

**THE INFLUENCE OF SUBJECTIVE AND OBJECTIVE WORKING
KNOWLEDGE ON ATTITUDE STRENGTH**

by

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Abstract

Many researchers have typically treated subjective and objective measures of working knowledge as alternative operationalizations of working knowledge. Some researchers have argued that these measures should not be treated interchangeably and that one measure is better than the other. However, See, Petty, and Fabrigar (2014) have recently proposed a dual-construct perspective, where they argued that subjective and objective measures of attitudinal properties, including working knowledge, reflect distinct but equally important processes that influence attitude strength. If these two measures reflect different processes, then they should have unique effects related to attitudinal consequences (e.g., message elaboration). Following this logic, we hypothesized that these two measures of working knowledge are not alternative operationalizations of the same construct and that both types of working knowledge have unique effects associated with message elaboration. We conducted two experiments to test these two hypotheses, where we measured participants' subjective knowledge, objective knowledge, and initial attitudes towards an attitude object and presented participants with a persuasive message about the object. In the first study, we used an anti-nuclear power message as the persuasive message. In the second study, we used a pro-legalization of marijuana message as the persuasive message. Subsequently, we used argument quality effects on post-message attitudes to gauge message elaboration. In both studies, the correlations between subjective and objective were modest, which suggested that subjective and objective measures of working knowledge were not redundant of each other. In addition, both types of knowledge produced significant effects associated with message elaboration, even when controlling for each other. Overall, the two studies supported the dual-construct perspective.

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Chapter 1

Introduction

An attitude is generally defined as a positive or negative evaluation of an object. While researchers have agreed on this definition of attitudes, they have also long recognized that underlying these evaluations are more complex constructs. Two individuals can report the same attitude towards an attitude object, but their strength of attitude can differ. For example, both individuals can have the same attitude ratings towards an attitude object (e.g., both rating a politician 6 out of 7), but one individual's attitude might be more durable than the other's. There has been a substantial amount of research on attitude strength (see Krosnick and Petty, 1995) and the properties that influence it. Antecedents of attitude strength include, but are not limited to, attitude accessibility (e.g., Fazio, 1995), attitude ambivalence (e.g., Thompson, Zanna, & Griffin, 1995), attitude certainty (e.g., Gross, Holtz, & Miller, 1995), attitude importance (e.g., Boninger, Krosnick, Berent, Fabrigar, 1995), and working knowledge (e.g., Wood, Rholes, & Biek, 1995).

Working Knowledge

Although researchers have identified a number of properties that influence attitude strength, not all have received equal amounts of attention. One property that has been particularly focal in the literature and one the longest standing properties of attitude strength is working knowledge (e.g., Wood, 1982; Wood *et al.*, 1995). Working knowledge is defined as the amount of attitude-relevant information one can retrieve

from memory (Wood *et al.*, 1995). There are a couple features of this definition that require clarification. First, this definition does not require the retrieved information to be factually correct, as working knowledge influences attitude strength based on the amount of the information but not its veracity. The accuracy of information is not always useful in influencing of attitude strength, as people do not always rely on accurate knowledge to gauge their own attitude towards an object. People may rely on objectively inaccurate knowledge because the knowledge may be subjectively meaningful to them or they may believe their knowledge to be correct. Indeed, working knowledge is not always highly correlated with factual accuracy (*rs* ranged from $-.07$ to $.25$; as cited in Wood *et al.*, 1995, p. 288).

Second, there are no content restrictions on the attitude-relevant information, which means that the information can be anything as long as the information activated in memory is associated with the attitude object. Working knowledge is not represented by all the information that is associated with the object in memory but only the information that is activated when the object is activated in memory. Thus, working knowledge is a function of both the total amount of information associated with the object and the strength of the associative links between the information and the object (see Wood *et al.*, 1995).

Beyond its definition, there are many consequences of working knowledge. Working knowledge has been shown to influence information processing (e.g., Biek, Wood, & Chaiken, 1996), in that more knowledgeable individuals process information more thoroughly than less knowledgeable individuals. Furthermore, working knowledge has been demonstrated to influence persuasion (e.g., Wood, 1982), in that less

knowledgeable individuals change their opinions to be more consistent with the message position than more knowledgeable individuals. Moreover, working knowledge has been shown to influence attitude-behaviour consistency (e.g., Davidson, Yantis, Norwood, Montano, 1985), in that more knowledgeable individuals have higher levels of attitude-behaviour consistency than less knowledgeable individuals. In general, attitudes based on extensive knowledge tend to be stronger than those based on minimal knowledge.

Working Knowledge Measures

While the consequences of working knowledge have been studied, there has been remarkably little focus on how this construct should be measured. Indeed, this was the focus of our research program. Working knowledge is typically measured one of two ways: subjectively and objectively. Subjective measures of working knowledge involve asking participants to report their knowledge of an attitude object on a rating scale (e.g., Wood, 1982). For example, on a 7-point scale, with 1 being *not knowledgeable at all* and 7 being *extremely knowledgeable*, researchers ask participants how knowledgeable they feel about an attitude object (e.g., a politician's platform). These measures are subjective because they require participants to engage in direct judgment or construal of their working knowledge. These measures tap into one's perception of his or her own working knowledge, which is simply how much one thinks he or she knows.

Objective measures of working knowledge consist of knowledge listing tasks (e.g., Wood, 1982), in which researchers ask participants to list as many different beliefs and prior experiences about an object as they are capable of recalling. Subsequently, researchers code responses by counting the number of separate knowledge items listed by

the participants. Knowledge listing tasks are comparatively objective because their computational scores are based on an objective property: the number of beliefs and prior experiences listed. These measures do not require the construals of the participant or a third person. We refer to these measures as objective, not because the content is objective—the content can be subjective—but because the scoring of the amount of knowledge is relatively objective. Basically, objective measures assess how much information one has about an attitude object.

Interchangeability of Measures.

While these two types of measures have been widely used in the literature, the relationship between these measures of working knowledge has seldom been formally investigated. In the literature, these measures have been treated in numerous ways. Perhaps the predominate way is to treat these two measures as interchangeable (e.g., Davidson *et al.* 1985; Johnson, 1994). In this view, researchers treat subjective and objective measures of working knowledge as alternative operationalizations of the same construct. Though this view is not often explicitly articulated, there is evidence for this assumption. First, researchers have often used a subjective measure in one study and then used an objective measure in another study, or vice versa, without justification for switching measures (e.g., Davidson *et al.* 1985; Johnson, 1994). Since these researchers do not provide justification for doing so, it is fair to assume that they consider subjective and objective measures to be interchangeable. Second, these researchers make the same predictions regardless of which measure they use, which implies that they see these measures as assessing the same construct.

At face value, there is no reason for these researchers to doubt the interchangeability of these measures, as both subjective and objective measures have produced results consistent with theory. However, there is reason to question whether or not subjective and objective measures assess the same construct, as correlations between subjective and objective measures are typically modest. A review of several working knowledge studies by See *et al.* (2014) revealed that correlations between subjective and objective measures to be modestly positive, ranging from .12 to .57, with a weighted average of .30 for 4 coefficients. If these measures were measuring the same construct, then one would expect the two measures to be highly correlated.

An alternative explanation is that the measures are assessing the same construct but these modest correlations are due to the low reliabilities of the measures. However, See *et al.* (2014) argued that if the correlations were corrected for attenuation, the measures must have extremely low reliabilities in order for the two measures to be highly correlated. However, the reliabilities reported for these scales are not nearly that low, which suggest that the low to moderate correlations cannot be purely due to low reliabilities. If one were to correct for attenuation given the reliabilities in the literature, the two measures would only be modestly correlated, which would indicate that they are not assessing the same construct. This suggests that subjective and objective measures of working knowledge are not interchangeable.

One Measure is Better than the Other.

If the two working knowledge measures are not interchangeable, then perhaps one measure is better than the other at assessing working knowledge. Indeed, some theorists have argued that the two measures are not interchangeable and that objective measures

are better than subjective measures at assessing attitudinal strength properties. Perhaps the best exemplar of this viewpoint was Bassili (1996), who argued that for many attitudinal strength properties, including working knowledge, objective measures are better than subjective measures at accurately capturing the basic underlying processes that are related to attitude judgments.

When applied to the concept of working knowledge, this suggests that objective measures have an advantage in assessing working knowledge over subjective measures because objective measures accurately capture the cognitive processes of working knowledge, whereas subjective measures do not. In general, Bassili (1996) argued that subjective measures of attitudinal strength properties depend on memorial information, which may be vulnerable to contextual influences irrelevant to the attitudinal strength properties, and consequently, leading people to make inaccurate judgments. Thus, subjective measures would be poor indicators of attitudinal strength properties.

In support of this argument, researchers have found that subjective judgments of attitude certainty can be influenced by extraneous factors. Haddock, Rothman, Reber, and Schwarz (1999) asked individuals to either generate three or seven arguments about an object. They found that individuals listing three arguments about the object, as opposed to seven, had significantly higher levels of subjective attitude certainty. This difference in certainty was due to ease of retrieval, as it is more difficult to generate seven arguments than three arguments. However, based on objective measurements, the seven-argument individuals should be more certain than the three-argument individuals, as the seven-argument individuals listed more arguments than the three-argument individuals. Thus,

this study would suggest that subjective beliefs of attitudinal strength properties (i.e., attitude certainty) could be vulnerable to contextual influences.

Based on Bassili's (1996) arguments, it would seem that objective measures are superior to subjective measures at assessing attitudinal strength properties. However, this may not apply to the construct of working knowledge for several reasons. First, there has not been any direct comparisons between the two measures of working knowledge to determine which one is better at assessing working knowledge, so one cannot conclude which measure is superior.

Second, several of Bassili's (1996) arguments were not supported by his data, as there were several flaws in his research. Firstly, he confounded attitudinal strength measures with attitudinal strength constructs, as he compared attitudinal strength measures and different attitudinal strength properties at the same time. Therefore, the differences found between subjective measures and objective measures could be due to the differences between attitudinal strength properties. Secondly, he argued that his factor analysis of the measures showed that subjective and objective measures loaded onto two distinct factors. However, thorough examination of his factor analyses reveal that some items (e.g., attitude certainty) loaded on both factors. Thus, it is unclear whether his predictions about subjective and objective measures loading onto distinct factors were true. Finally, he argued that, overall, objective measures were much better predictors of opinion pliability and stability than subjective measures. However, there were several anomalies he chose to ignore, as some subjective measures (e.g., attitude certainty) were good predictors of pliability and stability, while some objective measures were not (e.g., attitude extremity).

Lastly, past research have shown that subjective measures of working knowledge have predictive utility for various consequences, such as persuasion and attitude-behaviour consistency. For example, Johnson (1994) found that when individuals had high levels of involvement with the attitude object, less knowledgeable individuals were more persuaded by the strong arguments than more knowledgeable individuals. Also using subjective working knowledge measures, Davidson *et al.* (1985) found that consistency between attitudes and behavior increased as a function of working knowledge about the attitude object. Thus, objective measures may not necessarily be better than subjective measures at assessing working knowledge.

Dual-Construct Perspective.

If these two measures of working knowledge are not interchangeable and one measure is not necessarily better than the other, then a third possibility is that these two measures assess two different processes. What Bassili (1996) and proponents of the one is better argument failed to consider is that a measure does not have to accurately assess the underlying structure of an attitudinal property to be useful. Even though subjective measures do not “accurately” assess one’s working knowledge, it can have predictive utility for various consequences.

In congruence with this point of view, researchers have recently proposed a new dual-construct perspective, in which they posited that subjective and objective measures of attitudinal properties, including working knowledge, reflect distinct but equally important processes that influence attitude strength (See, Petty, & Fabrigar, 2014; see also See, Petty, & Fabrigar, 2008; 2013). Furthermore, they proposed that each of the two measures represent different constructs, which could sometimes predict different

outcomes, predict the same outcome but for different reasons, or predict the same outcome but under different contexts. This is why both measures have produced results that are consistent with theory. Supporting this perspective is research by See *et al.* (2008; 2013), where they measured people's subjective and objective affective bases (i.e., reliance on affect), as well as subjective and objective cognitive bases (i.e., reliance on cognition). They also found that subjective affective and cognitive bases predicted information interest and attitude change above and beyond objective affective and cognitive bases. Furthermore, they found that information processing efficiency for affective over cognitive information is captured by objective affective and cognitive bases. These findings provide evidence that subjective and objective measures do in fact capture different constructs.

In the dual-construct perspective, See *et al.* (2014) proposed that because subjective measures directly assess individuals' perceptions, it is possible for individuals to respond according to their explicit intentions and current goals. Thus, subjective measures likely capture *motivational* or *goal dependent* processes. In the context of working knowledge, subjective measures likely capture the motivational processes of working knowledge.

Alternatively, individuals' intentions are unlikely assessed with objective measures because the focal attitudinal property is often unapparent to the participants. Thus, the individuals' intentions do not influence the attitudinal property. In the context of working knowledge, objective measures likely assess the amount of working knowledge. The amount of existing knowledge should be positively related with the ability to process new information. Thus, objective measures likely capture *ability* or

capacity dependent processes, which is the efficiency with which individuals respond to attitudinal information. Because these two measures tap into two different processes, one should not necessarily expect them to be strongly correlated nor treat them as interchangeable.

Working Knowledge and Message Elaboration

If we were to follow the logic of the dual-construct perspective and divide working knowledge into two different measures, then we would predict a number of consequences for these two different measures of working knowledge. For example, we know that working knowledge influences attitude-behaviour consistency. What this perspective might suggest is that although both measures have been found to influence attitude-behaviour consistency, they may influence it as a result of different mechanisms. Similarly, the two measures of working knowledge may influence other attitudinal consequences, such as message elaboration and persuasion, as a result of different mechanisms.

In our program of research, we chose to investigate how subjective and objective measures of working knowledge differ in its association with message elaboration, which is the careful scrutiny of the merits of a message. Working knowledge has been shown to influence message elaboration, which researchers have explained these effects with motivational and ability dependent components. In terms of motivation, researchers have argued that high levels of working knowledge motivate message elaboration through self-efficacy beliefs (e.g., Wood *et al.*, 1995). More knowledgeable individuals may believe

that they are able to engage in elaboration with ease because they recognize that their ability to do so.

In contrast, less knowledgeable individuals may not be motivated to engage in elaboration because they feel they do not have the capacity to do so. Furthermore, less knowledgeable individuals may be bothered by the frustration and other negative emotions produced by unsuccessful attempts at message elaboration. However, one might argue that being more knowledgeable may also lead to less elaboration because these individuals may not feel the need to elaborate on information they already know.

In terms of ability, Wood *et al.* (1995) have argued that high levels of working knowledge enhances one's ability for message elaboration, as more knowledgeable individuals require less effort for elaboration than less knowledgeable people. More knowledgeable individuals are able to detect strengths and weaknesses in new information due to their strong background knowledge of the object. In comparison, less knowledgeable individuals are unable to distinguish between strong and weak messages due to their lack of background knowledge.

Subjective and Objective Knowledge.

Although Wood *et al.* (1995) have proposed motivational and ability mechanisms to explain how working knowledge influences message elaboration, they have combined both motivational and ability dependent processes into one construct under working knowledge. We believe that it would be more useful to consider these processes as two distinct constructs: subjective knowledge (i.e., the subjective impression one has about the magnitude of one's knowledge base) and objective knowledge (i.e., the amount of information associated with an attitude in memory). Subjective knowledge, which is also

referred to as meta-cognitive knowledge, is how much information individuals feel they have about an attitude object. It should primarily correspond to one's motivation during message elaboration. Subjective knowledge is best captured by subjective measures of working knowledge. Objective knowledge, which is also referred to as structural knowledge, is how much information an individual has about an attitude object. It should primarily correspond to one's ability during message elaboration. Objective knowledge is captured by objective measures of working knowledge.

Predictions.

In congruence with the dual-construct perspective, we predict that subjective and objective knowledge are not alternative operationalizations of the same construct. This prediction should manifest itself in two ways. First, the correlations between these two types of working knowledge should be modest, which would suggest that these two measures are not redundant. Second, both subjective and objective knowledge should both have unique effects when specified in the same statistical model. The interchangeability perspective would predict that both these types of knowledge would not have unique effects if specified in the same model. If these two measures are redundant, then controlling for one measure should completely eliminate the effects of the other and vice versa. The one is better perspective would predict that only objective knowledge would consistently produce unique effects, while the subjective knowledge would not. If the objective measure is the better measure, then any subjective knowledge effects should be due to the extent it is associated with objective knowledge. Thus, if subjective effects were to emerge, then they should be weaker than those of its objective counterpart.

Beyond our prediction that subjective and objective knowledge have unique effects on message elaboration, we have several predictions as to how these effects will emerge. We hypothesize that subjective knowledge is predominantly associated with one's motivation for message elaboration. Thus, we predict that subjective knowledge's association with message elaboration would be qualified by initial attitudes (i.e., pre-existing attitudes about the object), as researchers have noted that motivational processes for message elaboration are often shaped by message direction (e.g., Clark, Wegener, & Fabrigar, 2008a; Clark, Wegener, & Fabrigar, 2008b).

When individuals are presented with a counter-attitudinal message (i.e., message that directly contradicts their pre-existing attitudes), we predict that individuals with low subjective knowledge will be associated with more elaboration. Although these individuals may disagree with the message, they may also doubt their knowledge and engage in message elaboration to gain more knowledge. Contrarily, individuals with high subjective knowledge may believe that they have already scrutinized the counter-message arguments and considered them to be false, and thus, they do not feel the need for elaboration. Furthermore, the unpleasantness of the message may generate cognitive dissonance and deter these individuals from elaboration. Thus, high subjective knowledge individuals should engage in less elaboration.

Alternatively, when individuals are presented with a pro-attitudinal message (i.e., message that agrees their pre-existing attitudes), we predict that these individuals will engage in elaboration regardless of the level of subjective knowledge. Individuals with low subjective knowledge will engage in elaboration because while they agree with message, they may want to know more information to help justify their position.

Individuals with high subjective knowledge will also want to engage in message elaboration because of the message's appeal. In addition, there is no reason for them to doubt the veracity of the message. Furthermore, pro-attitudinal messages may be self-esteem enhancing/reinforcing for high subjective knowledge individuals because pro-attitudinal messages reinforce/validate existing attitudes, which help these individuals justify their position.

In contrast to subjective knowledge, we hypothesize that objective knowledge primarily enhances one's ability for message elaboration. Specifically, increases in objective knowledge will be associated with more elaboration. The increased amount of knowledge about an object should provide more objectively knowledgeable individuals with an advantage when engaging in elaboration than less objectively knowledgeable individuals. This effect should apply to all individuals, regardless of the direction of initial attitudes. Since objective knowledge is mainly associated with one's ability for message elaboration, its effects should not be qualified by initial attitudes.

Carry-Over Effects.

Another set of predictions we have concern the carry-over effects generated by the subjective and objective knowledge measures. Whenever subjective and objective knowledge are measured together, there is a risk of carry-over effects. We predict that presenting participants with the subjective measure first will be the superior order compared to presenting participants with the objective measure first because the prior should produce less carry-over effects. This is because completing the objective measure first might influence one's subjective knowledge, as listing items about an attitude object could influence one's subjective belief about his or her knowledge. In our studies, we

gave participants the opportunity to list up to 10 items, which may have led them to infer that 10 is the standard number of items to be listed. However, if a participant only list four items, it may lead him or her to feel unknowledgeable about the object, which would decrease his or her level of subjective knowledge. Alternatively, if a participant lists 10 items with ease, it may lead him or her to feel knowledgeable about the object, which would increase his or her level of subjective knowledge.

Completing the subjective measure first should be less likely to influence one's objective knowledge. If a participant believes he or she is knowledgeable about an object, he or she may be motivated to prove it when asked to list items. However, his or her belief of knowledgeability does not provide him or her with additional knowledge to complete the objective measure. Thus, stating one's subjective beliefs about his or her knowledge should be less likely to influence his or her ability to list items about an object. Therefore, we predict that under the subjective measure first condition, the correlation between subjective and objective knowledge should be lower than the objective measure first condition. Since presenting participants with the subjective measure first should generate less carry-over effects, we also predict that the effects of subjective and objective knowledge associated with message elaboration would be stronger under the subjective measure first condition than the objective measure first condition.

Chapter 2

Study One

The goal of this study was to conduct an initial test of our hypothesis that subjective and objective measures capture distinctively different constructs. We intended to accomplish this by showing that the two measures have distinctively different relationships with the amount of elaboration when individuals are presented with persuasive messages. We tested this hypothesis in the context of a real world issue, in which we measured individuals' subjective and objective knowledge, as opposed to manipulating them. We recognize that it would be optimal to determine whether subjective and objective knowledge had distinct causal effects on message elaboration. However, subjective and objective knowledge were measured in our studies, and thus, we cannot conclude causal effects. We examined these measures in the context of nuclear power because nuclear power has substantial variabilities in subjective knowledge, objective knowledge, and initial attitudes. Furthermore, pretesting showed that both subjective knowledge and objective knowledge were only modestly correlated with initial attitudes, which unconfounds subjective knowledge and objective knowledge with initial attitudes.

The focus of this and the following study was to examine the unique relationships among subjective knowledge, objective knowledge, and message elaboration. There have been a number of ways in which researchers have gauged the amount of message elaboration. Perhaps the most common way is through the manipulation of argument quality (see Petty & Cacioppo, 1986), which was the method used in Study One. In this method, individuals are randomly assigned to either receive a compelling or a specious

message. Processing is inferred by the extent to which people are sensitive to the quality of arguments. If individuals are engaging in careful thought, then there should be large differences in persuasion when individuals receive strong arguments versus weak arguments (i.e., argument quality differentiation is strong). Alternatively, if individuals are not being thoughtful, then there should be little difference in persuasion between the two messages. This implies that they are not carefully considering the message content because they are not differentially responding to the messages. For example, we could use strong and weak messages to compare the amount of information processing between high and low levels of objective knowledge. If the effects of argument quality differentiation are present for high levels of objective knowledge but not for low levels of objective knowledge, then it means that high objective knowledge individuals engaged in more elaboration.

Design

This study was a 2 (Argument Quality: Strong vs Weak) X 2 (Measure Order: Subjective First vs Objective First) between-subjects design with measured independent continuous variables of initial attitudes, subjective knowledge, and objective knowledge.

Participants

Participants included 670 undergraduate students of an introductory psychology course at Queen's University. The projected sample size was based on cell size, which was a minimum of 20 participants per cells and an optimal of 40 participants per cells. The highest order prediction was a three-way interaction among argument quality,

subjective knowledge, and initial attitudes. If this three-way interaction was conceptualized in terms of a cell design, then it would have a total of 18 cells: 2 (Argument Quality: Strong vs Weak) x 3 (Subjective Knowledge: High vs Medium vs Low) x 3 (Initial Attitudes: Pro-message vs Neutral vs Counter-message). Under an 18 cell design, we would have about 38 participants per cell, which was close to the optimal cell size. Participants received extra course credit for participation.

Procedures

Consent Phase. When participants arrived at the lab, we provided them with a letter of information and a consent form (See Appendix A for all ethics documents for Study One and Two). We began the experiment after the participants signed the consent forms.

Initial Measurement Phase. First, we measured participants' attitudes towards the nuclear power. Our message was anti-nuclear power, thus, participants with unfavourable attitudes towards nuclear power were considered to have pro-message initial attitudes and participants with favourable attitudes towards nuclear power were considered to have counter-message initial attitudes. Secondly, we administered a subjective measure of working knowledge and an objective measure of working knowledge. We counter-balanced the order of the subjective measure and the objective measure in order to gauge carry-over effects.

Persuasive Message Phase. Immediately after the initial measurement phase, we presented each participant with an anti-nuclear power message. Participants were randomly assigned to receive either a strong message or a weak message (See Appendix

B for all Study One messages). A pre-test was conducted to produce arguments that generated thoughts in the same direction as the advocacy of the message. Because the message was in a negative direction, strong arguments should produce thoughts that were predominately negative. Using a cognitive response task (see Greenwald, 1968), we computed a favourability of thought index, which was calculated with this equation: (positive relevant thoughts – negative relevant thoughts) / total relevant thoughts. This index was used to select five strong and five weak arguments. Because the persuasive message was anti-nuclear power, more negative values on this index indicated stronger arguments, whereas more positive values on this index indicated weaker arguments. For this index, the five strong arguments had a range of -.57. to -.22, with an average of -.37 and the five weak arguments had a range of +.12. to +.45 with an average of +.31.

An example of a strong message argument was:

“Before the production of energy, fuel for nuclear reactors needs to be mined and then highly refined - processes in which workers and unwary citizens may be exposed to radioactive particles and dust.”

An example of a weak message argument was:

“Coal burning power plants require continual maintenance and smokestack emissions monitoring. This will create more jobs. Modern nuclear plants, on the other hand require very little maintenance and about four-fifths the number of employees.”

Post-Message Measures Phase. After providing participants with a persuasive message, we asked all participants to complete an attitude scale on nuclear power.

Finally, we had participants complete a cognitive response task on nuclear power.

Debriefing Phase. We debriefed the participants at the end of the experiment.

Measures

Initial Attitudes. This measure consisted of four-items that assessed participants' attitudes towards nuclear power prior to the persuasive message (see Crites, Fabrigar, & Petty, 1994; see Appendix C for all Study One measures). Each attitude item contained a word that could be used to describe the participants' overall evaluation of the use of nuclear power. The four words were good, undesirable, dislike, and positive. For each attitude item, participants recorded their responses on a 1 to 7 scale, where 1 represented *Not at all*, and 7 represented *Definitely*. An initial attitudes score was computed by reverse-coding the positively worded items (i.e., good and positive) and averaging the scores of the four items. This was done so that higher values would indicate more message consistent attitudes. The reliability for this measure was $\alpha = .85$.

Subjective Knowledge. This measure consisted of four-items that assessed how much participants feel they know about nuclear power (see Smith, Fabrigar, Wood, & Fitzsimmons, 2011). For example, we asked participants: how informed do you consider yourself on the issue of nuclear power? For each subjective knowledge item, participants recorded their responses on a 1 to 7 scale, where 1 represented *Not at all*, and 7 represented *Extremely*. A subjective knowledge score was computed by averaging the scores of the four items. Higher scores indicated higher levels of subjective knowledge. The reliability for this measure was $\alpha = .96$.

Objective Knowledge. This measure was a knowledge listing task, where we asked participants to list what they knew about the topic of nuclear power, as well as any experiences they may have related to this issue (see Wood, 1982). We asked them to list

only one point per box and to separate each point. We asked them to write down as many points as they could, up to 10 points, and to stop when they had no more points to list. An objective knowledge score was computed by counting the number of separate points listed by the participants. The content of the points listed was not considered in the calculation. This score ranged from 0 to 10, where higher scores indicated higher levels of objective knowledge.

Post-Message Attitudes. This measure consisted of four-items that assessed the participants' attitudes towards nuclear power post-message (modified from Crites *et al.*, 1994). This measure had the same response structure as the initial attitudes measures except the four items were different. The four words for this measure were bad, desirable, like, and negative. A post-message attitude score was computed by reverse-coding the positively worded items (i.e., desirable and like) and averaging the scores of the four items. This was done so that higher values would indicate more message consistent attitudes and thus, more attitude change. The reliability for this measure was $\alpha = .88$.

Cognitive Response Task. In this measure, we asked participants to list up to 12 items, as many ideas, reactions, and thoughts that they had while reading the nuclear power messages (see Greenwald, 1968). Subsequently, we asked participants to rate each item as favourable, neutral, unfavourable, or unrelated to nuclear power. We used this to create two indices.

The first was the favourability of thought index, which was calculated with this equation: (negative relevant thoughts – positive relevant thoughts) / total relevant thoughts. This index had a range of -1 to +1, with -1 indicating every thought generated to be a positive relevant thought and +1 indicating every thought generated to be a

negative relevant thought. This index was coded so that more negative values on this index indicated participants had a greater proportion of message inconsistent thoughts than message consistent towards the persuasive message, whereas more positive values indicated that participants had a greater proportion of message consistent thoughts than message inconsistent towards the persuasive message. The second was the total relevant thoughts index, which was calculated with this equation: positive relevant thoughts + negative relevant thoughts + neutral relevant thoughts. This index had a range from 0 to 12, where more thoughts listed indicated more elaboration.

Results

Preliminary Analyses.

We selected nuclear power as the context in which we tested our hypotheses because pretesting indicated that this attitude object had a couple of key qualities required for the tests. First, we required subjective knowledge, objective knowledge, and initial attitudes to have substantial variability. As seen in Table 1, none of the averages of these three independent variables were near the extreme ends of their respective scales. In addition, the standard deviations ranged from 1.17 to 2.66. Objective knowledge and initial attitudes had maximum range, while subjective knowledge was near maximum range. Furthermore, the skew and kurtosis for all three variables were only modest. Overall, these three variables had substantial variability and were satisfactory for the study.

Table 1

Subjective Knowledge, Objective Knowledge, and Initial Attitudes Descriptives.

Variable	<i>M</i>	<i>SD</i>	<i>Mdn</i>	Range	Skew	Kurtosis
Subjective Knowledge	2.64	1.17	2.25	1 – 6	.59	-.27
Objective Knowledge	4.75	2.66	5.00	0 – 10	.32	-.46
Initial Attitudes	4.16	1.37	3.75	1 – 7	.60	-.52

Second, we required initial attitudes to be unconfounded with the two measures of knowledge. Subjective knowledge and initial attitudes were weakly correlated, $r(668) = .004$, $p = .89$. Likewise, objective knowledge and initial attitudes were weakly correlated, $r(668) = -.11$, $p < .001$.

Correlation Analyses.

Our first prediction was that subjective and objective knowledge are not alternative operationalizations of the same construct, which would be reflected in the modest correlation between the two measures of knowledge. Indeed, we found a modest correlation between subjective knowledge and objective knowledge, $r(668) = .40$, $p < .001$. Given the measures' high reliabilities, this correlation falls well below what would be expected for the two measures that are assumed to assess the same construct. This would suggest that subjective and objective knowledge are not alternative operationalizations of the same construct. This correlation was slightly greater than the median of past studies ($r = .30$), however, it was well within the range of previous correlations ($r = .12$ to $r = .57$).

Another prediction that we had was that the subjective measure first condition would be the superior measure order compared to the objective measure first condition, as it would have less carry-over effects. We found the carry-over effects to be slightly weaker if participants completed the subjective measure first, $r(329) = .36, p < .001$, than if they had completed the objective measure first, $r(337) = .46, p < .001$. However, a formal test of this difference revealed non-significance, $z = 1.54, p = .12$. The effects were in the expected direction, however, it was not significant, and thus, we cannot conclude that the subjective first condition had less carry-over effects than the objective measure first condition from these results.

Message Elaboration with Post-Message Attitudes.

The primary goal of this study was to examine the unique effects of subjective knowledge and objective knowledge that are associated with message elaboration. Historically, there have been a number of ways to assess message elaboration. Perhaps the best method to assess elaboration is to examine argument quality differentiation via the use of post-message attitudes (see Petty & Cacioppo, 1986). In this method, participants are unaware that researchers are assessing message elaboration, as participants are not explicitly asked how much effort they expended in processing the message nor are they directly asked to what thoughts were generated during message elaboration. This method is non-reactive because participants are not asked to generate thoughts retrospectively post-message. If participants are prompted to generate thoughts post-message, the number of thoughts actually generated during the message may be artificially inflated. Thus, we chose this non-intrusive and non-reactive method of

gauging message elaboration as the primary method of analysis. Our primary conclusions were based on this analysis, as it is the analysis that is most widely accepted in the field (see Petty and Cacioppo, 1986). We reported two others as supplementary analyses for the purposes of completeness.

We specified a general linear model with post-message attitudes as the dependent variable. In this model, there were two categorical independent variables: argument quality and measure order, as well as three centered continuous independent variables: initial attitudes, subjective knowledge, and objective knowledge. Furthermore, we included all main effects and all possible interactions in this model. Recall that we reverse-coded initial and post-message attitudes, so that higher initial and post-message attitudes indicated more message consistent attitudes and lower initial and post-message attitudes indicated more message inconsistent attitudes. Thus, higher post-message attitudes suggested more persuasion and greater differences in persuasion between strong and weak messages implied more elaboration.

Main Effects. We expected a significant main effect of argument quality, which was the case, $F(1,638) = 176.77, p < .001$. This effect revealed that the strong message ($M = 5.10, SE = 0.08$) elicited more persuasion than the weak message ($M = 3.88, SE = 0.08$). We predicted initial attitudes to have a significant main effect because one should anticipate some correlation between initial and post-message attitudes. As expected, there was significant main effect of initial attitudes, $F(1,638) = 164.23, p < .001$. This effect indicated that initial attitudes were positively associated with post-message attitudes, $B = .53$. We did not predict a main effect of subjective knowledge. However, a significant main effect emerged, $F(1,638) = 6.26, p = .004$, in which increases in subjective

knowledge were associated with less persuasion, $B = -.25$. This effect did not replicate in the second study, and thus, we are hesitant to comment.

Two-Way Interactions. We predicted that objective knowledge would be associated with message elaboration in the form of a two-way interaction between argument quality and objective knowledge. We found that this effect to be non-significant, $F(1,638) = 0.04$, $p = .84$. Though objective knowledge was not associated with message elaboration in the pattern that we expected, it could have effects on elaboration in another form.

Examination of the other two-way interactions revealed several unpredicted effects. First, there was a significant interaction between objective knowledge and measure order, $F(1,638) = 5.61$, $p = .02$. Using simple slopes analyses, we found that if participants were presented with the objective measure first, then objective knowledge was not related to persuasion ($B = -.03$, $SE = .03$, $p = .22$). Alternatively, if participants completed the subjective measure first, then increases in objective knowledge were associated with less persuasion ($B = -.08$, $SE = .03$, $p = .006$). This effect did not replicate in our second study, and thus, we are hesitant to comment on this effect.

Second, we found a significant interaction between argument quality and subjective knowledge, $F(1,638) = 8.26$, $p = .004$. Increases in subjective knowledge were associated with less message elaboration, as there was less elaboration at higher levels of subjective knowledge (+1 SD above the mean; $B = .46$, $SE = .07$, $p < .001$) than at moderate (mean; $B = .59$, $SE = .05$, $p < .001$) and lower levels of subjective knowledge (-1 SD above the mean; $B = .71$, $SE = .07$, $p < .001$). We did predict an argument quality by subjective knowledge interaction, but we did predict that this two-way interaction would

be qualified by initial attitudes. However, we did not find this two-way interaction in our second study, and thus, we are reluctant to interpret these results.

Third, there was a significant interaction between subjective knowledge and initial attitudes, $F(1,638) = 13.36, p < .001$. When initial attitudes were counter-message (i.e., $-1 SD$ below the mean), increases in subjective knowledge were associated with less persuasion ($B = -.28, SE = .05, p < .001$). When initial attitudes were pro-message (i.e., $+1 SD$ below the mean), subjective knowledge was not associated with persuasion ($B = .07, SE = .06, p = .24$). This effect did emerge in our second study, though not exactly in the same form. Thus, we are reluctant to interpret this effect.

Finally, we found a marginally significant interaction between argument quality and initial attitudes, $F(1,638) = 3.53, p = .06$. Participants with pro-message initial attitudes ($B = .72, SE = .06, p < .001$) engaged in more message elaboration than participants with counter-message initial attitudes ($B = .52, SE = .06, p < .001$). This effect was not in our second study, and thus, we will not comment further.

Higher Order Interactions. We predicted that subjective knowledge would be associated with message elaboration in the form of a three-way interaction among argument quality, subjective knowledge, and initial attitudes. We found that this effect to be non-significant, $F(1,638) = .01, p = .92$. Though this effect did not emerge as we expected, subjective knowledge could have effects associated with elaboration in other higher order interactions.

Two unpredicted effects emerged after examination of the other higher-order interactions. First, we found a significant four-way interaction among argument quality, subjective knowledge, objective knowledge, and measure order, $F(1,638) = 6.55, p = .01$.

Recall that we predicted that effects should be more robust in the subjective measure first condition due to less carry-over effects. Indeed, when we split the interaction by measure order, we found that the three-way interaction was not significant when participants were presented with the objective measure first, $F(1,331) = 1.57, p = .21$. However, the three-way interaction was significant when the participants were presented with the subjective measure first, $F(1,323) = 8.26, p = .004$. This significant three-way interaction supported our prediction that subjective and objective knowledge would both have unique effects on message elaboration. However, this pattern of effect was different than the predicted forms of subjective and objective knowledge.

We probed this three-way interaction under the subjective measure first condition. Table 2 provides the regression coefficients of this effect broken down by subjective and objective knowledge, in which argument quality differentiation is represented by the slopes. Greater regression coefficients equal stronger argument quality differentiation, which indicates more message elaboration.

We noticed some intriguing patterns when examining Table 2. Of particular interest were participants with what we refer to as matched knowledge (i.e., low subjective and low objective knowledge or high subjective and high objective knowledge). Located in the top left corner are the coefficients for participants with low subjective and low objective knowledge, who engage in a modest amount of elaboration. Located in the bottom right corner are the coefficients for participants with high subjective and high objective knowledge, who also engage in a modest amount of elaboration. When we compare all coefficients in the table, we can see that matched knowledge participants have the lowest levels of message elaboration.

Also of interest were participants with what we refer to as mismatched knowledge (i.e. low subjective and high objective knowledge or high subjective and low objective knowledge). Located in the top right corner are participants with low subjective and high objective knowledge, who have high levels of message elaboration. Located in the bottom left corner are participants with high subjective and low objective knowledge, who have high levels of message elaboration. When we compare all coefficients in the table, we can see that mismatched knowledge participants have the highest levels of message elaboration.

Table 2

Subjective Measure First: Simple Slopes of the Argument Quality, Subjective Knowledge, and Objective Knowledge Interaction.

Subjective Knowledge	Low Objective Knowledge	Medium Objective Knowledge	High Objective Knowledge
Low	$B = .53, SE = .12, p < .001$	$B = .71, SE = .10, p < .001$	$B = .90, SE = .17, p < .001$
Medium	$B = .69, SE = .10, p < .001$	$B = .66, SE = .07, p < .001$	$B = .64, SE = .10, p < .001$
High	$B = .85, SE = .18, p < .001$	$B = .62, SE = .11, p < .001$	$B = .38, SE = .12, p = .001$

An alternative way to represent these results is by plotting the slopes (see Figure 1), where steeper slopes equal more argument quality differentiation, which indicates more message elaboration. In Panel A of Figure 1, we have participants with low levels of objective knowledge. For these individuals, increases in subjective knowledge were associated with more engagement in message elaboration. This is illustrated by the

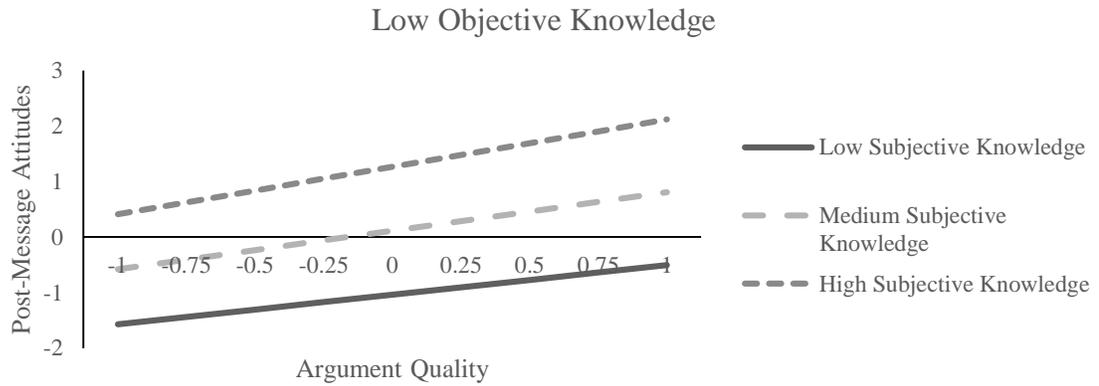
steeper slope for high subjective knowledge individuals than low subjective knowledge individuals in Panel A.

In Panel B of Figure 1, we have participants with moderate levels of objective knowledge. For these individuals, increases in subjective knowledge did not seem to be associated with engagement in message elaboration. This is illustrated by the similarity in the steepness of the slopes for high, medium, and low subjective knowledge individuals in Panel B. In Panel C of Figure 1, we have participants with high levels of objective knowledge. For these individuals, increases in subjective knowledge were associated with less engagement in message elaboration. This is illustrated by the shallower slope for high subjective knowledge individuals than low subjective knowledge individuals in Panel C.

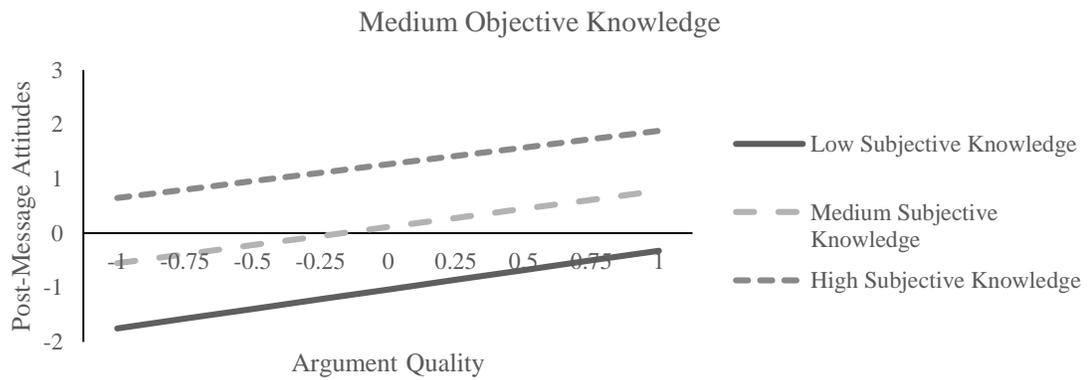
Figure 1

Subjective Measure First: Simple Slopes of the Argument Quality, Subjective Knowledge, and Objective Knowledge.

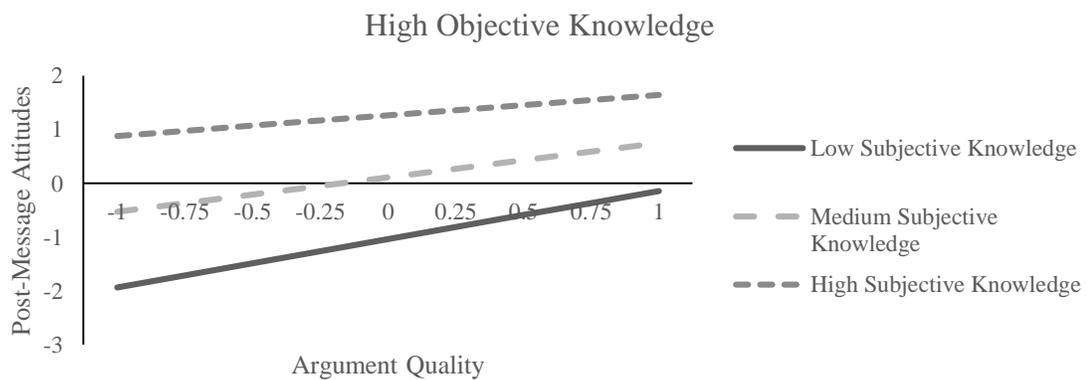
Panel A



Panel B



Panel C



Second, we found a marginally significant four-way interaction among argument quality, subjective knowledge, initial attitudes, and measure order, $F(1,638) = 2.89, p = .09$. We split the interaction by measure order and found both three-way interactions to be non-significant (the subjective measure first: $F(1,323) = 1.68, p = .20$; the objective measure first: $F(1,331) = 2.41, p = .12$). Even though the two three-way interactions had marginally different patterns from each other, both patterns were not significant interactions by themselves. Thus, we are reluctant to comment further. No other interactions were predicted nor significant.

Message Elaboration with Favourability of Thoughts.

The second way we assessed message elaboration was by gauging argument quality differentiation using a favourability of thoughts index as the dependent variable (see Cacioppo & Petty, 1981). As we have noted, this analysis was a supplementary analysis, which we have presented for purposes of completeness. This index was calculated from the cognitive response task data with the equation: (negative relevant thoughts – positive relevant thoughts) / total relevant thoughts. Consequently, the maximum range for this index was -1 to +1, where -1 indicated all relevant thoughts generated were message inconsistent and +1 indicated all relevant thoughts generated were message consistent. More positive values implied more persuasion, whereas more negative values implied less persuasion.

The predictions for the dependent variable favourability of thoughts index were the same as the post-message attitudes. However, we expect the effects to be slightly weaker because the favourability of thoughts index is less sensitive in gauging message

elaboration than post-message attitudes. The favourability of thoughts index was generated from the cognitive response task, in which we asked participants to list thoughts they had during message elaboration. This was a more direct method to gauge generated thoughts, however, it may have led participants to generate thoughts retrospectively that may not have been present while they were reading the message. These additional thoughts may cause less precision when gauging message elaboration. Thus, the cognitive response task has been viewed as a supplemental tool in assessing message elaboration (see Cacioppo & Petty, 1981).

Main Effects. We found a main effect of argument quality, $F(1,638) = 146.17, p < .001$, where the strong message ($M = .50, SE = .04$) elicited more persuasion than the weak message ($M = -.09, SE = .03$). There was also a main effect of initial attitudes, $F(1,638) = 48.97, p < .001$, in which more pro-message initial attitudes were associated with more favourable thought, $B = .14$. Both of these results were predicted and were found in the post-message attitudes analysis. However, they were not found in the favourability of thought index analysis of the subsequent study.

Two-Way Interactions. We predicted an interaction between argument quality and objective knowledge, but this was not significant, $F(1,638) = 0.25, p = .62$. However, two unpredicted interactions emerged. First, we found a significant interaction between subjective knowledge and initial attitudes, $F(1,638) = 7.05, p = .008$. For counter-message initial attitudes, increases in subjective knowledge were associated with persuasion ($B = -.07, SE = .03, p = .01$). For pro-message initial attitudes, subjective knowledge was not associated with persuasion ($B = .04, SE = .03, p = .17$).

Second, we found a significant interaction between subjective knowledge and objective knowledge, $F(1,638) = 5.47, p = .02$. This effect indicated increases in subjective knowledge were associated with less persuasion at higher levels of objective knowledge ($B = -.08, SE = .03, p = .01$) but not associated with persuasion at moderate ($B = -.02, SE = .02, p = .36$) and lower levels of objective knowledge ($B = .04, SE = .03, p = .28$). Both these two-way interactions were not found in the same analysis of subsequent study, thus, we are hesitant to comment further.

Higher Order Interactions. We predicted a three-way interaction among argument quality, subjective knowledge, and initial attitudes but this interaction was not significant, $F(1,638) = 0.05, p = .82$. However, one unpredicted marginally significant interaction among argument quality, subjective knowledge, initial attitudes and measure order emerged, $F(1,638) = 3.23, p = .07$. We split the interaction by measure order and found that the three-way interaction was marginally significant if participants were presented with the subjective measure first, $F(1,323) = 3.11, p = .08$, but not with the objective measure first, $F(1,331) = 2.01, p = .16$.

We probed the interaction under the subjective measure first condition (see Table 3). When participants had counter-message initial attitudes, increases in subjective knowledge were associated with more elaboration. This did not agree with our prediction, as we expected increases in subjective knowledge would be associated with less elaboration for participants with counter-message initial attitudes. When participants had pro-message initial attitudes, increases in subjective knowledge were associated with less elaboration. This also did not concur with our prediction, as we expected the amount of message elaboration would be similar across different levels of subjective knowledge for

pro-message initial attitudes. Once again, we are reluctant to further interpret this result, as it was not replicated. No other interactions were predicted nor significant.

Table 3

Subjective Measure First: Simple Slopes of the Argument Quality, Subjective Knowledge, and Initial Attitudes Interaction.

Subjective Knowledge	Counter-Message Initial Attitudes	Pro-Message Initial Attitudes
Low	$B = .17, SE = .06, p = .009$	$B = .37, SE = .06, p < .001$
Medium	$B = .21, SE = .04, p < .001$	$B = .31, SE = .04, p < .001$
High	$B = .26, SE = .05, p < .001$	$B = .24, SE = .08, p < .001$

Message Elaboration with Total Relevant Thoughts.

The third way we use assessed message elaboration was by using a total relevant thoughts index, which was generated from the cognitive response task (see Burnkrant & Howard, 1984). This analysis was also a supplementary analysis for the purposes of completeness and thus, these results should be interpreted with caution. This index was calculated with this equation: positive relevant thoughts + negative relevant thoughts + neutral relevant thoughts. The maximum range for this index is 0 to 12, where higher scores indicated more relevant thoughts generated.

The total relevant thoughts index was a more direct measure of message elaboration, as more relevant thoughts listed indicated more elaboration. In this analysis, argument quality differentiation is used to gauge message elaboration, and thus, our argument quality predictions were no longer valid. By removing the need for argument

quality, our two- and three-way predictions were shifted down one level. For this index, we predicted that there would be a main effect of objective knowledge, where increases in objective knowledge would be associated with more elaboration. We predicted that there would be a two-way interaction between subjective knowledge and initial attitudes. For counter-message initial attitudes, individuals with lower subjective knowledge would elaborate more than individuals with higher subjective knowledge. For pro-message initial attitudes, there would be no differences in elaboration between different levels of subjective knowledge.

Though the total relevant thoughts index method was the most direct method to assess elaboration, historically, researchers have found this to be the least sensitive (e.g., Petty & Cacioppo, 1986). Being generated from the cognitive response task, this method had the same issues as the favourability of thoughts index method (i.e., thoughts generated retrospectively). Compared to the favourability of thoughts index method, the total relevant thoughts index method provided us with less insight on how carefully an individual scrutinized a message. By simply adding all relevant thoughts together, the total relevant thoughts index provided us with an index regarding generated thoughts that were relevant to the message but were not necessarily reflective of the content of the message. For example, the statement, “nuclear power is important” would be relevant to the anti-nuclear power message but would not be reflective of how carefully an individual is scrutinizing the merits of a message.

Main Effects. We predicted that increases in objective knowledge would be associated with more elaboration. Indeed, we found a significant main effect of objective knowledge, $F(1,638) = 131.64, p < .001$, in which increases in objective knowledge were

associated with more elaboration, $B = .28$. Given that this result did not replicate in the second study, we are hesitant to interpret these results.

We did not predict any other significant main effects. However, several main effects emerged. First, we found a significant main effect of initial attitudes, $F(1,638) = 4.56, p = .03$, where more pro-message initial attitudes were associated with less elaboration than more counter-message initial attitudes, $B = -.08$. Second, there was a marginally significant main effect of subjective knowledge, $F(1,638) = 2.71, p = .10$, where increases in levels of subjective knowledge were associated with less elaboration, $B = -.12$. Finally, we found a marginally significant main effect of measure order, $F(1,638) = 2.88, p = .09$, where completing the subjective measure first ($M = 5.21, SE = 0.17$) resulted in more elaboration than completing the objective measure first ($M = 4.93, SE = 0.12$). All these unpredicted main effects were non-significant in Study Two, except for subjective knowledge, which was only marginal. Thus, we are cautious to interpret further.

Two-Way Interactions. We predicted a two-way interaction between subjective knowledge and initial attitudes, which was marginally significant, $F(1,638) = 2.68, p = .10$. Subjective knowledge was not associated with elaboration for counter-message initial attitudes ($B = .11, SE = .09, p = .22$). Increases in subjective knowledge were associated with more elaboration for pro-message initial attitudes ($B = .28, SE = .11, p = .009$). Both effects contradicted our predictions. We found a two-way interaction between initial attitudes and measure order, $F(1,638) = 5.19, p = .02$. The effects were not significant for both measure orders (subjective measure first: $B = -.11, SE = .08, p = .18$;

objective measure first: $B = .03$, $SE = .09$, $p = .70$). Both these two-way interactions were not found in the subsequently study, and thus, we are hesitant to interpret these results.

Higher Order Interactions. We did not predict any higher order interactions, however, several significant interactions emerged. First, we found a significant three-way interaction among objective knowledge, initial attitudes, and measure order, $F(1,638) = 4.89$, $p = .03$. Overall, increases in objective knowledge were associated with more elaboration. However, in the subjective measure first condition, this effect was more pronounced for counter-message ($B = .40$, $SE = .05$, $p < .001$) than pro-message initial attitudes ($B = .34$, $SE = .06$, $p < .001$). Conversely, at the objective measure first condition, this effect was more pronounced for pro-message ($B = .38$, $SE = .06$, $p < .001$) than counter-message initial attitudes ($B = .13$, $SE = .06$, $p = .02$).

Second, there was a significant three-way interaction among subjective knowledge, objective knowledge, and measure order, $F(1,638) = 4.17$, $p = .04$ (see Table 4). When participants were presented with the subjective measure first, subjective knowledge was not associated with elaboration. However, when participants were presented with the objective measure first, increases in subjective knowledge were associated with less elaboration but only at lower and moderate levels of objective knowledge. Subjective knowledge was not associated with elaboration at higher levels of objective knowledge.

Table 4

Simple Slopes of the Subjective Knowledge, Objective Knowledge, and Measure Order Interaction.

Objective Knowledge	Subjective Measure First	Objective Measure First
Low	$B = .08, SE = .14, p = .56$	$B = -.34, SE = .15, p = .02$
Medium	$B = -.05, SE = .10, p = .61$	$B = -.21, SE = .10, p = .04$
High	$B = -.18, SE = .13, p = .18$	$B = -.08, SE = .13, p = .53$

Third, we found a significant four-way interaction among subjective knowledge, objective knowledge, initial attitudes, and measure order, $F(1,638) = 4.74, p = .03$. We split the interaction by measure order and found that the three-way interaction was significant if participants were presented with the subjective measure first, $F(1,323) = 7.90, p = .005$, but not with the objective measure first, $F(1,331) = 0.83, p = .36$.

We probed the interactions under the subjective measure first condition (see Table 5). At both levels of initial attitudes, increases in objective knowledge were associated with increases in elaboration. However, for counter-message initial attitudes, increases in subjective knowledge were associated with decreases of this effect. For pro-message initial attitudes, increases in subjective knowledge were associated with increases of this effect. However, the pattern of effects were weaker for pro-message initial attitudes than counter-message initial attitudes.

Table 5

Subjective Measure First: Simple Slopes of the Objective Knowledge, Subjective Knowledge, and Initial Attitudes Interaction.

Subjective Knowledge	Counter-Message Initial Attitudes	Pro-Message Initial Attitudes
Low	$B = .58, SE = .08, p < .001$	$B = .30, SE = .08, p < .001$
Medium	$B = .42, SE = .06, p < .001$	$B = .36, SE = .06, p < .001$
High	$B = .25, SE = .08, p = .002$	$B = .42, SE = .09, p < .001$

Finally, there was a significant four-way interaction among argument quality, subjective knowledge, objective knowledge, and measure order, $F(1,638) = 5.43, p = .02$. We split the interaction by measure order and found that the three-way interaction was significant if participants were presented with the objective measure first, $F(1,331) = 8.00, p = .005$, but not with the subjective measure first, $F(1,323) = 0.79, p = .38$.

We probed the interactions under the subjective measure first condition (see Table 6). In the weak message condition, increases in subjective knowledge trended towards less elaboration at higher levels objective knowledge. Subjective knowledge was not associated with elaboration at moderate and lower levels of objective knowledge. In the strong message condition, increases in subjective knowledge were associated with less elaboration at lower levels objective knowledge. Subjective knowledge was not associated with elaboration at moderate and higher levels of objective knowledge. None of these higher-order interactions replicated in the second study, and thus, we are reluctant to comment further. No other interactions were predicted nor significant.

Table 6

Objective Measure First: Simple Slopes of the Objective Knowledge, Subjective Knowledge, and Argument Quality Interaction.

Objective Knowledge	Weak Message	Strong Message
Low	$B = .00, SE = .21, p = 1.00$	$B = -.63, SE = .21, p = .03$
Medium	$B = -.15, SE = .14, p = .28$	$B = -.23, SE = .15, p = .12$
High	$B = -.31, SE = .18, p = .09$	$B = .17, SE = .20, p = .39$

Discussion

Recall that we predicted that subjective and objective knowledge are not alternative operationalizations of the same construct. We predicted that this would be demonstrated in two ways. First, the correlations between subjective and objective knowledge would be modest and indeed, this was the case for this study. Second, subjective and objective knowledge would have unique effects on message elaboration even when controlling for the effects of one another. In fact, that was what we found.

Specifically, we predicted that the unique effects of subjective and objective knowledge would manifest in a two-way interaction between argument quality and subjective knowledge, as well as a three-way interaction among argument quality, subjective knowledge, and initial attitudes. However, these interactions were not significant. However, we did find an interesting four-way interaction among argument quality, subjective knowledge, objective knowledge, and measure order. Under the subjective measure first condition, we found that participants with matched levels of knowledge had the lowest levels of elaboration, while participants with mismatched levels of knowledge had the highest levels of elaboration.

We also predicted that there would be less carry-over effects for the subjective measure first condition when compared to the objective measure first condition. Our results seemed to support this hypothesis. First, we found that the correlation between subjective and objective knowledge were slightly lower for participants who completed the subjective measure first condition than the objective measure first condition. However, a formal test of this difference revealed non-significance. In addition, in our analyses, more effects emerged for the subjective measure first condition than the objective measure first condition, which suggested that there were less carry-over effects. By examining our primary and supplementary analyses, we determined that six of the nine effects that included measure order had stronger effects under the subjective measure first condition than the objective measure first condition.

Chapter 3

Study Two

In Study One, our primary analyses with post-message attitudes consisted of a complex model with the highest order interaction being a five-way interaction, which required us to examine numerous effects. In such a case, the possibility of committing family-wise errors is substantial. Consequently, the significant results in the first study need to be interpreted with caution pending replication. Thus, the purpose of the second study is to determine the reliability of the results of the first study.

Furthermore, Study One was tested with only one attitude object: nuclear power. In order to ensure that the results in Study One were not due to the idiosyncrasies of nuclear power or the specific features of the messages, we decided to test our hypotheses

with another object (i.e., the legalization of marijuana). In addition, in the previous study, pro-message initial attitudes were negative because the message was negative. However, pro-message initial attitudes could be positive if the message was positive. Thus, we used a positive message in Study Two. We expected conceptually similar results to Study One.

Design

This study was a 2 (Argument Quality: Strong vs Weak) X 2 (Measure Order: Subjective First vs Objective First) between-subjects design with measured independent continuous variables of subjective knowledge, and objective knowledge, and initial attitudes.

Participants

Participants included 633 undergraduate students of an introductory psychology course at Queen's University. The projected sample size was determined with the same method as Study One.

Procedures

All procedures in Study Two were the same as Study One with a few exceptions.

Initial Measurement Phase. We measured initial attitudes, subjective knowledge, and objective knowledge in the same manner as Study One except in Study Two, the attitude measures referred to legalization of marijuana, while the knowledge measures referred to marijuana. The message that we presented was pro-legalization of marijuana, thus participants with favourable attitudes towards the legalization of

marijuana were considered pro-message, while participants with unfavourable attitudes were considered counter-message.

Persuasive Message Phase. We used the same pretesting procedures in Study Two as Study One (See Appendix D for all Study Two messages). Once again, we used a favourability of thought index to gauge argument strength. Because the persuasive message is pro-marijuana, more positive values on this index indicated stronger arguments, whereas more negative values on this index indicated weaker arguments. For this index, the five strong arguments had a range of +.17. to +.40, with an average of +.28 and the five weak arguments had a range of -.46. to -.03 with an average of -.24.

An example of a strong message argument was:

“The legalization of marijuana will allow the government to regulate the buying and selling of marijuana. Having the government regulate the industry will allow the government to address the safety concerns of the consumers. Without government regulation, it is unknown what kinds of toxins are contained within marijuana products.”

An example of a weak message argument was:

“People who use marijuana do not commit other crimes because they are so high and happy that they physically cannot hurt other people or damage people’s property.”

Post-Message Measures Phase. We measured post-message attitudes and used a cognitive response task in the same manner as Study One except in Study Two, the measures specified the legalization of marijuana as an attitude object.

Measures

Initial and post-message attitudes were coded so that higher values would indicate more message consistent attitudes and attitude change. In Study Two, the reliability for initial attitudes was $\alpha = .91$. The reliability for subjective knowledge was $\alpha = .95$. The reliability for post-message attitudes was $\alpha = .91$.

Results

Preliminary Analyses.

As seen in Table 7, none of the averages of the three independent variables were near the extreme ends of their respective scales. In addition, the standard deviations ranged from 1.27 to 2.85 and all three variables had maximum range. Overall, these three variables were satisfactory for this study. We found a weak correlation subjective knowledge and initial attitudes, $r(631) = .26, p < .001$. Objective knowledge and initial attitudes were also weakly correlated, $r(631) = .10, p = .02$.

Table 7

Subjective Knowledge, Objective Knowledge, and Initial Attitudes Descriptives.

Variable	<i>M</i>	<i>SD</i>	<i>Mdn</i>	Range	Skew	Kurtosis
Subjective Knowledge	3.96	1.27	4.00	1 – 7	-.14	-.50
Objective Knowledge	4.75	2.85	7.00	0 – 10	-.52	-.70
Initial Attitudes	3.94	1.61	4.00	1 – 7	-.25	-.84

Correlation Analyses.

Recall that our first prediction was that subjective and objective knowledge are not alternative operationalizations of the same construct. Indeed, we found a weak correlation between subjective knowledge and objective knowledge, $r(631) = .16, p < .001$. This correlation was less than the median of past studies ($r = .30$) and within the range of previous correlations ($r = .12$ to $r = .57$).

We also predicted that the subjective measure first condition would have less carry-over effects than the objective measure first condition. We found the carry-over effects to be slightly stronger if participants completed the objective measure first, $r(317) = .20, p < .001$, than if they completed the subjective measure first, $r(312) = .12, p < .001$. However, a formal test of this difference revealed non-significance, $z = 1.03, p = .30$. The effects were in the expected direction, however, it was not significant, and thus, we cannot conclude that the subjective first condition had less carry-over effects than the objective measure first condition from these results.

Message Elaboration with Post-Message Attitudes.

For the same reasons stated in Study One, our primary analysis was the post-message attitudes analysis. We specified the same general linear model with the dependent variable post-message attitudes as Study One. Thus, our predictions for this analysis were the same as the ones in the same analysis of the previous study. Higher values for initial and post-messages attitudes indicated more persuasion and lower values indicated less persuasion.

Main Effects. We found a significant main effect of argument quality, $F(1,601) = 25.05, p < .001$, which revealed that strong messages ($M = 4.36, SE = 0.07$) elicited more persuasion than weak messages ($M = 3.88, SE = 0.07$). There was significant main effect of initial attitudes, $F(1,601) = 779.78, p < .001$. This effect indicated that initial attitudes were positively associated with post-message attitudes, $B = .68$. Both these effects also emerged in the post-message attitudes analysis in Study One.

Two-Way Interactions. We predicted an interaction between argument quality and objective knowledge, but this was not significant, $F(1,601) = 0.55, p = .46$. Though objective knowledge was not associated with message elaboration in the pattern that we expected, it could have effects on elaboration in another form.

Examination of the other two-way interactions revealed several unpredicted effects. First, we found a significant interaction between subjective knowledge and initial attitudes, $F(1,601) = 7.39, p = .007$. For counter-message initial attitudes, subjective knowledge was not associated with persuasion ($B = -.03, SE = .04, p = .48$). For pro-message initial attitudes, increases in subjective knowledge were associated with more persuasion ($B = .14, SE = .04, p = .001$). In Study One, the interaction between subjective knowledge and initial attitudes was significant, however, the pattern of the interaction was not the same. In the previous study, when initial attitudes were counter-message, increases in subjective knowledge were associated with less persuasion. However, when initial attitudes were pro-message, subjective knowledge was not associated with persuasion. Since the pattern of effects were different, we are cautious to interpret further.

Second, we found a significant interaction between objective knowledge and initial attitudes, $F(1,601) = 8.27, p = .004$. For counter-message initial attitudes, increases

in objective knowledge were associated with less persuasion ($B = -.04, SE = .02, p = .02$). For pro-message initial attitudes, increases in objective knowledge were associated with more persuasion ($B = .04, SE = .02, p = .05$). The pattern of effects is similar to the subjective knowledge and initial attitudes interaction. We did not find this objective knowledge and initial attitudes interaction in the previous study, and thus, we are reluctant to interpret this effect.

Higher Order Interactions. We predicted a three-way interaction among argument quality, subjective knowledge, and initial attitudes but this interaction was not significant, $F(1,601) = 0.53, p = .47$. Though subjective knowledge was not associated with message elaboration in the pattern that we expected, it could have effects on elaboration in other higher order interactions. After examination of the analysis, we found three unpredicted higher order interactions. First, we found a marginally significant three-way interaction among argument quality, subjective knowledge, and objective knowledge, $F(1,601) = 2.78, p = .10$.

Table 8 provides the regression coefficients of this three-way interaction broken down by subjective and objective knowledge, in which argument quality differentiation is represented by the slopes. Greater regression coefficients equal stronger argument quality differentiation, which indicates more message elaboration. We noticed some interesting patterns when examining Table 8. Of particular interest were the regression coefficients of the matched knowledge individuals (i.e. low subjective and low objective knowledge or high subjective and high objective knowledge), which are located in the top left corner, as well as the bottom row right corner. Here, we can see that matched knowledge individuals had modest levels of elaboration.

Also of interest were the regression coefficients of the mismatched knowledge individuals (i.e. low subjective and high objective knowledge or high subjective and low objective knowledge), which are located in the top right corner, as well as the bottom left corner. Here, we can see that mismatched knowledge individuals had the highest levels of elaboration. These complex pattern of results for matched and mismatched individuals were very similar to the interaction among argument quality, subjective knowledge, and objective knowledge under the subjective measure first condition in Study One.

Table 8

Simple Slopes of the Argument Quality, Subjective Knowledge, and Objective Knowledge Interaction.

Subjective Knowledge	Low Objective Knowledge	Medium Objective Knowledge	High Objective Knowledge
Low	$B = .20, SE = .10, p = .06$	$B = .26, SE = .08, p = .002$	$B = .32, SE = .12, p = .01$
Medium	$B = .29, SE = .08, p < .001$	$B = .21, SE = .06, p < .001$	$B = .13, SE = .08, p = .11$
High	$B = .38, SE = .12, p = .003$	$B = .17, SE = .17, p = .05$	$B = -.05, SE = .11, p = .67$

An alternative way to represent these results is by plotting the slopes (see Figure 2), where steeper slopes represent more argument quality differentiation, which indicates more message elaboration. In Panel A of Figure 2, we have participants with low levels of objective knowledge. For these individuals, increases in subjective knowledge were associated with more engagement in message elaboration. This is illustrated by the

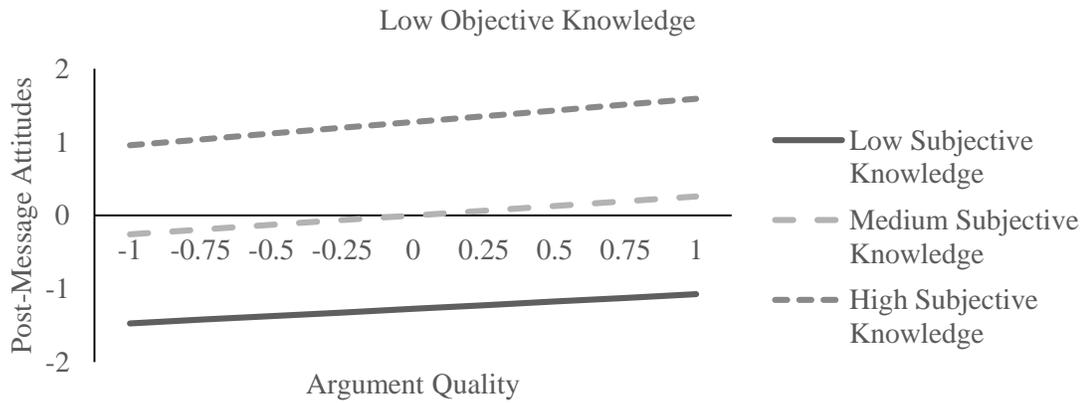
steeper slope for high subjective knowledge individuals than low subjective knowledge individuals in Panel A.

In Panel B of Figure 2, we have participants with moderate levels of objective knowledge. For these individuals, increases in subjective knowledge did not seem to be associated with engagement in message elaboration. This is illustrated by the similarity in the steepness of slopes for high, medium, and low subjective knowledge individuals in Panel B. In Panel C of Figure 2, we have participants with high levels of objective knowledge. For these individuals, increases in subjective knowledge were associated with less engagement in message elaboration. This is illustrated by the shallower slope for high subjective knowledge individuals than low subjective knowledge individuals in Panel C.

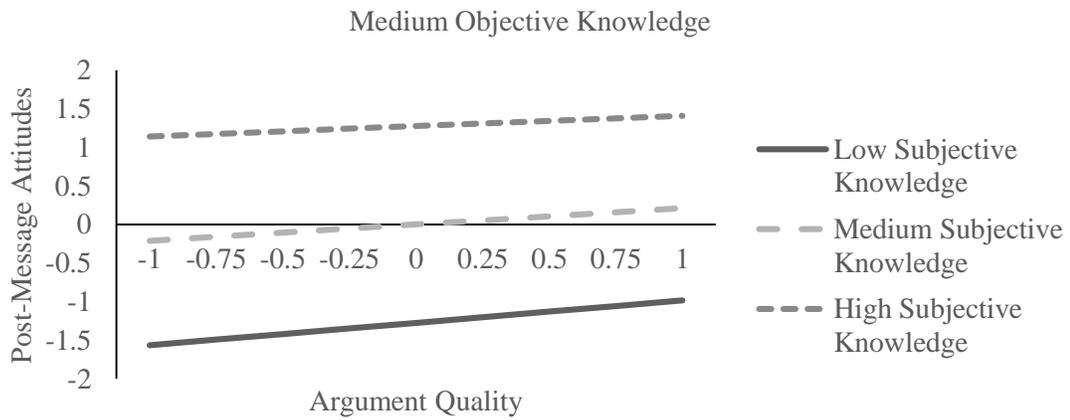
Figure 2

Simple Slopes of the Argument Quality, Subjective Knowledge, and Objective Knowledge.

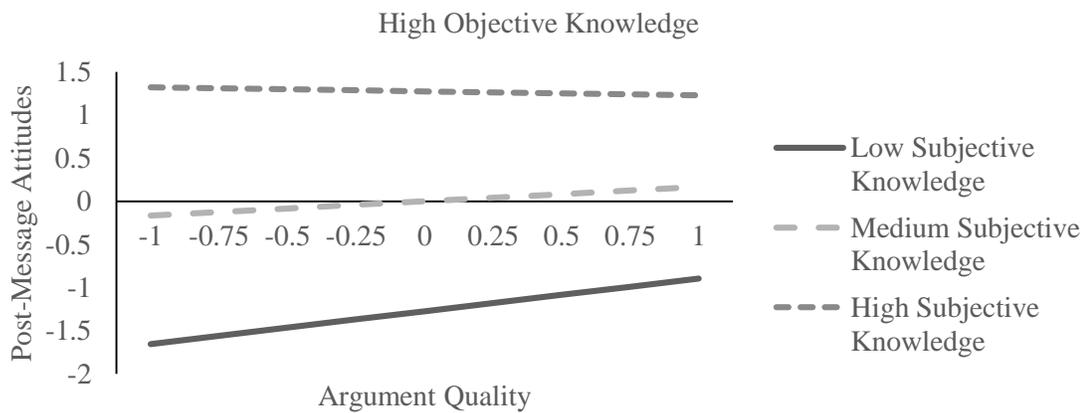
Panel A



Panel B



Panel C



We did not find this significant three-way interaction in the previous study. However, we found a four-way interaction among argument quality, subjective knowledge, objective knowledge, and measure order. When we split the interaction by measure order in Study One, there was a significant interaction with the same pattern between argument quality, subjective knowledge, and objective knowledge for participants who received the subjective measure first.

In this study, the four-way interaction among argument quality, subjective knowledge, objective knowledge, and measure order was not significant, $F(1,601) = 2.00$, $p = .16$. This suggested that the discrepancy between the two measure orders was not as substantial as it was in Study One. Given that the three-way interaction under the subjective measure first condition in Study One was significant, it would be informative to probe this interaction in Study Two. Recall that we predicted that the effects would be stronger under the subjective measure first condition than the objective measure first condition. Indeed, we found that this interaction was not significant under the objective measure first condition, $F(1,311) = 2.02$, $p = .16$, and was significant under the subjective measure first condition, $F(1,306) = 3.84$, $p = .05$.

Although the sample size was roughly cut in half, the p-value was smaller for the three-way interaction under the subjective measure first condition than the overall three-way interaction. When comparing these two three-way interactions, the same pattern of effects emerged, however, the effects were stronger for three-way interaction under the subjective measure first condition. In Study One, the overall three-way interaction was not significant, whereas the three-way interaction under the subjective measure first condition was significant. Thus, it seems that the three-way interaction under the

subjective measure first condition was stronger than the overall three-way interaction for both studies.

Table 9 provides the regression coefficients of the three-way interaction under the subjective measure first condition in the same fashion as Table 8. In Table 9, greater regression coefficients represent stronger argument quality differentiation, which indicates more message elaboration. The pattern of effects in Table 9 were similar to those in Table 2 and Table 8, as matched knowledge individuals had the lowest levels of elaboration, while mismatched knowledge individuals had the highest levels of elaboration.

This three-way interaction under the subjective measure first condition seemed to be robust, as the three-way interactions under the subjective measure first condition for both studies reached significance under conventional standards. In addition, the patterns of effects for this complex three-way interaction were similar for both studies. The likelihood for this three-way interaction to be significant and have the same complex pattern between two studies is very low.

Table 9

Subjective Measure First: Simple Slopes of the Argument Quality, Subjective Knowledge, and Objective Knowledge Interaction.

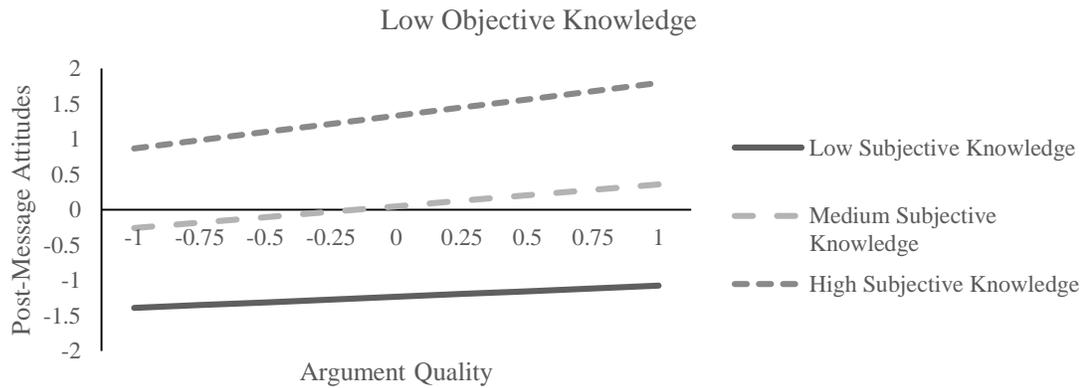
Subjective Knowledge	Low Objective Knowledge	Medium Objective Knowledge	High Objective Knowledge
Low	$B = .16, SE = .16, p = .31$	$B = .25, SE = .12, p = .04$	$B = .34, SE = .18, p = .06$
Medium	$B = .31, SE = .12, p = .01$	$B = .25, SE = .08, p = .004$	$B = .19, SE = .12, p = .13$
High	$B = .46, SE = .18, p = .009$	$B = .24, SE = .12, p = .04$	$B = .03, SE = .16, p = .86$

Once again, we represented this pattern of effect by plotting the slopes (see Figure 3) in the same manner as Figure 2. Figure 3 illustrates the same pattern of effects as Figures 1 and 2. In Panel A of Figure 3, we can see that for participants with low levels of objective knowledge, increases in subjective knowledge were associated with more engagement in message elaboration. In Panel B of Figure 3, we can see that for participants with moderate levels of objective knowledge, increases in subjective knowledge did not seem to be associated with engagement in message elaboration. In Panel C of Figure 3, we can see that for participants with high levels of objective knowledge, increases in subjective knowledge were associated with less engagement in message elaboration.

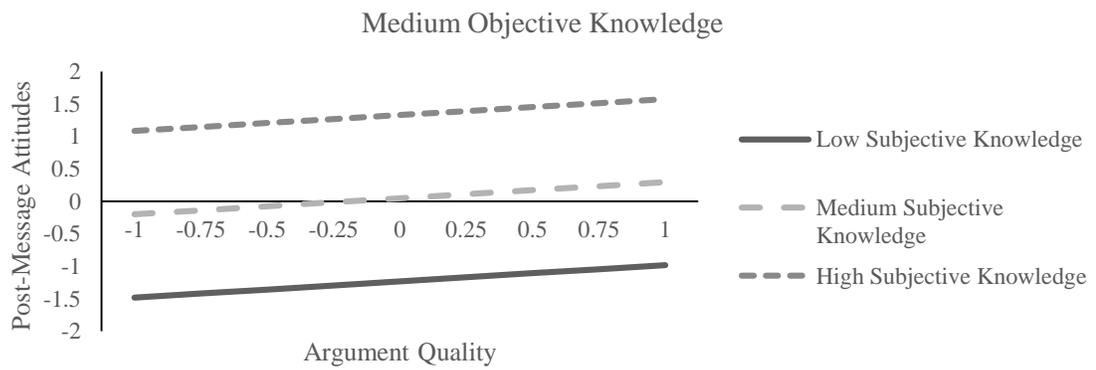
Figure 3

Subjective Measure First: Simple Slopes of the Argument Quality, Subjective Knowledge, and Objective Knowledge.

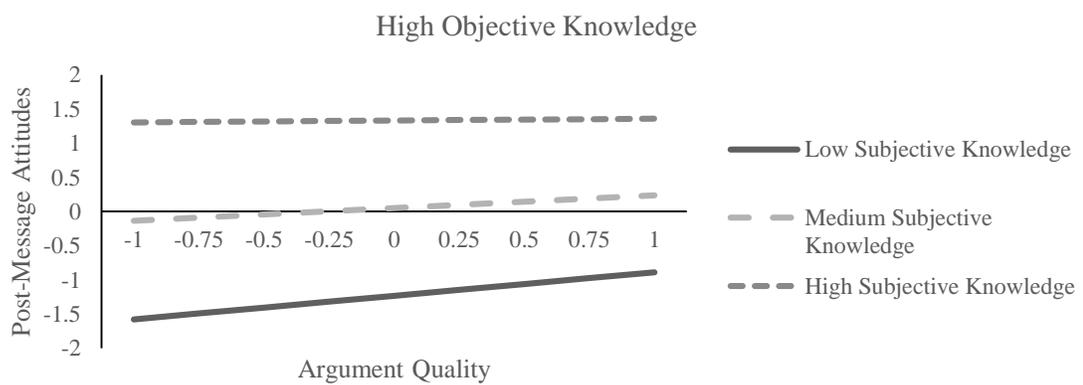
Panel A



Panel B



Panel C



Second, we found a marginally significant three-way interaction among objective knowledge, initial attitudes, and measure order, $F(1,601) = 2.77, p = .10$ (see Table 10). Increases in objective were associated with less persuasion if participants were counter-message and were presented with the subjective measure first. At all other levels of measure order and initial attitudes, objective knowledge was not associated with persuasion. We did not find this three-way interaction in Study One, thus, we are cautious to interpret this result.

Table 10

Simple Slopes of the Objective Knowledge, Initial Attitudes, and Measure Order Interaction.

Measure Order	Counter-Message Initial Attitudes	Pro-Message Initial Attitudes
Subjective Measure First	$B = .08, SE = .14, p = .56$	$B = -.18, SE = .13, p = .18$
Objective Measure First	$B = -.34, SE = .15, p = .02$	$B = -.08, SE = .13, p = .53$

Third, we found a marginally significant four-way interaction among argument quality, subjective knowledge, initial attitudes, and measure order, $F(1,601) = 3.16, p = .08$. We split the interaction by measure order and found that the three-way interaction was marginally significant if participants were presented with the subjective measure first, $F(1,306) = 2.74, p = .10$, but not significant if presented with the objective measure first, $F(1,311) = 0.75, p = .39$.

We probed the interaction under the subjective measure first condition (see Table 11). For counter-message initial attitudes, we predicted increases in subjective knowledge would be associated with less elaboration, however, subjective knowledge was not associated with elaboration and trended towards the opposite direction. For pro-message

initial attitudes, we predicted there would be no differences in elaboration between different levels of subjective knowledge. However, increases in subjective knowledge were associated with elaboration. In addition, there was no elaboration at high subjective knowledge. We did not find the same interaction in the same analysis of the same study, and thus, we are reluctant to comment further. No other interactions were predicted nor significant.

Table 11

Subjective Measure First: Simple Slopes of the Argument Quality, Subjective Knowledge, and Initial Attitudes Interaction.

Subjective Knowledge	Counter-Message Initial Attitudes	Pro-Message Initial Attitudes
Low	$B = .11, SE = .11, p = .32$	$B = .35, SE = .13, p = .007$
Medium	$B = .16, SE = .08, p = .06$	$B = .22, SE = .08, p = .01$
High	$B = .21, SE = .13, p = .11$	$B = .09, SE = .10, p = .39$

Message Elaboration with Favourability of Thoughts.

As in Study One, we used the favourability of thoughts index as the dependent variable to assess message elaboration. Once again, this is a supplementary analysis for the purposes of completeness. However, the calculation for this index was different due to the direction of the message: (positive relevant thoughts – negative relevant thoughts) / total relevant thoughts. The maximum range for this index was -1 to +1 and more positive values implied more persuasion, whereas more negative values implied less persuasion. Our predictions for this analysis were the same as the ones in the same analysis of the Study One.

Main Effects. We expected a main effect of argument quality, however, this effect did not reach significance, $F(1,601) = 2.03, p = .18$. We expected a main effect of initial attitudes but this effect was not significant, $F(1,601) = 0.19, p = .62$. Both of these effects were significant in the prior study. These two effects should have emerged. However, because these effects did emerge in our post-message attitudes analysis, there absence of effects in this analysis was not too concerning. Though we did not expect a main effect of objective knowledge, a significant main effect emerged, $F(1,601) = 4.76, p = .03$, where increases in objective knowledge were associated with less persuasion, $B = -.02$. This effect was not a replication of the same analysis in the prior study, and thus, we are hesitant to comment further.

Two-Way Interactions. We predicted an interaction between argument quality and objective knowledge, but this was not significant, $F(1,601) = 0.08, p = .77$. However, a marginally significant interaction between initial attitudes and measure order emerged, $F(1,601) = 3.22, p = .07$. Initial attitudes were not associated with persuasion if participants were presented with the subjective measure first, $B = -.02, SE = .02, p = .31$, or with the objective measure first, $B = .02, SE = .02, p = .31$. This effect should be dismissed for several reasons. First, the interaction was only marginally significant. Second, neither simple effects were significant. Third, this effect did not emerge in the previous study.

Higher Order Interactions. We predicted a three-way interaction among argument quality, subjective knowledge, and initial attitudes but this interaction was not significant, $F(1,601) = 0.13, p = .72$. However, one unpredicted marginally significant three-way interaction among objective knowledge, subjective knowledge, and initial

attitudes emerged, $F(1,601) = 3.37, p = .07$ (see Table 12). For counter-message initial attitudes, increases in objective knowledge were associated with less persuasion at higher levels of subjective knowledge. Objective knowledge was not associated with persuasion at moderate and lower levels of objective knowledge. For pro-message initial attitudes, objective knowledge was not associated with persuasion. We did not find this effect in the previous study, so we will not comment further. No other interactions were predicted nor significant.

Table 12

Simple Slopes of the Objective Knowledge, Subjective Knowledge, and Initial Attitudes Interaction.

Subjective Knowledge	Counter-Message Initial Attitudes	Pro-Message Initial Attitudes
Low	$B = .01, SE = .02, p = .47$	$B = -.03, SE = .02, p = .22$
Medium	$B = -.02, SE = .01, p = .09$	$B = -.02, SE = .01, p = .10$
High	$B = -.06, SE = .02, p = .008$	$B = -.02, SE = .02, p = .23$

Message Elaboration with Total Relevant Thoughts.

As in Study One, we used a total relevant thoughts index to assess message elaboration. Once again, this analysis was also a supplementary analysis. The maximum range for this index is 0 to 12 and more relevant thoughts listed indicated more elaboration. We had the same predictions as the same analysis in Study One.

Main Effects. We predicted that increases in objective knowledge would be associated with more elaboration, however, we did not find a significant effect, $F(1,601) = 0.79, p = .37$. We did not predict any other significant main effects, however, a marginally significant main effect of subjective knowledge emerged, $F(1,601) = 2.71, p =$

.10, where increases in subjective knowledge were associated with more elaboration, $B = .31$. We found the same marginally significant effect in the previous study. However, we are cautious to interpret this result because it did not emerge in our primary analysis with post-message attitudes.

Two-Way Interactions. We predicted a two-way interaction between subjective knowledge and initial attitudes but this was not significant, $F(1,601) = 0.02, p = .89$. However, a couple two-way interactions emerged. First, we found a significant two-way interaction between subjective knowledge and argument quality, $F(1,601) = 4.32, p = .04$. If participants were presented with strong messages, then increases in subjective knowledge were associated with more elaboration, $B = .24, SE = .10, p = .02$. However, if participants were presented with weak messages, subjective knowledge was not associated with elaboration, $B = .04, SE = .10, p = .66$.

Second, we found a significant two-way interaction between objective knowledge and measure order, $F(1,601) = 5.90, p = .02$. However, the effects were not significant for both measure orders (the subjective measure first: $B = .08, SE = .04, p = .08$; the objective measure first: $B = -.07, SE = .04, p = .13$). Both these two-way interactions were not significant in Study One, so we are hesitant to interpret these results.

Higher Order Interactions. We did not predict any higher order interactions, however, several significant interactions emerged. First, we found a significant three-way interaction among subjective knowledge, initial attitudes, and argument quality, $F(1,601) = 3.86, p = .05$ (see Table 13). Increases in subjective knowledge were associated with more elaboration only when participants had pro-message initial attitudes and received a strong message. Subjective knowledge was not associated with elaboration at other

levels. These results did not agree with our predictions, as we predicted that increases in subjective knowledge would be associated with less elaboration for counter-message initial attitudes and the amount of message elaboration would be similar across different levels of subjective knowledge for pro-message initial attitudes.

Table 13

Simple Slopes of the Subjective Knowledge, Initial Attitudes, and Argument Quality Interaction.

Initial Attitudes	Weak Message	Strong Message
Counter-Message	$B = .18, SE = .14, p = .21$	$B = .11, SE = .14, p = .43$
Pro-Message	$B = -.08, SE = .14, p = .55$	$B = .39, SE = .14, p = .004$

Second, we found a marginally significant three-way interaction among objective knowledge, subjective knowledge, and initial attitudes, $F(1,601) = 2.95, p = .09$. However, none of the simple slope analyses were significant (see Table 14). This effect should be dismissed for several reasons. First, the interaction is only marginally significant. Second, neither simple effects were significant. Third, this effect did not emerge in the previous study.

Table 14

Simple Slopes of the Objective Knowledge, Subjective Knowledge, and Initial Attitudes Interaction.

Subjective Knowledge	Counter-Message Initial Attitudes	Pro-Message Initial Attitudes
Low	$B = .06, SE = .05, p = .24$	$B = -.08, SE = .07, p = .29$
Medium	$B = .03, SE = .04, p = .55$	$B = -.05, SE = .04, p = .25$
High	$B = -.01, SE = .08, p = .88$	$B = -.03, SE = .09, p = .57$

Finally, we found a marginally significant four-way interaction among objective knowledge, initial attitudes, argument quality, and measure order, $F(1,601) = 3.06, p = .08$. We split the interaction by measure order and both three-way interactions were non-significant (the subjective measure first: $F(1,306) = 2.18, p = .14$; the objective measure first: $F(1,311) = 1.46, p = .23$). The same four-way interaction was not significant in the prior study, and thus, we are hesitant to comment further. No other interactions were predicted nor significant.

Discussion

In Study Two, we found several effects that were consistent with Study One. First, we found that the correlation between subjective and objective knowledge was only modest. Second, we found that the subjective and objective knowledge correlation difference between the subjective measure first condition and the objective measure first condition was not significant. However, it was in the expected direction (i.e., it was lower for the subjective measure first condition). Third, both types of knowledge had unique effects, though they were not in the expected forms. Finally, a significant three-way

interaction with the same pattern among argument quality, subjective knowledge, and objective knowledge under the subjective measure first condition emerged in both studies.

Most surprising was that the argument quality and initial attitudes main effects for the favourability of thought index analysis were not significant. Though this analysis was a supplementary analysis and less sensitive at gauging message elaboration, its argument quality and initial attitudes main effects should have emerged. Receiving strong messages and/or having pro-message initial attitudes should lead to more persuasion, however, this was not the case. There are a couple possible reasons for this result. First, it could be that the manipulation of argument quality was poor. However, pre-testing revealed that the differences in favourability of thought between the strong and weak messages of the legalization of marijuana were comparable to those of nuclear power.

Second, it could be that there was less elaboration overall in the second study. The two studies may have differed on other attitude strength properties (e.g., attitude importance). We did not formally test any other properties, thus, we cannot comment on the influences of other properties. In addition, participants in Study Two may be more fatigued than participants in Study One. Both studies were conducted in experimental sessions that included other studies. Study One was first in its session, while Study Two was second in its session. Completing a study before Study Two may have caused participants to be fatigued and led to less elaboration.

Third, it could be that there was not less elaboration overall in the second study but that our ability to detect elaboration was weaker for Study Two than Study One. In Study Two, an error was made for the initial and post-message attitudes measurements,

where participants are asked about their overall evaluation of marijuana, as well as their evaluation of the legalization of marijuana. When completing these measures, some participants may have interpreted these measures as assessing their overall evaluation of marijuana, while some others may have interpreted these measures as assessing their overall evaluation of the legalization of marijuana. Thus, participants' overall of the legalization of evaluation of marijuana may be have been confounded with their overall evaluation of marijuana.

While this error may have hindered our ability to detect message elaboration, it is unlikely that this error falsely accentuated our effects. This is because the participants were likely divided into two subgroups: one that interpreted the measure as assessing their overall evaluation of the legalization of marijuana and another that interpreted the measure as assessing their overall evaluation of marijuana. Participants in the legalization of marijuana group completed the measures as we intended and thus, we are comfortable with our ability to detect elaboration for this group. Our ability to detect elaboration was most likely weaker for the overall evaluation of marijuana group, as their responses targeted the overall evaluation of marijuana but not the legalization of marijuana specifically. We suspect that participants' overall evaluation of marijuana may have encompassed their overall evaluation of the legalization of marijuana, and thus, we suspect our elaboration effects were detected but to a weaker extent. To the extent that we have elaboration effects, we feel comfortable with our effects, as they are not falsely accentuated effects but rather just underestimated effects.

Chapter 4

General Discussion

Summary of Findings

In our program of research, we had numerous analyses, which included complex models with up to five-way interactions. Across the three dependent variables in both studies, there was a total of 180 effects. With so many effects, it may be challenging to organize significant and non-significant effects, as well as mapping all the consistencies and inconsistencies among analyses. However, the interpretation of the effects can be simplified by focusing on the post-message attitudes analyses and treating the other two analyses as supplementary, as the post-message attitudes analysis is the most widely accepted method to gauge elaboration. Provided in Table 15 is a comparison of effects between Study One and Two. In the p column are the p-values for the effects for the two studies. In the far right column, we indicated whether the effects in both studies were the same, different, or not applicable.

When examining the table, we recognize that a number of effects emerged in both studies and very few that were consistent across the two studies. However, three consistent effects did emerge. The first two were the main effects of initial attitudes and argument quality, which were sensible but not theoretically novel. The third was a three-way interaction among argument quality, subjective knowledge, and objective knowledge under the subjective measure first condition, which was of theoretical interest.

Table 15

Post-Message Attitudes Analyses: Comparison of Effects Between Study One and Two.

Main Effects and Interactions	<i>p</i>		Same Pattern of Effects?
	Study One	Study Two	
Measure Order	.14	.84	N/A
Argument Quality	< .001	< .001	Yes
Initial Attitudes	< .001	< .001	Yes
Subjective Knowledge	.01	.36	N/A
Objective Knowledge	.63	.83	N/A
Argument Quality X Objective Knowledge	.84	.46	N/A
Argument Quality X Initial Attitudes	.06 [†]	.19	N/A
Argument Quality X Subjective Knowledge	.004	.95	N/A
Measure Order X Argument Quality	.36	.74	N/A
Initial Attitudes X Objective Knowledge	.90	.004	N/A
Subjective Knowledge X Objective Knowledge	.94	.19	N/A
Measure Order X Objective Knowledge	.02	.26	N/A
Initial Attitudes X Subjective Knowledge	< .001	.007	No
Measure Order X Initial Attitudes	.56	.34	N/A
Measure Order X Subjective Knowledge	.29	.52	N/A
Argument Quality X Initial Attitudes X Objective Knowledge	.86	.84	N/A

Main Effects and Interactions	<i>p</i>		Same Pattern of Effects?
	Study One	Study Two	
Argument Quality X Subjective Knowledge X Objective Knowledge	.53	.10 [†]	N/A
Measure Order X Argument Quality X Objective Knowledge	.61	.66	N/A
Argument Quality X Initial Attitudes X Subjective Knowledge	.93	.47	N/A
Measure Order X Argument Quality X Initial Attitudes	.67	.29	N/A
Measure Order X Argument Quality X Subjective Knowledge	.80	.79	N/A
Initial Attitudes X Subjective Knowledge X Objective Knowledge	.14	.67	N/A
Measure Order X Initial Attitudes X Objective Knowledge	.89	.10 [†]	N/A
Measure Order X Subjective Knowledge X Objective Knowledge	.30	.29	N/A
Measure Order X Initial Attitudes X Subjective Knowledge	.60	.99	N/A
Argument Quality X Initial Attitudes X Subjective Knowledge X Objective Knowledge	.28	.85	N/A
Measure Order X Argument Quality X Initial Attitudes X Objective Knowledge	.88	.84	N/A
Measure Order X Argument Quality X Subjective Knowledge X Objective Knowledge	.01	.16	N/A
Subjective Measure First: Argument Quality X Subjective Knowledge X Objective Knowledge	.004	.05	Yes

Main Effects and Interactions	<i>p</i>		Same Pattern of Effects?
	Study One	Study Two	
Objective Measure First: Argument Quality X Subjective Knowledge X Objective Knowledge	.21	.16	N/A
Measure Order X Argument Quality X Initial Attitudes X Subjective Knowledge	.09 [†]	.08 [†]	No
Measure Order X Initial Attitudes X Subjective Knowledge X Objective Knowledge	.85	.62	N/A
Measure Order X Argument Quality X Initial Attitudes X Subjective Knowledge X Objective Knowledge	.51	.65	N/A

Note: [†] = marginally significant, **bold** = significant

Implications

Dual-Construct Perspective.

Our program of research began with two key premises about the dual-construct perspective. The first premise was that subjective and objective knowledge measures are not alternative operationalizations of the same construct. In both studies, we found modest correlations between the two measures of working knowledge, which cannot be explained by random error. Given the high reliabilities for the subjective knowledge items, these modest correlations were unlikely due to the unreliability of the subjective knowledge measures. The interchangeability perspective would suggest that these two measures would be highly correlated with each other. For these two measure to be only modestly correlated suggested that these measures are unlikely interchangeable.

The second premise was that both subjective and objective knowledge measures would have unique effects associated with message elaboration. If these two measures were in fact redundant, as implied in the interchangeability perspective, then no effects should emerge when controlling for each other. If the objective measures were better than the subjective measures at measuring working knowledge, then only effects for the objective measures should consistently emerge but not the effects for the subjective measures. However, significant effects for both measures emerged despite controlling for each other. Thus, it is improbable that these two measures of working knowledge are interchangeable and unlikely that objective measures are better than subjective measures at measuring working knowledge. After the examination our analyses, we can conclude that our results supported our two general hypotheses.

Working Knowledge and Message Elaboration.

Subjective Knowledge. While our studies provided support for our general predictions, they did not support our specific predictions regarding the effects of subjective and objective knowledge. Recall that we expected that the argument quality by subjective knowledge interaction would be qualified by initial attitudes. However, we did not find this interaction to be significant in both studies. We found a significant two-way interaction between argument quality and subjective knowledge in the first study but not in the second study, which may suggest that this two-way interaction is not qualified by initial attitudes. Because this was only found in one of the studies, we are cautious to interpret this two-way interaction pending replication.

Objective Knowledge. We predicted that increases in objective knowledge would be associated with more elaboration, as this has been shown in past research (Biek *et al.*, 1996). However, this result did not emerge in our primary analyses. At first, we suspected that this effect did not emerge because of a ceiling effect. The difficulty of the messages may have been low, so even less objectively knowledgeable individuals were able to engage in elaboration with ease. Thus, more objectively knowledgeable individuals did not have an advantage over less knowledgeable individuals when engaging in elaboration. However, this may not be the case, as the individuals with different levels of objective knowledge were differentiated in a three-way interaction between argument quality, subjective knowledge, and objective knowledge. Thus, the effects objective knowledge that are associated with message elaboration may be qualified by subjective knowledge.

Subjective Knowledge and Objective Knowledge. Though unpredicted, we found an interesting four-way interaction among argument quality, subjective knowledge, objective knowledge, and measure order. When this four-way interaction was broken down by measure order, we found that the three-way interaction among argument quality, subjective knowledge, and objective knowledge was significant if participants received the subjective measure first but was not significant if they received the objective measure first. It was sensible that the effect would be significant under the subjective measure first condition, as the difference between the two subjective and objective knowledge correlations were slightly lower—though not significant—for the subjective measure first condition than the objective measure first condition. This suggested that the subjective measure first condition may be less likely to have carry-over effects than the objective

measure first condition. By splitting this effect by measure order, the sample size was effectively in half. Even with the sample size cut in half, the two three-way interactions reached significance by conventional standards and displayed similar patterns, which suggested that this effect was relatively robust.

We found that participants with matched levels of working knowledge (i.e., low subjective and objective knowledge or high subjective and objective knowledge) elaborated the least. Conversely, participants with mismatched levels of working knowledge (i.e., low subjective knowledge and high objective knowledge or high subjective knowledge and low objective knowledge) elaborated the most. The differences in the levels of elaboration may be due to the differences in expected and actual difficulty and novelty, where subjective knowledge is associated with expected difficulty and objective knowledge is related to actual difficulty and novelty.

Provided in Table 16 are the proposed mechanisms as to why matched knowledge individuals have low levels of elaboration and mismatched knowledge individuals have high levels of elaboration. Located in the top left corner are the individuals with low subjective and low objective knowledge. As many people would expect, these individuals had lower levels of elaboration. Based on past literature (e.g. Wood *et al.*, 1995), one would expect that these individuals would not have the motivation and the ability to engage in elaboration. However, we have our own speculations for the mechanisms of this effect. We suspect that these individuals feel that they are not knowledgeable about the object, which may lead them to expect message elaboration to be difficult. When these individuals engage in message elaboration, their expected level of difficulty is confirmed because their levels of objective knowledge are low. Having their expectations

confirmed may lead these individuals to be discouraged and subsequently, give up on message elaboration. These individuals may expect the message to be novel and indeed, find the message to be novel. However, we suspect that novelty does not play a role in message elaboration for these individuals because their low levels of message elaboration are already being driven by the confirmed level of difficulty.

Located in the bottom right corner are the individuals with high subjective and high objective knowledge. In past research, both measures have been positively associated with message elaboration, so higher levels of subjective and objective knowledge should have higher levels of message elaboration. However, contrary to what many may believe, these individuals had lower levels of elaboration. These individuals feel that they are knowledgeable about the object, which may lead them to expect that they would not acquire new information from the message and that message elaboration would be easy. When these individuals process the message, their expectations about the message are confirmed because their levels of objective knowledge are high. They may not be motivated to process the message, as they may not see a gain in processing information of which they already know, and thus, they do not engage in message elaboration.

Located in the bottom left corner are individuals with high subjective and low objective knowledge, who had high levels of elaboration. These individuals feel that they are knowledgeable about the object, which may lead them to expect that they would not acquire new information from the message and that message elaboration would be easy. However, when these individuals try to engage in elaboration, they may find elaboration to be more difficult and the information to be more novel than they expected, which may

surprise these individuals. Past research has shown that surprise attracts individuals' attention (e.g., Itti & Baldi, 2005), which may be why these individuals to engage in elaboration. In addition, these individuals may be motivated to engage in elaboration, as they feel that they have the ability to engage in message elaboration because they believe that they have substantial knowledge about the object.

Located in the top right corner are individuals with low subjective and high objective knowledge, who had high levels of elaboration. These individuals feel that they are not knowledgeable about the object, which may lead them to expect difficulties when processing the message. However, when these individuals try to engage in elaboration, they may find the elaboration to be less difficult and the information to be not as novel as they expected, which may make these individuals pleasantly surprised. This may draw their attention and lead them to engage in elaboration. In addition, these individuals expect that message elaboration would be difficult, which may lead them to put extra effort into engaging in message elaboration. When they realize that message elaboration is actually easy, they have already engaged in message elaboration.

Table 16

Matched and Mismatched Levels of Knowledge.

	Low Objective Knowledge	High Objective Knowledge
	Low Elaboration	High Elaboration
Low Subjective Knowledge	<ul style="list-style-type: none"> • Expected elaboration difficulty: High • Actual elaboration difficulty: High • Expected message novelty: Novel • Actual message novelty: Novel 	<ul style="list-style-type: none"> • Expected elaboration difficulty: High • Actual elaboration difficulty: Low • Expected message novelty: Novel • Actual message novelty: Not Novel
	High Elaboration	Low Elaboration
High Subjective Knowledge	<ul style="list-style-type: none"> • Expected elaboration difficulty: Low • Actual elaboration difficulty: High • Expected message novelty: Not Novel • Actual message novelty: Novel 	<ul style="list-style-type: none"> • Expected elaboration difficulty: Low • Actual elaboration difficulty: Low • Expected message novelty: Not Novel • Actual message novelty: Not Novel

Carry-Over Effects.

Our results supported our prediction that the subjective measure first condition would have less carry-over effects. First, for both studies, we found that the subjective and objective knowledge correlation to be slightly lower for the subjective measure first condition than the objective measure first condition. However, this was not significant. We probed this difference using a meta-analysis, which revealed this difference to be marginally significant for a two-tailed test, $z = 1.82, p = .07$. Given that we have a

directional prediction (i.e. the subjective more first condition should have lower a correlation), a one-tailed test is permissible. If so, then the subjective measure first condition would have a significantly lower correlation between subjective and objective knowledge than the objective measure first condition, $z = 1.82$, $p = .03$.

Second, we found a greater number of effects under the subjective measure first condition than objective measure first condition. Between all primary and supplementary analyses of the three studies, we determined that 8 of the 12 effects that included measure order had stronger effects under the subjective measure first condition. This also suggested that the subjective measure first condition generated less carry-over effects.

Limitations and Future Directions

When designing these studies, we took a number of precautions to maximize the chances that these results would provide us with meaningful results. We selected the attitude objects (i.e., nuclear power and the legalization of marijuana) based on a series of pre-tests, which indicated the objects had substantial variability in terms of subjective knowledge, objective knowledge, and initial attitudes. Pre-testing also indicated that initial attitudes were weakly correlated with the two measures of knowledge. The results in our preliminary analyses confirmed these results. Furthermore, pre-testing of the persuasive messages indicated that the strong messages generated more message consistent thoughts than the weak messages. The results in our primary analyses confirmed these results, as strong messages led to more elaboration than weak messages.

In our design, we tested for carry-over effects by counter-balancing measure order. We found that more effects emerged when participants received the subjective

measure first than when they received the objective measure first. Additionally, our preliminary results revealed that the reliabilities for all our measures were quite high ($\alpha = .88$ to $.96$). Furthermore, between our two studies, we had two different attitude objects, as well as messages in both positive and negative directions, which should have increased the reliability and generalizability of our results. Finally, for both studies, we had close to an optimal sample size of 40 participants per cells, which was based on the assumption our highest order prediction was an 18-cell three-way interaction.

Though we took many precautions in our study design, we found some limitations after reviewing our results, which could be addressed in future studies. First, the sample size was near optimal for the two studies but only if we collapsed measure order. However, we have reason to believe that the subjective measure first condition is the superior measure order because our results suggest that the subjective measure first condition may be less likely to have carry-over effects than the objective measure first condition. Thus, we believe that only using the subjective measure first condition for future studies is justifiable. If we were to only consider our results by the subjective measure first, then effectively, the sample sizes would have been cut in half, which would have been closer to the minimal sample size. By having the same sample size and removing an independent variable (i.e., measure order), we would be able to increase the power of our analyses.

Second, many effects emerged in our studies, however, we found only three effects that were consistent across both studies. The effect of most theoretical interest was a three-way interaction between argument quality, subjective knowledge, and objective knowledge under the subjective measure first condition. While these results are

interesting, we are cautious to further interpret preceding replication. This is because the numerous statistical tests in our studies may have increased the chances for the random emergence of these effects. Though it is already unlikely for this complex pattern of results to emerge consistently in both studies, a replication of these results would further demonstrate the robustness of these effects.

However, if these effects did replicate a third time, then we would investigate the mechanisms that underlie the three-way interaction among argument quality, subjective knowledge, and objective knowledge. We speculated that these effects may be driven by expected and actual difficulty, as well as expected and actual novelty of the message. Thus, we could manipulate expected and actual difficulty, as well as expected and actual novelty to investigate the mechanisms driving these effects.

Finally, in our two studies, subjective knowledge and objective knowledge were measured, so we cannot infer causality in our results. Manipulation of these variables would aid us in inferring causality of these two types of knowledge. In addition, we would be able to minimize the correlations between subjective and objective knowledge, which would help to unconfound our results. For future studies, we would like to manipulate subjective and objective knowledge by introducing of a novel attitude object. This novel object would be fictional, which would deny participants from having pre-existing attitudes and knowledge about the object. We could manipulate subjective knowledge by providing participants with an ostensible knowledge quiz, in which we would tell participants that they are knowledgeable or unknowledgeable regardless of their quiz result. We could manipulate objective knowledge by providing some participants with more information and others with less information.

Beyond addressing the limitations of our studies, there are a number of other future directions for our program of research, as working knowledge is just the tip of the iceberg. According to See *et al.* (2014), there are many other attitude properties (e.g., attitude ambivalence, attitude certainty, attitude importance, etc.) that could be separated into subjective and objective measures. Thus, we could extend our study of working knowledge to these other attitudinal properties. These subjective and objective measures could have different influences on attitudinal consequences such as persuasion and message elaboration.

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Appendix A

Ethics Documents

Letter of Information **POWER**

This research project POWER is being conducted by Dr. Leandre Fabrigar and Matthew Kan of the Department of Psychology at Queen's University.

In this study you will be asked to answer several questions regarding your thoughts and opinions about an object, as well as read a passage about object. We estimate answering these questions will take about 15 minutes. There are no known physical, psychological, economic, or social risks associated with this study. This study has been granted clearance according to the recommended principles of Canadian ethics guidelines, and Queen's policies.

Although it would be greatly appreciated if you answer all questions as frankly as possible, you should not feel obliged to answer any questions that you find objectionable or that make you feel uncomfortable. You may withdraw from this study at any time up until the end of the study by notifying the experimenter. This will not affect your compensation and your data will be destroyed. Because responses are anonymous, once the study is completed you can no longer withdraw your data.

We will keep your responses confidential. We will store the data in a locked room until the data is no longer needed. Only authorized personnel will have access to this area. To help us ensure confidentiality, please do not put your name on the questionnaire. The data may also be published but any such presentations will be of general findings and will not breach individual confidentiality. Should you be interested, you are entitled to a copy of the findings. Furthermore, if this research is published, the data will be released upon request to authorized researchers. However, no identifying information will be provided.

In exchange for your participation in all tasks in this experimental session, we will indicate that you have earned 1.0 of a maximum of 5.0 credits toward your final Psychology 100 grade, or \$5 if you have arranged with the research assistant to be compensated monetarily.

Any questions about study participation may be directed to the Dr. Leandre Fabrigar, (613-533-6492, fabrigar@queensu.ca) or Matthew Kan (matthew.kan@queensu.ca). Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at chair.GREB@queensu.ca or 613-533-6081. Again, thank you. Your interest in participating in this research study is greatly appreciated.

Leandre R. Fabrigar
Associate Professor

Matthew Kan
MSc Candidate

**Consent Form
POWER**

Name (please print clearly): _____

1. I have read the Letter of Information and have had any questions answered to my satisfaction.
2. I understand that I will be participating in a study called POWER. I understand that this means that I will be asked to answer several questions regarding my thoughts and opinions about an object, as well as read a passage on the object.
3. I understand that my participation in this study is voluntary and I may withdraw at any time. I understand that every effort will be made to maintain the confidentiality of the data now and in the future. I understand that the data will be stored in a locked room and only authorized personnel will have access to this area. The data may also be published but any such presentations will be of general findings and will never breach individual confidentiality. I understand that if the data is requested by other researchers, the information provided will not permit others to ascertain my identity.
4. I understand that any questions about study participation may be directed to Dr. Leandre Fabrigar, (613-533-6492, fabrigar@queensu.ca) or Matthew Kan (matthew.kan@queensu.ca). Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at chair.GREB@queensu.ca or 613-533-6081.
5. I understand that I may withdraw from this study at any time up until the end of the study by notifying the experimenter. This will not affect my compensation and my data will be destroyed. However, because responses are anonymous, once the study is completed I acknowledge that I can no longer withdraw my data.
6. I understand that this study has been granted clearance according to the recommended principles of Canadian ethics guidelines, and Queen's policies.

I have read the above statements and freely consent to participate in this research.

Signature: _____

Date: _____

Debriefing Form
POWER

In the study, you were first given an attitude measure towards nuclear power. This was just to gauge your initial opinion towards nuclear power. Subsequently, you were given two measures of knowledge on nuclear power. One measure gauges how much you think you know and the other gauges how much you actually know. We refer to these measures as subjective and objective measures, respectively. You might think that how much you think you know closely relates with how much you actually know but that is not often the case. For example, you could know a lot about a topic but feel like you do not know much. Conversely, you could feel like you know a lot about a topic but actually not know much. Past research has not made a clear differentiation between subjective and objective knowledge in terms of their influence on the information processing of persuasive messages. Thus, our goal is to investigate the differences subjective and objective knowledge in terms of their influence on the information processing of persuasive messages. We expect that people with high subjective knowledge may not extend enough effort carefully thinking about the information because they already feel like they know a lot about the topic and do not need to carefully think about the information. We also expect that people with high objective knowledge will process information faster because of their knowledge enhances their ability to do so.

Please note that all information provided to you in this study is not necessarily accurate. That is, you were given a persuasive message that presented you with information about nuclear power. This information was all made up and is not based on actual research. Therefore, you should be aware that everything in the message is not necessarily true.

If you are interested in learning more about this area, the following publication is recommended:

See, Y. H. M., Petty, R. E., & Fabrigar, L. R. (2008). Affective and cognitive meta-bases of attitudes: Unique effects on information interest and persuasion. *Journal of personality and social psychology*, 94(6), 938.

Any questions about study participation may be directed to the Dr. Leandre Fabrigar, (613-533-6492, fabrigar@queensu.ca) or Matthew Kan (matthew.kan@queensu.ca). Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at chair.GREB@queensu.ca or 613-533-6081.

Your participation in this study is greatly appreciated and your responses will be kept confidential. We ask you to please not discuss this project with anyone, as this is an on-going study and knowledge about the procedure or our hypothesis may alter the results we obtain from future participants. Thank you very much for your cooperation and your participation in this study.

Dr. Leandre R. Fabrigar

Matthew Kan, MSc Candidate

Letter of Information PAPER

This research project PAPER is being conducted by Dr. Leandre Fabrigar and Matthew Kan of the Department of Psychology at Queen's University.

In this study you will be asked to answer several questions regarding your thoughts and opinions about an object, as well as read a passage about object. We estimate answering these questions will take about 15 minutes. There are no known physical, psychological, economic, or social risks associated with this study. This study has been granted clearance according to the recommended principles of Canadian ethics guidelines, and Queen's policies.

Although it would be greatly appreciated if you answer all questions as frankly as possible, you should not feel obliged to answer any questions that you find objectionable or that make you feel uncomfortable. You may withdraw from this study at any time up until the end of the study by notifying the experimenter. This will not affect your compensation and your data will be destroyed. Because responses are anonymous, once the study is completed you can no longer withdraw your data.

We will keep your responses confidential. We will store the data in a locked room until the data is no longer needed. Only authorized personnel will have access to this area. To help us ensure confidentiality, please do not put your name on the questionnaire. The data may also be published but any such presentations will be of general findings and will not breach individual confidentiality. Should you be interested, you are entitled to a copy of the findings. Furthermore, if this research is published, the data will be released upon request to authorized researchers. However, no identifying information will be provided.

In exchange for your participation in all tasks in this experimental session, we will indicate that you have earned 1.0 of a maximum of 5.0 credits toward your final Psychology 100 grade, or \$5 if you have arranged with the research assistant to be compensated monetarily.

Any questions about study participation may be directed to the Dr. Leandre Fabrigar, (613-533-6492, fabrigar@queensu.ca) or Matthew Kan (matthew.kan@queensu.ca). Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at chair.GREB@queensu.ca or 613-533-6081.

Again, thank you. Your interest in participating in this research study is greatly appreciated.

Leandre R. Fabrigar
Associate Professor

Matthew Kan
MSc Candidate

**Consent Form
PAPER**

Name (please print clearly): _____

1. I have read the Letter of Information and have had any questions answered to my satisfaction.
2. I understand that I will be participating in a study called PAPER. I understand that this means that I will be asked to answer several questions regarding my thoughts and opinions about an object, as well as read a passage on the object.
3. I understand that my participation in this study is voluntary and I may withdraw at any time. I understand that every effort will be made to maintain the confidentiality of the data now and in the future. I understand that the data will be stored in a locked room and only authorized personnel will have access to this area. The data may also be published but any such presentations will be of general findings and will never breach individual confidentiality. I understand that if the data is requested by other researchers, the information provided will not permit others to ascertain my identity.
4. I understand that any questions about study participation may be directed to Dr. Leandre Fabrigar, (613-533-6492, fabrigar@queensu.ca) or Matthew Kan (matthew.kan@queensu.ca). Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at chair.GREB@queensu.ca or 613-533-6081.
5. I understand that I may withdraw from this study at any time up until the end of the study by notifying the experimenter. This will not affect my compensation and my data will be destroyed. However, because responses are anonymous, once the study is completed I acknowledge that I can no longer withdraw my data.
6. I understand that this study has been granted clearance according to the recommended principles of Canadian ethics guidelines, and Queen's policies.

I have read the above statements and freely consent to participate in this research.

Signature: _____

Date: _____

Debriefing Form
PAPER

In the study, you were first given an attitude measure towards marijuana. This was just to gauge your initial opinion towards marijuana. Subsequently, you were given two measures of knowledge on marijuana. One measure gauges how much you think you know and the other gauges how much you actually know. We refer to these measures as subjective and objective measures, respectively. You might think that how much you think you know closely relates with how much you actually know but that is not often the case. For example, you could know a lot about a topic but feel like you do not know much. Conversely, you could feel like you know a lot about a topic but actually not know much. Past research has not made a clear differentiation between subjective and objective knowledge in terms of their influence on the information processing of persuasive messages. Thus, our goal is to investigate the differences subjective and objective knowledge in terms of their influence on the information processing of persuasive messages. We expect that people with high subjective knowledge may not extend enough effort carefully thinking about the information because they already feel like they know a lot about the topic and do not need to carefully think about the information. We also expect that people with high objective knowledge will process information faster because of their knowledge enhances their ability to do so.

Please note that all information provided to you in this study is not necessarily accurate. That is, you were given a persuasive message that presented you with information about marijuana. This information was all made up and is not based on actual research. Therefore, you should be aware that everything in the message is not necessarily true.

If you are interested in learning more about this area, the following publication is recommended:

See, Y. H. M., Petty, R. E., & Fabrigar, L. R. (2008). Affective and cognitive meta-bases of attitudes: Unique effects on information interest and persuasion. *Journal of personality and social psychology*, 94(6), 938.

Any questions about study participation may be directed to the Dr. Leandre Fabrigar, (613-533-6492, fabrigar@queensu.ca) or Matthew Kan (matthew.kan@queensu.ca). Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at chair.GREB@queensu.ca or 613-533-6081.

Your participation in this study is greatly appreciated and your responses will be kept confidential. We ask you to please not discuss this project with anyone, as this is an on-going study and knowledge about the procedure or our hypothesis may alter the results we obtain from future participants. Thank you very much for your cooperation and your participation in this study.

Dr. Leandre R. Fabrigar

Matthew Kan, MSc Candidate

Appendix B

Study One Persuasive Messages

Strong Message

Nuclear Is Not the Answer

Proposals for construction of new nuclear power plants in British Columbia and Alberta have recently been submitted for consideration by the provincial government.

Angela Palmer, a member of the appointed Committee on Energy Development, argues that Canada does not need to and cannot afford to build more nuclear power plants.

Recent reports have suggested that energy in Canada should be generated with nuclear power plants. People in favour of nuclear power cite the damage to the environment from fossil fuel sources and suggest that nuclear power avoids damage to the environment. There is more to the story, however.

There are numerous problems with nuclear energy processes, ranging from the process of developing the fuel for the reactors to the lack of adequate disposal technologies of radioactive waste. These factors make it an unwise choice for future energy needs.

Before the production of energy, fuel for nuclear reactors needs to be mined and then highly refined - processes in which workers and unwary citizens may be exposed to radioactive particles and dust.

Subsequent to the production of energy, the nuclear waste needs to be safely disposed. However, scientists from the Canadian Science Foundation agree that no one can guarantee that current technologies for disposal will result in no harm to the environment, humans, or wildlife.

There are numerous problems with nuclear energy processes, ranging from the process of developing the fuel for the reactors to the lack of adequate disposal technologies of radioactive waste. These factors make it an unwise choice for future energy needs.

Before the production of energy, fuel for nuclear reactors needs to be mined and then highly refined - processes in which workers and unwary citizens may be exposed to radioactive particles and dust.

Subsequent to the production of energy, the nuclear waste needs to be safely disposed. However, scientists from the Canadian Science Foundation agree that no one can guarantee that current technologies for disposal will result in no harm to the environment, humans, or wildlife.

Weak Message

Nuclear Is Not the Answer

Proposals for construction of new nuclear power plants in British Columbia and Alberta have recently been submitted for consideration by the provincial government.

Meredith Martin, a member of the Committee on Energy Development, argues that Canada does not need to and cannot afford to build more nuclear power plants.

Recent reports have suggested that more energy in Canada should be generated with nuclear power plants. Advocates of nuclear power suggest that one of the main reasons for building more plants is that nuclear power causes much less damage to the environment than fossil fuel sources.

While nuclear power plants may be less harmful to the environment than other sources of power, their large and unattractive physical design makes them an unwise choice.

Part of the reason the plants are so large is that they are built to last up to 100 years without any major maintenance and there are so many Federal safety regulations and multiple backup systems that the plants end up being about one-third larger than they really need to be.

In addition to its unattractive physical design, building new nuclear power plants will have severe implications on the job market. Both coal based and nuclear based power plants do produce waste. Although coal based power plants create much more waste than nuclear plants, the large amount of waste created from coal burning power plants provides many jobs for truck drivers and landfill operators. New kinds of nuclear power plants, on the other hand, create so little waste that the waste products can be easily and safely stored on site for hundreds of years. Relatively few trucking or landfill jobs are created with the use of nuclear power plants.

Moreover, coal burning power plants require continual maintenance and smokestack emissions monitoring. This will create more jobs. Modern nuclear plants, on the other hand require very little maintenance and about four-fifths the number of employees.

Furthermore, statistics show that there are more Canadian coal mining engineers than nuclear engineers. Constructing more coal power plants will be more suitable to the skill sets of the Canadian labour market. This will decrease the unemployment rate for Canada.

Finally, it is useful to note that while nuclear proponents seem to consider long term energy needs, they often fail to consider the short term human needs. Nuclear power is not the solution.

Appendix C

Study One Measures

Initial Attitudes Scale

Following these instructions there will be a set of words that could be used to describe your overall evaluation of the use of nuclear power. Please use the list provided to describe your evaluation of increasing the number of nuclear power plants. Use the intermediate numbers between 1 and 7 to indicate responses between these two extremes. Work rapidly. Your first reaction is best. Please make evaluations for all of the words provided. This should only take a minute. Please begin.

Good

1 2 3 4 5 6 7

Not at all

Definitely

Undesirable

1 2 3 4 5 6 7

Not at all

Definitely

Dislike

1 2 3 4 5 6 7

Not at all

Definitely

Positive

1 2 3 4 5 6 7

Not at all

Definitely

Objective Knowledge Measure

In the space provided on the next few screens, please briefly list what you know about the topic of nuclear power, as well as any experiences you may have related to this issue. Please list only one point per box and press enter after each separate point. Please write down as many points as you feel is necessary.

You are required to enter something in each box given; however, only enter as many points as you desire.

If you run out of points you may type "none" until no more boxes are presented.

Post-Message Attitudes Scale

Following these instructions there will be a set of words that could be used to describe your overall evaluation of the use of nuclear power. Please use the list provided to describe your evaluation of increasing the number of nuclear power plants. Use the intermediate numbers between 1 and 7 to indicate responses between these two extremes. Work rapidly. Your first reaction is best. Please make evaluations for all of the words provided. This should only take a minute. Please begin.

Bad

1	2	3	4	5	6	7
Not at all						Definitely

Desirable

1	2	3	4	5	6	7
Not at all						Definitely

Like

1	2	3	4	5	6	7
Not at all						Definitely

Negative

1	2	3	4	5	6	7
Not at all						Definitely

Cognitive Response Task

We are interested in what thoughts came to mind while you were reading to the passage on the proposed increased of nuclear power plants in Ontario and Quebec. That is, as you read the passage, you probably had positive, neutral, negative, or unrelated reactions and thoughts. Whatever you thought is perfectly fine. We are simply interested in knowing what those thoughts were.

On the following screens, you will find a series of boxes. Simply type what it is that you were thinking while you read the message about the proposed increased of nuclear power plants in Ontario and Quebec in the boxes provided. Please make sure to press ENTER after each separate thought. Type the first idea that comes to mind in the first box, press enter, then type the second idea in the second box, press enter, and so forth. Please put only one thought or idea in each box.

Only try to record those ideas, reactions, and thoughts that you were thinking while you were actually reading to the nuclear power plant passage. Do not worry about spelling, grammar, or having complete sentences.

Use only as many boxes as you need. If you can remember only four thoughts, use only four boxes. However, you are required to make a response. As such, you may enter the word "none" for the remaining boxes. If you can remember more, use as many boxes as you need. But, you do not have to use every box; only as many as you need.

Please begin now.

Please enter your thoughts in the boxes provided. Please be sure to press enter after each separate thought.

You are required to enter something in each box given; however, only enter as many thoughts as you desire.

If you run out of thoughts you may type "none" until no more boxes are presented.

We now want you to read back over the thoughts that you have listed on the previous screens. FOR EACH BOX THAT YOU HAVE WRITTEN A THOUGHT IN, read the thought and decide if that thought is favourable, neutral, unfavourable, or unrelated towards INCREASING THE NUMBER OF NUCLEAR POWER PLANTS IN ONTARIO AND QUEBEC.

If you typed "none" in a previous box, please select the "no thoughts" button.

Favourable	Neutral	Unfavourable	Unrelated	None

Appendix D

Study Two Persuasive Messages

Strong Passage

It's Time To Legalize Marijuana!

Proposals for the legalization of marijuana in British Columbia and Alberta the next 10 years have recently been submitted for consideration by their provincial governments.

Kevin Hudson, a member of the Committee on Drug Policy, argues for the legalization of marijuana in Canada. He argues that there are many advantages to legalizing marijuana.

Firstly, Marijuana use does not lead to other crimes. Statistics Canada have shown that there is only a correlation of 0.1 between marijuana use and other crimes, which is very low.

In terms of health concerns, marijuana use is safer than tobacco use. In comparison to tobacco, the opponents would argue that the second-hand smoke from marijuana causes cancer and serious lung damage. However, studies have shown that the chance of contracting cancer from second-hand marijuana smoke is minuscule. It usually takes only one "hit" for people to feel the euphoric effects of marijuana and smoking one joint does not generate a lot of smoke. On the other hand, people who smoke cigarettes often need multiple cigarettes to feel the euphoria. The smoking of multiple cigarettes create more toxic fumes.

Additionally, the legalization of marijuana will lower the price of medical marijuana. This will allow poorer families to afford marijuana for medicinal use, such as treatment for glaucoma, epilepsy, and Tourette syndrome.

Moreover, the legalization of marijuana will allow the government to regulate the buying and selling of marijuana. Having the government regulate the industry will allow the government to address the safety concerns of the consumers. Without government regulation, it is unknown what kinds of toxins are contained within marijuana products.

In addition to health advantages, there are environmental advantages of the legalization of marijuana. Marijuana can actually be processed into paper. The use of marijuana as paper will save many trees and thus, help save our environment.

Finally, it is useful to note that those against the legalization of marijuana fail to consider the lives of many people being ruined due to a minor run-in with the law regarding marijuana. The legalization of marijuana is the way to go.

Weak Passage

It's Time To Legalize Marijuana!

Proposals for the legalization of marijuana in Ontario and Quebec in the next 5 years have recently been submitted for consideration by their provincial governments.

Stanley Malone, a member of the Committee on Drug Policy, argues for the legalization of marijuana in Canada. He argues that there are many advantages to legalizing marijuana.

Firstly, in terms of criminal activity, people who use marijuana do not commit other crimes because they are so high and happy that they physically cannot hurt other people or damage people's property.

Secondly, in terms of health concerns, users of marijuana will usually not use other harder drugs because they are usually so overwhelmed with euphoria when smoking marijuana that they do not need to use other harder drugs.

Additionally, although marijuana is somewhat more dangerous than alcohol, we have managed to regulate alcohol in our society, therefore there no reason why we cannot also regulate the slightly more dangerous marijuana. Additionally, legalizing marijuana would allow people to practice self-regulation instead of having government officials regulating citizens' use of marijuana.

Moreover, although marijuana is somewhat more addicting and has health consequences that are a bit more severe than other commonly used legal drugs, it is not clear it is not unmanageable for regular sensible people to use. Many other highly addictive things in our society exist, such as gambling, so why not marijuana? We cannot protect everyone from every addicting thing.

Furthermore, in terms of economic benefits, the legalization of marijuana will boost the tourism industry in Canada. Tourists from all over the world, especially the United States, will want to come to Canada to use marijuana recreationally. The Canadian Tourism Commission expects a 450% increase in revenue in the tourism industry once marijuana is legalized.

Finally, it is useful to note that those against the legalization of marijuana fail to consider the lives of many people being ruined due to a minor run-in with the law regarding marijuana. The legalization of marijuana is the way to go.

Appendix E

Study Two Measures

Initial Attitudes Scale

Following these instructions there will be a set of words that could be used to describe your overall evaluation of marijuana. Please use the list provided to describe your evaluation of legalizing marijuana. Use the intermediate numbers between 1 and 7 to indicate responses between these two extremes. Work rapidly. Your first reaction is best. Please make evaluations for all of the words provided. This should only take a minute. Please begin.

Good							
1	2	3	4	5	6	7	
Not at all							Definitely

Undesirable							
1	2	3	4	5	6	7	
Not at all							Definitely

Dislike							
1	2	3	4	5	6	7	
Not at all							Definitely

Positive							
1	2	3	4	5	6	7	
Not at all							Definitely

Subjective Knowledge Measure

The following questions will be asking about your knowledge towards marijuana.

How knowledgeable do you consider yourself on the issue of marijuana?

1	2	3	4	5	6	7
Not at all						Extremely

How much information do you feel you have about marijuana?

1	2	3	4	5	6	7
None at all						A Great Deal

How knowledgeable do you feel you are about marijuana?

1	2	3	4	5	6	7
Not at all						Extremely

How informed do you consider yourself to be on the issue of marijuana?

1	2	3	4	5	6	7
Not at all						Extremely

Objective Knowledge Measure

In the space provided on the next few screens, please briefly list what you know about the topic of marijuana, as well as any experiences you may have related to this issue. Please list only one point per box and press enter after each separate point. Please write down as many points as you feel is necessary.

You are required to enter something in each box given; however, only enter as many points as you desire.

If you run out of points you may type "none" until no more boxes are presented.

Post-Message Attitudes Scale

Following these instructions there will be a set of words that could be used to describe your overall evaluation of marijuana. Please use the list provided to describe your evaluation of legalizing marijuana. Use the intermediate numbers between 1 and 7 to indicate responses between these two extremes. Work rapidly. Your first reaction is best. Please make evaluations for all of the words provided. This should only take a minute. Please begin.

Bad							
1	2	3	4	5	6	7	
Not at all							Definitely
Desirable							
1	2	3	4	5	6	7	
Not at all							Definitely
Like							
1	2	3	4	5	6	7	
Not at all							Definitely
Negative							
1	2	3	4	5	6	7	
Not at all							Definitely

Cognitive Response Task

We are interested in what thoughts came to mind while you were reading to the passage on the proposed legalization of marijuana. That is, as you read the passage, you probably had positive, neutral, negative, or unrelated reactions and thoughts. Whatever you thought is perfectly fine. We are simply interested in knowing what those thoughts were.

On the following screens, you will find a series of boxes. Simply type what it is that you were thinking while you read the message about the legalization of marijuana in the boxes provided. Please make sure to press ENTER after each separate thought. Type the first idea that comes to mind in the first box, press enter, then type the second idea in the second box, press enter, and so forth. Please put only one thought or idea in each box.

Only try to record those ideas, reactions, and thoughts that you were thinking while you were actually reading to the legalization of marijuana passage. Do not worry about spelling, grammar, or having complete sentences.

Use only as many boxes as you need. If you can remember only four thoughts, use only four boxes. However, you are required to make a response. As such, you may enter the word "none" for the remaining boxes. If you can think of more, use as many boxes as you need. But, you do not have to use every box; only as many as you need.

Please begin now.

Please enter your thoughts in the boxes provided. Please be sure to press enter after each separate thought.

You are required to enter something in each box given; however, only enter as many thoughts as you desire.

If you run out of thoughts you may type "none" until no more boxes are presented.

We now want you to read back over the thoughts that you have listed on the previous screens. **FOR EACH BOX THAT YOU HAVE WRITTEN A THOUGHT IN**, read the thought and decide if that thought is favourable, neutral, unfavourable, or unrelated towards the **LEGALIZATION OF MARIJUANA**.

If you typed "none" in a previous box, please select the "no thoughts" button.

Favourable	Neutral	Unfavourable	Unrelated	None