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Abstract

The purpose of this study was to assess the impact of young students' prior attitude on source consideration when watching videos on controversial topics. 271 seventh graders watched a series of videos in which two interviewees (one expert in the field, one layperson) expressed divergent positions on a socioscientific issue ("Will organic farming be able to feed the entire world population by 2050?"). After watching the videos, students were asked to recall the identity and arguments of the interviewees and indicate how far they had perceived them to be credible and convincing. If no effect of students' prior attitude was found on source recall, students were prompt to judge the interviewee who provided arguments that were congruent with their prior attitude as more credible and convincing that the interviewee that provided incongruent arguments. These results suggest that young students' beliefs contribute to their assessment of the credibility of an information source when watching videos.

References

Searching the Internet for information on controversial topics requires evaluating the source of the information, as reliable information from expert sources coexists with erroneous or deliberately misleading information (Lazer et al., 2018; Miller, 2020). After analysing the content of the first 200 YouTube videos when searching for the keywords "climate" or "climate change", Allgaier (2019) found, for example, that more than half of the videos shared climate-sceptic or even conspiracy theories on climate change.

Several studies indicate that students, even at a young age, are aware of the need to assess the reliability of the source of information and have the skills to do so - as long as they are confronted with documents adapted to their educational level and have a sufficient level of prior knowledge on the topic (e.g., Potocki et al., 2020). Young students also seem to make greater use of these skills when they process conflicting information (Braasch et al., 2012; Braasch & Bråten, 2017).

A limitation of these studies remains the lack of consideration of students' prior beliefs and attitudes about the topic. Students do not approach the study of controversial issues empty-minded, without any opinion on the issue. Even though numerous studies have shown that this prior opinion can have an impact on their processing of conflicting information about the issue (Richter & Maier, 2017), including source consideration (e.g., Van Strien et al., 2016), the impact of younger students' prior beliefs on the evaluation of the information source remains little explored. In this study, we investigated how middle-school students' prior attitudes about a controversial topic (“Will organic farming be able to feed the entire world population by 2050?”) affected their evaluation of the source of information, by exposing a sample of 7th grade students to a series of videos in which two sources varying in expertise made conflicting statements about the topic. Before presenting the study in more detail, the relevant literature is reviewed.

Students' Consideration Of The Source In The Context Of Conflicting Information

Identifying the source of information and assessing its credibility are considered critical literacy skills students need to learn in order to be able to evaluate the quality of information (Anmarkrud et al., 2022). Several studies indicate that students are, by the end of primary school, able to correctly identify the source of a piece of information and assess its credibility based on the information provided in the document (Macedo-Rouet et al., 2013; Paul et al., 2017, 2018; Potocki et al., 2020). However, these studies also suggest that young students are unlikely to make spontaneous use of these skills when performing complex tasks (i.e. multi-document processing, online information retrieval) that do not explicitly require them to pay attention to the source of information (Braasch et al, 2009; Goldman, 2011; Paul et al., 2017, 2018; Perez et al., 2018; Potocki et al., 2020).

An important factor to consider is the degree of consistency between the information provided in the document(s). A significant number of studies have validated these assumptions in undergraduate students (Braasch et al., 2012, 2017; Bråten et al., 2016; Kammerer et al., 2016; Rouet et al, 2016; Saux et al. 2017, 2018) as well as younger students (De Pereyra, 2016; Salmerón et al., 2016). De Peyrera (2016) exposed his participants (a group of 5th grade students, a group of 9th grade students and a group of undergraduate students) to short stories in which two sources held either concordant or discordant views on a given topic. He observed that the participants, regardless of their educational level, paid more attention to the sources, memorised them better, and were more inclined to cite the sources in their answers when the sources held discordant views. Salmerón and colleagues (2016) presented their participants (a group of 10- to 11-year-old primary school students, a group of middle-school students (13-14 years old) and a group of undergraduate students (19-20 years old) to a series of forum pages in which several sources provided either concordant or discordant answers to a user's question. Again, regardless of educational level, participants were more inclined to cite the source in their response when the sources held divergent opinions.

A limitation of the studies presented above is the focus on the processing of textual documents, to the detriment of other types of documents such as videos. As noted by Salmerón and colleagues (2020), very little research has been done on how young students process source information when watching videos. Yet, students are likely to process the source differently in the case of videos, to the extent that the combination of sound and image makes it easier to identify who is saying what within the video (Schroeder et al., 2017). After having their participants (4th to 6th graders) read two texts and watch two videos on the topic of bottled water, Salmerón and colleagues (2020) observed that students tended to recall the sources seen in the videos better than the sources found in the texts. Moreover, students were more likely to defend the source's position in their writing after watching the videos than after reading the texts, which replicates the results of earlier studies in field of persuasion (Booth-Butterfield & Gutowski, 1993, Chaiken & Eagly, 1983).

Another limitation is the lack of consideration of the potential impact of young students' prior beliefs and attitudes on the topic on source processing, when such an impact has been demonstrated in studies involving undergraduate students.

The Impact Of Students' Prior Beliefs And Attitudes On Source Consideration When Processing Conflicting Information

Several studies have shown that undergraduate students' prior beliefs and attitudes impact their consideration of source when processing conflicting information (Bråten et al., 2016; Kobayashi, 2014; Maier & Richter, 2013; Van Strien et al., 2016). Notably, some studies found an effect of students' prior beliefs on source credibility assessment (Kobayashi, 2014; Van Strien et al., 2016). According to the literature on persuasive communication (Perloff, 2017; Pornpitakpan, 2004; Stiff & Mongeau, 2016; Wilson & Sherell, 1993), source credibility encompasses two main dimensions: source expertise, i.e. the perceived level of topic-knowledge or skills of communicator, and source trustworthiness, i.e. the perceived degree of honesty and goodwill of the communicator (Perloff, 2017). Since individuals evaluate these source characteristics on the basis of objective data (e.g. the occupation of the source) but also on the basis of their beliefs about the topic at-hand (Kumkale et al., 2010), the compatibility of the source's statements with these beliefs is likely to impact on how credible the source is perceived to be.

Kobayashi (2014) had his participants (undergraduate students) read two conflicting texts on the relationship between blood type and personality. He found that participants' prior beliefs on the issue impacted the evaluation of the texts, such as the text that provided beliefs-congruent arguments was judged more credible and persuasive than the text that provided beliefs-incongruent arguments. Similar results are reported by Van Strien and colleagues (2016). Participants in their study (undergraduate students) were asked to rate the credibility of several web pages giving conflicting information about the effects of organic food consumption. The strength of participants' prior attitude on the topic (whether they were for or against organic food consumption) was assessed in a pretest phase. The authors found that students that had a strong prior attitude on the issue rated the web pages that provided information congruent with their attitude to be more credible (more expert, more trustworthy, more convincing) that the web pages that provided incongruent information.

Other studies showed an impact of undergraduate students' beliefs on source memorization. Maier and Richter (2013) had their participants read a series of texts on two scientific controversies ("Are vaccines dangerous to health?", "Is man responsible for global warming?"). Participants' recall of the source was assessed at the end of the reading by a free recall task. The authors observed that participants were better at recalling the source of texts that went against their prior beliefs on the topic. Similar findings are reported by Bråten and colleagues (2016) on a different topic (the health effects of waves emitted by cell phones), although the effect proved inconsistent – depending on the direction of students' prior beliefs on the issue.

Such results, however, have not been replicated with younger students. Although presenting conflicting information from multiple sources may be an adequate strategy for promoting greater source awareness amongst young students (Braasch & Bråten, 2017; De Pereyra et al., 2014; Salmerón et al., 2016), it remains to be seen whether these students are biased in their perception of source credibility, depending on their pre-existing opinion on the topic.

Our Study

In this study, we investigated how middle-school students' prior attitude impacted their consideration and evaluation of the source when watching videos about a controversial issue. To this end, we exposed a sample of seventh graders to a series of videos in which two sources varying in expertise (researcher vs. consumer) expressed divergent opinions about a controversial issue ("Will organic farming be able to feed the entire world population by 2050?"). We were particularly interested in how students' prior attitudes would impact their memorization of the sources and of their arguments, and which source they would find most credible and convincing on the topic.

Indeed, as some studies on older students suggest, middle-school students' prior attitude on the issue might contribute to source evaluation (Kobayashi, 2014; Van Strien et al., 2016). Insofar as students are prone to process conflicting information in a beliefs-protective fashion (Richter & Maier, 2017), students might be biased by their prior beliefs when it comes to evaluate the credibility and persuasiveness of the source of information. In this, we expected students to find the source providing arguments congruent with their prior attitude on the issue more credible and convincing than the source providing incongruent arguments.

However, this attitude-congruency effect might be reduced when students are confronted with two sources of unequal expertise on the issue. Indeed, a source perceived as expert on the topic (by virtue of its profession and experience in the area) is usually considered more credible than a source perceived as inexpert (Pornpitakpan, 2004). While the effect of the congruence of the source's arguments with students' prior attitude may be maximal when the two sources are of similar expertise, this effect may be diminished (or even disappear) when one source is unambiguously more expert on the topic than the other. To test this assumption, students were here confronted either with two sources of equal expertise (e.g., two researchers) or with two sources of asymmetrical expertise (e.g., researcher vs. consumer).

Our hypotheses were thus as follows:

- In terms of source memorization, in line with previous findings (Maier and Richter; 2013; Bråten et al., 2016), we expected students to remember better the source that provided attitude-incongruent arguments than the source providing attitude-congruent arguments (H1a), and that this effect would also be observed in the memorization of the sources' arguments (H1b).
- In terms of source evaluation, we expected students to consider the source providing attitude-congruent arguments more credible, i.e. more expert (H2a) and trustworthy (H2b), than the source providing attitude-incongruent arguments. However, we expected that this effect would be reduced when students were confronted with two sources of unequal expertise vs. when they were confronted with sources of similar expertise (H3a and H3b).
- Finally, we expected that students would be more likely to consider the source providing attitude-congruent arguments to be the most convincing source than the source providing attitude-incongruent arguments (H4a), but that this tendency would be less prevalent when students were

confronted with two sources of unequal expertise vs. when they were confronted with sources of similar expertise (H4b)

Method

Sample

Three-hundred and nineteen French seventh graders participated in this study (M_{age}=13, *ET*=.56). 55.2% of the students (*N*=176) declared themselves as girls and 44.8% (*N*=143) as boys. 6.9% of the students (*N*=22) attended a middle school located in the suburbs of a large city, 57% (*N*=182) attended two middle schools located in the centre of a medium-sized city and 36.1% (*N*=115) attended three middle schools located in rural areas.

Students participated in the study as part of the curriculum, after obtaining their (and their parents') consent to participate. The sample size indicated in this section includes only those students who agreed to participate in the study.

Of this sample, 15% of the students (*N*=48) reported a neutral attitude towards organic food feeding the entire world population by 2050. In order to be able to manipulate the congruence of the arguments presented with students' prior attitude, these students were removed from the analyses - which were thus carried out on a total of 271 participants.

Material

Videos

Students were exposed to six video extracts of fictitious interviews ($M_{duration}$=49 seconds per video, *ET*=4.7 sec.) on the topic "Will organic food be able to feed the entire world population planet by 2050?"

Of the six extracts, three consisted of an interview with a source arguing that organic agriculture could feed the planet in 2050 and that a transition to 100% organic agricultural production would have positive consequences for the consumer and the environment (*positive* source). This source was considered *congruent* for students holding a positive attitude towards organic food feeding the entire world population by 2050, and *incongruent* for students holding a negative attitude. The other three extracts consisted of an interview with a source arguing that this change in agricultural production was not feasible and would have negative consequences (*negative* source). This source was considered *incongruent* for students holding a positive attitude towards organic food feeding the entire world population by 2050, and *congruent* for students holding a negative attitude.

Each of the interviewees gave their opinion on three subtopics (with one video per theme and per interviewee, for a total of six extracts viewed by the students): (1) the level of productivity of organic farming; (2) the need to change diet to ensure sufficient yield; and (3) the cost to the consumer of a

transition to 100% organic farming. Table 1 indicates the arguments given by the interviewees on each of the subtopics, according to their position (favorable/unfavorable).

Table 1

Arguments Presented By Sources According To Their Position (Positive/Negative)

	Negative source	Positive source
Theme 1 = Yield	*Interview extract 1* = Organic farming does not have a sufficient level of productivity to feed the entire world population and switching to fully organic farming by 2050 would require increasing the number of agricultural plots.	*Interview extract 2* = Organic agriculture is able to achieve similar levels of productivity to conventional agriculture through the use of certain farming techniques, which are more environmentally friendly.
Theme 2 = Need to change diet	*Interview extract 3* = Eating less meat means an increased consumption of vegetable proteins to the detriment of animal proteins, which are also necessary for the human body to function.	*Interview excerpt 4* = One third of the world's cereal production is now used to raise livestock. By reducing our consumption of meat, this share will decrease and switching to 100% organic agriculture by 2050 becomes possible.
Theme 3 = Cost to the consumer	*Interview extract 5* = Organic food is more expensive for the consumer because it requires more labour. If by 2050, organic food is the only alternative, then less well-off consumers will find it difficult to eat properly.	*Interview extract 6* = The share of the household budget allocated to food has been falling sharply since the 1950s. Organic products are more expensive, but of better quality and this price is fairer because it allows farmers to be better paid.

The expertise of the sources was manipulated by varying the identity (name/occupation) of the interviewees, identified either as (1) researchers in the field (e.g. "*Denis Marchal, researcher in agronomy at INRA (Bordeaux)* (2) consumers interviewed during their shopping (e.g. "*Léo-Paul, 33 years old*"), using a banner presented at the bottom of the screen for 5 seconds at the beginning of each extract. To support this manipulation, sources were interviewed in an environment congruent with their assigned identity (office for sources identified as researchers, supermarket for sources identified as consumers), as represented in Figure 1.

Insert Figure 1 about here

The interviewees were actors recruited by an audiovisual agency, and were all Caucasian men between 36 and 44 years of age in order to neutralise potential effects of attractiveness and identification at source (DeBono & Harnish, 1988; Pornpitakpan, 2004; Stiff & Mongeau, 2016).

Experimental Platform

Students watched the videos on an experimental platform designed for the purpose of the study. The list of the six extracts to be watched was displayed on the screen as a list of bookmarks on the left of the

screen, as shown in Figure 2 ("Pour le bio" referring to extracts from the favorable source; "Contre le bio" referring to extracts from the unfavorable source). The video player included a play/pause button, a progression bar with a timer, and a button to toggle the video to full screen.

Insert Figure 2 about here

Experimental Design

The identity of the interviewees was manipulated as a between-subject factor by creating pairs of interviewees either similar or contrasting in terms of expertise, resulting in four experimental groups varying on the "Pair of Sources" factor, summarised in Table 2. Students were randomly assigned to the different groups.

Table 2 Experimental Groups

Pair of Source	Negative Source	Positive Source
Pair 1 (*N*=84)	Researcher	Researcher
Pair 2 (*N*=57)	Researcher	Consumer
Pair 3 (N=53)	Consumer	Researcher
Pair 4 (N=77)	Consumer	Consumer

Measures

Attitude And Prior Knowledge On The Topic.

Prior Attitude. In order to assess the direction of students' prior attitude on the topic, students were asked to indicate the extent to which they were in favour of (or against) organic agriculture feeding the whole entire population by 2050 on a 9-points bipolar scale ("Are you for or against organic agriculture feeding the entire world population by 2050?"), scoring from -4 ("*Totally against")* to +4 ("*Totally for*").

Participants were considered to have a *negative* prior attitude if their score failed between -4 and -1 (*N*=55, 20.3% of participants) and *positive* if their score failed between +1 and +4 (*N*=216, 79.7% of participants).

Prior Knowledge. In order to assess the level of students' prior knowledge on the topic, they were asked to complete an 8-item multiple-choice questionnaire in the pre-test phase, with one point for each correct answer (total score from 0 to 8). E.g.: "Nowadays, *how much of the world's cereal production is allocated to feeding livestock (cows, pigs, sheep, etc.)?* (a) *Half of the production*. (b) *One third of production*. (c) *10% of production*. (d) *Don't know."* The internal consistency of the questionnaire evaluated by Cronbach's alpha was acceptable (α=.71).

Source Recognition

Students' recognition of the sources seen during the videos was assessed using two recognition tasks. As recognition cues, the screenshots of the two interviewees seen during the videos were displayed (without the indication of their name and profession) with the mention "Person A", "Person B".

Source Identity Recognition. During the first recognition task, students had to recognize the correct identity the interviewees in two lists of six items (one per interviewee) including one item giving the correct occupation and name of the interviewee (scored 2), one item giving the correct occupation of the interviewee but a wrong name (scored 1) and four incorrect items (wrong name and occupation, scored 0).

Source Arguments Recognition. Students were then confronted with a list of twelve arguments, containing three arguments expressed by the positive source (one for each interview extract), three by the negative source (one for each interview extract) and six distractors. For each argument, the students had to indicate whether it was made by the Person A, the Person B, or if it was not included in the videos they had watched. Each correct recognition was scored 1, false recognition were scored 0 and the scores were added to give a score of 0 to 3 for each source.

Source Credibility

After completing the recognition tasks, students were asked to assess the credibility of each interviewee seen in the videos, using a selection of items from McCroskey's Authoritativeness and Character Scale (1966), which have proven their validity and robustness with different audiences, including adolescents (Stiff and Mongeau, 2016). A screenshot of the face of the interviewee (without mentioning his name and occupation) seen in the videos was shown with the mention person A, person B.

Source Expertise. In order to assess the extent to which students perceived the interviewees as experts on the topic, students were asked to complete - for each interviewee - a four-item questionnaire based on a selection of items from McCroskey's Authoritativeness Scale. For each item, students were asked to indicate their level of agreement with statements such as "*This person seemed to me to be competent enough to deal with this topic*", on a 7-point Likert scale ranging from 1 ("*Strongly disagree")* to 7 ("*Strongly agree"*). The internal consistency of the questionnaire as measured by Cronbach's alpha was high (α=0.84).

Source Trustworthiness. In order to assess the extent to which students perceived interviewees as trustworthy on the topic, students were asked to complete - for each of the sources seen in the videos - a four-item questionnaire based on a selection of items from McCroskey's Character Scale. For each item, students were asked to indicate their level of agreement with statements such as *"I trust this person to tell the truth about the subject*", on a 7-point Likert scale ranging from 1 ("*Strongly disagree")* to 7 ("*Strongly agree"*). The internal consistency of the questionnaire as measured by Cronbach's alpha was high (α=0.82).

Source convincingness

Lastly, students were asked to indicate which interviewee they found the most convincing on the subject, with three possible answers: Person A; Person B; Both were equally convincing. Students were asked to justify their answers in writing ("*Why did you find this person more convincing than the other one? Justify your answer using the text field below*" if the answer *Person A* or *Person B* was selected, and "*Why did you find both persons equally convincing? Justify your answer using the text field below*" if the answer "*Both were equally convincing* " was selected).

We applied a thematic content analysis (Bardin, 2013) to cluster students' justifications. Two judges discussed the original statements and came-up with a set of categories, summarized in Appendix A. In order to assess the validity of these categories, the interjudge method (involving the calculation of Cohen's Kappa) was implemented using two independent judges who were blind to the hypotheses of the study (graduate students). These judges coded 25% of the written data following the grid provided. The percentage of agreement was high (94%; κ = .86) and disagreements were resolved by discussion. One of the independent judges then coded the remaining data.

Procedure

The procedure for this experiment consisted of three phases, each separated by one week.

Phase 1 (pre-test). In this phase, students individually completed an online questionnaire under the supervision of their teachers (who were asked not to intervene except to solve a comprehension problem), during school hours. In order to avoid the emergence of a social desirability bias, the instructions stressed that the responses were anonymous and that only the researchers conducting the study would have access to the answers provided. Students were also informed that the questionnaire was neither a test nor an evaluation, and were therefore encouraged to answer the questions as honestly as possible.

The questionnaire included (1) the collection of demographic data (first name, age, gender, middle school), (2) the bipolar scale to obtain data on students' prior attitudes on the topic, and (3) the MCQ questionnaire to assess the level of students' prior knowledge on the topic.

Phase 2 (viewing of videos/immediate post-test). A week later, the students were asked to watch the six interview extracts on the topic (*see* above - Material section). The students watched the videos individually with headphones provided by the experimenter, in their usual classroom, in the presence of

their teacher. The students were instructed to watch the videos in the order they wished and that they would have to give their opinion on the topic after viewing the videos. Students were given 20 minutes to watch the videos at their own pace and, if necessary, to watch them again.

After viewing the videos, all students were asked to complete a second online questionnaire to evaluate: (1) students' recognition of interviewees' identity and arguments, using two recognition tasks (*see* Measures), (3) the perceived credibility (expertise/trustworthiness) of the interviewees. Finally, students were asked to indicate which interviewee they found the most convincing on the topic and to justify their answer.

Phase 3 (delayed post-test). One week later, students were asked to complete a final online questionnaire similar to the one in Phase 2 (credibility of source and selection of the most convincing source excepted) in order to consider potential long-term changes in the measures.

Results

Appendix B summarises the means and standard deviations observed on each measure of the study, according to the experimental phase (pre-test, immediate post-test, delayed post-test). Examination of the kurtosis and skewness coefficients of the distributions supports the use of parametric tests to analyse the results of the study, with all coefficients remaining within acceptable limits to validate the hypothesis of normality of the distributions (Gravetter & Wallnau, 2014).

Analyses were carried out with Jamovi software version 2.2 (The jamovi project, 2021), using the R packages "afex: Analysis of Factorial Experiments" (Singmann, 2018), "emmeans: Estimated Marginal Means" (Lenth, 2020), and "car: Companion to Applied Regression" (Fox & Weisberg, 2020)

No significant difference between the experimental groups was observed in relation to the age of the participants, $F(3,267)=1.570$, $p=.192$, gender, $\chi^2(3)=5.591$, $p=.134$, prior attitude, $F(3,267)=0.470$, $p=.703$, or level of prior knowledge, $F(3,267)=0.344$, $p=.79$.

Source Recognition

In order to highlight potential differences in the source recognition scores according to students' prior attitude (Hypothesis 1a and 1b), mixed ANOVAs including two within-subjects factors (*Experimental Phase:* immediate post-test, delayed post-test; *Source Congruency:* congruent, incongruent) and one between-subjects factor (*Pair of Sources*: P1, P2, P3, P4) were run on source identity and source arguments recognition scores.

Recognition of Sources' Identity.

A simple effect of the factor *Pair of Sources* was found on source identity recognition scores, $F(3,267)=14.452$, $p<.001$, $\eta^2_p=.140$, as students for whom both interviewees were identified as researchers (Pair 1) obtained significantly lower scores than the other students, 95% IC [1.18:1.38] (Pair 1) vs. 95% CI

[1.51:1.75] (Pair 2), $t(267)=-4.412$, $p_{bonferroni}<.001$, $M_{difference}=-0.352$, $SE=.080$; vs. 95% CI [1.57:1.82] (Pair 3) , $t(267)=-5.074$, $p_{bonferroni}<.001$, $M_{difference}=-0.414$, $SE=.081$; vs. 95% CI [1.60:1.81] (Pair 4), , $t(267)=-5.750$, $p_{bonferroni}<.001$, $M_{difference}=-0.421$, $SE=.073$. There was no significant difference between students confronted with three other pairs (all $p_{bonferroni}>.10$).

Within-subjects effects revealed a simple effect of the factor *Experimental Phase,* $F(1,267)=6.325$, $p=.012$, $\eta^2_p=.023$. Post-hoc tests showed that students recognized the identity of sources better in the immediate post-test than in the delayed post-test, 95% CI=[1.55:1.69] (immediate posttest) vs. 95% CI=[1.47:1.60] (delayed posttest), $t(267)=2.515$, $M_{difference}=0.086$, $SE=.034$, $p=.012$. On the other hand, there was no simple effect of the factor *Source Congruency*, $F(1,267)=2.436$, $p=.120$, $\eta^2_p=.009$, and no interaction effect between the factors included in the ANOVA (all $p>.10$). These results indicate that students did not better recognise the source providing arguments congruent with their prior attitude on the topic, and invalidates Hypothesis 1a.

Recognition of Sources' Arguments

There was no significant simple effect of the factor *Pair of Sources* on source arguments recognition score, although the effect proved tendential, $F(3,267)=2.415$, $p=.067$, $\eta^2_p=.026$.

Within-subjects effects did not reveal an effect of the factor *Experimental Phase,* $F(1,267)=1.963$, $p=.162$, $\eta^2_p=.007$, but a simple effect of the factor *Source Congruency* was noted, $F(1,267)=25.164$, $p<.001$, $\eta^2_p=.086$. Post-hoc tests indicated that students recognised the arguments of the incongruent source better than the arguments of the congruent source, 95% CI [1.52:1.75] (incongruent source) vs. 95% CI [1.29:1.49] (congruent source), $t(267)=5.02$, $M_{difference}=0.248$, $SE=.049$, $p<.001$. Although an effect of the factor Source Congruency was expected, the direction of this effect proves opposite to that postulated by Hypothesis 1b.

No interaction effect between the factors included in the ANOVA reached significance (all $p>.10$)

Source Credibility

In order to investigate the extent to which students rated interviewees' credibility differently based on (1) the congruency of interviewees' arguments with students' prior attitude (Hypotheses 2a, 3a) and (2) the pair of sources seen in the videos (Hypotheses 2b, 3b), mixed ANOVAs including one within-subjects factor (*Source Congruency:* congruent, incongruent) and one between-subjects factor (*Pair of Sources*: P1, P2, P3, P4) were implemented on perceived expertise and trustworthiness ratings.

Perceived Expertise

A strong simple effect of the factor *Pair of Sources* was observed on perceived expertise ratings, $F(1,267)=20.865$, $p<.001$, $\eta^2_p=.190$. As shown in Figure 3, students for whom both interviewees were identified as researchers (Pair 1) rated the interviewees more expert than the other students, 95% IC

[4.79:5.23] (Pair 1) vs. 95% CI [4.31:4.84] (Pair 2), $t(267)=2.503$, $p_{bonferroni}=.013$, $M_{difference}=0.435$, $SE=.174$; vs. 95% CI [4.04:4.59] (Pair 3) , $t(267)=3.918$, $p_{bonferroni}<.001$, $M_{difference}=0.693$, $SE=.177$; vs. 95% CI [3.54:4.00] (Pair 4), , $t(267)=7.793$, $p_{bonferroni}<.001$, $M_{difference}=-0.421$, $SE=.073$. Students from whom one of the interviewee was presented as a researcher and the other as a consumer (Pair 2, Pair 3) also rated the interviewees more expert than the students for whom both interviewees were identified as consumers (Pair 4), $t(267)=4.542$, $p_{bonferroni}<.001$, $M_{difference}=0.177$ [Pair 2 vs. Pair 4], $t(267)=3.038$, $p_{bonferroni}=.003$, $M_{difference}=0.547$ [Pair 3 vs. Pair 4].

Insert Figure 3 about here

The analysis also revealed a strong effect of the factor *Source Congruency*, $F(1,267)=71.347$, $p<.001$, $\eta^2_p=.211$, as students rated the congruent source as more expert than the incongruent source, 95% IC [4.81:5.14] (congruent source) vs. 95% CI [3.66:4.05] (incongruent source), $t(267)=8.447$, $p_{bonferroni}<.001$, $M_{difference}=1.119$, $SE=.132$. These results provide support for Hypothesis 2a. In opposition with Hypothesis 2b, however, the *Source Congruency* * *Pair of Sources* interaction effect proved insignificant, $F(1,267)=2.166$, $p=.092$, $\eta^2_p=.024$. As shown in Figure 4, students' tendency to rate the interviewee providing arguments congruent with their prior attitude as more expert than the interviewee providing incongruent arguments was found in all groups, even students confronted with pair of sources of unequal expertise.

Insert Figure 4 about here

Perceived Trustworthiness

A simple effect of the factor *Pair of Sources* was observed on perceived trustworthiness ratings, $F(1,267)=4.990$, $p=.001$, $\eta^2_p=.053$, as students for whom both interviewees were identified as researchers (Pair 1) rated the interviewees more trustworthy than the other students, 95% IC [4.89:5.31] (Pair 1) vs. 95% CI [4.39:4.90] (Pair 2), $t(267)=2.679$, $p_{bonferroni}=.008$, $M_{difference}=0.453$, $SE=.169$; vs. 95% CI [4.48:5.01] (Pair 3) , $t(267)=2.053$, $p_{bonferroni}=.041$, $M_{difference}=0.355$, $SE=.173$; vs. 95% CI [4.30:4.75] (Pair 4), , $t(267)=3.677$, $p_{bonferroni}<.001$, $M_{difference}=0.572$, $SE=.156$. There was no other difference between the groups (all $p_{\text{bonferroni}}>.10$).

Again, a strong simple effect of the factor *Source Congruency* was observed, $F(1,267)=39.767$, $p<.001$, $\eta^2_p=.130$, as students rated the congruent source as more trustworthy than the incongruent source, 95% IC [4.81:5.14] (congruent source) vs. 95% CI [3.66:4.05] (incongruent source), $t(267)=6.306$, $p_{bonferroni}<.001$, $M_{difference}=0.737$, $SE=.117$. These results provide support for Hypothesis 3a. The *Source Congruency* * *Pair of Sources* interaction effect was not significant, $F(1,267)=1.316$, $p=.270$, $\eta^2_p=.015$ as students' tendency to rate the interviewee providing arguments congruent with their prior attitude as more trustworthy than the interviewee providing incongruent arguments was observed in all groups – as shown in Figure 5. These results invalidate Hypothesis 3b.

Insert Figure 5 about here

Source Convincingness and Justifications

Source Convincingness

In agreement with Hypothesis 4a, a strong association between the source perceived as the most convincing and students' prior attitude was observed, $\chi^2(2)=69.49$, $p<.001$, *Cramer's V*=.506. As shown in Table 3, students who positioned themselves as being against organic agriculture feeding the entire population by 2050 perceived the negative source as the most convincing much more frequently than students who held a positive attitude, 58.18%, *n*=32 (negative students) *vs.* 9.72%, *n*=45 (positive students). Conversely, students who held a positive attitude chose the positive source as the most convincing more frequently than students who held a negative attitude, 45.83%, *n*=99 (positive students) *vs.* 9.09%, *n*=5 (negative students).

Table 3 Source perceived as the most convincing, according to students' prior attitude

	Prior Attitude	
Source Perceived as the Most Convincing	Negative	Positive
Negative Source	58.18 % (32)	9.72% (21)
Both were equally convincing	32.72 % (18)	44.44% (96)
Positive Source	9.09 % (5)	45.83% (99)

The implementation of a multinomial logistic regression including as a predictor students' prior attitude (2 levels: negative, positive) and as an outcome students' choice (3 possibilities: positive source, negative source, both were equally convincing) confirmed that students' prior attitude was a significant predictor of the source selected as the most convincing one by the students, *Deviance*=506.914, *AIC*=514.914, *BIC*=529.322, R^2_{McF}=.110, $\chi^2(2)=62.697$, $p<.001$. Students that held a negative attitude towards organic farming feeding the whole population by 2050 were much more likely to select the negative source as the most convincing than students that held a positive attitude, *Estimate*=3.408, *Z*=6.338, *SE*=0.538, $p<.001$, *OR*=30.193. The opposite pattern was observed for the positive source, *Estimate*=3.407, *Z*=6.338, *SE*=0.538, $p<.001$, *OR*=30.176. These results validate Hypothesis 4a.

In line with Hypothesis 4b, an association between the pair of sources seen in the videos and the proportion of students that judged the congruent source to be the most convincing was found, $\chi^2(3)=10.326$, $p=.016$, *Cramer's V*=.195. As shown in Table 4, however, the sole difference observed was that students confronted with the pair 3 (positive researcher – negative consumer) were more inclined to consider the congruent source as the most convincing than students of the other groups – which contradicts Hypothesis 4b.

Table 4 Proportion of students that chose the congruent source, according to the pair of sources seen in the videos

	Congruent Source Chosen ?		
Pair of Source	**No**	**Yes**	**Total**
1 (Researcher vs. Researcher)	59.52 % (50)	40.48 % (34)	84
2 (Negative Researcher vs. Positive Consumer)	54.38 % (31)	45.61 % (26)	57
3 (Positive Researcher vs. Negative Consumer)	32.07 % (17)	67.92% (36)	53
4 (Consumer vs. Consumer)	51.94 % (40)	48.05% (37)	77

Justifications

As shown in Table 5**,** the frequency data show that a relatively small proportion of students cited interviewees' expertise as an argument to justify which interviewee they judged to be the most convincing (19.56%, *N*=53). Most students cited their agreement with all (21.77%, *N*=59) or part of the source's arguments (25.4%, *N*=64) as justification for their choice. These results provide additional support for the assumption that students' prior attitude on the issue contributed to their evaluation of the sources of information.

Table 5 Students' Justification For Their Choice

	Coding category	% of students
Speaker	Expertise	19.56 % (*N*=53)
	Argumentative skills	17.71 % (*N*=48)
Discourse	Overall agreement with the source	21.77 % (*N*=59)
	Agreement with specific arguments	23.61 % (*N*=64)
Other	Don't know	4.06 % (*N*=11)
	Other	5.17 % (*N*=14)

Discussion

Summary of the Results

The purpose of this study was to investigate how middle-school students' prior attitude toward a controversial topic (here, "Will organic farming be able to feed the entire world population by 2050 ?") affected their consideration and evaluation of sources when watching conflicting videos on the topic. As students were exposed to video interviews during which two interviewees took opposing positions on the

topic, we expected to observe an attitude-congruency effect on students memorization of the interviewees' identity and arguments, as well as on which source students would find the most credible and convincing, i.e. that the interviewee providing attitude-congruent arguments would be judged more credible and convincing that the interviewee providing attitude-incongruent arguments.

While no significant effect of students' prior attitude was found on the recognition of the identity of the sources. In discordance with our hypotheses, most students correctly recognized the identity of the interviewees seen in the videos both on the immediate post-test and the delayed post-test, whether they gave arguments congruent with their attitude on the topic or not. These results prove different from those reported by Maier and Richter (2013) and Bråten and colleagues (2016), who found that students remembered better the source that provided arguments that were incongruent with their prior beliefs. However, these studies used free recall as a method to assess participants' memorization of sources, whereas a recognition task was employed in this study. This type of task may have made it easier for students to correctly recall the sources, regardless of how congruent their arguments were with students' prior attitudes. Moreover, in contrast to the text material used in the previous studies, the video material used in our study may have reinforced the salience of the sources and thus supplied more cues to support a good recognition of the sources (Booth-Butterfield & Gutowski, 1993; Chaiken & Eagly, 1983).

In agreement with our hypotheses, however, a strong attitude-congruency effect was found on the evaluation of source credibility, as students were prone to judge the source providing arguments congruent with their prior attitude as more credible than the source providing incongruent arguments. Interestingly, this effect was observed whether the two sources were of similar expertise (e.g. two researchers) or whether one source was unambiguously more expert than the other (i.e., researcher vs. consumer). This finding is concerning, in that it suggests that the effect of the congruence of the source's arguments with students' prior attitude exceeds that of source expertise. Even in a case where they are confronted with two sources of unequal expertise, seventh graders appear inclined to consider the source providing attitude-congruent arguments as more credible than the source providing attitude-incongruent arguments (whether the former is objectively expert on the topic or not). An attitude-congruency effect was also observed when students were asked which source they found most convincing, with students showing a tendency to consider the source that provided arguments consistent with their attitude the most convincing.

These results have important educational implications, in that they provide evidence that young students' prior beliefs contribute to their evaluation of the source of information. Students' justifications as to which source was most convincing further support this conclusion, in that a significant share of students justified their choice on the basis of their adherence to the source's discourse. These results suggest that school-based interventions dedicated to improving young students' consideration of source information (e.g., Pérez et al., 2018) should train students to disassociate their evaluation of source from their prior beliefs about the topic, in order to assess the quality of a source of information in a more objective fashion. However, some limitations of this study mean that these conclusions must be drawn with caution.

Limitations and Research Perspectives

First, the results reported here were obtained only on seventh graders and on a single topic, organic farming. Further studies, involving students of different ages and varying the topic of the material, are needed to assess the consistency of the effects reported in this study. Varying the age of participants would be useful to test whether the effects observed here are replicable with other age groups, or are specific to the population studied in this research. Manipulating the topic of the material would also be necessary to ensure that the results observed here are not topic specific. The topic of organic food was chosen in this study because it is part of the syllabus of French seventh graders. However, students at this grade level may have lacked the prior knowledge or adequate experience with the object to have a “strong” attitude on the topic (that is, an attitude held with conviction, Bassili, 2008). It would thus be particularly interesting to test whether the effects observed here are reduced or accentuated when the material concerns a topic that is more involving for young students (e.g. cell phone use or video games).

Another limitation is that the concept of source in video processing has been treated here only as the identity of the person speaking on the screen, i.e. embedded sources (Strømsø, 2017). This study does not address how young students process primary source information when watching videos, while these characteristics are just as necessary to consider to evaluate the reliability of an information. Further studies manipulating the primary source of information (person/organization that produced the video, date of publication...) remain thus needed to get a more thorough understanding of how students process source characteristics when viewing videos on controversial topics.

A final limitation is the lack of online measurement of student attention to sources, such as eyetracking (Maier & Richter, 2013). While the source recognition measures do not suggest a difference in students' processing of source information based on students' prior attitudes, it remains possible that these measures do not reflect how students processed source information (banner presenting the identity of the sources) during video viewing. The addition of an eye-tracking measure in the protocol could thus highlight a potential difference in the attention to the sources paid by the students according to the congruence of the source's arguments with their prior attitude that may not be observed in the recognition measures.

Conclusion

The purpose of this study was to examine the extent to which young students' prior attitudes impacted their consideration of the source when processing information from conflicting sources. While the study did not show an impact of students' attitudes on source recognition, a significant effect of students' attitudes was found on the evaluation of the credibility of sources and their convincingness, with students showing a tendency to judge as more credible and convincing the source giving arguments congruent with their previous attitude. These findings are important for critical thinking education, in that they suggest that young students need to be trained not to be influenced by prior beliefs when assessing

the credibility of an information source, during courses or school-interventions aimed at raising students' source-awareness.

The protocol of this study needs to be replicated with students of different ages and with material on other topics to assess the robustness of the effects obtained. However, it shows that students' prior beliefs and attitudes must be considered as a factor that can affect how students consider and evaluate the source of a piece of information, especially in the case of controversial topics where students may be confronted with conflicting information.

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Figures

Figure 1

Banner presenting the identity of the interviewees

Figure 2

Screenshot of the viewing page

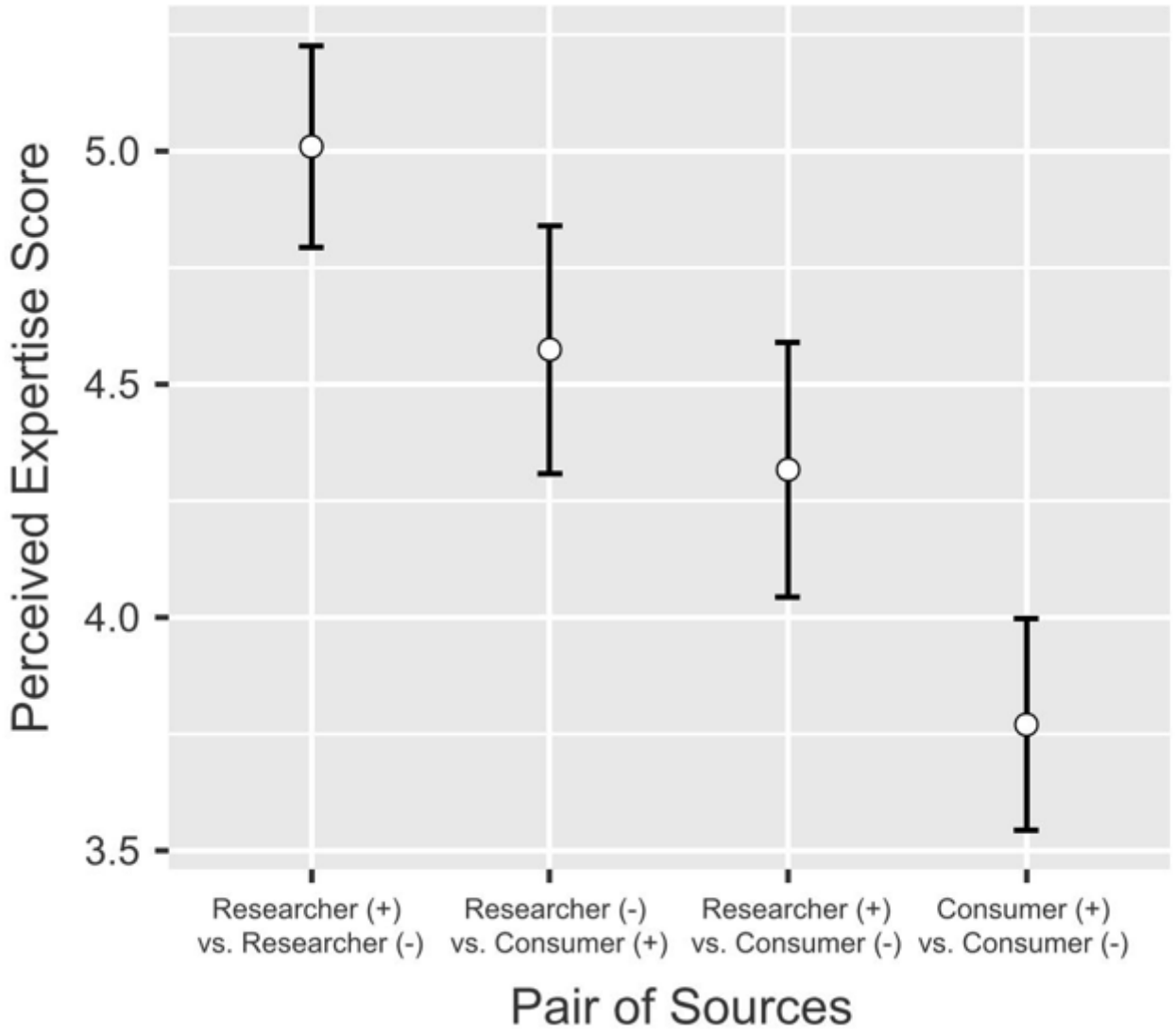

Figure 3

Expertise Scores, According to the Pair of Sources Seen in the Videos

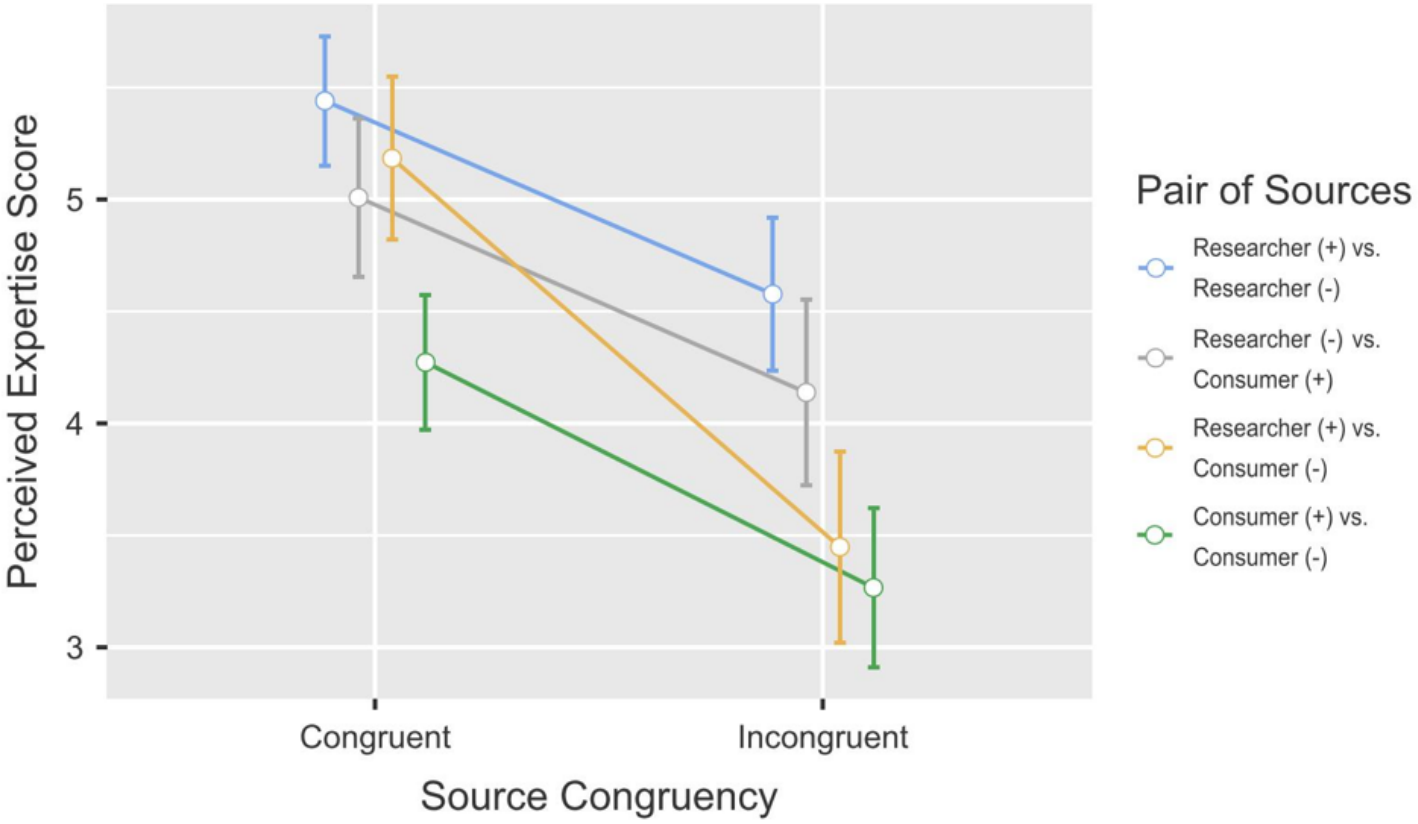

Figure 4

Expertise Scores, According to Source Congruency and the Pair of Sources Seen in the Videos

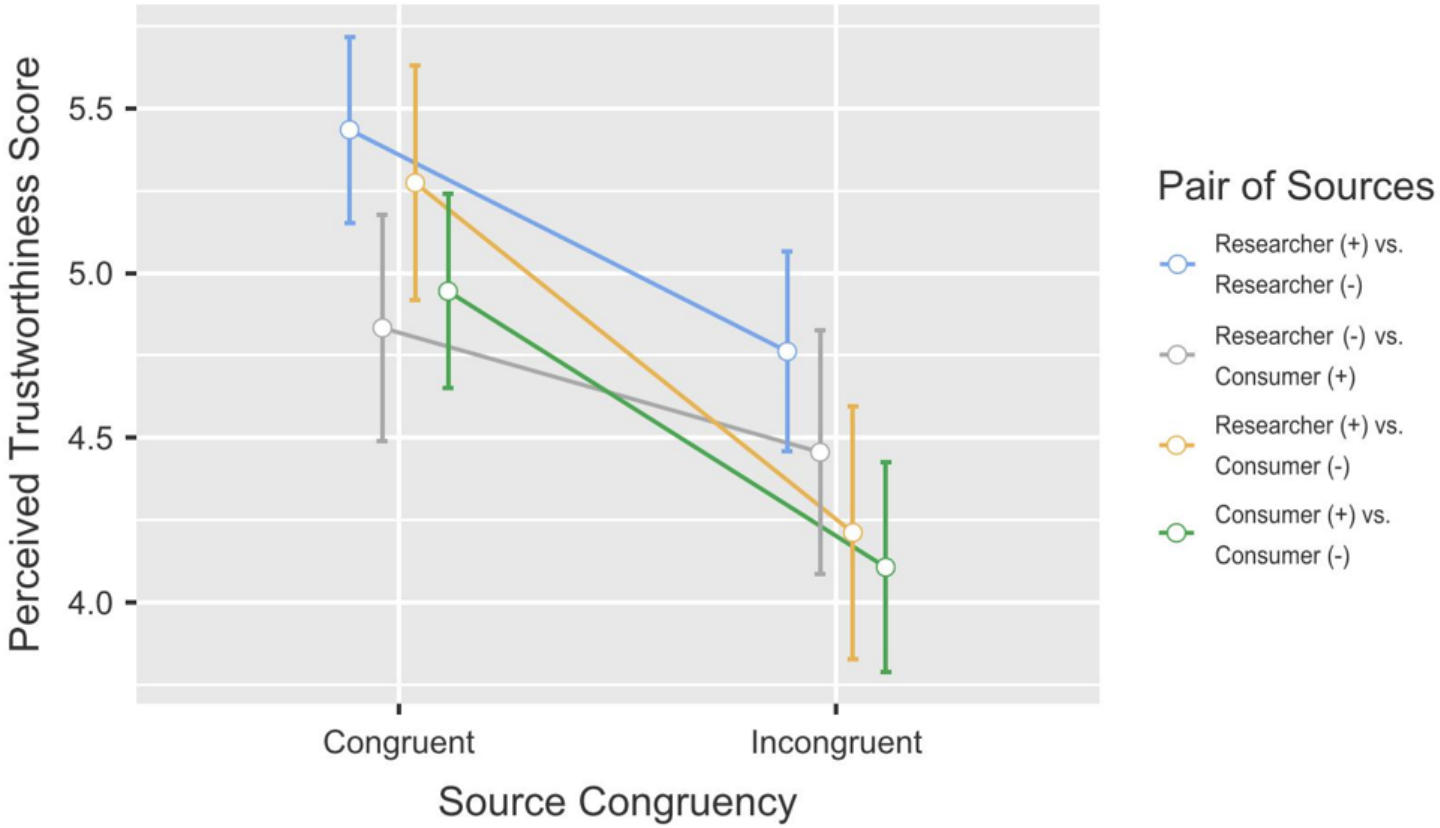

Figure 5

Trustworthiness scores, According to Source Congruency and the Pair of Sources Seen in the Videos

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- AppendixA.docx
- AppendixB.docx