this study has shown participants most often make higher gains in didactic knowledge following CAPSI teaching as compared to procedural knowledge gains. However, results from Experiment 2 showed the opposite result, with CAPSI participants demonstrating more gains in procedural knowledge as compared to didactic gains. An additional explanation for this may be the inclusion of the video model in the

teaching packages being studied because video models, as previously discussed, have been shown to be effective tools in teaching novel, applied behaviours (e.g., Thomson et al., 2012).

Limitations

First, because of the proposed participants being drawn from the participant pool, a limit was placed on the number of hours required of the participants to complete the study. Therefore, the entire DTT text could not be used and tested on; rather, only the procedural descriptions were taught without the background information explaining the relevance of the information, arguably pertinent to a fuller understanding and application of DTT methodology. This may help to explain why the increase in procedural accuracy was not as significant as previous research using the DTT manual (e.g., Wightman et al., 2012). Second, as participants drawn from the participant pool received credit for participating, not necessarily for doing well in the study, several participants were notably nonchalant about participating (e.g., not watching the video modelling, not attempting to answer written test questions, not attempting to complete the data collection portion regardless of being taught how to do it). Moreover, six participants did not show up for their scheduled follow-up session (i.e., 31.6% attrition for the follow-up phase) and therefore, maintenance data for these participants could not be collected, perhaps accounting for the increase in average didactic accuracy at follow-up for the CAPSI group. Interestingly, the same effect was not seen in procedural knowledge data, suggesting that the individuals who did not complete the follow-up phase produced greater procedural scores at baseline and post-intervention as compared to their didactic tests. This suggestion is demonstrated by the loss of the procedural scores not affecting the group's mean procedural accuracy as significantly as didactic accuracy.

Implications and Areas for Other Research

As CAPSI in combination with a SIM and video model was shown to produce both procedural and didactic knowledge increases in its users, Experiment 2 provides support for the use of video modelling in combination with ICTS in teaching behavioural interventions. Maximizing instructional effectiveness is a worthwhile goal; however, maximized instructional effectiveness in combination with an effective, flexible, and cost-effective method of instruction is arguably an even greater goal. Therefore, establishing CAPSI as an effective teaching medium in combination with video modelling provides support for potentially other additional interventions to be employed with ICTS for teaching. Future research should look to identifying further teaching interventions which are effective when utilized within an ICTS (e.g., periodic SKYPE check-ins with an instructor).

General Discussion

This study compared (a) the effectiveness of POV and TPP viewing formats of video models in teaching DTT methodology, and (b) the effectiveness of CAPSI in combination with a SIM and video model created in a combination of viewing formats with the SIM and same video model alone. Overall, the results of Experiment 1 showed that both POV and TPP produce similar improvement in teaching, with some indication of their effectiveness being task dependent. As such, a component analysis may be beneficial in determining what specific component of a task benefits greater from a specific viewing format. This would be important for researchers and teachers wanting to use video models effectively in their laboratories or classrooms. Applying these results to Experiment 2, CAPSI with a SIM and video model was shown to perform about as effectively as a SIM with the same video model alone on both

didactic and procedural knowledge acquisition. These results add to the literature on (a) POV and TPP video modelling with typically developed populations, and (b) the use of video modelling as an additive component in teaching packages, both ICTS and SIM based. However, neither teaching package was able to increase didactic knowledge scores to a 'passing level' (e.g., 50% in several University classes), with the average post-intervention scores being 48.6% and 40.4% for the SIM and CAPSI groups respectively. Procedural knowledge scores fared somewhat better following receiving the teaching package intervention with post-intervention scores being 66.2% and 70.8% for the SIM and CAPSI groups respectively. Future research should look to researching additional components for inclusion in teaching packages to ensure a higher level of uptake, accuracy, and maintenance for both didactic and procedural knowledge.

Limitations

In addition to the limitations discussed pertaining specifically to Experiments 1 and 2, several limitations should be noted regarding conducting a DTT imitation trial with a confederate and participant, and when grading the procedural tests with the DTTEF. First, a generalization phase was not completed in this study, with the participants not implementing the DTT methodology with an individual with ASD. As such, generalization data is not available and discussion regarding the effectiveness of both teaching packages in teaching individuals to implement DTT with individuals with ASD is limited. Second, most participants (particularly opposite sex participants compared to the confederate) were uncomfortable touching the confederate to physically prompt them to complete actions. This was determined through visual cues (i.e., the participant hesitating to physically touch the confederate, looking down at the confederate's hands and back to the confederate's eyes), as well as by vocal responses following the test (e.g., "I didn't know if I should touch you. I don't know you"). As such, a neutral

instruction prior to the initiation of the procedural test was given saying that the participant should feel free to touch the confederate's arms and hands if needed. However, arguably, this may have served as a prompt for participants to use physical touch as a prompt. Second, several participants demonstrated, with some stating explicitly following the role-play session, that they wanted to "be polite" and during the role-play session, would often issue the necessary instruction in an interrogative statement while using "please" and "thank you" throughout. Several participants shared that they did "not feel comfortable" saying only "do this!" to someone that they did not know (i.e., the confederate). However, in typical use of the DTTEF, interrogative and lengthy instructions are incorrect which means for those participants using a 'polite response' always resulted in an incorrect marking on the instruction delivery component of the trial. Furthermore, almost all of the participants would mark any response requiring a prompt as an "incorrect" response on the DTT datasheet regardless of the confederate producing the correct response. This suggests that further instruction in what constitutes a "correct" response is needed, whether via the manual or additional teaching tools (e.g., video model). Lastly, two participants with English as a second language shared that they felt self-conscious of their use of English and asked the primary researcher during the role-play session if the confederate was not responding to their teaching attempts due to a language barrier. Additional, neutral clarification to these participants was provided by the primary researcher, potentially inadvertently serving as additional instruction for the role play session which the other participants did not receive.

DTTEF Recommendations. As discussed, several limitations and the initially low IOA of this study pertained to the use of the DTTEF. Four recommendations for averting these limitations are as follows: (1) be concise on what constitutes the start of a trial (e.g., teacher

switches exemplars or the student responds), (2) be lenient on what is considered a correct instruction (e.g., as long as the instruction includes "do this", isn't an interrogative statement, and is under three words is considered correct), (3) as prompt fading is a different skill than delivering a prompt to ensure a correct response, such components should be scored separately on the DTTEF, and (4) if an incorrect exemplar was modelled during a trial, that same exemplar must be modelled in the error correction trial.

As the results of this study indicate that both CAPSI and a SIM in combination with a video are similarly effective in teaching DTT, and because procedural and didactic knowledge maintenance was shown to decrease for both Experiment 1 and Experiment 2 participants from post-intervention to the follow-up phase, future research should look to ways to maximize maintenance of material taught via a video model alone or when taught through a teaching package (e.g., CAPSI with a video model). Researchers may want to look at the addition of intermittent reinforcers throughout teaching to help promote the maintenance of the behaviour. With the influx of technology in today's classrooms, and the proven effectiveness of video modelling as a teaching tool, continuing to research ways to maximize the effectiveness of both TPP and POV video modelling is necessary.

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Appendix A

Demographics Questionnaire

Research Project: The Role of Effective Video-Modelling in Combination with CAPSI in Procedural and Didactic Knowledge Acquisition

Please answer the questions below to provide us with some more information regarding your background. Please do not put your name on this form. The researcher will assign an arbitrary code for you to mask your identity.

You do not have to give any information that you do not want to. Please let the researcher know if you have any questions.

1. Please indicate your gender: _____

2. A) Is English your first language?

Y / N

2. B) If no, how long have you been communicating in English? _____

2. C) What is your first language? _____

3. Please indicate your average high school grade:

- □ 50-60%
- □ 61-70%
- □ 71-80%
- □ 81-90%
- □ 91-100%

4. Please identify the range that includes your age.

- □ 18-24 years
- □ 25-29 years
- □ 30-34 years
- □ 35+ years

5. Have you used Computer-aided Personalized System of Instruction (CAPSI) before?

Y / N

5. B) If yes, to what capacity? Please describe _____

6. If you've completed or are working on a university degree, please indicate your major and minor areas of study.

Major(s): _____

Minor(s): _____

Highest level of education completed: _____

7. Have you received or attended any training on how to teach individuals with autism or developmental disabilities?

Y / N

8. If you answered yes to the previous question, please describe the training: _____

9. Have you received any previous training on discrete trials teaching (DTT) or do you know any information regarding DTT and how DTT sessions are run?

Y / N

Appendix B

DTT Imitation Task Instructions and Data Sheet

The DTT imitation task instructions and data sheet was modified and re-printed with permission from the *Discrete-trials teaching with children with autism: A self instructional manual* (Fazzio & Martin, 2011).

Data Sheet for Imitation of Simple Actions

Materials Required: None.	Child's Response on Each Trial: Child imitates the action modeled by teacher.
Set-Up for Each Trial: Teacher models an action to be imitated.	Instructions at start of each trial: Teacher says, "Do this."

Prompts or Cues to Consider Using:
Full prompt (F): Full physical guidance.
Partial prompt 1 (P1): Light physical guidance.
Partial prompt 2 (P2): Gestural prompt, pointing to the child's hand that was previously guided.
No prompt (NP).

On each trial, record child's response as correct (✓) or error (x) in the appropriate column, and indicate prompting level (F, P1, P2, or NP).

Teaching Trials	Action to Model for Child	Standard Trials		Error Correction Trials (next trial after an error)	
		Correct	Error	Correct	Error
1	Arms Up				
2	Arms Up				
3	Hands Ready				
4	Clap				
5	Hands Ready				
6	Clap				
7	Hands Ready				
8	Arms Up				
9	Clap				
10	Arms Up				
11	Hands Ready				
12	Clap				

Appendix C

Experiment 1 - Researcher Script - Procedural Reliability

Step	Script	Correct	Incorrect
1	"Hi! My name is Kara-Lynn Kehler and I am the primary researcher for the study entitled "The Role of Effective Video-Modelling in Combination with CAPSI in Procedural and Didactic Knowledge Acquisition". Thank you very much for coming out today!		
2	Before we begin, I would like to ask if you can please read through this consent form and if you feel that you would like to continue with the study, to please sign your name on the last page of the document. Please take as long as you need.		
3	As stated in the consent form, the whole or parts of our session will be video recorded today. Is that okay with you?		
4	Thank you very much. First off, I would like to go over a few guidelines for our study today. It is expected to take 2 hours to complete all portions of the study today and then a final session will be booked in a week's time. You can take a break at any point during today's session and the bathrooms are located _____.		
5	To begin, here is the demographics form which I will ask you please fill out so that we may record a bit more information about your background.		
6	Now we are going to begin the baseline phase of the study. I am going to hand you a form with abbreviated instructions on running a discrete trials teaching session. You will be asked to teach a confederate role-playing a child with autism spectrum disorder 3 different gross motor actions. You will be provided with all materials needed to run the session. You will have ten minutes maximum to read over the instructions and prepare. When you are		

	ready to begin, please let me know. When you are finished the session, please let me know.		
7	Thank you. The baseline phase is completed. Next, I will ask you to please watch this video. It is a video modelling the different components of a DTT trial. Please only watch the video one time. If an emergency arises, we can pause the video. Following watching the video, you will be asked to again attempt to teach a confederate role-playing a child with autism 3 different gross motor tasks. When you have finished watching the video, please let me know.		
8	Thank you. As in baseline, I will now provide you with an instructions sheet and all of the required materials for running a DTT session when teaching gross motor imitation. You will have 10 minutes maximum to read over the instructions to prepare. Please tell me when you are ready to begin.		
9	Thank you. You will have a maximum of 15 minutes to run the session. Please begin and let me know when you are finished.		
10	Thank you very much! Today's session is now complete let's now book the follow up session in one week's time. It is expected to take a half hour.		
11	Thank you for coming in today! Similar to our last session, I will administer an abbreviated set of instructions and all materials required for teaching a DTT imitation session. You will have 10 minutes to read over the instructions and to prepare and will have a total of 15 minutes to run a session. Please let me know when you are ready to begin. When you have completed the session, please let me know.		
12	Our experiment is now complete. You will be receiving a total of 5 credits for your participation. Thank you very much for participating!		

Appendix D

Confederate Role-Playing Script - Baseline

Trial	Response	Error Correction	Paying attention to teacher?
1	Full Prompt - Correct		Y
2	Full Prompt - Correct		Y
3	Error	Full Prompt	Y
4	Full Prompt - Correct		N
5	Full Prompt - Correct		Y
6	Full Prompt - Correct		Y
7	Error	Full Prompt	Y
8	Partial Prompt 1-Correct		Y
9	Partial Prompt 1-Correct		N
10	Partial Prompt 1 - Correct		N
11	Partial Prompt 2 - Correct		Y
12	Partial Prompt 2 - Correct		Y

Appendix E

Confederate Role-Playing Script - Post-Intervention

Trial	Response	Error Correction	Paying attention to teacher?
1	Error	Full Prompt	N
2	Full Prompt - Correct		Y
3	Full Prompt - Correct		Y
4	Full Prompt - Correct		Y
5	Error	Full Prompt	Y
6	Partial Prompt 1 - Correct		N
7	Partial Prompt 1 - Correct		Y
8	Partial Prompt 1- Correct		Y
9	Partial Prompt 2 - Correct		Y
10	Partial Prompt 2 - Correct		Y
11	Partial Prompt 2 - Correct		Y
12	Independent - Correct		N

Appendix F

Confederate Role-Playing Script - Follow-Up

Trial	Response	Error Correction	Paying attention to teacher?
1	Full Prompt - Correct		Y
2	Full Prompt - Correct		N
3	Full Prompt - Correct		N
4	Partial Prompt 1 - Correct		N
5	Partial Prompt 1 - Correct		Y
6	Partial Prompt 1 - Correct		Y
7	ERROR	Full Prompt	Y
8	Partial Prompt 2 - Correct		Y
9	Partial Prompt 2 - Correct		Y
10	ERROR	Full Prompt	Y
11	Partial Prompt 2 - Correct		Y
12	Partial Prompt 2 - Correct		Y

Appendix G

Discrete Trials Teaching Evaluation Form (DTTEF)

The DTTEF was reprinted with permission from *Discrete-trials teaching evaluation form (DTTEF): scoring manual* by Fazzio, D., Arnal, L., & Martin, G. (2007) Unpublished manuscript.

Part I: Preparing to Conduct a Teaching Session	
1. Determine Teaching Task(s)	
2. Gather Materials	
3. Select at Least 3 Reinforcer(s)	
4. Arrange the Teaching Setting	
5. Determine the Prompt-Fading Procedure and the Initial Fading Step	
6. Invite Child to the Table and Give a Reinforcer Choice	

Part II: On Standard Trials, Manage Antecedents		1	2	3	4	5	6	7	8	9	10	11	12
7. Check data sheet for arrangement of teaching materials &/or response to model.													
8. Secure the child's attention before proceeding													
9. Present the teaching materials, or model response *(if Imitation).*													
10. Present the correct instruction.													
11. Present prompts (within 3 s).													
Record prompt level (F/P1/P2/NP):													
Part III: On Standard Trials, Manage Consequences & Record Data													
Score #12 **OR** #13 -	12. Following a correct response, praise & present an additional reinforcer.												
Not both!	13. Following an incorrect response, block gently if possible, remove materials or stop gesturing & show a neutral expression for 2-3 s.												
14. Record the response immediately AND accurately.													
15. Allow brief inter-trial interval of 3-10 s.													
Part IV: An Error Correction Trial Following an Error													
16. Secure the child's attention													
17. Re-present the correct materials *(or model, if Imitation task)*													

18. Re-present the instruction & prompt immediately to guarantee correct response											
19. Praise only											
20. (cf. 14) Record the response immediately AND accurately											
21. (cf. 15) Allow brief inter-trial interval of 3-10s.											
22. Fade prompts across trials (correct fading steps & rules on >= 80% of trials)											

Appendix H

Experiment 2 - Researcher Script - Procedural Reliability

Step	Script	Correct	Incorrect
1	"Hi! My name is Kara-Lynn Kehler and I am the primary researcher for the study entitled "The Role of Effective Video-Modelling in Combination with CAPSI in Procedural and Didactic Knowledge Acquisition". Thank you very much for coming out today!		
2	Before we begin, I would like to ask if you can please read through this consent form and if you feel that you would like to continue with the study, to please sign your name on the last page of the document. Please take as long as you need.		
3	As stated in the consent form, the whole or parts of our session will be video recorded today. Is that okay with you?		
4	Thank you very much. First off, I would like to go over a few guidelines for our study today. It is expected to take 7 hours to complete all portions of the study today and then a final session will be booked in a week's time taking approximately 1 hour. You can take a break at any point during today's session and the bathrooms are located _____.		
5	To begin, here is the demographics form which I will ask you to please fill out so that we may record a bit more information about your background.		
6a	Now we are going to attempt a procedural test. I am going to hand you a form with abbreviated instructions on running a discrete trials teaching session. You will be asked to teach a confederate role-playing a child with autism spectrum disorder 3 different gross motor actions. You will be provided with all materials needed to run the session. You will have ten minutes maximum to read over the instructions and prepare. When you are ready to begin, please let me know. When you are finished the session, please let me know.		
6b	Now we are going to administer a written knowledge test consisting of 5 short answer questions. Please try your best to answer all questions. If you do not		

	know an answer to a question, you may leave the question blank. You will have 15 minutes to complete all 5 questions. Please let me know when you are finished.		
7a	Thank you. The baseline phase is completed. Next, I am going to give you a DTT manual, CAPSI username, password, website link and guide for you to log in to the CAPSI system to complete all of the unit tests. You are asked to please read the first unit of material, log into CAPSI and complete the first unit test. Once you are finished the test, you will submit it for grading. I will immediately grade the test and if you receive a "pass", you will be asked to watch e a video model of the material just taught. You can complete the readings and CAPSI tests at your own pace however I will ask if you can please let me know when you have completed each CAPSI test so that I may grade it immediately. Once you have completed all 4 units of reading, the four CAPSI unit tests, and have watched a model of the 4 components of a DTT trial, the intervention phase will be completed. Please get started once you are comfortable.		
7b	Thank you. The baseline phase is now complete. Next, I am going to give you a DTT manual and instructions on which pages you are asked to read. The manual is broken down into four units. Please read each unit of material and following each unit, let me know when you have completed it and you will then watch a video model pertaining to that unit of material. You will then repeat that procedure for the remaining units. Once you have read all four units of material and watched the corresponding video model, the intervention phase will be complete.		
8a	Thank you. As in baseline, I will now provide you with an instructions sheet and all of the required materials for running a DTT session when teaching gross motor imitation. You will have 10 minutes maximum to read over the instructions to prepare. When you are ready, you will have a maximum of 15 minutes to run the session. Please begin and let me know when you are finished. Please tell me when you are ready to begin.		

8b	Thank you. As in baseline, I will now provide you with a 5 question short-answer test. You will have a maximum of 15 minutes to complete all 5 questions. Please let me know when you are done.		
9	Thank you very much! Today's session is now complete. Your follow up session is scheduled for _____. It's expected to take no longer than an hour. I will see you in a week!		
10a	Thank you for coming in today! Similar to our last session, I will administer an abbreviated set of instructions and all materials required for teaching a DTT imitation session. You will have 10 minutes to read over the instructions and to prepare and will have a total of 15 minutes to run a session. Please let me know when you are ready to begin. When you have completed the session, please let me know.		
10b	Thank you for coming in today! Similar to our last session, I will administer a written knowledge test consisting of 5 questions pertaining to DTT. You will have a total of 15 minutes to complete the test. Please try your best to answer the questions but feel free to leave any blank that you are not sure about. Please let me know when you are done.		
11	Our experiment is now complete. You will be receiving a total of 12 credits for your participation. Thank you very much for participating!		

Appendix I

Experiment 2 - Written Test - A

Participant Code:

Phase:

1. List 3 general rules for presenting an instruction at the beginning of a trial.

2. If a child is not attending when you are about to begin a trial, what might you do to secure the child's attention?

3. In a sentence or two, describe the most-to-least prompt fading method.

4. What is a vocal prompt? Give an example.

5. Define prompt.

Appendix J

Experiment 2 - Written Test - B

Participant Code:

Phase:

1. Describe the antecedents at the beginning of a trial to teach a child to imitate clapping his hands.

2. What is physical guidance? Give an example.

3. What is the correct instruction at the beginning of each trial during imitation training?

4. What is the difference between an overly complex instruction and a simple instruction for the purposes of teaching imitation? Provide an example.

5. List the five components for managing antecedents on each standard DTT trial.

Appendix K

Experiment 2 - Written Test - C

Participant Code:

Phase:

1. What is the rationale for giving less enthusiastic praises only as opposed to enthusiastic praise and an edible when a child responds correctly on an error correction trial?

2. List the six components for conducting an error correction trial following an error.

3. What two things should you do immediately following a correct response on a trial.

4. What should you do on a trial if, after presenting the antecedents, the child does not respond after approximately 4 seconds.

5. Describe an example of prompt fading in which a physical prompt is faded from most-to-least. Identify the full prompt and one partial prompt in your example.

Appendix L

Experiment 2 - Written Test Key - A

1. List 3 general rules for presenting an instruction at the beginning of a trial.

1) Keep it simple **(.67)**2) Ensure that it has a distinct beginning and end **(.67)**3) Keep it consistent trial to trial **(.67)**

2. If a child is not attending when you are about to begin a trial, what might you do to secure the child's attention?

Answer should include: Saying child's name **(1)** and providing the instruction "Look" at either the materials or the instructor etc. **(1)**

3. In a sentence or two, describe the most-to-least prompt fading method.

Should include:

-Beginning with whatever prompt is necessary to evoke a correct response **(1)** and then gradually remove that prompt across trials **(1)**.

4. What is a vocal prompt? Give an example.

"Vocal prompts are spoken hints or cues that help a student to emit a correct response". **(1)**

Correct example **(1)**

5. Define prompt.

"Assistance provided to increase the likelihood that a correct responses will occur". **(2)**

Appendix M

Experiment 2 - Written Test Key - B

1. **Describe the antecedents at the beginning of a trial to teach a child to imitate clapping his hands.**

-Say "Do this!" **(1)**

-Model clapping hands **(1)**

2. **What is physical guidance? Give an example.**

-"Consists of the teacher touching the child to guide him or her to respond appropriately". **(1)**

- Correct example **(1)**

3. **What is the correct instruction at the beginning of each trial during imitation training?**

"Do this!" **(2)**

4. **What is the difference between an overly complex instruction and a simple instruction for the purposes of teaching imitation? Provide an example.**

Increasing the mean length of the instruction above the minimal number of words required to evoke a correct response. **(1)**

Correct example **(1)**

5. **List the five components for managing antecedents on each standard DTT trial.**

1) Check the data sheet for the arrangement of teaching materials. **(.4)**2) Secure the child's attention. **(.4)**3) Present the teaching materials. **(.4)**4) Present the correct instruction. **(.4)**5) Present prompts. **(.4)**

Appendix N

Experiment 2 - Written Test Key - C

1. **What is the rationale for giving less enthusiastic praise only as opposed to enthusiastic praise and an edible when a child responds correctly on an error correction trial?**

"Maximize the chances of a correct response on a correct trial **(1)** and minimize the potential development of a sequence consisting of an error on a regular trial, correct response to the more effective prompt on an error correction trial, followed by the usual strong reinforcer" **(1).**

Paraphrasing is acceptable as long as the general intention in the answer is the same as that listed above.

2. **List the six components for preparing to conduct a teaching session.**

1) Determine teaching task **(0.33)**2) Gather teaching materials **(0.33)**3) Gather potentially effective reinforcer(s) **(0.33)**4) Arrange the teaching setting **(0.33)**5) Determine the prompt-fading procedure and the initial fading step **(0.33)**6) Invite child to the table and give a reinforcer choice **(0.33)**

3. **What two things should you do immediately following a correct response on a trial.**

1) Praise **(1)**2) Present additional reinforcer **(1)**

4. **What should you do on a trial if, after presenting the antecedents, the child does not respond after approximately 4 seconds.**

Repeat the instruction **(1)** and prompt again immediately to ensure a correct response **(1)**.

5. **Describe an example of prompt fading in which a physical prompt is faded from most-to-least. Identify the full prompt and one partial prompt in your example.**

-Identifies characters + plausible scenario in which such prompting would be employed **(1)**

-Lists minimum of 3 different fading steps from most-to-least invasiveness **(1)**