# A PRELIMINARY EXPLORATION OF THE MULTIMEDIA PRINCIPLE'S APPLICABILITY FOR IMPROVING COMPREHENSION OF YOUTH INTERROGATION RIGHTS

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We examined the extent to which presenting youth interrogation rights using different combinations of three multimedia elements (Animation, Audio, and Caption) improved comprehension. A 2 (Animation: Present, Absent) × 2 (Audio: Present, Absent) × 2 (Caption: Present, Absent) between-participants design was employed using samples of adults (Experiment 1: $N = 207$) and youth (Experiment 2: $N = 193$). Participants in both experiments were shown one of eight multimedia presentations and asked about their understanding of the presented youth interrogation rights. In both experiments, the multimedia presentation that contained animation and caption led to the highest level of comprehension. Implications of these findings for protecting youth and the use of technology during interrogations are discussed.

***Keywords:*** interrogation rights comprehension; police cautions; appropriate adults; investigative interviewing; youth

Youth are recognized as a vulnerable population due to their less well-developed cognitive and psychosocial capacities relative to adults. Specifically, young people are less likely to understand the risks of their actions, which may impair their decision-making (e.g.,

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Gardner & Steinberg, 2005; Grisso, 2013; Viljoen & Roesch, 2005). In recognition of these vulnerabilities, some countries have provided youths with extra safeguards when speaking to the police. For example, in Canada, an appropriate adult (e.g., parent, guardian) can be present when youth are detained to help with understanding their interrogation rights (McCardle et al., 2021; Youth Criminal Justice Act, 2002).[1] Despite those enhanced protections, research has continued to show that youth struggle to understand their interrogation rights (e.g., Eastwood et al., 2015; Rogers et al., 2007, 2008), and the presence of an appropriate adult is not entirely effective; that is, adults also do not always comprehend the rights afforded to youth (e.g., Cavanagh & Cauffman, 2017; Cleary & Warner, 2017). Also, research has shown that incorporating psychological findings pertaining to communication and information processing (i.e., listenability; Rubin, 1993, 2012; see e.g., Eastwood & Snook, 2012) can help improve how well youth and adults comprehend interrogation rights (e.g., Davis et al., 2011; Eastwood et al., 2016; Snook et al., 2016). However, as with the extra safeguards, full comprehension is still elusive.

One area of the psychological literature that may help improve comprehension of interrogation rights is the principles of multimedia learning (Mayer, 2009). These principles draw upon cognitive and information processing theories and suggest ways to improve overall learning (i.e., comprehension) of material that is presented in a multimedia format. Thus, applying these principles to how youth interrogation rights are presented (i.e., as a multimedia presentation) may help improve comprehensibility. The goal of the current research was twofold. First, given the procedural safeguards of having an appropriate adult present to help facilitate a young person's comprehension of their interrogation rights, we sought to examine if adults' comprehension of youth interrogation rights could be improved using multimedia learning. Second, as it has been well-documented that youth interrogation rights as they are typically presented by the police are not being understood by youth, we also sought to examine if youths' comprehension of their interrogation rights could be improved via a multimedia presentation.

## HOW WELL DO ADULTS AND YOUTH COMPREHEND YOUTH INTERROGATION RIGHTS?

One of the key changes in youth interrogation rights brought in by legislative changes and court rulings in various jurisdictions (e.g., Canada, United States, United Kingdom, and many others globally) was the opportunity for youth to consult with an appropriate adult (usually a parent/caregiver) prior to being interrogated (see King, 2006; Police and Criminal Evidence Act, 1984; Youth Criminal Justice Act, 2002). Moreover, these legislative changes allowed the appropriate adult to support and advise the youth throughout the statement-giving process. This new legal mechanism assumed that an appropriate adult could serve as a source of support and help the youth understand complex information (e.g., their interrogation rights).

Despite numerous studies having examined parental legal knowledge about the justice system more generally (e.g., Cavanagh & Cauffman, 2017; Woolard et al., 2008), very few studies have specifically investigated parental knowledge of youth interrogation rights. Although not assessing adults' understanding of youth interrogation rights directly, Woolard and colleagues (2008) examined parents' understanding of the Miranda warning. They reported that parents had a vastly better understanding of the Miranda rights components

relative to youth ($d = 7.84$). However, they also discovered that the parents had many misunderstandings related to police interrogation practices (e.g., incorrectly thinking that American police must wait for parents before questioning a youth). More recently, Cleary and Warner (2017) reported that—based on a survey of American parents' general knowledge of the police interrogation practices and youths' rights—parents answered fewer than half (46%) of the knowledge questions correctly.

Unsurprisingly, youth also struggle to understand their interrogation rights. For example, Eastwood and colleagues (2015) presented Canadian high school students with their interrogation rights verbally and asked the students to explain the meaning of these rights. Their results indicated that students recalled only 40% of their interrogation rights. In the United States, Grisso (1981) found that around one-fifth of American juveniles fully understood their Miranda rights. Based on decades of research across various jurisdictions, the convergence of evidence is clear: Adults and youth do not fully understand youth interrogation rights.

## IS IT POSSIBLE TO INCREASE COMPREHENSION OF YOUTH INTERROGATION RIGHTS?

Given the demonstrated lack of understanding that people have when it comes to interrogation rights, researchers have attempted to improve comprehension levels. Numerous studies have shown, for example, that adults' comprehension levels of interrogation rights are higher when presented in written format (cf. verbal; e.g., Clare et al., 1998; Eastwood & Snook, 2009; Fenner et al., 2002). Eastwood and Snook (2009) found that when participants were able to read their Right to Silence and Right to Legal Counsel (presented in written format), their comprehension scores were 45% and 25% higher, respectively, compared with those who listened to someone read the rights to them (presented in verbal format). Eastwood and Snook (2012) also found that increasing the listenability (see Rubin, 1993, 2012) of the police caution can help improve understanding of interrogation rights. Their results indicated that the caution containing all three listenability modifications (i.e., instructions, listing, and explanation) resulted in the highest levels of comprehension (73% compared with 37% for the original interrogation rights).

There is also some indication that comprehensibility of interrogation rights can be increased with modifications to the police caution issued to youth detainees. For example, Eastwood et al. (2016) created a youth police caution consisting of only the five core rights contained in the Youth Criminal Justice Act (2002) and relevant case law requirements (e.g., *R. v. Bartle*, 1994; *R. v. Brydges*, 1990). The interrogation rights were delivered in short sentences, contained simple language, and presented in a listing format regarding the number of rights to be recalled. Eastwood and colleagues discovered that a simplified waiver form (i.e., the document used to deliver legal rights to youth) allowed youth to recall significantly more of their interrogation rights than the original waiver form ($d = 1.40$). Such research suggests that changes can be made to increase youth's understanding of their interrogation rights.

One untested option for improving comprehension of interrogation rights even further is the cognitive theory of multimedia learning. Mayer (2009) proposed the cognitive theory of multimedia learning to help foster understanding of the material presented through computer-aided instruction. The theory rests on three key assumptions about how humans

process information: (a) the dual-channel assumption (i.e., humans use two different channels to process visual and auditory information), (b) the limited-capacity assumption (i.e., humans have finite cognitive resources available for processing information within a channel at any given time), and (c) the active-processing assumption (i.e., humans must actively engage in the learning process to comprehend information by identifying relevant information, organizing the information into a coherent mental representation, and consolidating the learned information with other current knowledge). To maximize learning through multimedia, instructional materials should follow the theory of cognitive load; specifically, the information to be learned should be simplified as much as possible, and external distractions should be minimized (Kirschner, 2002; see Sweller, 1988).

Based on the theories of information processing and cognitive load, Mayer (2009) offered 12 principles of multimedia learning that instructors can use to help maximize learning and comprehension of the material presented in a multimedia format (see Supplementary Materials [available in the online version of this article] for a brief breakdown of each principle). Of those principles, the multimedia principle—one of the most empirically supported (Halpern et al., 2007; Pashler et al., 2007)—suggests that individuals learn better from materials containing words and graphics rather than words alone. In a series of studies testing the multimedia principle, Mayer and colleagues compared the test performance of students who learned from animation and narration versus narration alone or from text and illustrations versus text alone (e.g., Mayer, 1989; Mayer & Anderson, 1991, 1992; Mayer et al., 1996; Mayer & Gallini, 1990; Moreno & Mayer, 2002). In all comparisons, students who received a multimedia lesson consisting of words and pictures performed better on a subsequent knowledge transfer test than students who received the same information in words alone (median effect size reported across studies was $d = 1.73$; see Mayer & Moreno, 2002). Research has also shown that using words and graphics is particularly important for teaching learners who have low knowledge of the domain (Kalyuga et al., 1998, 2000; Mayer & Gallini, 1990; Ollernshaw et al., 1997). Most often, interrogation rights (whether for adults or youth) are delivered as solely audio information—with the police officer reading the rights verbatim to the detainee (e.g., Chaulk et al., 2014; McCardle et al., 2021).

## THE CURRENT RESEARCH

The objective of the current research was to test the effect of various multimedia presentations on the comprehension of youth interrogation rights. We aimed to test this idea with samples of adults (Experiment 1) and youth (Experiment 2). We reasoned that it was important to test if a multimedia approach for delivering youth interrogation rights was useful for appropriate adults and youth, given the legislative changes to allow appropriate adults to accompany a youth during a police interrogation (e.g., Youth Criminal Justice Act, 2002).

## EXPERIMENT 1

Our predictions are based on findings from previous research on comprehension of interrogation rights (e.g., Clare et al., 1998; Eastwood & Snook, 2009; Fenner et al., 2002) and Mayer's (2009) multimedia learning theory. It is expected that interrogation rights presented through dual processing modalities (e.g., visual/animation and auditory/audio) will result in higher comprehension than when presented through a single modality (e.g., visual/animation alone) or when presented through dual but competing modalities (e.g., both

visual; watching the animation and reading the captions). In addition, the previous research on comprehension of interrogation rights has demonstrated that having participants read interrogation rights (e.g., captions) leads to greater comprehension than when they are delivered verbally (e.g., audio; Clare et al., 1998; Eastwood & Snook, 2009; Fenner et al., 2002). With the aforementioned theory and empirical findings in mind, we predicted that comprehension of youth interrogation rights delivered via multimedia presentations will foster understanding in the following order (from highest to lowest comprehension levels):

| | |
|---|---|
| 1. Animation + Caption (Condition 3) | 5. Caption (Condition 7) |
| 2. Animation + Audio (Condition 2) | 6. Audio (Condition 6) |
| 3. Audio + Caption (Condition 5) | 7. Animation (Condition 4) |
| 4. Animation + Audio + Caption (Condition 1) | 8. No multimedia (Condition 8) |

## METHOD

### Participants

A total of 301 Canadian adults were recruited online through Prolific Academic (www.prolific.co) and compensated £2.50 for participating. Ninety-four participants were removed due to various exclusion criteria (e.g., the study was not completed in its entirety, instructions were not followed, failed attention checks, encountered technical errors); the final sample size was 207. A power analysis indicated that (with medium effect size, $d = 0.50$, and alpha level of $\alpha = .05$) the power in this sample was .95 (Cohen, 1992). Most of the participants were female (50.72%), White/Caucasian (74.39%), with a mean age of 33.86 years ($SD = 11.26$, range = 18–67; for a summary of the demographic variables, see the Supplementary Materials).

Except for citizenship, there were no significant differences in the distribution of participants' age, gender, ethnicity, level of education, or Province/Territory of residence between the eight conditions ($ps > .05$). There were more self-identified non-Canadian citizens in the Animation + Audio group than you would expect by chance, and fewer self-identified Canadian citizens in the Animation + Audio group than you would expect by chance, $\chi^2(7, N = 207) = 15.86$, $p = .026$. There was no significant difference in performance based on citizenship.[2]

### Design

A 2 (Animation: Present, Absent) × 2 (Audio: Present, Absent) × 2 (Caption: Present, Absent) between-subjects design was employed. Participants in Conditions 1 to 7 were shown a presentation featuring the multimedia element(s) as outlined above. Participants in Condition 8 (i.e., no multimedia elements) were instructed to listen to a music track (the same music was featured in all other presentations) while reflecting on what they knew about youth interrogation rights.

### Measures

The main dependent variable of interest was comprehension measured via recall memory (Eastwood & Snook, 2012; Eastwood et al.,2010, 2016; Freedman et al., 2014). Two

open-ended recall questions were asked to participants after being exposed to one of the eight conditions. The first question asked them to recall everything they learned about youth interrogation rights from the multimedia presentation they viewed (or asked them to report on their current knowledge related to youth interrogation rights; Condition 8). The second question probed further to determine if they were able to remember any additional information. Participants were provided with a textbox at the end of each question to write their response, with no time restrictions imposed.

We also used two measures of recognition memory. First, we used a modified version of the five-item multiple-choice measure created by Eastwood et al. (2016) to assess participants' recognition knowledge of youth interrogation rights. Modifications included changing the language used for Eastwood et al.'s target population (youth) to the current target population (adults). Second, a nine-item true/false test was developed to assess participants' recognition knowledge of youth interrogation rights (see Supplementary Materials for multiple-choice and true/false measures). We also included a single attention check item that was embedded within the true/false test (i.e., 10th item) that told participants which answer to select. Demographic information pertaining to age, gender, ethnicity, education level, Province/Territory of residence, Canadian citizenship status, English as a first language, and any diagnosed learning disabilities were collected. At the end of the experiment, we also asked participants to report if they used headphones (51.69% reported yes), took notes (all participants reported no) or paused/fast-forwarded the clip while viewing the multimedia presentation (all participants reported no), and if they had heard these youth interrogation rights previously (52.17% reported yes); there were no significant differences in the distribution of participants' across conditions based on these criteria ($ps > .05$).

#### Materials

The multimedia presentations were created by Memorial University of Newfoundland's Centre for Innovation and Teaching in Learning (St. John's, NL, Canada). The script for the multimedia presentations was based on the youth waiver form developed by Eastwood et al. (2016). The script was voiced at a rate of 122.90 words per minute. All multimedia presentations were 2 minutes 15 seconds in length. The multimedia presentations created for this research can be viewed on our Open Science Framework page.

*Multimedia elements.* The Animation element depicted genderless and raceless characters acting out the interrogation rights; these characters were used to avoid biases and to represent all youth suspects. The relative sizes and accessories of the characters served to indicate their roles. For example, the youth character is smaller in size, and the police officer character is wearing an identifiable police hat. The Audio element presented a narration of the interrogation rights script voiced by an actress at a rate of 122.9 words per minute. The Caption element displayed the narrated words along the bottom of the presentation in white font with a bordering black background, offsetting the text from the animation.

*Background music.* A quiet background track of light music plays in each presentation. The music was a simple tune played in a major key at a tempo of 154 beats per minute and was 2 minutes 15 seconds in length.

### Procedure

Participants were assigned randomly to one of the eight conditions and completed the experiment online via a Qualtrics survey. Participants took, on average, 16.62 minutes ($SD = 7.03$) to complete the study, and there were no differences in the time it took for participants to complete the survey as a function of condition ($p > .05$).

The first page of the survey presented participants with an informed consent form. The second page contained a set of presurvey questions asking participants if they (a) had at least 20 minutes to complete this study, (b) agreed to complete this study alone in one sitting, and (c) would turn off any devices (e.g., television, music) in their immediate surroundings to reduce distraction. On the third page, participants completed a brief test to ensure that the audio and video on their computer were working correctly. The next page indicated that the main part of the study was about to begin and asked participants to pay close attention to the subsequent instructions provided. Hereafter, participants were assigned randomly to one of the eight conditions. The fifth page explained to participants that they were next going to view a multimedia presentation that explained youth interrogation rights and that it was important that they pay attention because they would be required to answer questions about its content (participants in the No Multimedia condition were told that they were going to reflect on what they currently knew about youth interrogation rights while listening to music on the next page). The next page presented one of the eight conditions, explained how to play the multimedia presentation (or music clip in the No Multimedia condition), and asked participants specifically to not pause, fast forward, or rewind the multimedia (or music) clip. Importantly, participants could not advance pass this page until the length of time of the multimedia (or music) clip had elapsed. The next few pages contained the comprehension measures. The two open-ended questions were presented on their own pages and always presented before the multiple-choice and true/false tests. However, the presentation order of the two recognition tests was counterbalanced, and each test item from both recognition tests was presented on its own page. The final three pages of the survey consisted of a demographic questionnaire, asking whether the participant wanted their data to be retained for analyses by the researchers (e.g., Research Participation vs. Observation), and a debriefing form.

### Interrater Reliability

A 16-item coding guide and content dictionary was created to measure the participants' understanding of the five youth interrogation rights (see Supplementary Materials). The first author and a research assistant each coded 100% of the participants' open-ended responses. Both raters were blind to which conditions the responses were from. Any disagreements were resolved through discussion. Interrater agreement testing across all subcomponents of the interrogation rights yielded a mean $\kappa$ of .93 (range = .81–1.00), suggesting excellent agreement between raters (Cohen, 1960; Landis & Koch, 1977).

## RESULTS

Practical significance, rather than statistical significance, was of primary interest for this research given its applied nature. Effect sizes and their 95% confidence intervals (CIs; Cohen's *d*; Cohen, 1988; Kirk, 1996) were used to present and interpret the results.

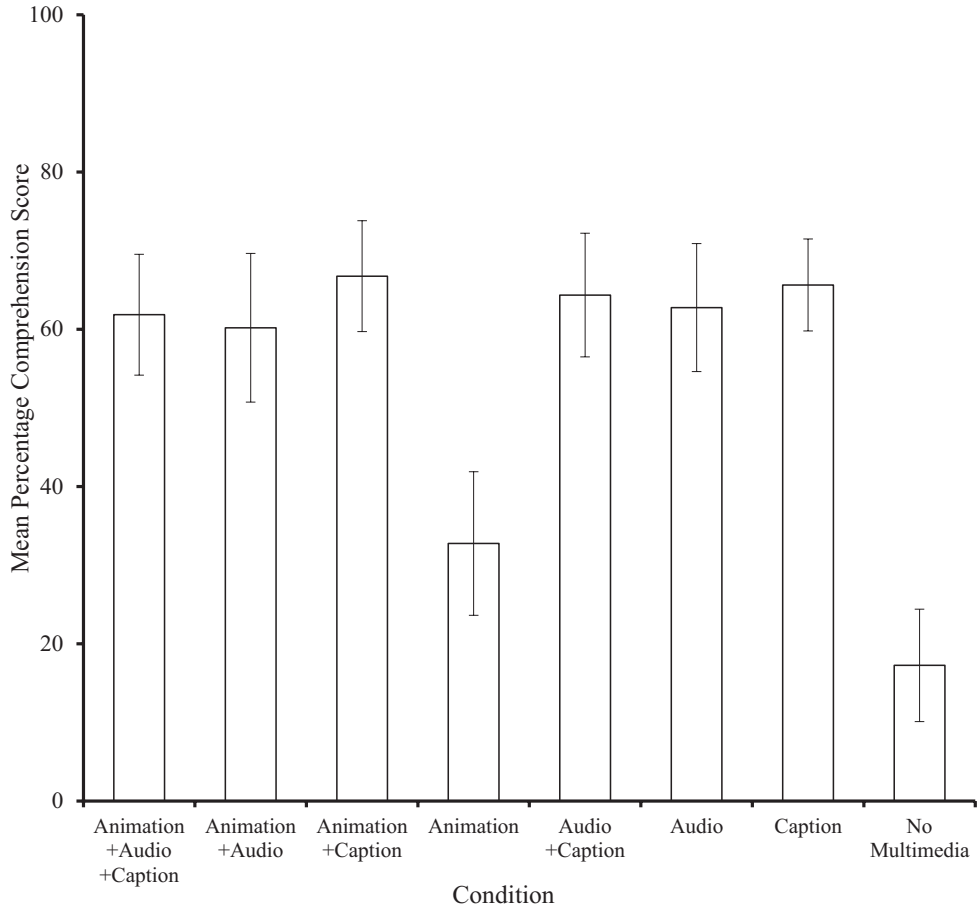


**Figure 1: The Mean Percentage Comprehension Scores and Associated 95% Confidence Intervals for Responses to the Open-Ended Recalls per Condition (Experiment 1, $N = 207$ Adults)**

CIs were interpreted as containing a range of plausible values for effect size, whereas values outside the CIs are relatively implausible (Cumming & Finch, 2005).

The mean percentage of rights recalled for the open-ended prompt, and associated 95% CIs, for each of the eight conditions are shown in Figure 1. The magnitude of the effect sizes between all conditions for the open-ended recall dependent measure is reported in Table 1. Collapsed across conditions, the average recall score from the open-ended responses was 54.23% ($SD = 25.67$), 95% CI = [50.71, 57.74]. As can be seen in Figure 1, except for the Animation and No Multimedia conditions, the mean percentage of comprehension for the top six presentations are quite similar (approximately 64%) and the CIs around those means overlap substantially. The average effect size for the top six presentations, when compared against the No Multimedia and Animation conditions, was $d = 2.56$ and $d = 1.44$, respectively. Despite not containing written and audio information, the performance of those in the Animation condition was substantially better than those in the No Multimedia condition, $d = 0.78$. Notwithstanding comparable levels of comprehension from the top six

**TABLE 1: Difference in Magnitude (Effect Size Expressed as Cohen's *d* with 95% CIs) for Recall Scores From Open-Ended Responses Across the Eight Conditions (Experiment 1; *N* = 207 Adults)**

| Condition | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 1. Animation + Audio + Caption | — | — | — | — | — | — | — |
| 2. Animation + Audio | –0.07 [–0.61, 0.46] | — | — | — | — | — | — |
| 3. Animation + Caption | 0.27 [–0.28, 0.81] | 0.31 [–0.24, 0.86] | — | — | — | — | — |
| 4. Animation | –1.39 [–2.00, –0.78] | –1.19 [–1.78, –0.59] | –1.72 [–2.37, –1.06] | — | — | — | — |
| 5. Audio + Caption | 0.13 [–0.41, 0.66] | 0.19 [–0.35, 0.72] | –0.13 [–0.67, 0.42] | 1.51 [0.88, 2.12] | — | — | — |
| 6. Audio | 0.05 [–0.50, 0.59] | 0.12 [–0.43, 0.66] | –0.22 [–0.77, 0.34] | 1.43 [0.80, 2.05] | –0.08 [–0.63, 0.46] | — | — |
| 7. Caption | 0.22 [–0.32, 0.76] | 0.28 [–0.27, 0.81] | –0.07 [–0.62, 0.48] | 1.77 [1.11, 2.41] | 0.07 [–0.47, 0.61] | 0.17 [–0.38, 0.72] | — |
| 8. No Multimedia | –2.41 [–3.11, –1.68] | –2.04 [–2.71, –1.36] | –2.88 [–3.67, –2.07] | –0.78 [–1.35, –0.21] | –2.52 [–3.24, –1.78] | –2.45 [–3.18, –1.70] | –3.03 [–3.84, –2.21] |

*Note.* Direction of comparison is Column–Row. CI = confidence interval.

**TABLE 2: The Main Effects and Interactions of Animation, Audio, and Caption on Rights Recalled via Open-Ended Recall (Experiment 1; *N* = 207 Adults)**

| Main effects | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | *M* (*SD*) | | |
| | *F* | *df* | *p* | $\eta_p^2$ | IV Present | IV Absent | *d* [95% CI] |
| Open Ended | | | | | | | |
| Animation | 1.13 | 1,199 | .29 | .01 | 55.59 (24.40) | 52.85 (26.94) | 0.11 [–0.17, 0.38] |
| Audio | 37.82 | 1,199 | <.001 | .16 | 62.26 (20.63) | 45.79 (27.76) | 0.68 [0.39, 0.96] |
| Caption | 62.26 | 1,199 | <.001 | .24 | 64.58 (17.78) | 43.57 (28.15) | 0.90 [0.61, 1.18] |

| Interactions | | | | |
|---|---|---|---|---|
| | *F* | *df* | *p* | $\eta_p^2$ |
| Open Ended | | | | |
| Animation × Audio | 4.02 | 1,199 | .046 | .20 |
| Animation × Caption | 1.75 | 1,199 | .187 | .01 |
| Audio × Caption | 53.34 | 1,199 | <.001 | .21 |
| Audio × Animation × Caption | 1.76 | 1,199 | .186 | .01 |

*Note.* IV = independent variable; CI = confidence interval.

presentations, the absolute highest comprehension was observed for those in the Animation + Caption condition ($M = 66.75$, $SD = 17.09$, 95% CI = [59.70, 73.80]).

In terms of the three independent variables, the conditions that contained captions outperformed those without captions, on average, by 21%; the conditions that contained audio outperformed those without audio, on average, by 17%; and the conditions that contained animation outperformed those without animation, on average, by 3%. A three-way analysis of variance (ANOVA) was conducted to compare main effects and interactions using the independent variables as fixed factors (Animation, Audio, Caption) and participants' comprehension scores from the three dependent variables (see Table 2 for the inferential statistics). For brevity, the magnitude of the effect sizes between all conditions for the multiple-choice and true/false dependent measures can be found in the Supplementary Materials.

## EXPERIMENT 2

We updated our predictions for Experiment 2 based on the findings from Experiment 1. Given that Experiment 2 was planned as a direct replication of our first experiment with a sample of youth, we expected to see a similar pattern to that observed in Experiment 1. Therefore, we revised our expectations such that the comprehension of the youth interrogation rights would be in the following order (from highest to lowest comprehension levels):

1. Animation + Caption (Condition 3)
2. Caption (Condition 7)
3. Audio + Caption (Condition 5)
4. Audio (Condition 6)
5. Animation + Audio + Caption (Condition 1)
6. Animation + Audio (Condition 2)
7. Animation (Condition 4)
8. No multimedia (Condition 8)

## METHOD

### Participants

A total of 312 Canadian youth were obtained online through social media (e.g., Facebook, Twitter; $n = 48$; compensated by being entered into a draw for a chance to win one of three $100 Amazon eGift Cards), Prolific Academic (www.prolific.co; $n = 106$; compensated £2.50), HoneyBee Hub (www.honeybeehub.io; $n = 3$; compensated $1.50 CAD), and Qualtrics Survey Panels (www.qualtrics.com; $n = 155$; compensated through the Qualtrics company directly[3]). A total of 119 participants were removed due to the same exclusion criteria mentioned in Experiment 1; the final sample size was 193. A power analysis (using the same criteria as mentioned in Experiment 1) indicated that the power in this sample was .93 (Cohen, 1992). Most of the participants were male (58.03%), White/Caucasian (69.43%), with a mean age of 14.81 years ($SD = 1.65$, range = 12–17; for a summary of the demographic variables, see the Supplementary Materials). There were no significant differences in participants' age, gender, ethnicity, level of education, Province/Territory of residence, or citizenship between the eight conditions ($ps > .05$).

### Design and Materials

Experiment 2 used the same experimental design and materials as the first experiment.

### Measures

In contrast to Experiment 1, we asked one open-ended question because data from our first experiment suggested that the second open-ended question did not contribute extra details. We also used the original five-item multiple-choice measure created by Eastwood et al. (2016) and a modified version of our nine-item true/false test used in Experiment 1. Modifications included changing the language to be appropriate for the targeted youth sample (see Supplementary Materials). We collected the same demographic information as outlined in Experiment 1. As our sample consisted of youth, we also asked participants to report if their parent(s)/caregiver(s) stayed with them during the survey (70.46% reported no) and if their parent(s)/caregiver(s) helped them with any of the answers (all participants reported no); there were no significant differences in the distribution of participants across conditions based on these criteria ($ps > .05$).

### Procedure

The procedure outlined in Experiment 1 was followed in the current experiment. Sixty-seven participants (34.71%) reported using headphones during the experiment, 99 (51.29%) participants reported that they heard the youth interrogation rights previously, no participants reported taking notes, no participants reported pausing/fast-forwarding the multimedia clips, and there were no significant differences in these variables and the distribution of participants ($ps > .05$). Participants took, on average, 17.11 minutes ($SD = 18.01$) to complete the study, and there were no differences in the time it took for participants to complete the survey as a function of condition ($p > .05$).

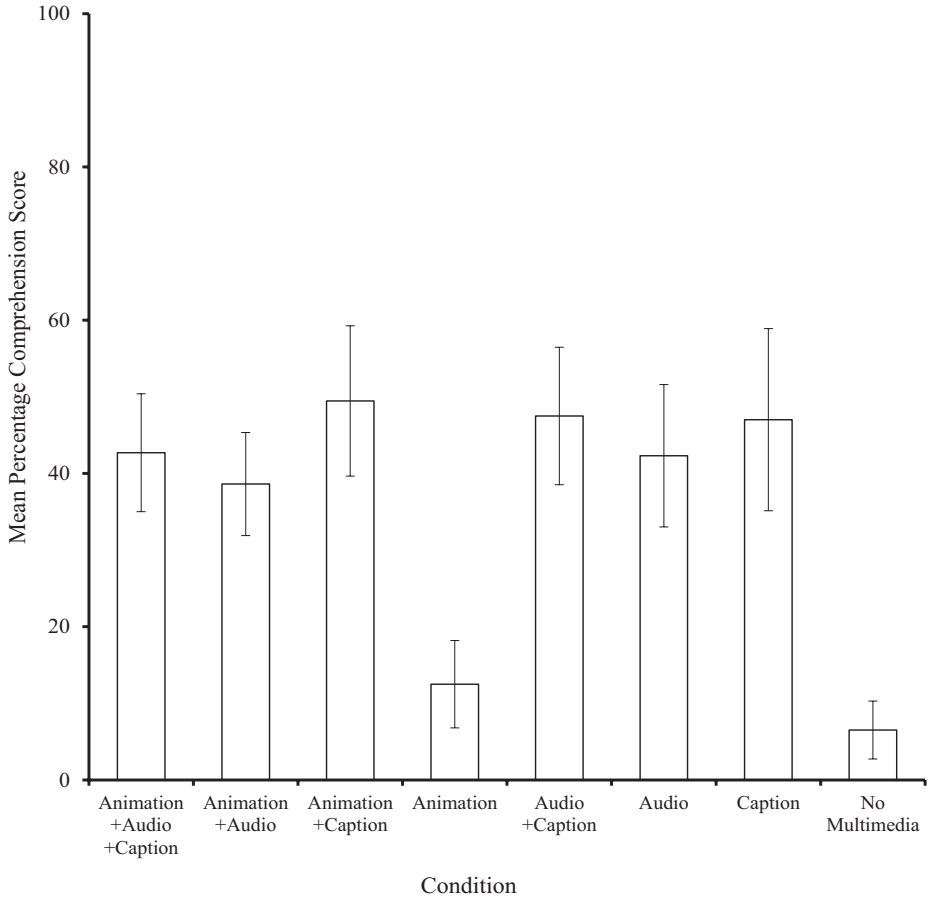


**Figure 2: The Mean Percentage Comprehension Scores and Associated 95% Confidence Intervals for Responses to the Open-Ended Recall per Condition (Experiment 2, $N = 193$ Youth)**

### Interrater Reliability

The same coding guide, content dictionary, and coding process used in Experiment 1 were used in the current experiment. The same coders from Experiment 1 each coded 100% of the responses and solved disagreements via discussion. Interrater agreement testing across all subcomponents of the interrogation rights yielded a mean κ of .90 (range = .83–1.00), suggesting excellent agreement between raters (Cohen, 1960; Landis & Koch, 1977).

## RESULTS

As with Experiment 1, practical significance was of primary interest for this research given its applied nature. The mean percentage of rights recalled for the open-ended prompt, and associated 95% CIs, for each of the eight conditions are shown in Figure 2. The magnitude of the effect sizes between all conditions for the open-ended recall dependent measure is reported in Table 3. Collapsed across conditions, the average recall score from the

**TABLE 3: Difference in Magnitude (Effect Size Expressed as Cohen's *d* with 95% CIs) for Recall Scores from Open-Ended Responses Across Eight Conditions in Experiment 2 ($N = 193$ Youth)**

| Condition | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 1. Animation + Audio + Caption | — | — | — | — | — | — | — |
| 2. Animation + Audio | −0.23 [−0.78, 0.32] | — | — | — | — | — | — |
| 3. Animation + Caption | 0.33 [−0.25, 0.90] | 0.54 [−0.02, 1.10] | — | — | — | — | — |
| 4. Animation | −1.90 [−2.58, −1.19] | −1.67 [−2.31, −1.02] | −1.99 [−2.70, −1.27] | — | — | — | — |
| 5. Audio + Caption | 0.24 [−0.33, 0.80] | 0.46 [−0.09, 1.00] | −0.09 [−0.65, 0.48] | 1.93 [1.23, 2.61] | — | — | — |
| 6. Audio | −0.02 [−0.57, 0.54] | 0.18 [−0.35, 0.72] | −0.31 [−0.88, 0.25] | 1.57 [0.92, 2.20] | −0.23 [−0.78, 0.32] | — | — |
| 7. Caption | 0.19 [−0.39, 0.78] | 0.39 [−0.18, 0.96] | −0.10 [−0.69, 0.49] | 1.69 [0.99, 2.38] | −0.02 [−0.60, 0.56] | 0.19 [−0.38, 0.77] | — |
| 8. No Multimedia | −2.52 [−3.28, −1.74] | −2.27 [−2.97, −1.55] | −2.50 [−3.27, −1.71] | −0.53 [−1.12, 0.06] | −2.44 [−3.18, −1.68] | −2.01 [−2.69, −1.31] | −2.12 [−2.86, −1.37] |

*Note.* Direction of comparison is Column–Row. CI = confidence interval.

**TABLE 4: The Main Effects and Interactions of Animation, Audio, and Caption on Rights Recalled via Open-Ended Recall (Experiment 2; *N* = 193 Youth)**

Main effects

| | | | | | *M* (*SD*) | | |
|---|---|---|---|---|---|---|---|
| | *F* | *df* | *p* | $\eta_p^2$ | IV Present | IV Absent | *d* [95% CIs] |
| Open Ended | | | | | | | |
| Animation | 0.00 | 1,185 | .995 | .00 | 36.03 (22.45) | 36.05 (26.65) | 0.00 [–0.28, 0.28] |
| Audio | 24.22 | 1,185 | <.001 | .12 | 42.66 (20.14) | 28.47 (26.98) | 0.60 [0.39, 0.96] |
| Caption | 58.90 | 1,185 | <.001 | .24 | 46.64 (21.99) | 26.19 (22.73) | 0.09 [0.61, 1.21] |

Interactions

| | *F* | *df* | *p* | $\eta_p^2$ |
|---|---|---|---|---|
| Open Ended | | | | |
| Animation × Audio | 2.23 | 1,185 | .137 | .01 |
| Animation × Caption | 0.17 | 1,185 | .682 | .00 |
| Audio × Caption | 53.34 | 1,185 | <.001 | .16 |
| Audio × Animation × Caption | 1.76 | 1,185 | .829 | .00 |

*Note*. IV = independent variable; CI = confidence interval.

open-ended responses was 36.04% (*SD* = 24.56), 95% CI = [32.56, 39.53]. As can be seen in Figure 2, except for the Animation and No Multimedia conditions, the mean percentage of comprehension for the top six presentations is similar (approximately 44%), and there is substantial overlap among the CIs. The average effect size for the six best presentations, when compared against the No Multimedia and Animation conditions, was *d* = 2.31 and *d* = 1.79, respectively. Despite not containing written and audio information, the performance of those in the Animation condition was substantially better than those in the No Multimedia condition, *d* = 0.53. Notwithstanding comparable levels of comprehension from the top six presentations, the absolute highest comprehension was observed for those in the Animation + Caption condition (*M* = 47.50, *SD* = 21.73, 95% CI = [40.19, 58.73]).

The conditions that contained captions outperformed those without captions, on average, by 20%; the conditions that contained audio outperformed those without audio, on average, by 14%; and the conditions that contained animation performed the same as those without animation. A three-way ANOVA was conducted to compare main effects and interactions using the independent variables as fixed factors (Animation, Audio Caption) and participants' comprehension scores from the three dependent variables (see Table 4 for the inferential statistics). For brevity, the magnitude of the effect sizes between all conditions for the multiple-choice and true/false dependent measures can be found in the Supplementary Materials.

## GENERAL DISCUSSION

Informed by previous research on the comprehension of interrogation rights (e.g., Eastwood & Snook, 2009) and principles of multimedia learning as part of our theoretical foundation (Mayer, 2009), we tested the effect of three multimedia elements (i.e., Animation, Audio, and Caption) on adults' and youth' comprehension of youth interrogation rights.

Across two experiments, we found that the Animation + Caption condition rendered the highest comprehension score for both groups. In other words, presenting adults and youth with a multimedia presentation that involves watching the rights being acted out while also reading the rights will lead to higher comprehension, relative to no multimedia, by approximately 50% and 43%, respectively. These findings support the general premise of the multimedia principle as outlined by Mayer (2009).

In absolute terms, except for the Animation and No Multimedia conditions, the comprehension levels among the top six multimedia presentation conditions were similar (on average, 64% for adults and 44% for youth). Unexpectedly, our estimated levels of comprehension are below those achieved in previous studies. For example, Eastwood and Snook (2012) observed average comprehension levels of 73% for adults when learning adult legal rights, whereas Eastwood et al. (2016) observed average comprehension levels of 81% for youth when learning youth legal rights. It might be the case that our estimated levels of comprehension are lower because of the natural variations that occur when using a different experimental paradigm (e.g., in-person vs. online testing). Alternatively, we may also have a ceiling effect, whereby the results are due to tension with some of the other multimedia learning principles. For example, although we controlled for background music across all conditions, the coherence principle of multimedia learning suggests that the use of background music may have acted as a distraction for the participants. Specifically, the music may have served as a "seductive detail" (Mayer, 2009, p. 97) and acted as a piece of material that hindered—rather than helped—the learner. It may also be the case that participants' lack of control to learn the material at their own pace may have played a hindering role (i.e., we forced a reading/learning speed on participants).

In contrast to what would be expected by Mayer's (2009) multimedia principles—dual processing conditions leading to higher comprehension—we found that the single channels conditions (i.e., Caption-only and Audio-only) led to similar levels of comprehension as dual processing conditions across both samples. It is not immediately clear why we found such results. Although speculative, it may be the case that multimedia learning principles do not lend themselves as well to helping people understand legal material (cf. cause-and-effect or "scientific explanations"; see e.g., Mayer et al., 1996, p. 64). Furthermore, we did not have control over the environment where participants completed the experiment (e.g., distractions may have been present). It is also possible that we observed high comprehension in these conditions due to the simplified nature of the youth interrogation rights script we used (Eastwood et al., 2016); using a simplified version of the interrogation rights may have led to increased comprehension of interrogation rights scores across conditions (aside from the Animation and No Multimedia conditions) for both of our samples. Perhaps the differences between our multimedia conditions might have been more pronounced if we had used a standard police caution script of youth interrogation rights; this notion should be tested in future studies.

We want to stress that our findings be viewed as preliminary. As the highest levels of comprehension found in the current experiments are not as high as found in previous studies (e.g., Eastwood & Snook, 2009, 2012; Eastwood et al., 2016), it is only with additional replication and modification of the experimental paradigm (e.g., using different multimedia learning principles, and additional measures of learning such as knowledge transfer) that it will be possible to know how well multimedia learning principles can increase comprehension. We anticipate that the conceptual and direct replications will lead to

greater improvements in learning than we have achieved here. In addition, the continued exploration of the various multimedia presentations in this domain will have the added advantage of removing the documented disparity in how police officers deliver these rights and check to ensure the youth understands their rights. Data from McCardle and colleagues (2021) suggest that police officers do not deliver interrogation rights in their entirety to youth in nearly 75% of interrogations and that officers checked for understanding rarely (less than 10% of interrogations) using simple yes/no questions.

As we continue to explore and determine which multimedia conditions produce maximized understanding of youth interrogation rights, the implications of this research may lead to introducing a standardized process for delivering interrogation rights. While we are advocates for moving toward this goal, we recognize that such a change of implementing multimedia technology in the interrogation room would require support and buy-in from legislators, courts, and police agencies. Given that the goal of this work is to protect all parties involved—youth and police interviewers—and to ensure that youth detainees are fully informed of their interrogation rights, we would be surprised if these governing bodies were unsupportive of these potential changes. However, the fact remains that much more work is needed before we are at the stage of implementing such changes to youth interrogations.

Our findings need to be tempered considering some limitations. First, our dependent measures have concerns about construct validity. That is, we used memory recall and recognition tests to assess comprehension. Despite previous research using similar measures (e.g., Eastwood & Snook, 2012; Eastwood et al.,2010, 2016; Freedman et al., 2014), memory and comprehension are related but distinguishable concepts. In that regard, different measures of learning that better capture understanding may need to be incorporated. Second, although conducting research online has become a standard approach for many psychological studies, there are some problems identified with collecting data online. One issue is that these convenience samples may not be generalizable to the population (e.g., online participants may have higher levels of education and socioeconomic status). Another concern pertains to how the information is collected from participants. In contrast to the reality of youth interrogations where information is collected verbally from detainees, our study collected information in written format—participants were required to type their answers into response boxes. The quality of the information provided by writing out the answers may have been impacted by the individuals' typing and spelling abilities, or due to the fatigue effects of having to take the time to write out their answers (see Porter, 2004). Conversely, there are documented benefits of crowdsourcing platforms for data quality (e.g., an effective means of obtaining reliable data; see Palan & Schitter, 2018; Peer et al., 2017), and increasing the ability to obtain a sample of people beyond a local homogeneous group (e.g., a cross-Canadian sample). It goes without saying that future studies should consider replicating our experiments in the laboratory setting (e.g., verbal responses), under more ecologically valid settings (e.g., inducing stress), using more diverse samples (e.g., justice-involved youth), with different measures of learning (e.g., knowledge transfer), and exploring additional principles of multimedia learning (e.g., segmenting principle; see Mayer, 2009).

Technology is continually being embraced to improve all areas of day-to-day life and work, including within policing (e.g., body-worn cameras; Blaskovits & Bennell, 2019). One consequential area that has escaped an infusion of technology (but would be beneficial to both the police and youth) has been the delivery of interrogation rights. Comprehension

of interrogation rights has been studied for nearly four decades; the general conclusion from the literature is that both adults and youth do not fully understand the rights afforded to them, and police sometimes struggle to administer these rights fully and completely. Youth are a particularly vulnerable population when it comes to interacting with the police and consequently need extra protection. It seems that governing bodies globally (at least in Canada, the United States, and the United Kingdom) recognize that more protections for justice-involved youth are needed, as evidenced by changes in legislation (e.g., King, 2006; Police and Criminal Evidence Act, 1984; Youth Criminal Justice Act, 2002). Despite these changes being a step in the right direction, a full consideration of ways to improve comprehension has not been explored. Our research has taken the first step toward using multimedia learning principles to improve comprehension and learning of interrogation rights. We also know that technology can provide a standardized process in this domain (i.e., helping the police reduce the amount of variation in their performance, and hence challenges to the extent to which their delivery of the interrogation rights was sufficient; see McCardle et al., 2021). We anticipate that the continued exploration of multimedia learning principles within this domain will lead to improvements in comprehension, and more broadly, help ensure that youth are fully equipped to make informed decisions when facing an interrogation.

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## SUPPLEMENTAL MATERIAL

Supplementary Material is available in the online version of this article at http://journals.sagepub.com/home/cjb

## NOTES

1. McCardle et al. (2021) found that adults were present in 83% of youth interrogations examined. The assumed role of these adults is to help the youth during the interrogation, but some data suggest that adults' roles often remain unexplained in these situations (see Clarke & Milne, 2001) or that they contribute inappropriately during the interrogation (see Medford et al., 2003).

2. When recruiting through Prolific Academic, filters were set such that the sampling was to target Canadian participants only. However, despite applying these filters on Prolific's site, some self-identified non-Canadian participants appear to have completed the experiment ($n = 13$). As this variable was not planned to be used as an exclusion criterion, we decided to simply run tests to see if there were any concerns about retaining them in our sample. A Welch's independent $t$ test revealed no significant differences between Canadian and non-Canadian participants' as function of comprehension, $t_{Open\ Recall}(13.975) = -0.74$, $p = .475$, $t_{Multiple\text{-}Choice}(13.350) = -0.17$, $p = .864$, $t_{True/False}(13.889) = 0.19$, $p = .850$; therefore, it was concluded that there were no concerns about retaining these participants in the sample. Furthermore, we decided to retain this small group of non-Canadian adults in the sample because although these participants may not be Canadian, they were still living in Canada and could arguably still serve as an appropriate adult for a youth taken into custody by the police in Canada.

3. Qualtrics Survey Panels was hired as a third-party recruiter and operates such that researchers pay a monetary rate per recruited participant (as determined and set by Qualtrics). Qualtrics recruiters subsequently recruit participants based on the study's criteria (e.g., age, ethnicity, gender). In terms of compensation for the recruited participants, Qualtrics uses several different incentive packages (e.g., travel vouchers, gift card draws, and money) depending on how and where participants are recruited (B. Hoang, personal communication, January 15, 2021).

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