A SUBJECTIVE MEASURE OF ATTITUDE EXTREMITY: VALIDATION AND EXTENSION

by

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Abstract

Attitudes are individuals' enduring global evaluations of objects, concepts, or ideas, which may vary in both valence and extremity. There are many important determinants of attitudes and attitude strength, with research suggesting that one important determinant is the extremity of one's attitude. The present research explored two possible methods of capturing individuals' attitude extremity through objective and subjective measures. The goal of the current research was therefore to test two propositions: First, that the measures should be largely independent of one another, and second, that each measure would tap into meaningful processes of the functioning of the attitude.

Study one examined the role of objective and subjectively measured attitude extremity on resistance to persuasion attempts. Here, we found that the measures were modestly correlated to one another, and that both exerted independent and opposite effects on persuasion resistance. Study two examined the role of subjective and objectively measured extremity on information processing. We again found modest correlations between the measures, though each measure produced minimal effects on information processing. The exception to this was our finding that individuals' attitudes affected the favorability of their thoughts, and that this effect was more pronounced for objectively extreme attitudes. We discuss implications for this research in the context of the broader attitude strength literature and future directions for this work.

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Genetically Modified Organisms (GMOs)

Milliseconds (ms)

Chapter 1

Introduction

Attitudes typically are defined as evaluations of objects as favorable or unfavorable, and these objects can range on a continuum from very concrete (e.g., a toaster) to very abstract (e.g., a political orientation; Eagly & Chaiken, 1993; Petty, Wegener, & Fabrigar, 1997). Attitudes are often studied for their effect on judgements, behaviors, and perceptions of the world. (Fazio, Chen, McDonel, & Sherman, 1982; Fazio & Zanna, 1981; Zanna, Olson, & Fazio, 1980). Not all attitudes have the same effects, however, and so researchers have turned to attitude strength to help predict situations in which they might occur (Petty et al., 1997; Petty & Krosnick, 1995). Research on attitude strength primarily focuses on its determinants, which helps to better define and predict its effect on attitudes (Petty & Krosnick, 1995).

Features of Attitude Strength

Attitude strength has been conceptualized as the relative durability and impactfulness of an attitude (Petty & Krosnick, 1995). Each of these aspects of attitude strength also have distinct features, which Petty and Krosnick use to further describe attitude strength. First, durability is characterized through persistence or resistance. The persistence of an attitude describes the likelihood for that attitude to remain stable, or unchanged, over time. In contrast, resistance describes the likelihood for an attitude to resist change in the face of a threat (e.g., counter-attitudinal information, persuasion attempts, etc.).

Much as the durability of an attitude has been further broken down into its key features, so too has impactfulness (Petty & Krosnick, 1995). Impactful attitudes can influence information processing and judgments, such that they direct the individual's attention to information. This difference in attention directs the information that people focus on, how carefully they think about the information, how likely they are to see the information as plausible or implausible, and

what information they are likely to remember. As judgments are often closely related to behaviors, it is perhaps unsurprising that strong attitudes can be impactful insofar as they tend to be related to, and guide, behaviors.

There are several comments about the relationships among these attitude strength features that might be relevant. First, an attitude is considered maximally strong when it contains all four of these features and is considered weak to the extent that it lacks all four. In general, these four features tend to co-occur such that to the extent that one feature is true, it is more likely that another feature will also be true (e.g., persistent attitudes tend to be those that also guide behavior). That being said, it is important to note that the features are not redundant. That is, the mere presence of one feature does not guarantee the presence of another feature.

Researchers have long recognized that attitudes vary in their strength on the basis of these features. What has been a primary focus of investigation has been what determines whether they will be strong or weak. Researchers have thus identified a host of properties (i.e., determinants) that will lead to attitudes having these defining features of attitude strength. A few key determinants that have been extensively studied, include but are not limited to: working knowledge, attitude importance, certainty, accessibility, ambivalence, and extremity. An individual's attitude may vary on any number of these determinants, with each uniquely contributing to the durability and impactfulness of the attitude.

Attitude Strength Determinants

One such determinant that has been shown to consistently produce stronger attitudes is working knowledge. Working knowledge is the amount of attitude-relevant information that readily comes to mind (Wood et al., 1985). Knowledge has been demonstrated to impact levels of information processing, such that individuals with greater levels of attitude-relevant information tend to process information more than those with less attitude-relevant knowledge (Biek et al., 1996). Attitudes that are built on the basis of greater attitude-relevant knowledge are also more

resistant to change than those with less attitude-relevant knowledge (Wood, 1982). Attitudes formed on the basis of more knowledge also tend to be more influential on behavior, increasing attitude-behavior consistency for more knowledgeable individuals (Davidson et al., 1985).

In a similar way that knowledge can have a significant effect on the strength of an attitude consider ambivalence as well, which has been consistently demonstrated to affect the strength of attitudes. Ambivalence is concerned with the evaluation of an object as positive or negative, and the extent to which these evaluations are held simultaneously. Here, a highly ambivalent attitude occurs when an individual simultaneously holds very powerful, positive evaluations, and very powerful negative evaluations of the attitude object. In contrast, low ambivalence occurs when an individual holds only positive or only negative evaluations of the object. Indeed, individuals may also be moderately ambivalent, such that they hold both positive and negative evaluations of the object, but one of the two evaluations is more powerful than the other. Ambivalence has an impact on the levels of information processing whereby highly ambivalent attitudes lead to more biased information processing (Nordgren et al., 2006). Highly ambivalent attitudes also lead to greater susceptibility to persuasion attempts that use strong arguments by increasing the level of scrutiny with which the persuasive information is processed (Maio et al., 1996). Attitude-behavior consistency is also significantly affected by the ambivalence of an attitude, such that highly ambivalent attitudes lead to weaker attitude-behavior consistency than do less ambivalent attitudes (Conner et al., 2002). Thus, higher levels of ambivalence (i.e., more ambivalent attitudes) tend to lead to weaker attitudes.

Importantly, these are only illustrative examples drawn from the larger list of determinants that have been linked to attitude strength. Though each of these determinants have demonstrated effects on durability and impactfulness, they are not redundant with one another. That is, though they may correlate with one another, these correlations are indeed quite low,

suggesting that each determinant has separable effects on attitude strength (Holbrook et al., 2005; Krosnick et al., 1993).

Organizing the Determinants of Attitude Strength

One issue that has been of interest in the attitude strength literature is a parsimonious categorization of these determinants. Though there have been attempts to organize the literature, none have gained broad acceptance (e.g., Krosnick & Petty, 1995). However, the focus of the current work is not to adopt a particular categorization of determinants. Rather, the present research focuses on a different method of organizing the determinants of strength by looking at the measurement approaches for each of them.

Primarily, determinants are measured using either objective or subjective measures. An objective measure asks an individual to perform a judgmental task related either to the attitude or the attitude object and an objective property of how the task is performed is assessed. A person's performance of this task is presumed to reflect the determinant. A subjective measure, on the other hand, asks individuals to report their subjective impression of the particular determinant.

Working Knowledge

Consider working knowledge as an example to illustrate some of these differences in measurement type. An objective measure of knowledge, as common in the literature, would ask people to perform an objective task, such as a knowledge listing task, and would measure their performance. A knowledge listing task simply asks people to list all of the beliefs and experiences that they have about the attitude object, assessing performance by counting the number of beliefs or experiences listed (e.g., Wood, 1982). In this task, an individual may be presented with a series of individual text boxes and asked to provide only one belief or experience about the attitude object in each box, leaving subsequent boxes blank if they have no remaining thoughts. A highly knowledgeable individual will tend to list more beliefs or experiences about the object than a less knowledgeable individual. It is presumed that the number of beliefs or experiences that an

individual can list about the topic is therefore representative of the amount of knowledge that they have about the topic.

Importantly, this measure is not objective in terms of the content that is listed. What is objective, however, is the sheer amount of content that is listed; this is a property that could be indexed by, e.g., counting the number of beliefs or experiences that have been listed. Knowledge refers to the total number of other knowledge structures and the strength of the associative links to those knowledge structures. Recognizing this, a person with a large number of strong associative links to an attitude object would be more likely to produce substantial content than someone with weak, or few associative links. As with any measure, in order to be considered a true reflection of knowledge, there are a few assumptions that are being made. The first is that the number of beliefs or experiences that are listed are indeed driven by the attitude network, such that someone with more associative structures in memory will list more about the topic. The second is that the person's ability to retrieve their beliefs and experiences is not significantly impacted by their motivation or other situational factors at the time of retrieval.

In contrast, a subjective measure of working knowledge would have an individual report on the amount of knowledge they are capable of retrieving (Petty et al., 2009). For example, an individual might be asked how well informed, or knowledgeable, they are about a topic on a scale from, e.g., 1 to 7. The individual's subjective perception of their amount of topic-relevant knowledge is therefore their self-reported score on this measure. Here, the content and subsequent rating are inherently subjective measures of an individual's knowledge.

In a similar way that objective knowledge measures have inherent assumptions under which they operate, so too do subjective measures. In the strictest sense, objective and subjective measures are trying to capture the same thing; that is, that individuals can access their knowledge and map it onto a rating scale. The first assumption is that people are interpreting the word knowledge to mean what the researcher intends. This is not self-evident; for the individual,

knowledge might signify the frequency with which the object has been thought about, rather than the amount of content. Further, a subjective measure assumes that the individual has introspective awareness of the contents of their knowledge and that they have a frame of reference for what is a lot or a little knowledge, in order to accurately represent this on the rating scale.

Attitude Ambivalence

Consider attitude ambivalence as another determinant where both objective and subjective measurements have been used. An objective measure of ambivalence would have an individual report their attitude on a unipolar attitude scale where each scale item represents an adjective evaluating the attitude object (e.g., "Good", "Bad", etc.). For example, an individual would be presented with an attitude object and asked to rate how good it is. Then, they would be presented with a second unipolar scale and asked to rate how bad the object is. This process would then continue with several other positive and negative adjectives. An individual's ambivalence score is then determined by calculating an aggregate index of the positive items, and an aggregate index of the negative items. These aggregates are then combined using a mathematical formula (see Priester & Petty, 1996; Thompson et al., 1995). The goal of this analysis is then to look at to what extent individuals are endorsing both positive and negative items, or to what extent they are inversely related (e.g., high positive endorsement, low negative endorsement). An unambivalent attitude would therefore be demonstrated by an individual endorsing the maximum value for the positive (negative) adjectives (i.e., rating "good" as a 7) and the minimum value for the negative (positive) adjectives (i.e., rating "bad" as a 1). In contrast, the most highly ambivalent attitude would be one where the individual endorses the maximum value for both the positive and negative adjectives.

This is considered an objective measure of ambivalence, not because the judgments are objective, but because the relationship between the judgments is an objective property of the

measurement. The logic of this approach is that individuals who have a large number of negative and positive evaluative responses to an object are going to engage in endorsing both aspects; conversely, an individual with only one dominant evaluation will endorse only one. Of course, this measure is also predicated on underlying assumptions such as individuals' ability to introspect about their positive and negative evaluations of an object, separately.

As with working knowledge, ambivalence can also be measured through subjective means. A subjective measure of ambivalence might ask an individual to what extent they feel torn about the attitude object, or to what extent they feel confused about their opinion of the attitude object, rating their endorsement from, e.g., 1 to 7. For example, Thompson et al. (1995) asked individuals for their level of agreement with statements such as "I'm confused about (euthanasia) because I have strong thoughts about it and I can't make up my mind one way or another." Again, as with knowledge, individuals' perceptions and subsequent ratings of their ambivalence is an inherently subjective assessment.

There are also some assumptions inherent in subjective measures; for example, they assume that the individual is construing the items to reflect holding both positive and negative evaluations of the object. Consider the example of confusion, from Thompson and colleagues. Though confusion could certainly mean ambivalence, it could also be construed as one's certainty about the attitude object, such that a lack of confusion might indicate a more certain attitude. Of course, the individual also needs a frame of reference for what is a little or a lot of, e.g., confusion or mixed thoughts and so it may not be the case that everyone interprets their relative ambivalence in the same way.

Understanding the Objective and Subjective Measurement Difference

Though both types of measurement have been used, the ways in which these measures relate to one another has historically been less clear. Traditionally, these two types of measures have been treated in one of three ways. The first perspective is that both types of measurement for a given

determinant are largely interchangeable. The second perspective is that the types of measurement are capturing unique constructs and one measure is better. The final perspective is that both measures are capturing unique constructs and that both provide important insights.

Both Measures are Interchangeable

The perspective that both measures are interchangeable is one that has not been explicitly stated but is one that has emerged as a basic assumption inherent in many methodological practices that have been common in the literature. The assumption is that both objective and subjective measures are different ways of capturing the same underlying construct. This has been demonstrated in several ways in the literature.

The first way in which researchers might demonstrate their implicit assumptions about the interchangeability of measures is when they use different measures within the same article without justification (e.g., Davidson et al. 1985). In study one, Davidson et al. employ objective measures in the form of knowledge listing tasks, finding a moderating effect of knowledge on attitude-behavior consistency. In study two, Davidson et al. use subjective measures by asking participants about their level of knowledge of the topic, where they again find support for a moderating effect of knowledge on attitude-behavior consistency. In no point in the article do they make any mention of changing measurement type, implying their interchangeability.

While using both types of measures within, or between, studies makes an implicit assumption about the interchangeability of the measures, a more explicit demonstration of this assumption can be seen in studies that have aggregated the two measures. Indeed, this has often been the case in studies of ambivalence. For example, Hänze (2001) used both subjective and objective assessments of ambivalence when assessing individuals' speed with which they took action on a topic. In measuring subjective ambivalence, they used a single item and in capturing objective ambivalence, they used several unipolar scale items (e.g., Kaplan, 1972). When

analyzing the results, Hänze treats both measures as capturing the same underlying construct, aggregating the objective and subjective measures into an index of ambivalence.

If both measures are indeed capturing the same construct, as these results could suggest, it might also seem reasonable to interchangeably use the measures for manipulation checks. For example, Jonas et al. (1997) use both a subjective and objective assessment of ambivalence in the same study. To assess individuals' subjective ambivalence, they were asked to rate statements about their simultaneous positive and negative beliefs about the attitude object while their objective ambivalence was assessed by rating unipolar statements about the attitude object as good or bad. They then use both measures to perform a manipulation check, without distinguishing their results on the basis of the measures.

Research on knowledge has sometimes taken a similar approach. Johnson (1994), for example, uses objective and subjective measures interchangeably to perform a manipulation check on high- vs low-knowledge conditions. In pretesting, the high-knowledge condition demonstrated higher scores on the objective and subjective measures, while the low-knowledge condition produced lower scores on the measures. Treating these measures as interchangeable in order to demonstrate an overall successful knowledge manipulation is a slightly more overt statement about the interchangeability of the measures.

If one, however, considers findings in the ambivalence or knowledge literature, it should not be surprising that they have treated both measures as capturing the same underlying construct. Indeed, the results of both objective and subjectively measured determinants often line up quite reasonably with theoretical expectations. For example, Kallgren and Wood (1986) and Davidson et al. (1985), both found support for the theory that knowledge moderates the relationship between attitudes and behaviors (i.e., attitude-behavior consistency), despite Kallgren and Wood using objective measures and Davidson et al. using subjective measures . This has also been the case in the ambivalence literature. For example, both Conner et al. (2002), and Costarelli and

Colloca (2007) have demonstrated that increased ambivalence leads to decreased attitude-behavior consistency. Here, while Conner et al. use objective ambivalence measures, Costarelli and Colloca find similar results using subjective ambivalence measures. Since the objective and subjective measures for knowledge and ambivalence both produced results as expected, it likely would not have caused concern for any of these researchers, and the presumption that both measures are capturing the same construct would appear to be valid.

In each of the examples provided, it appears that there was no difference in the findings regardless of whether the researcher used an objective, subjective, or aggregate measure, suggesting that perhaps both measures are capturing the same construct. The problem, however, is that these measures do not tend to be strongly correlated with one another. For example, Wood et al. (1995) note that the correlation between objective and subjective measures of knowledge are quite low, $r = .29$. Wood's findings are not specific to her research; consider Krosnick et al. (1993) as well, who also find modest correlations, $r = .29$, between the objective and subjective measures of knowledge. These findings are typical and reoccurring in the literature.

Indeed, this is true for ambivalence as well; Thompson et al. (1995) and Priester and Petty (1996) both demonstrate that the correlations between a host of formulas for calculating objective measures, and a subjective measure of ambivalence can be quite low ($r = .27$, $r = .36$, respectively) or, at best, relatively modest ($r = .49$, $r = .44$, respectively). The similarity of the correlations even across several studies and among different authors suggests that these correlations are not spurious or related only to a particular context. Indeed, Jonas et al. (1997) find very modest correlations between the objective formulas and the subjective measure $r = .49$, as do Newby-Clark et al. (2002), $r = .40$. These modest correlations are problematic, because it should be true that measures of the same construct are highly correlated with one another.

There are alternative explanations for these modest correlations, however. They might, for example, be due to measurement error. If this were the case, we would expect that taking

measurement error into account should increase the correlation between the two measures substantially. However, if this were true then it must mean that the reliabilities of the two types of measures are quite poor. For example, even if we assume that the higher correlation for ambivalence measures of $r = .44$ is the most accurate, reliabilities for those scales should be around .50 in order for the two measures to be correlated at $r = .80$, in reality. Any scale that has such poor reliability would be hard pressed to consistently produce any demonstrable effect, which has been demonstrated to be untrue. Problematically for this argument, however, is that many of these authors did report their reliabilities and they are not poor. Kallgren and Wood (1986), for example, find that the knowledge listing task– a measure of objective knowledge – has an inter-rater reliability of .95. Kaplan (1972) also finds good reliability for his measure of objective ambivalence, $\alpha = .81$, while Jonas et al. (1997) find good reliability for their subjective ambivalence measure, $\alpha = .91$.

If these measures are not highly correlated with one another, and it does not appear to be due to measurement error, then there must be an alternative explanation for the modest correlations. Some researchers have interpreted this to mean that the two measures are capturing unique constructs (Bassili, 1996).

The Measures are Separable, and One is Better

Some researchers have argued that objective and subjective measures are not interchangeable measures capturing the same underlying construct. In fact, the lack of redundancy between the two measures is some of the evidence that researchers cite when arguing that they are separable. One interpretation, when arguing that the measures are separable, is that one measurement type is better. On one side of this discussion, researchers have argued that objective measures are better (e.g., Bassili, 1996; Haddock et al., 1999). On the other side, some have implied that subjective measures might be better (e.g., Newby-Clark et al., 2002).

Objective Measures are Better. Considering the "objective is better" perspective first, one demonstration can be found in Haddock et al. (1999). They suggest that researchers should be careful about the use of subjective measures of strength determinants because they often do not provide accurate reflections of the underlying constructs that they are intended to capture. To illustrate this point, they argued that subjective measures of attitude strength determinants such as certainty, intensity, and importance are inherently more susceptible to context manipulations than are objective measures. In one study, for example, individuals with moderate attitudes reported that they were less certain, had less intense attitudes, and that their attitudes were less important when they were asked to generate many arguments, rather than a few, about a topic (a difficult task). This finding was unusual because listing more thoughts typically leads to greater attitude certainty, which runs counter to these findings (Albarracin & Johnson, 2018). The logic for Haddock et al., then, was that certainty, intensity, and importance – each of which are captured with subjective measures – were affected by individuals' transitory subjective experience of greater difficulty, rather than some comparatively stable objective property of the attitude.

Haddock et al.'s (1999) findings are in line with arguments that other researchers have made, such as Bassili (1996), who posed a more overt argument about the superiority of objective measures. Bassili refers to the separability of what he calls operative and meta-cognitive measures of attitude strength determinants, which map closely onto the objective and subjective measures that I have been referring to throughout. In the first demonstration of this position, Bassili factor analyzed a host of attitude strength determinants and found that the subjective measure for a given determinant often did not load on the same factor as its objective counterpart. Rather, across three topics of interest, the subjective and objective measures of each determinant often loaded on separate factors. Bassili took the results of this factor analysis to further argue that objective measures of any determinant are more similar to one another (e.g., objective

ambivalence and objective knowledge) than are subjective and objective measures of the same determinant (e.g., subjective and objective ambivalence).

Given that the objective measures were more similar to one another than they were to their subjective counterparts, Bassili took these measures and formed an objective and a subjective index. He then looked at the ability for the indices to predict relevant attitude strength outcomes like stability over time, finding that the objective indices were better predictors of stability than were the subjective indices. Bassili also looked at the predictive value of each of the indices in the context of resistance – specifically, if individuals changed their attitudes in the face of counterarguments – and again found that the objective index performed better than the subjective index.

Subjective Measures are Better. Bassili reflects a clear preference for objective measures. Looking at the attitude strength literature more generally, however, it is not clear that this position is universal. Consider the ambivalence literature, for example, where subjective measures implicitly tend to be preferred. For example, in a series of studies Newby-Clark and colleagues (2002) asked individuals to report their levels of potential and felt ambivalence. Of particular note are the conceptualizations of potential and felt ambivalence. That is, when discussing objectively measured ambivalence, the authors refer to this as potential ambivalence. In contrast, when they refer to ambivalence measured subjectively, they refer to this as felt ambivalence. The central goal of the research was to consider when, and to what degree, potential ambivalence was related to felt ambivalence. Implicit in both this question and in the terminology used is that potential ambivalence is just that – potential – unless it corresponds with felt ambivalence. This further implies that an objective measure might be seen as the less direct or less preferable measure.

This implicit way of thinking can be found in other areas of the ambivalence literature as well. The typical standard for evaluating the adequacy of an objective measure, for example, is

how well it predicts the subjective measure. In this validation literature, there is an implicit assumption that objective measures are inferior to subjective measures. The implication is that there must be a high degree of correspondence between the objective and subjective measures, or else the objective measure is not a good indicator of ambivalence. This also implies that the subjective experience of ambivalence is central to the construct and any measure that fails to capture that subjective feeling should be deemed less adequate. Finally, this interpretation is further supported by the asymmetry with which validation assessments have occurred, such that there does not appear to be any researchers evaluating subjective ambivalence measures with respect to objective ambivalence measures.

Following this logic, both Priester and Petty (1996) and Thompson et al. (1995) assessed a range of objective formulas for calculating ambivalence on the basis of their relation to a subjective measure. Though the results differed slightly for each article, the central point was the same. In nearly all cases, the objective measures of ambivalence were not redundant with the subjective measures, consistent with a separability argument. For Priester and Petty, this led to the proposal of a new formula for calculating objective measures which mapped more closely onto the subjective measure, while for Thompson et al. this led to the recommendation of adopting the formula which correlated most strongly with the subjective measure.

The Measures are Separable, and Both are Important

Recently, however, a new perspective has emerged. This perspective also recognizes that the measures are separable, but it gives no special primacy to objective or subjective measures. That is, each measure can provide unique insights into the functioning of attitudes. Moreover, while acknowledging that subjective measures may not be accurate in capturing objective properties of attitudes, this perspective argues that a person's mere subjective beliefs could nonetheless be consequential. This view has been most explicitly articulated and tested by See et al. (2008, 2013) in the context of affective and cognitive bases of attitudes.

Affect refers to the emotions that individuals experience associated with the attitude object, while cognition refers to the beliefs that people have about positive and negative attributes of the attitude object. Researchers have explored the notion that some attitudes can be predominantly based on affect or on cognition, which they refer to as affective or cognitive attitude bases. Though attitude bases are not a strength determinant, the construct is nonetheless tied into many of the same processes that strength determinants are, such as attitude-behavior consistency and persuasion resistance (e.g., Fabrigar & Petty, 1999; Millar & Tesser, 1989).

Importantly, as See et al. (2008) have noted, in much the same way as determinants can be measured objectively or subjectively, so too can affective and cognitive attitude bases. In the case of objective measures, individuals make affect judgments and belief judgments, and report their attitude toward the attitude object. Then, researchers calculate the congruency between the affective base and the global attitude score, as well as the cognitive base and the global attitude score. These congruency scores are then compared to one another; if the affective-attitude congruency score is higher, then the individual's attitude is presumed to be based primarily on affect. Conversely, if the cognitive-attitude congruency score is higher, their attitude is presumed to be based primarily on their beliefs. For subjective bases, individuals answer to what extent they feel that their attitude is driven by their affect or their cognitions. Whichever subjective base the individual reports relying more on is thus their primary subjective attitude base.

In a similar way as with attitude strength determinants, the correlation between these objective and subjective measures tends to be quite weak, ranging from $r = -.02$ to $r = .18$. What See et al. have shown, however, is that each can be used to predict consequences related to attitudes. Importantly, the processes involved in those consequences also appear to be largely independent of one another. What they propose is that objective bases reflect the efficiency with which individuals can process information. For example, people who have a stronger affective-objective attitude base can process affective information more efficiently, while someone with a

stronger cognitive-objective attitude base can process cognitive information more efficiently. In contrast, subjective attitude bases reflect the information that people are interested in and believe they should rely on. Because they reflect efficiency, objective measures often operate outside of intentional control, whereas subjective measures involve more intentional processes.

See at al.'s (2008) results provide preliminary support for this speculation. For example, given these different processes, it might be the case that different bases should predict opposite effects in some situations. See and colleagues (2013) tested this prediction by examining the role of objective and subjectively measured bases in a reading time paradigm. Individuals received a combination of affective and cognitive information and their time spent reading each type of information was recorded. Here, as predicted, they found that objective attitude bases were negatively related to reading time, such that individuals spent less time reading information that matched their objective base. This was in line with their theoretical expectations that objective bases lead to increased efficiency in information processing. For subjective bases they found, as predicted, that individuals spent more time reading information that matched their subjective base. This was a direct result of motivational factors driving subjective interest in the information.

Of course, there might be cases where the same outcome is produced, despite these differences in measurement. In this case, See et al. suggest that the same result will be produced but will reflect different processes. For example, they hypothesize that in the context of persuasion, an individual who has an affective (cognitive)-objective attitude base will be more persuaded by affective (cognitive) information because they are more efficient at processing this information. They also predict that someone who has an affective (cognitive)-subjective attitude base will again be persuaded by affective (cognitive) information but that this is because they are more motivated to process this type of message.

In a test of this, See et al. (2008) demonstrated a persuasion matching effect that differed by attitude base, with measurement type accounting for unique variance. They found two key

effects; first, they found an interaction such that people were more persuaded when information matched their subjective attitude base, and second, that individuals were more persuaded when information matched their objective attitude base. When accounting for the effect of the other measure in a regression model, they found that objective attitude bases accounted for unique variance in persuasion beyond the effect of subjective bases, and subjective attitude bases accounted for unique variance beyond the effect of objective bases. Thus, though the outcome was the same, each measure accounted for unique variance in the outcome variable and, indeed, controlling for the other variable had virtually no effect on the results.

Finally, See and colleagues predicted that each of the measures may also produce similar effects but under different circumstances. They suggest, for example, that individuals will use certain types of information more, depending on whether they have ample time to think (i.e., thoughtful processing) or not (i.e., nonthoughtful processing). They argue that under nonthoughtful conditions, individuals will tend to use information based on their objective attitude base to make their judgments because objective bases reflect processing efficiency, while under thoughtful conditions they will use information that is consistent with their subjective base, reflecting intentional motivation.

To test this, individuals were presented with information describing several film or class-related video clips that were either high in their cognitive or in their affective qualities. They were then asked to rate the qualities of these clips and their preference for watching the clip or film. From this, See and colleagues (2008) found that under nonthoughtful conditions, individuals' objective bases were more predictive of their use of information matching their objective base when ranking their preference for the film or clip. For example, affective-objective based attitudes were more predictive of relying on affective information to make this decision, while cognitive-objective based attitudes were more predictive of relying on cognitive information. In contrast, individuals' subjective bases were more predictive of their use of information matching

their subjective base, under thoughtful conditions. For example, affective-subjective based attitudes predicted greater use of affective information, while cognitive-subjective based attitudes predicted greater use of cognitive information. These results demonstrate that similar effects may be produced (e.g., the individuals' dominant attitude base was predictive of information use) under different circumstances, such as under thoughtful or nonthoughtful conditions.

There are at least a few implications for this research. Primarily, this perspective that each measure is useful could be applied to attitude strength determinants. For example, in the case of working knowledge, it could be the case that objective measures correspond to the amount of knowledge that individuals bring to a given task, which in turn should be related to the ease with which they are able to access knowledge. Conversely, subjective measures might capture perceptions of what information is important, which may drive the desire obtain more information. In both cases, the objective and subjective measures should both drive use of information, but as a result of different processes, do so under different conditions. Thus, if this is true, it would help to explain why the measures are largely independent of one another, and why they produce nearly parallel results, despite being modestly correlated. This is not unique to the knowledge literature, of course; this perspective could be tied back to many of the findings in the attitude strength determinants literature, and one would expect that this perspective could provide reasonable explanations for many of the findings (e.g., ambivalence). To date, however, these possible extensions to other areas of the literature have been largely unexplored.

Attitude Extremity

The goal of this thesis is extending the findings of this third perspective to other attitude strength determinants. In principle, the perspective could be applied to any attitude strength determinant. However, there are some differences in terms of how objective and subjective measures of determinants have been explored in the literature. For some determinants, as in knowledge and ambivalence, both measurement types have tended to be used. Indeed, it could be

useful to use this perspective to clarify existing findings in these areas, as well as to explore the mechanisms underlying those effects. On the other hand, there are some literatures where only one measurement type has tended to be used. Though no researchers have taken the perspective that the other measure would not be useful, these literatures have focused primarily on one measure, while leaving the other relatively untested. Applying this perspective to a literature where this has been the case could thus be interesting as it suggests that there may be unique effects that have not yet been recognized. Thus, it could be the case that research in this area is more useful, because so little is known about both measures and their relation to one another.

One area of the literature where only one measure has tended to be used is attitude extremity. Attitude extremity is the extent to which an attitude deviates from neutrality and has been documented to be linked to the strength of an attitude. For example, Wilson et al. (1989) have demonstrated that more extreme attitudes are related to increased attitude-behavior consistency. Other researchers have demonstrated the ability for extreme attitudes to resist change in the case of susceptibility to persuasion attempts (e.g., Osgood & Tannenbaum, 1955; Bassili, 1996; Tesser et al., 1995). Additionally, more extreme attitudes have been demonstrated to distort the interpretation of information more than moderate attitudes (e.g., Fiske & Taylor, 1991; Lord et al., 1979; Ross & Nisbett, 1991). Though these are just a few notable examples, they demonstrate how attitude extremity is consistently related to the strength of an attitude.

In a similar way as attitude extremity can produce important consequences, there has also been research examining the processes that initially lead to the development of extreme attitudes. For example, research on processes leading to polarization has demonstrated that attitudes become more polarized (i.e., extreme) in response to repeated expressions of the attitude (Brauer et al., 1995), in response to mere exposure of a stimuli, regardless of valence (see Zajonc, 1968), and even after engaging in discussions with like-minded individuals via group polarization (Isenberg, 1986). This research has also been extended, finding that individuals are often not

aware of the extent to which their attitudes have become polarized, instead misjudging the degree to which their attitudes have become more extreme (Van Boven et al., 2012).

In considering these findings, it is interesting to note that all of the research mentioned here has relied on an objective approach to measuring attitude extremity. Specifically, they measure extremity by calculating the degree of deviation from the midpoint of the attitude measure (Krosnick et al., 1993). As such, an objective measure of attitude extremity first has an individual report their attitude on a global attitude scale. Using a unipolar attitude measure, an individual is presented with an attitude object and is asked to rate a variety of adjectives evaluating it, such as how good it is, from, e.g., 1 to 7. They are then asked, on a separate scale item, to rate how bad the object is. This process then repeats with several other adjectives, each representing a positive or negative evaluation of the attitude object. Then, to calculate the objective extremity for a given individual, researchers take the individual's average attitude score and calculate the absolute deviation of the score from the midpoint of the scale. This is done, in the case of a 7-point scale, by taking the absolute value of the difference between the attitude score and 4 (or the scale's midpoint); this generates an objective extremity score for each person ranging from a score of 0 (no extremity) to a score of 3 (maximum extremity). When using a bipolar measure, the process is quite similar except that individuals are asked to rate an attitude object where the endpoints of the scale are labelled with opposing adjectives (e.g., -3 (Bad) to +3 (Good)). In this case, one's attitude extremity score is simply the deviation from 0, rather than from 4.

Though the judgment of one's attitude is an inherently subjective judgment, this measure is an objective measure of extremity because it captures the objective deviation from the midpoint of the scale. There are, however, a few assumptions that are inherent in this approach. The first assumption, given that objective measures of extremity rely on global attitude measures, is that people have introspective awareness of their attitudes, such that they can report their attitude on

an attitude scale. Importantly, the treatment of this measurement as objective also presumes that the objective midpoint of the scale corresponds to the psychological midpoint of the construct. For example, on a bipolar scale it could be the case that the endpoints of -3 (Terrible) and +3 (Good) are not equally extreme representatives of the opposing endpoints; in this instance, for example, it may be the case that terrible is a more powerful descriptor than good, such that individuals will tend to respond more positively than they would if both endpoints were psychologically equivalent. A similar issue arises with unipolar scales as well, where it may be the case that good and bad are separate scale items but are still not equally extreme representatives of the endpoints of the scale. In this instance, people may tend to respond more extremely to the 'good' adjective than to the 'terrible' adjective, simply because the negative adjective is psychologically more extreme. In either instance, the endpoints or scale items would be expected to have a consistent effect on the ways that individuals respond to the measure. Thus, a response at the middle of the scale may not be psychologically neutral, or an extreme response may not be psychologically extreme.

This objective measurement type is the way that extremity has typically been tested in the literature. However, the perspective proposed by See et al. (2008, 2013) suggests that subjective measures could also provide important insights. Though no subjective measure of extremity has been formally proposed in the literature, a subjective measure of extremity should follow a similar logic as other subjective measures discussed in knowledge or ambivalence. That is, individuals would simply be asked to report how extreme they perceive their attitude to be. However, this question is not necessarily an intuitive one to answer, and certainly it is not clear that subjective extremity measures should fully map onto objective extremity measures, particularly given that objective and subjective judgments may rely on different frames of reference. If, for example, you are asked about your opinion of slavery, you may report on an objective measure that your attitude towards it is very extreme; however, when asked your

subjective opinion of how extreme your attitude is, you may report it to be not extreme at all. Perhaps you view the extremity of your attitude of slavery in normative, rather than absolute, terms and so a strongly negative opinion is not extreme to you at all, though it is objectively so.

There is good reason, therefore, to think that subjective measures might be interpreted differently than objective measures. The question, however, is whether responses to subjective extremity measures can provide important insight above and beyond an objective measure. If See and colleagues are correct, then this may indeed be the case. To date, however, no one has examined systematic differences between the two measures. Therefore, the first goal of this thesis is to construct an adequate subjective extremity measure to test these differences. To date, this has only been done a few times and in a very cursory fashion, often with a single item (e.g., Flynn & Goldsmith, 1999; Miller et al., 1993). In constructing a subjective measure, it is also important to determine if the measure has key psychometric properties that make it a valid measure. The second goal is to gauge to what extent the objective and subjective measures of extremity relate to each other. Based on the logic already articulated, we predict that they will be comparatively independent. The final goal of this thesis is to examine if the subjective measure has separable effects on attitude-relevant outcomes. This goal will be explored through two studies: study one will explore whether extremity is associated with increased resistance to persuasion, while study two will examine whether attitude extremity moderates the effect of attitudes on information processing.

Chapter 2

Pretesting

Pretest 1

Introduction

To examine the ways in which attitude extremity relates to key attitude strength findings, it was first necessary to determine suitable attitude objects. The goal of this pretesting was therefore to identify attitude objects that had a broad distribution of attitudes, varying on both extremity and valence; specifically, attitudes toward a topic should not be stacked entirely on one side of an issue. This variation in attitudes allows information processing and persuasion resistance to be tested more readily, which are the relevant phenomenon that will be explored.

Method

Participants

In order to examine variations in attitudes towards attitude objects, a global attitude measure was administered to participants ($N = 20$) recruited from the Queen's University Psychology Participant Pool. Participants completed the pretesting as part of a larger study package containing several other studies for bonus credit.

Measures/Procedures

For each attitude object, participants were presented with the object (i.e., a noun) and were asked to rate their attitude. To report their attitude, participants completed a (Crites et al., 1994) global attitude measure, which demonstrated good reliability for each of the attitude objects presented here (α = .89-.94). This measure has participants rate an object on the basis of eight adjectives (e.g., "Good", "Bad", etc.) by reporting their evaluation of each adjective on a 7-point unipolar scale response, with labelled endpoints 1 (*Not at all*) and 7 (*Definitely*), indicating their level of endorsement for each adjective. Negatively phrased items are reverse coded such that

more positive attitude scores represent a more positive attitude towards the attitude object. After rating each of the 10 attitude objects, participants continued to the rest of the studies in the package.

Results and Discussion

The average attitude ratings for each of the 10 attitude objects is presented in Table 1. The goal of this pretesting was to select attitude objects that were viable and for which passages would be created for the main studies. An optimal object in this phase was identified as one for which participants' attitudes were near the midpoint of the scale; an attitude object whose rating is near the midpoint (i.e., 4) is optimal because such an object allows for meaningful variation in attitudes. Specifically, some participants should be favorable towards the object, while others should be not favorable.

There are a number of ways that an average rating of 4 (the midpoint) could occur, however, and not all of these imply that an attitude object is optimal. For example, participants could be highly polarized in their opinions of the attitude object. In this situation, approximately half of the participants may hold a maximally positive attitude while the other half hold a maximally negative attitude toward the object. Though attitudes here are very polarized and extreme, the average attitude would still be 4; however, in this case the distribution would show a very high standard deviation and the distribution should be platykurtic (i.e., negative kurtosis). This distribution is not optimal because it signals that there is a lack of variation in the extremity of individuals' attitudes, thereby reducing the likelihood of finding either of the key effects in the main studies at varying levels of attitudinal extremity.

Another situation in which participants' attitudes would appear near the midpoint is if their opinions were truly neutral; here, no one is particularly positive, and no one is especially negative in their opinion of the attitude object. If this were true, we would expect to see a

relatively small standard deviation and a leptokurtic (i.e., positive kurtosis) distribution. This distribution is not optimal because there is no substantial variation in opinions.

Finally, an average attitude score of 4 could be achieved in instances where individuals hold a mix of positive and negative attitudes and these attitudes are approximately normally distributed. If this were the case, the standard deviation should be somewhere around 1 or 1.5, indicating that most individuals' attitudes are within ~1.5 scale points of neutral and that more extreme attitudes are less common. Though a standard deviation of 1 would correspond to a normal distribution, a standard deviation closer to 1.5 may be slightly more optimal for our purposes. This distribution of attitudes indicates that most individuals have moderate attitudes, but that there is substantial variation in individuals' distribution of scores. This range of attitudes, in turn, is directly related to the variation in one's attitude extremity on the topic, signaling a varied distribution of extremity towards the topic.

The results of the present pretesting are outlined in Table 1. In the present pretesting, some items were immediate contenders for being removed from consideration based on their distributional properties. For example, items such as animal testing and tanning beds had quite low average attitude ratings, while other objects such as Apple or laser eye surgery were substantially above the midpoint of the scale. Since attitude ratings for these objects were substantially more extreme than the midpoint, they did not allow for a large range of attitudes, and do not serve as good attitude objects. This is particularly problematic because it does not allow us to capture individuals on the opposite side of the issue (e.g., those strongly opposed to laser eye surgery or strongly in favor of animal testing). Though not as extreme, we can look to an object such as vegetarianism (M = 5.1) and see that it is slightly more than one scale point above neutral. Though this does not necessarily make the object bad, a more optimal object would fall within one scale point.

Table 1.

Frequencies of Attitude Objects (Pretesting 1).

Attitude Object	Attitude Rating			
	M	*SD*	Kurtosis	Skewness
Genetically Modified Organisms (GMOs)	3.9	1.1	-0.06	-0.07
Vegetarianism	5.1	1.8	-0.82	-0.05
Laser Eye Surgery	5.4	1.2	1.49	-0.96
Apple (company)	5.9	1.1	0.52	-1.16
Protein Shakes	5.0	1.8	-0.68	-0.51
Animal Testing	1.8	1.0	0.66	1.21
Tanning Beds	2.3	1.0	-1.48	-0.09
Plastic Surgery	3.2	1.4	2.23	0.75

Note. In the original iteration of this pretesting we also considered marijuana and nuclear power. Given that they were used in other studies and thus could not be used in the current research, we did not include them in the final presentation of attitude objects.

Given a range of one scale point within neutral, we are then left with three attitude objects: GMOs, protein shakes, and plastic surgery. Indeed, plastic surgery initially appears to fall quite reasonably into the criteria outlined earlier. Problematically, however, it has a very high kurtosis and relatively high skewness. Specifically, a kurtosis of 2.23 means that the distribution is very leptokurtic, such that a large majority of individuals hold attitudes that are near the mean of 3.2. Thus, most people are likely to hold moderately negative attitudes towards plastic surgery with minimal variation and few positive attitudes. In contrast, genetically modified organisms (GMOs, $M = 3.9$, $SD = 1.1$) and protein shakes ($M = 5.0$, $SD = 1.8$) have more suitable distributions. Though opinions of protein shakes are slightly above the midpoint, the larger standard deviation means that it is not unreasonable for individuals within one standard deviation to be below the midpoint or for others to be substantially above the midpoint, allowing for greater

variation in opinions. Further, the kurtosis and skewness of protein shakes are quite reasonable; the distribution is not especially positively skewed, and the distribution is somewhat flat.

GMOs are thus the most optimal attitude object given the attitude object's distributional properties. Attitudes towards GMOs tend to have an average score near the midpoint and reasonable standard deviation, as well as a relatively normal distribution, which collectively indicate an optimal distribution consistent with the criteria outlined prior. Though GMOs more closely aligned with our theoretical criteria for an optimal attitude object, we opted to retain protein shakes in the next iteration of pretesting as it was also a reasonable attitude object and would provide greater variability in the passages that we could test.

Pretest 2

Introduction

Before launching the two main studies to test attitude strength paradigms, it was also necessary to pilot test the subjective attitude extremity measure. The subjective attitude extremity measure was constructed drawing on prior literature which attempted to capture subjective extremity using single-item measures (e.g., Bassili, 1996). Though these measures captured some aspects of how individuals may perceive their attitudes to be extreme, there are a number of ways to capture subjective extremity. For example, one could ask for individuals' perceptions of the extremity of their attitude without any frames of reference or with multiple frames of reference, which might be expected to change their interpretation of the extremity of their attitude. In order to capture these differences, we developed a subjective attitude extremity measure to capture multiple frames of reference. This pretesting phase tests the psychometric properties of the measure and compares it to existing objective attitude extremity measures.

Method

Participants

For this phase of pretesting, participants (N = 82) were recruited from the Queen's University Psychology Participant Pool. Participants completed this pretesting in exchange for course credit as part of a broader study package containing several other studies. For this phase, approximately half of the participants rated protein shakes as the attitude object (N = 38), while the other half rated GMOs (N = 44).

Measures and Procedure

Participants were randomly assigned to complete measures asking about their attitude towards either protein shakes or GMOs. Participants completed the Crites et al. (1994) global attitude measure, which was also used to calculate individuals' objective attitude extremity. This is the same measure that was used in pretest 1, calculated slightly differently to capture objective extremity. Here, participants again reported their attitude on a 7-point unipolar scale response towards a series of positive and negative evaluative adjectives, and each negative item was reverse scored. After participants report their attitude, this measure is recoded to capture participants' objective attitude extremity. To calculate objective extremity, 4 (the midpoint) is subtracted from each participant's average attitude score, after all negative items are reverse coded. The absolute value of this difference yields an objective attitude extremity score ranging from 0-3. Once the objective attitude extremity scores were calculated for each participant, we also calculated their subjective attitude extremity scores.

In addition to the objective extremity measure, participants were also asked to report their subjective attitude extremity. The measure is comprised of three items, which each attempt to capture unique aspects of how one could judge their attitude to be extreme. Here, participants rated their subjective extremity on a 4-point scale response with labelled endpoints *Neutral* and *Extreme* for each item. This yields a subjective attitude extremity score ranging from 0-3, which

is the same scaling as the objective attitude extremity measure. The first item did not include a particular frame of reference, allowing participants to freely judge their subjective extremity: "I consider my opinion of [topic] to be _____." The second item uses an interpersonal frame of reference, asking participants to draw on normative influences underlying their extremity judgment: "Other people might consider my opinion on [topic] to be _____." The third, and final, item uses an intrapersonal frame of reference, asking participants to draw on their ratings of other attitude objects to form their subjective judgment: "Compared to my feelings on other issues, I would consider my feelings towards [topic] to be ____."

Results and Discussion

Of interest for this phase of pretesting were the psychometric properties of the subjective attitude extremity measure and its relation to the established objective extremity measure. In exploring the relevant psychometric properties, we first wanted to establish good reliability for each of the measures. The subjective extremity measure demonstrated acceptable-good reliability when both GMOs (α = .74) and protein shakes (α = .87) were the attitude object. The objective extremity measure was derived from the global attitude measure, which demonstrated good reliability for both GMOs and protein shakes (α = .94, .95). Beyond the reliability of the measures, we also wanted to explore the inter-item correlations for each of the items of the subjective extremity measure, which are presented in Tables 2 and 3. For ease of presentation, the item using no frame of reference is referred to as 'No frame', the item using a normative frame of reference is referred to as 'Others' since it refers to others' opinions, and the item using an intrapersonal frame of reference is referred to as 'Other issues' since it refers to the individual's opinion relative to other issues.

There are a few findings that were expected when looking at the inter-correlation matrix for the subjective extremity measure. First, we[1] expected that all of the items should be substantially correlated with one another. Indeed, across both topics this appears to be the case, with correlations ranging from $r = .39$ to $r = .62$. Beyond this, we expected that there should be predictable differences in correlation amongst the measures depending on the frame of reference (or lack thereof) that is used.

Table 2.

GMO correlation matrix for Subjective Attitude Extremity Measure (Pretest 2).

	1	2	3
1. No Frame		.60**	.49**
2. Others			.39**
3. Other Issues			

1. Pearson's correlation coefficients are reported. ** Indicates a significant correlation with $p < .01$.

For example, if our theory that merely asking an individual to rate the extremity of their attitude is drawing on multiple frames of reference, then it should be the case that the two items using a frame of reference are more strongly related to the no frame item than they are to one another. Indeed, as can be seen in Table 2, 'Others' and 'Other issues' do tend to be more strongly correlated with the 'No frame' item (*rs* = .60, .49) than they do with one another (r = .39). This pattern of correlations is most explicit with GMOs, though the general pattern can be seen in Table 3 when protein shakes are the topic, such that 'Others' is more strongly related to the 'No frame' item ($r = .82$) than it is to the 'Other issues' frame of reference item ($r = .62$).

[1] Though I wrote this thesis, I use the term "we" in place of this throughout. The usage of this term reflects the work of this project as being in consultation with my supervisor, and is the term that will be used in the event of any manuscripts or publications deriving from this thesis.

Table 3.

Protein shake correlation matrix for Subjective Attitude Extremity Measure (Pretest 2).

	1	2	3
1. No Frame		.82**	.62**
2. Others			.63**
3. Other Issues			

1. Pearson's correlation coefficients are reported. ** Indicates a significant correlation with $p < .01$.

Additionally, if each of the frames of reference are indeed components of the more general 'No frame' question of one's subjective extremity, we would expect that the two frame of reference items should be most weakly related to one another. Indeed, this was the case for GMOs ($r = .39$) but was not the case for protein shakes ($r = .63$), though the differences in correlations between this and the lowest correlation are negligible.

Table 4.

Summary of Objective and Subjective Extremity Scores and Intra-Correlations, by topic.

	Objective Attitude Extremity		Subjective Attitude Extremity		Pearson's r
	M	*SD*	*M*	*SD*	*r*
1. GMOs	1.1	0.8	1.0	0.7	.19
2. Protein Shakes	1.5	0.8	0.9	0.8	.58

Finally, we wanted to examine the relationship between the objective and subjective extremity measures. The summary of this comparison is found in Table 4. The first thing to note is that the objective and subjective extremity scores are quite comparable to one another, particularly for GMOs. Despite this, however, the correlations between the measures suggest that the measures are not redundant with one another, contrary to what we would expect if they were capturing the same construct. Indeed, this finding is consistent with the perspective proposed by See et al. (2008). Their perspective suggests that if both measures were capturing the same

construct, they should be highly correlated with one another, to the point of redundancy. Though a common criticism of See et al.'s perspective is that lower correlations may be due to a lack of scale reliability, this criticism does not appear valid in the current context. As mentioned earlier, both measures indeed demonstrated acceptable-good reliability across both attitude objects. Despite this, the measures are indeed correlated with one another, to a substantial extent in the case of protein shakes, suggesting that there is some overlap in the constructs that are being captured by both measures.

Pretest 3

Introduction

Before beginning the main studies, it was also necessary to pilot test the proposed passages of information that would be used throughout. In constructing suitable passages, some needed to include information that was pro-GMO/protein shakes, and some needed to include information that was anti-GMO/protein shakes and this information needed to vary in its extremity. Given that some people will be in favor of the attitude object and some will be opposed to the attitude object, testing the biasing effects of extremity on information processing, as per study two in this package, requires that some of the messages participants receive vary in their position (pro vs anti-topic) as well as their extremity.

In addition, testing persuasion resistance requires that each participant receives information that is counter to their attitude but that this information is not too extreme or too moderate. Information that is too extreme does not allow any participants to resist the counter-attitudinal arguments, while information that is too weak will not be persuasive for any participant. As a result, we needed to test information that varied in its extremity for both paradigms and needed to ensure that participants rated this information consistent with the intended extremity of the passage.

Method

Participants

Participants in this phase were the same as those used in pretest 2. Participants completed the measures from pretest 2 and read the information from this phase in one session, though the analyses were sufficiently different that they will be treated as distinct pretesting phases.

Measures and Procedure

Participants followed the same procedure as in pretest 2, reporting their objective and subjective extremity and reading passages of information about either protein shakes or GMOs. After receiving each passage, participants rated the passage on a 4-point scale response with labelled endpoints *Neutral* and *Extreme*. For each object, passages were neutral, mildly positive (negative), moderately positive (negative), or extremely positive (negative). We constructed two passages for each valence (e.g., 2 neutral, 2 mildly positive (negative), etc.) and, as a result, participants rated and read fourteen passages with information about one of the two attitude objects. Positive passages were framed as advocating for the use of GMOs (e.g., arguing in favor of GMOs) while negative passages were framed as advocating against the adoption of GMOs. A list of the verbatim materials used in this pretesting can be found in Appendix D.

Results and Discussion

The results of participants' ratings of the GMO passages are presented in Table 5, and the ratings of the protein shake passages are presented in Table 6. In interpreting these results, we considered a few key metrics. First, the average ratings for each gradation in intensity should approximately correspond to our expectations of the intensity of the passage. Here, a score of 1 represents absolute neutrality and a score of 4 represents absolute extremity. Given that each of these items are at the endpoints of the scale, it would be very unlikely that a score is ever 1 or 4, but the closer the averages are to these numbers, the more closely they align with their intended

extremity. Thus, a score of 1 is optimal for neutral passages, a score of 2 is optimal for mild passages, 3 for moderate, and 4 for extreme passages.

The results of participants' ratings of the GMO passages are presented in Table 5. The first thing to note from these results is that each of the neutral and mildly positive (negative) passages lined up quite reasonably with expectations. The neutral passages had averages near 1 and very small standard deviations, indicating that most participants rated the neutral passages as neutral. The mildly positive and mildly negative passages also lined up quite well with expectations, with averages near 2 for each of the mild passages. The moderately positive passages were close to their intended extremity, while the moderately negative passages were rated as slightly milder than we expected and were revised in a second iteration of pretesting. Finally, both the positive and negative extreme passages were slightly below the expected extremity. These problematic passages are bolded in Table 5 below. As a result, we revised the moderately negative passages, as well as the positive and negative extreme passages. The ratings of these revised passages are reflected in Table 5.

Table 5.

Extremity ratings of GMO passages.

Intended Extremity (Topic)	Extremity Rating	
	M	*SD*
Neutral 1	1.6	0.2
Neutral 2	1.7	0.2
Mildly Positive 1	2.3	0.9
Mildly Positive 2	2.4	0.8
Moderately Positive 1	2.7	0.7
Moderately Positive 2	2.4	0.7
Extremely Positive 1	**2.7**	**0.7**
Extremely Positive 2	**3.0**	**0.9**
Mildly Negative 1	2.3	0.8
Mildly Negative 2	2.2	0.8

Moderately Negative 1	**2.1**	**1.0**
Moderately Negative 2	**2.3**	**0.6**
Extremely Negative 1	**3.0**	**1.0**
Extremely Negative 2	**3.3**	**0.6**

The extremity ratings of the protein shakes are presented in Table 6. The initial finding to note here is that the neutral and mildly positive (negative) passages are rated substantially higher than we would have expected. The neutral passages here are rated as nearly mild (~2), with large standard deviations indicating minimal agreement of the extremity of these passages. Beyond this, the mildly positive passages are practically indistinguishable from one another; in fact, the second mildly positive passage was rated as more extreme than the second moderately positive passage. Though the moderate positive and negative passages lined up reasonably well with our expectations, the positive extreme passages were rated as substantially lower than we expected. Though the extremely negative passages performed quite well, the other passages deviated substantially from what we expected and, thus, we opted to retain only GMOs as the attitude object to be carried forward to the main studies, needing only minor revisions to be suitable.

Table 6.

Extremity ratings of Protein Shake passages.

Intended Extremity (Topic)	Extremity Rating	
	M	*SD*
Neutral 1	1.7	0.9
Neutral 2	1.9	1.1
Mildly Positive 1	2.4	0.8
Mildly Positive 2	2.5	0.8
Table 6 (continued).		
Moderately Positive 1	2.6	0.8
Moderately Positive 2	2.5	0.7
Extremely Positive 1	3.2	0.9
Extremely Positive 2	3.2	0.9

Mildly Negative 1	2.4	0.8
Mildly Negative 2	2.3	0.8
Moderately Negative 1	2.5	0.7
Moderately Negative 2	2.7	0.8
Extremely Negative 1	3.6	1.0
Extremely Negative 2	3.6	0.9

Pretest 4

This pretesting followed identical procedures as those used in pretest 3 and was designed to refine the problematic passages for GMOs in that pretesting.

Method

Participants

Participants ($N = 10$) were recruited from the Queen's University Psychology Participant Pool. Participants completed this pretesting for course credit as part of a broader study package containing several other studies.

Measures and Procedure

In a similar manner as pretest 3, participants completed the Crites et al. (1994) global attitudes scale, as well as the subjective attitude extremity measure in counterbalanced order. Then, they read 2 moderately negative, 2 extremely positive, and 2 extremely negative passages of information about GMOs, in randomized order. Participants rated each of these passages for their extremity using the 4-point item from pretest 3, with labelled endpoints *Neutral* and *Extreme*.

Results and Discussion

The results of the revised passages are presented in Table 7. The first thing to note is that these revised passages line up much more closely with our expectations. The moderately negative passages now have averages that are much closer to 3, indicating that most participants found that the passages were indeed moderate in extremity. As well, the extremely positive and extremely

negative passages line up much more reasonably with our expectations; though the lowest average for these extreme passages is 3.3, this is much closer to our intended extremity than the previous iteration of these passages. Given these revised passages, we felt that the new passages were acceptable and rated consistently with their intended valence, making them suitable for the main studies, in conjunction with the passages from pretest 3.

Table 7.

Extremity Ratings of the Revised GMO Passages (Pretest 4).

Intended Extremity (Topic)	Extremity Rating	
	M	*SD*
Extremely Positive 1 (Revised)	3.4	0.8
Extremely Positive 2 (Revised)	3.3	0.9
Moderately Negative 1 (Revised)	2.7	0.5
Moderately Negative 2 (Revised)	2.7	0.5
Extremely Negative 1 (Revised)	3.6	0.8
Extremely Negative 2 (Revised)	3.6	0.7

Chapter 3

Study One

Introduction

Study one attempts to further validate the subjective measure of attitude extremity and considers the relationship of this measure to an established objective extremity measure. One of the key effects that relates attitude extremity to attitude strength is its ability to predict persuasion resistance (e.g., Osgood & Tannenbaum, 1955; Bassili, 1996; Tesser et al., 1995).

Though researchers examining this effect have provided minimal speculation for why extreme attitudes should be related to persuasion resistance, work by Sherif & Sherif (1967) on social judgement theory may help to inform the process by which objectively extreme attitudes operate in resisting persuasion. Their theory, focusing on latitudes of acceptance and rejection, suggests that there may be a range of acceptable valences and extremities for which an individual is willing to accept new information (i.e., latitude of acceptance). They suggest that information which falls significantly outside of the latitude of acceptance enters the latitude of rejection. This information is very unlikely to be accepted by the individual, and they will consistently tend to reject this information. This effect may be particularly pronounced for individuals who are very extreme in their views, as most opposing information will be likely to fall into the latitude of rejection.

Consider, for example, an individual who feels very strongly that the Liberal Party of Canada is the only viable political party. Any information that is not extremely favorable towards this party, therefore quickly falls out of the latitude of acceptance, even if that information is quite moderate or even neutral. In contrast, an individual who considers themselves politically moderate may be much more likely to entertain information that is on either side of their position. This is particularly important in the context of persuasion resistance wherein we expect that those

who hold extreme attitudes should be more likely to resist counter-attitudinal information, because it is likely to be in their latitude of rejection. Finally, we posit that this effect may be most likely if objective extremity operates under nonthoughtful processes, consistent with Sherif and Sherif's postulation that these latitudes of acceptance are akin to perceptual processes. Indeed, an individual may intuitively rate their attitude as extreme and oppose counter-attitudinal information, influenced by these processes, but the mere presentation of attitude-inconsistent information should not modify one's subjective rating of their extremity as this only modifies perceptions of the counter-attitudinal position.

While this is one possible mechanism for the tendency of objectively extreme attitudes to resist persuasion, which is essential to this paper, See et al. (2008) would suggest that an alternative method of measuring extremity should operate under a fundamentally different process. As perceiving one's subjective extremity is a higher order process, we expect that a more effortful mechanism may therefore be underlying the effect of subjective extremity on persuasion resistance. Specifically, it may be the case that individuals have cognitive consistency pressures leading them to tend to interpret new information in light of their pre-existing cognitions. Further, these consistency pressures are likely to be stronger for extreme attitudes than they are for moderate attitudes. Interestingly, Osgood and Tannenbaum (1955) made a similar point when they explored extremity. They speculated that consistency pressures may underly attitude extremity processes more generally, though it is important to note that at the time that they were theorizing, there was little distinction between objective and subjective attitude extremity.

Though previous extremity research has focused on using an objective measure, it was expected that subjective attitude extremity would also be related to increased persuasion resistance. Therefore, this study uses both an objective and subjective attitude extremity measure to predict resistance to change. This study therefore serves to help validate the subjective attitude extremity scale and attempts to understand if there is some unique predictive value attributable to

each of the scales. Consistent with See et al.'s (2008, 2013) perspective that both measures are separable and provide meaningful insight, in a regression model we expect to find two main effects for each method of measuring extremity on attitude change. As well, a two-way interaction between these two variables would also be consistent with their perspective, though it is not explicitly predicted.

Method

Participants

Participants were recruited via the Queen's University PSYC 200 Participant Pool during the fall and winter terms of 2019-20, and from the PSYC 100 Participant Pool during the spring/summer 2020 term. and were enrolled in a course for which they were eligible to receive bonus credit for their participation. The highest order interaction effect that was reasonably expected was a 2 (high/low objective extremity) x 2 (high/low subjective extremity) 2-way interaction. Though the objective and subjective extremity scores are continuous in the strictest sense, our pretesting suggested that participants should be primarily high or low on each of these and, further, that these measures should be relatively orthogonal to one another. Conceptually, therefore, we can think of the design as a 4-cell design; allowing for 50 participants per cell, we aimed to collect 200 participants. Indeed, in a statistical model an interaction between two continuous variables has the same number of parameters as a 2 x 2 dichotomous design. Because we collected data in two waves, we overshot our goal slightly, collecting 276 participants. After removing participants that completed less than 50% of the study (N = 42), 234 participants remained. Based on our calculations, this provides 95% power for detecting a small effect size, given a possible interaction (Erdfelder et al., 1996).

Procedure

First, passages were constructed that were of mixed intensity. The goal in constructing these passages is to create passages that are sufficiently compelling as to produce some attitude

change, but not so compelling that the information is impossible to resist. One method of constructing these passages would be to use the moderate extremity passages used in pretesting. Using these passages could be useful because the passages have been pretested and are of moderate intensity. An alternative method of constructing passages of mixed intensity is to use a combination of sentences from the mild and extreme passages. Using this method allowed for a range of intensities in the passage, which has at least one major benefit. With this, participants who wanted to resist the information presented were able to use the mildly extreme passages to counter-argue. On the other hand, participants who were open to accepting the new information were more likely to experience a change in attitude as a result of the more extreme pieces of information. Though each method of constructing mixed intensity passages were reasonable approaches, we opted for constructing passages that consisted of both mild and extreme sentences as we felt that this would provide a greater range of responses to the persuasion attempts. The mild and extreme passages were those which were tested in pretests 3 and 4. Specifically, half of the sentences in the mixed intensity passages were drawn from the mild passages and half of the sentences were drawn from the extreme passages, creating two passages of mixed intensity; one passage advocated for GMOs and one advocated against GMOs. Verbatim materials that were used here can be found in Appendix E.

This study was administered to participants using the Qualtrics survey platform. First, participants received a global attitudes measure, and the subjective attitude extremity measure in one of two counterbalanced orders. This initial global attitude measure served to capture participants' pre-message attitude. Participants then received one of the two passages about GMOs that was counter to their attitude, dependent on their response to this pre-attitude measure[2]. Specifically, if the sum of a participant's responses to the positive adjectives in the

[2] One possible artifactual explanation for enhanced persuasion resistance for extreme attitudes is that if participants have extreme attitudes and receive pro-attitudinal messaging, they have very little or no room to change their attitudes. In contrast, a participant with a milder attitude (e.g., 5 on a 7-point scale) is able to

attitude measure was greater than the sum of their responses to the negative adjectives, they received the negative (i.e., anti-GMO), mixed intensity passage of information. In contrast, participants whose negative attitude score was greater than their positive attitude score received positive (i.e., pro-GMO), mixed intensity information. All of the passages, both here and in study two, discussed the topic of GMOs, focusing on genetically modified foods such as crops. The message was framed explicitly as an advocacy message, advocating for a position that was counter to the participants' attitude. After receiving the counter-attitude information, participants were again asked to report their attitude towards GMOs using a post-message global attitudes scale and were asked to provide their thoughts in a cognitive response.

Measures

Pre-message attitudes. The pre-message attitude scale used was the Crites et al. (1994) global attitude scale. This measure demonstrated good reliability (α = .95) and is the same as that used in pretests 2-4. Scores for the pre-message attitudes were approximately neutral, *M* = 3.9, with a standard deviation, *SD* = 1.5, and distributional properties, skew = -0.1, kurtosis = -0.9.

Objective Extremity. As with pretest 2, the Crites et al. (1994) was recoded to compute a measure of objective attitude extremity for each participant. In general, participants were mild in their extremity, *M* = 1.3, and were approximately normally distributed, *SD* = 0.8, with a slightly positive skew (skew = 0.4) and playkurtic distribution (kurtosis = -0.6).

Subjective Extremity. The subjective attitude extremity scale used here was identical to that used in pretest 2, demonstrating good reliability (α = .81). Given that the measure demonstrated good reliability both here and in pretesting, we retained all three items. The exact wording of the items is outlined in pretest 2 and in Appendix G. Each of the items were rated on a 4-point scale response with endpoints *Neutral-Extreme*. To calculate subjective extremity an

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shift their attitude up to 2 full scale points in response to this information. However, we note that in this study participants received exclusively counter-attitudinal information, so attitude change would only be expected in a counter-attitudinal direction. Thus, we do not expect that this should be a concern.

average across the three items was calculated. That is, higher numbers represent more extreme responses, and lower numbers represent less extreme responses across all items. The average score across the items thus represents the subjective extremity of the individual's attitude towards GMOs, ranging from 0 (Neutral) to 3 (Very Extreme). Participant's perceptions were that their attitudes were mild, $M = 0.9$, with a standard deviation of 0.7, skew = 0.2, kurtosis = -1.0.

Post-message attitudes. The post-message attitude scale was derived from the Crites et al. (1994) global attitude scale and demonstrated good reliability ($\alpha = .94$). The measure was the same as the pre-message attitude measure but had participants rate their attitude toward GMOs on an 11-point scale response ranging from 1 to 11, with labelled endpoints *Not at all* and *Definitely*. By using an 11-point scale response, we attempted to reduce the likelihood of participants engaging in consistency bias, whereby they attempt to respond comparably to a post-message attitude to maintain consistency with their initial response. The mismatching scale points makes this consistency much more difficult for the participant to achieve. Participants' post-message attitudes were mildly positive, $M = 5.8$, $SD = 2.2$, skew = 0, kurtosis = -0.8.

Thought Listing Task. The thought listing task that participants performed after reading the counter-attitudinal message was a cognitive response task. Here, participants were simply asked to list up to five thoughts that came to mind while they were reading the information and to type none in the remaining boxes, if they had no other thoughts. Though there a number of indices that could be constructed, we focused on just two for these analyses: 1) an index of message-valence consistency, and 2) an index of the level of thought. Our first step was for an independent coder to code all thoughts for whether they were relevant or irrelevant with respect to GMOs. Then, relevant thoughts were coded for whether they were consistent, inconsistent, or neutral with respect to the information presented. For example, a participant presented with pro-GMO information who listed solely pro-GMO thoughts would have all thoughts coded as valence-consistent.

For each participant, we then constructed the first index as the number of valence-inconsistent thoughts subtracted from the number of valence-consistent thoughts, divided by the total number of relevant thoughts. The formula for this calculation was constructed in order to generate the relative proportion of thoughts that were consistent with the valence of the information presented. This is similar to formulas used to capture the proportion of the positivity of thoughts generated in response to persuasion attempts (Petty & Cacioppo, 1986). The formula for this calculation is presented in (1). This index generated a score of valence-consistent thinking for each participant ranging from -1 to +1, such that -1 corresponds to the least valence-consistent thinking and a score of +1 corresponds to the most valence-consistent thinking.

$$\frac{(Valence - consistent\ thoughts) - (Valence - inconsistent\ thoughts)}{Total\ Number\ of\ Relevant\ Thoughts} \quad (1)$$

The second index we constructed captures the amount of thinking about each passage. To calculate this index, we simply computed the total number of relevant thoughts that each participant listed, regardless of the valence of the thought.

Finally, to ensure that our coding was reliable, for each index we used a second independent coder to code a subset of approximately 20% of the data. The independent coders codes were used to compute each index on their subset of the data. We then correlated this index with the index computed by the original coder on the same subset of the data. The results of this independent coder analysis demonstrated good inter-rater reliability, with Pearson correlation coefficients on the valence-consistent thinking index of r = .86 and on the amount of thinking index of r = .89; in light of this reliability, we continued coding the remainder of the data with a single coder.

Attitude Change

In order to compute attitude change, we needed to ensure that both the pre- and post-message attitude scores were scaled the same, for ease of comparison. To do this, we converted both pre- and post- attitude scores to a 0-1 scale. This was done by taking the average attitude score for each participant, subtracting 1 from this average, and dividing by the number of scale points minus 1. This calculation was performed in order to more easily position the individual's attitude score relative to the scale points and relative to the post-attitude measure; the formula can be seen in (2). In the case of pre-message attitudes which are on a 7-point scale response, for example, the equation becomes ([average attitude score] – 1)/6.

$$\frac{[Attitude\ Score] - 1}{\#\ Scale\ Points - 1} \tag{2}$$

The attitude change variable was then computed in one of two ways depending on the participant's pre-message attitude. If their pre-message attitude was predominantly negative, which was computed by summing all negative adjectives of the global attitude measure, then we subtracted their pre-message attitude score (i.e., Time 1 attitude) from their post-message attitude score (i.e., Time 2 attitude). In contrast, if their pre-message attitude was predominantly positive, then we subtracted their Time 2 attitude from their Time 1 attitude. By computing attitude change in this way, participant's attitude change score was always in the same direction, such that a more positive attitude change score indicates attitude change in the direction of the persuasive message, while a negative score indicates attitude change in the direction of the pre-message attitude. Individuals did experience some attitude change, M = .2, SD = 0.2, skew = 0.3, kurtosis = -0.6. Given that attitude change was represented on a 0-1 scale, an average attitude change score of .2 indicates a moderate amount of attitude change.

Results

The goal of the first study was to observe whether varying levels of attitude extremity, measured both objectively and subjectively, independently predict enhanced resistance to persuasive messages. Based on logic described in See et al. (2008, 2013), we predicted that each

method of measuring attitude extremity contributes uniquely to the ability to resist persuasive attempts. In the first, and most central analysis, we tested the effects of objective and subjectively measured attitude extremity on attitude change. In a regression model, we expected this finding to manifest itself as two main effects, with one main effect of objective extremity on attitude change, and another main effect of subjective extremity on attitude change. Though we did not explicitly predict it, it would have been reasonable to find evidence of a two-way interaction between the two methods of measuring extremity.

Attitude Change

Before undertaking the regression analysis, we wanted to examine the relationship between the objective and subjective measures of extremity. Consistent with the perspective proposed by See et al. (2008, 2013), we found modest correlations between the measures, $r = .26$. For the first regression analysis, we mean centered each of the independent variables, objective and subjective extremity, and constructed the interaction term of objective extremity and subjective extremity. We then conducted a multiple linear regression, regressing the mean centered objective and subjective attitude extremity scores, as well as the interaction between these variables, onto the attitude change variable. The regression model was significant, $R^2 = .15$, $F(3, 209) = 12.18$, $p < .001$. The full results of the regression are presented in Table 8.

Table 8.

Regression of Objective and Subjective Extremity on Attitude Change (Study 1).

	Coefficient	Standard Error	T Value	Significance
Intercept	$B = .21$	SE = .02	$t(209) = 14.19$	$p < .001$
Objective Extremity	$B = .11$	SE = .02	$t(209) = 5.95$	$p < .001$

Subjective Extremity	*B* = -.04	SE = .02	*t*(209) = -1.92	*p* = .056
Objective x Subjective Extremity	*B* = -.03	SE = .02	*t*(209) = -1.36	*p* = .174

We expected to find two main effects, one for each of objective and subjective extremity, on attitude change, which our results supported. Prior literature has provided some evidence that increased extremity may be related to increased persuasion resistance, and indeed we expected this to be the case here (Osgood & Tannenbaum, 1955; Bassili, 1996; Tesser et al., 1995). Looking first to Table 8, row 2, however, our results demonstrated that objective extremity was positively related (*B* = .11) to attitude change. This means that greater objective extremity is related to a tendency to change one's attitude, demonstrating enhanced susceptibility to persuasion, in contrast to traditional findings.

Looking to row 3, we can see that subjective extremity, on the other hand, produced a marginal[3] effect in the expected direction. Though the effect was marginal, it appears to demonstrate that increased subjective extremity is related to decreased attitude change (i.e., greater persuasion resistance). Further, this suggests that individuals who feel that they are extreme in their beliefs are more likely to resist messaging that is counter to their attitude.

Finally, though we did not predict as such, we examined the two-way interaction between objective and subjective extremity. As noted, the presence of such a two-way interaction would be consistent with a separable, but equal, perspective of the two types of measurement of attitude

[3] We use the term “marginal” throughout to reflect conditions under which a p value would satisfy the threshold of significance for a one-tailed, but not a two-tailed test. We interpret these effects as marginal in conditions where we had clear, directional hypotheses about the expected direction of effects.

extremity. In contrast, a two-way interaction would be inconsistent with either of the other major perspectives discussing the relationship of objective and subjective measures to one another. However, we did not find evidence for such an effect, nor did we probe the interaction further.

Message-Valence Consistent Thoughts

Amount of attitude change can vary as a result of objective and subjectively measured extremity, but this attitude change does not speak to the underlying processes driving these effects, which additional dependent variables may help to clarify. One possible mechanism that could be responsible for these effects is the extent to which a participant counterargues the information presented to them. Counterarguing is a highly thoughtful mechanism for attitude change, so if counterarguing were playing a role, we would expect that the underlying mechanism should also be quite thoughtful. Conversely, if the mechanism was nonthoughtful, we would not expect to find evidence of counterarguing. The current index of message-valence consistent thinking attempts to capture the extent of counterarguing and high thoughtfulness as one possible mechanism through which attitude change could occur.

For this second analysis, we again conducted a multiple regression. We regressed the mean centered objective and subjective extremity variables, as well as their interaction, onto the index of valence-consistent thinking. The regression model was not significant, $R^2 = .02$, $F(3, 182) = .96$, $p = .41$. The results of this regression analysis are presented in Table 9.

Table 9.

Regression of Objective and Subjective Extremity on Valence-Thought Consistency (Study 1).

	Coefficient	Standard Error	T Value	Significance
Intercept	$B = -.06$	SE = .05	$t(182) = -1.14$	$p = .258$
Objective Extremity	$B = .00$	SE = .07	$t(182) = 0.09$	$p = .927$

Subjective Extremity	*B* = .13	SE = .08	*t*(182) = 1.63	*p* = .105
Objective x Subjective Extremity	*B* = -.01	SE = .08	*t*(182) = -0.10	*p* = .919

In general, as indicated by the intercept of the model in Table 9 row 1 (which reflects the level of the dependent variable when all other predictors are at their mean), participants listed more message valence-inconsistent thoughts than consistent. We expected to find a main effect of objective extremity on valence-thought consistency, such that greater objective extremity leads to more valence-inconsistent (i.e., pro-attitudinal) thinking. As shown in row 2 of Table 10, we did not find evidence for this. Indeed, only subjective extremity was near significance, though the effect was in the opposite direction of our prior analyses and so we are reluctant to comment on this effect further.

Amount of Thinking

One way that extremity might affect resistance is in how much people process information. Amount of information processing is indexed by the number of thoughts that a participant lists. A positive regression coefficient in this model should indicate more (less) thinking, which should in turn lead to more (less) persuasion. To test this, for the final analysis, we conducted a multiple regression. We regressed the mean centered objective and subjective attitude extremity variables on the amount of thinking. The regression model was not significant, R^2 = .01, $F(3, 227)$ = .86, p = ns. The results of this final regression analysis are found in Table 10.

Table 10.

Regression of Objective and Subjective Extremity on Amount of Thinking (Study 1).

	Coefficient	Standard Error	T Value	Significance
Intercept	$B = 2.67$	SE = .12	$t(227) = 22.38$	$p < .001$
Objective Extremity	$B = -.07$	SE = .15	$t(227) = -0.49$	$p = .626$
Subjective Extremity	$B = .26$	SE = .17	$t(227) = 1.54$	$p = .124$
Objective x Subjective Extremity	$B = -.09$	SE = .18	$t(227) = -0.48$	$p = .633$

First, we note that in general, when participants were at the mean of all independent variables, they produced between 2 and 3 thoughts (row 1). We did not have explicit predictions for the effects of objective or subjective extremity on amount of thinking and thus this analysis was primarily exploratory. None of the main effects nor the interaction effects approached significance.

Discussion

In study one, we expected to find two main effects of objective attitude extremity on resistance to persuasion. Prior literature had suggested that increased objective extremity should be related to increased persuasion resistance, which we expected to find support for, and we also hypothesized a similar pattern of results, via different mechanisms, for subjective extremity. Turning to subjective extremity, the results of the first analysis demonstrated that it was negatively related to attitude change, indicating increased persuasion resistance. While the subjective extremity results were in line with our predictions, objective extremity behaved much differently. Indeed, though we expected objective extremity to be positively related to persuasion

resistance, it was instead positively related to attitude change. Though our results for objective extremity were therefore contrary to the literature, we note in the general discussion that there are key methodological differences between our study and prior work on attitude extremity and persuasion resistance, which may explain these discrepancies. A possible criticism of our findings is that attitude change could be exaggerated for participants with extreme attitudes, given that they are able to shift their attitude more in response to counter-attitudinal information than those with milder attitudes. For example, a participant with an attitude score of 7 can shift their attitude 6 scale points in response to new information, while a participant with an attitude score of 5 can only shift 4 scale points. Looking to the descriptive statistics of our attitude change variable, however, this does not appear to have been the case. Rather, participants experienced an average attitude change of .2, corresponding to 2 scale points. Thus, it does not appear that participants with even mild attitudes were approaching ceiling effects on the attitude change variable.

Finally, both of our cognitive response indices, which could have provided more insight into the mechanisms of these effects, did not demonstrate significant results. One explanation for this finding is that both objective and subjective extremity operate through relatively nonthoughtful processes. While this may be true, we do not have sufficient evidence to speculate on whether nonthoughtful processes are the best explanation. We do note, however, that we may have inadvertently truncated our data by providing participants with an insufficient number of text boxes when completing the task. That is, we used only five cognitive response text boxes in the thought listing task. While this may be suitable in some instances, it may have truncated the data and produced ceiling effects. Indeed, participants tended to list a relatively high number of thoughts (M = 2.6) and, considering the comparatively high standard deviation (SD = 1.8), there was likely a meaningful portion of participants who would have listed more than five thoughts, if given the opportunity. Partway through the data collection we realized that we may have truncated the data in this way. Thus, we expanded the number of thoughts that participants could

list from 5 to 10, though this meant that approximately half of our data may have been truncated. Further, when analyzing this latter half of the data separately to test for this possibility, we found that 32.6% of participants listed more than 5 relevant thoughts, suggesting that given the opportunity a substantial proportion of our total participants would have listed more than 5 thoughts.

Chapter 4

Study Two

Introduction

Study two sought to further extend the findings of study one by examining the validity of the subjective extremity measure, its relationship to the established objective extremity measure, and their effects on biasing processes. We know from the attitude strength literature that strong attitudes can affect a range of processes, including biased information recall, biases in the length of time spent reading pro- and counter-attitudinal information (Judd & Kulik, 1980), and biased processing of information (e.g., (Biek et al., 1996; Giner-Sorolla & Chaiken, 1994; Krosnick & Petty, 1995).

Though the assumption in the literature is that attitude extremity should demonstrate these effects as well, there has not been a great deal of research testing this idea (e.g., see Judd & Kulik, 1980). Indeed, in most research and discussions in the literature, because other properties of attitude strength have been shown to be related to processing effects, and since extremity is one determinant of attitude strength, researchers have often assumed that effects found for properties of attitude strength should generalize to attitude extremity. As a result of this relative dearth of research, the current study is largely exploratory, and our hypotheses of expected effects are informed by the extant attitude strength literature, expecting that in general, strong attitudes will tend to exhibit more robust processing effects than weak attitudes (e.g., Brauer et al., 1995; Tesser et al., 1995). Indeed, we expect that this will be true moreso for objectively and subjectively extreme attitudes than for less extreme attitudes. Further, we expect that the extent to which objective and subjective attitude extremity are related to processing will be unique, consistent with our results from study one, and with perspectives discussed by See et al. (2008, 2013).

There are several biased processing effects commonly demonstrated in the literature. In general, these effects for strong attitudes can be linked to the global tendency to exhibit a congruency bias in processing information. Though this is not an exhaustive list, we have included key effects that we tested in Table 11, as well as the direction of the expected effect as demonstrated in the attitude strength literature.

Table 11.

Biasing Effects of Strong Attitudes.

	Amount of Time	Cognitive Response	Recall
Valence	More time spent reading attitude-valence consistent information (e.g., Lundgren & Prislin, 1998)	More attitude-valence consistent thoughts generated in response to information (e.g., Lord et al., 1979)	Tendency to recall attitude-valence consistent information (e.g., Robert, 1985)
Extremity	More time spent reading extreme information	More thoughts generated when reading extreme information	Tendency to recall extreme information (e.g., Judd & Kulik, 1980)
Amount of Processing	More time spent reading information, for extreme attitudes	A greater number of thoughts generated, for extreme attitudes	Tendency to recall more information, for extreme attitudes (e.g., Pomerantz et al., 1995)

In Table 11, the columns of the table describe the stage of processing effects, while the rows describe the nature of the processing effect. For example, amount of time (column 1) describes how long the participant takes to read the information that is presented to them, cognitive response (column 2) refers to the thoughts that participants list after receiving information, and recall (column 3) refers to the participant's ability to recall information that they were presented in an earlier phase of the study. One of the key biases driving these effects is a congruency bias, which suggests that individuals will tend to process information that is

congruent with their beliefs to a greater extent than information that is incongruent. This congruency bias is most readily noticeable in the processing of valenced information, though it manifests in each of the key effects outlined in the table.

Looking to valence (row 1), we can see that participants exhibiting a valence bias would be expected to spend more time reading information that is consistent with the valence of their attitude (column 1), they should generate more thoughts that are consistent with their attitude valence (column 2), and they should be more likely to remember information that is consistent with their attitude valence (column 3). In some instances, such as with the generation of cognitive responses, this bias may also mean that individuals are more likely to counter-argue information that is incongruent with their attitude.

Biases could also manifest in the processing of extreme information (row 2). Information that is extreme is more likely to be consistent or inconsistent with the individual's attitude, prompting extremity pressures for the processing of this information. Thus, we expect that individuals will spend more time reading information that is extreme, irrespective of the valence of the information (column 1), that they will demonstrate more thinking in response to extreme information (column 2), and that they will be more likely to recall extreme information (column 3).

Finally, considering the sheer amount of information processing that occurs (row 3), we expect more information processing to occur for extreme attitudes. For example, individuals are likely to spend more time reading, and engaging with information (column 1), to produce a greater number of thoughts in response to the information (column 2), and to recall more information (column 3), when their attitude is extreme.

Despite some of these documented effects of stronger attitudes biasing information processing, the possible mechanisms for this process, particularly with extreme attitudes, has been largely unexplored. However, we posit that Sherif and Sherif's (1967) work on social

judgement theory may provide a plausible mechanism, operating in a similar manner as the persuasion resistance effects from study one and providing a theoretical explanation for the presence of congruency biases in objectively extreme attitudes.

Their theory, focusing on latitudes of rejection, suggests that there may be a range of acceptable valences and extremities for which an individual is willing to accept new information. Information that falls in the "latitude of acceptance" is considered consistent with the attitude and is not resisted against. Individuals may also receive information that falls outside of this range of acceptance and enters the "latitude of non-commitment." In this case, the information is counter-attitudinal but is not substantially different to make the individual likely to reject the information. Rather, they may counter-argue the information or even reluctantly accept it. Finally, there may be information that is substantially opposed to one's attitude. This information falls significantly outside of the latitude of acceptance and enters the "latitude of rejection". This information is very unlikely to be accepted by the individual, and they may simply reject the information without counterarguing. This theory may be especially true for the current study, which presents participants with a mixture of mild and extreme pro- and counter-attitudinal information.

Importantly, as with much research on attitude strength determinants, any research considering the role of attitude extremity in biased information processing has focused primarily on objective attitude extremity. Study two extends the literature on extremity and information processing by considering the role of subjective extremity in information processing bias. Though no mechanisms have been proposed in the literature, we suggest that motivation may contribute to congruency biases for subjectively extreme attitudes, playing a role in the tendency to process information. Indeed, the literature suggests that if an individual has an extreme attitude towards an object, they should be more highly motivated to maintain their current position (e.g., Kunda, 1990). That is, the more extreme one perceives their attitude to be, the more motivated they are to

maintain their attitude, and the more likely they are to engage in biased processing of information.

The current study therefore uses both the objective and subjective extremity measures to test their role in biasing information processing. Consistent with See et al.'s (2008, 2013) perspective that both measures are separable and provide meaningful insight, in a regression model we expect to find two main effects for each method of measuring extremity on thought recall favorability. As well, a two-way interaction would also be consistent with their perspective such that both subjective and objective extremity might interact with global attitudes; in both cases, bias in information processing should be highest when attitudes are extreme than when they are moderate.

Methods

Participants

As with study one, participants were recruited via the Queen's University PSYC 100 Participant Pool system and were enrolled in a course for which they were eligible to receive bonus credit for their participation. The highest order interaction effect that we expected was a 2 (high/low objective extremity) x 2 (high/low subjective extremity) x 2 (positive/negative attitude) 3-way interaction. Though the objective and subjective extremity scores are again continuous, study one supported the notion that these measures should be relatively orthogonal to one another. Conceptually, therefore, we thought of the design as an 8-cell design; allowing for 50 participants per cell, we aimed to collect 400 participants. Unfortunately, due to a restricted subject pool and truncated data collection in the winter term, we were not able to collect the full number of participants that we wanted, collecting 198 participants. After removing participants that did not complete the study or had other data errors (N = 7), 191 participants remained. Although this sample size does not provide sufficient power to detect the highest-order 3-way interaction, most of our predictions manifest in 2-way interactions. Thus, we are unfortunately

underpowered for the highest order predictions, but are reasonably powered for lower order interactions.

Procedure

This study was conducted in a lab setting, using the Medialab survey platform. First, participants received the global attitudes measure, and the subjective attitude extremity measure in one of two counterbalanced orders. Participants then received four passages in randomized order, ranging in valence and extremity. After each passage, participants were asked to list up to five thoughts that came to mind while reading the information. All of the passages discussed the topic of GMOs, focusing on genetically modified foods such as crops. The information in the passages advocated for/against the use of GMOs and was either mild or extreme. After receiving each of the four passages, participants completed filler tasks in the form of unrelated studies, which lasted approximately 20 minutes. The filler tasks were included to allow memory decay to occur, minimizing the likelihood of ceiling effects in the amount of information recalled. After completing the filler tasks, participants returned to the study and were asked to recall as much as possible about the information which they were presented in phase one. Participants were allowed to recall up to 20 individual pieces of information and could type none to proceed when they had no more thoughts to provide.

Measures

Global attitudes. The global attitude scale was the same as that used in study one (i.e., "Pre-message attitudes"), the Crites et al. (1994) global attitude scale. This measure demonstrated good reliability (α = .90). Scores for the pre-message attitudes were approximately neutral, *M* = 3.8, with standard deviation, *SD* = 1.2, and distributional properties, skew = 0.21, kurtosis = -0.34.

Objective Extremity. As with study one, the global attitude measure was recoded to compute objective extremity scores for each participant, computed as the absolute value of the

participant's attitude minus 4, which yielded the absolute deviation of the participant's attitude from the midpoint. In general, participants were mild in their extremity, $M = 1.0$, and were approximately normally distributed, $SD = 0.8$, with a slightly positive skew (skew = 0.71) and playkurtic distribution (kurtosis = 0.01).

Subjective Extremity. The subjective attitude extremity scale used here was also the same as that used in pretest 2, again demonstrating good reliability ($\alpha = .76$). As a result, we again retained all three items. Each of the items were rated on a 4-point scale response with endpoints *Neutral-Extreme* and the average score across all items was the individuals' subjective extremity score. Participant's perceptions were that their attitudes were mild, $M = 1.1$, with a standard deviation of 0.7, skew = 0.19, kurtosis = -0.78.

Time Index. For each passage that participants were presented, we captured the amount of time that the participant spent reading the information. To compute this index, we divided each participant's total time spent reading the information by the number of words in the passage, which yielded an index of the amount of time spent reading, weighted by the number of words in the passage. From this index, we computed several additional indices. Specifically, we compared the amount of time that individuals spent reading positive or negative information, and the amount of time that they spent reading extreme compared to mild information.

To calculate the index of the amount of time reading valenced information, we first weighted the participant's time spent reading each passage by the number of words in the passage that they read. To do this, we divided the time spent reading the information, in milliseconds (ms) by the number of words in the passage. Then, we computed the index as the sum of the time spent reading negative information, subtracted from the sum of the time spent reading positive information, divided by the total amount of time spent reading all information. This yielded an index of the tendency to read information as it varies by valence ranging from -1 to +1, such that positive numbers indicate a tendency to spend more time reading information that is positive. In

general, participants spent approximately the same amount of time, per word, reading positive and negative information, *M* = -.1, *SD* = 0.2, skew = 0.33, kurtosis = 1.92.

We followed a similar process for calculating the index of the amount of time spent reading extreme information. Here, we again weighted participant's time spent reading each passage by the number of words in the passage. Then, we computed the index as the sum of the time spent reading mild information, subtracted from the sum of the time spent reading extreme information, divided by the total amount of time spent reading all information. This yielded an index of the tendency to read information varying in extremity ranging from -1 to +1, where positive numbers indicate a tendency to spend more time reading information that is extreme. Participants tended to spend a similar amount of time, per word, reading extreme and mild information, *M* = -.1, *SD* = 0.3, skew = -0.57, kurtosis = 1.02.

Finally, we computed an index of the total amount of time spent reading information, irrespective of valence or extremity. This was calculated by adding the total number of time spent reading each passage, weighted by the number of words, yielding a total amount of time spent reading per word, in milliseconds. Participants spent approximately 1.5 seconds reading each word, *M* = 1561.4, *SD* = 520.1, skew = 0.50, kurtosis = -0.06.

Thought Listing Task. The thought listing task that participants performed after reading each passage was similar to that used in study one. Here, participants were asked to list up to five thoughts that came to mind while they were reading the information and to type none in the remaining boxes, if they had no other thoughts. From these cognitive responses, we constructed three key indices: 1) an index of thought favorability, 2) an index of message-extremity consistency, and 3) the number of thoughts produced. We again had an independent coder to code all thoughts for whether they were relevant or irrelevant with respect to GMOs. Then, relevant thoughts were coded for whether they were favorable, unfavorable, or neutral with respect to GMOs.

We then constructed the first index as the number of unfavorable thoughts subtracted from the number of favorable thoughts, divided by the total number of relevant thoughts. This index generated a score of favorability of thinking for each participant ranging from -1 to +1, such that -1 corresponds to the least favorable thinking and a score of +1 corresponds to the most favorable thinking. This index was constructed for each passage, for a total of four indices; as well, we constructed an aggregate of this index across all passages for a global index of thought favorability. In general, as captured by this global index, participants tended to list information that was mixed, but was slightly more unfavorable than favorable towards GMOs, M = -.1, SD = 0.4, skew = 0.30, kurtosis = 0.13.

The second index we constructed captures the tendency to respond to extreme information. This index was a global index, constructed as the number of relevant thoughts for the cognitive response tasks which followed the mild information, subtracted from the number of relevant thoughts for the extreme information, divided by the total number of relevant thoughts. This yields an index of message-extremity recall ranging from -1 to +1, such that a score of -1 represents a tendency to generate more supportive thoughts in response to mild information, and a score of +1 represents a tendency to generate more supportive thoughts in response to extreme information. Participants tended to list as many thoughts in response to extreme information as mild information, M = 0.1, SD = 0.3, skew = 0.14, kurtosis = 3.46.

The third and final index was computed by adding the total number of relevant thoughts that a participant listed. This was computed by adding the total number of GMO-relevant thoughts for each passage to form a single number of the total number of thoughts across all four passages. Thus, out of a possible maximum of 20 thoughts across all passages, participants listed M = 12.6 thoughts, with distributional properties SD = 4.2, skew = -0.5, kurtosis = -0.04.

As with study one, to ensure that our coding was reliable, for each index we used a second independent coder to code a subset of approximately 20% of the data. The independent

coders codes were used to compute each index on their subset of the data. We then correlated this index with the index computed by the original coder on the same subset of the data. The results of this independent coder analysis demonstrated good inter-rater reliability computed from the thought favorability index of $r = .89$, from the extremity of information index of $r = .83$, and from the total amount of thinking index of $r = .92$; consistent with this inter-rater reliability, we continued the remainder of the coding with a single coder.

Recall Task. Correct recall is a piece of information that a participant listed, which contained information that was present in the information that they read in the previous phase, prior to completing the filler tasks. Although there are a number of indices that could be computed, past literature and lab findings suggest that correct recall tends to be a particularly useful metric. In contrast, there are two key errors that could be made in the recall phase. First, participants may commit a false information error, recalling information that was never presented to them. For example, an individual might state that Monsanto is bad because they distribute GMOs; while it is true that Monsanto distributes GMOs, this information never occurs in any of the passages, and would therefore be incorrect. Second, participants may misremember information, recalling information that was present but with substantial error(s). For example, an individual may recall that 80% of GMOs cause cancer, when the information presented stated that 8% of GMOs cause cancer. Though both errors may be informative in certain contexts, past research has suggested that these indices are often not particularly illustrative because they do not appear with enough frequency to provide substantial variance. Thus, we did not compute an index based on incorrect recall, looking instead to correctly recalled information which is inversely related to the incorrect recall of information.

The recall task captures the total amount, and type, of information that participants remembered. Here, participants listed all information that they could recall about GMOs, which were presented to them before the filler studies. From these responses, we constructed a number

of key indices: 1) a valence-bias index, 2) an extremity index, and 3) an index of the total amount of information recalled. First, we again coded all recalled information for whether it was correct or incorrect with respect to the information presented. We then constructed the first index of valence-bias recall. To do so, we coded the pieces of information listed by each participant as being either positive or negative with respect to GMOs. Then, the summation of the negative pieces of information was subtracted from the summation of the positive pieces of information, divided by all correct information. This yields an index ranging from -1 to +1, where a score of -1 indicates that only negative information was recalled, and a score of +1 indicates only positive information was recalled. In general, participants did not have a tendency to remember one valence of information more than another, $M = 0$, $SD = 0.3$, skew = 0.04, kurtosis = 0.52.

Second, we constructed an index to capture the overall tendency to recall extreme information. This index was calculated by subtracting the total pieces of correct, mild information recalled from the total pieces of correct, extreme information recalled, divided by the total number of correct pieces of information recalled. This yielded an index of extremity recall, such that a score of -1 indicates a tendency to recall mild information, and a score of +1 indicates a tendency to recall extreme information. Participants did not have strong tendencies to recall information due to its extremity, $M = -.1$, $SD = .3$, skew = .16, kurtosis = .82.

Finally, we also constructed an index of the total number of correct pieces of information remembered, yielding possible values ranging from 0 (no thoughts) to 20 (the maximum number of thoughts allowed) for each participant. This index captures the amount of processing that the participant engaged in, $M = 8.4$, $SD = 3.1$, skew = 0.61, kurtosis = 0.11.

Results

The goal of the second study was to observe whether varying levels of subjective and objective attitude extremity produced effects on information processing. Similar to study one, and consistent with logic articulated by See et al. (2008, 2013), we predicted that each method of

measuring attitude extremity would contribute uniquely to information processing effects. Further, we expected that there would be an attitude congruency effect, such that individuals would interpret information congruent with their initial attitude. In the first analysis, we tested the effects of objective and subjectively measured attitude extremity on the amount of time spent reading information which varied in both extremity and valence. At a general level, we expected both objective and subjective attitude extremity to have independent effects on each of time spent reading, amount of thoughts listed, and ability to recall information.

Time Spent Reading Information

Valence. We first examined the relationship between the objective and subjective measures of attitude extremity. Consistent with our findings from study one, we again found modest correlations between the measures, $r = .32$. In conducting the regression, we mean centered each of the independent variables, objective extremity, subjective extremity, and attitudes towards GMOs, and constructed all possible two-way and three-way interaction terms. We then conducted a multiple linear regression, regressing the mean centered independent variables and their interactions onto the index of the time spent reading valenced information. The regression model was not significant, $R^2 = .03$, $F(7, 186) = 0.84$, $p = .57$. The full results of the regression are presented in Table 12.

Table 12.

Regression Testing Valenced Reading Time (Study 2).

	Coefficient	Standard Error	T Value	Significance
Intercept	$B = -.08$	SE = .02	$t(186) = -4.89$	$p < .001$
Objective Extremity	$B = .00$	SE = .03	$t(186) = 0.19$	$p = .851$

Table 12 (continued).

Subjective Extremity	*B* = .02	SE = .03	*t*(186) = 0.95	*p* = .344
Attitude	*B* = -.02	SE = .02	*t*(186) = -0.87	*p* = .386
Objective x Subjective Extremity	*B* = -.04	SE = .03	*t*(186) = -0.09	*p* = .236
Objective Extremity x Attitude	*B* = .00	SE = .02	*t*(186) = 0.01	*p* = .952
Subjective Extremity x Attitude	*B* = .04	SE = .03	*t*(186) = 0.16	*p* = .207
Subjective Extremity x Objective Extremity x Attitude	*B* = -.02	SE = .03	*t*(186) = -0.72	*p* = .475

We expected to find a main effect of attitudes on time spent reading valenced information. Specifically, we expected that the more positive (negative) an individual's attitude was towards GMOs, the more time they would spend reading positive (negative) information, which should manifest as a positive coefficient in the regression model. Prior literature provided some support for this theory (Lundgren & Prislin, 1998). However, looking to Table 12, row 4, we did not find evidence for this effect; there was no significant effect of participants' attitudes

on their time spent reading valenced information, and the regression coefficient was negative, in contrast to our predictions (B = -.02).

We also expected to find two significant two-way interactions, such that objective attitude extremity and subjective attitude extremity would each independently interact with attitudes to affect time spent reading valenced information. Specifically, we expected that the biasing effects of attitudes on time spent reading valenced information would be greater for individuals who have objectively and subjectively extreme attitudes. Looking to Rows 6 and 7, we did not find evidence for either of these effects. Finally, though we did not explicitly predict it, we also tested a possible three-way interaction between objective attitude extremity, subjective attitude extremity, and attitudes on time spent reading positive or negative information. Looking to Row 8, we did not find evidence for this three-way interaction.

Extremity. We also wanted to examine the role of extremity of information on time spent reading information. To do this, we again mean centered each of the independent variables, subjective and objective extremity, and attitudes towards GMOs, and constructed all possible two-way and three-way interaction terms. We then conducted a multiple linear regression, regressing the mean centered independent variables and their interactions onto the index of the time spent reading extreme information. The regression model was not significant, R^2 = .03, F(7, 186) = .76, p = .62. The full results of the regression are presented in Table 13.

Table 13.

Regression Testing Reading Time of Extreme Information (Study 2).

	Coefficient	Standard Error	T Value	Significance
Intercept	B = -.06	SE = .02	t(186) = -3.02	p = .003
Objective Extremity	B = .03	SE = .03	t(186) = 0.87	p = .385

Table 13 (continued).

Subjective Extremity	*B* = -.02	SE = .03	*t*(186) = -0.53	*p* = .600
Attitude	*B* = .02	SE = .02	*t*(186) = 0.86	*p* = .392
Objective x Subjective Extremity	*B* = -.04	SE = .04	*t*(186) = -.92	*p* = .361
Objective Extremity x Attitude	*B* = -.05	SE = .02	*t*(186) = -2.05	*p* = .042
Subjective Extremity x Attitude	*B* = .01	SE = .04	*t*(186) = .31	*p* = .759
Subjective Extremity x Objective Extremity x Attitude	*B* = .01	SE = .03	*t*(186) = .19	*p* = .853

We expected that individuals would spend more time reading extreme information than mild information. Looking first to the distributional properties for the index of time spent reading extreme information, we did not find evidence for this effect, *M* = -.1, *SD* = 0.2 skew = -.60, kurtosis = 1.11, instead finding that individuals tended to spend slightly more time reading mild information. Row 1 of Table 13 (i.e., the intercept of the regression) provides some support for this finding as well, such that participants tended to spend more time reading mild information

when they were of average objective and subjective extremity, and attitude. We also expected that participants' objective and subjective attitude extremity would affect the amount of time spent reading extreme information. We did not find evidence for either of these effects.

We also tested all interaction effects. Of particular interest, we wanted to explore the possible interaction effect of objective and subjective extremity. We did not find support for this interaction (row 5). Interestingly, however, the interaction of objective extremity and attitudes produced a stronger, significant effect. Though we did not have theoretical basis to expect this effect, we probed the interaction for exploratory purposes. The simple slopes analysis revealed that the effect of attitudes on the amount of time spent reading extreme information was non-significant and negative at higher levels of objective extremity, B = -.01, $t(186)$ = -.85, p = .40. At lower levels of objective extremity, the effect of attitudes on time spent reading extreme information was non-significant and positive, B = .06, $t(186)$ = 1.45, p = .15. As both simple slope effects were small, and non-significant, we will not interpret these effects further.

Time Spent Processing. Finally, we tested the role of objective and subjective attitude extremity, and initial attitudes, on time spent processing information. To test this, we again mean centered each of the independent variables, constructing all possible two- and three-way interaction terms. We then conducted a multiple linear regression, regressing each of the independent variables and their interaction terms on the amount of time spent reading information. The regression model was not significant, R^2 = .036, $F(7, 186)$ = .98, p = .45. The full results of the regression are presented in Table 14.

Table 14.

Regression Testing Reading Time of All Information (Study 2).

	Coefficient	Standard Error	T Value	Significance
Intercept	B = 1551.54	SE = 39.70	$t(186)$ = 39.08	$p < .0001$

Table 14 (continued).

Objective Extremity	*B* = 68.43	SE = 58.57	*t*(186) = 1.17	*p* = .244
Subjective Extremity	*B* = -8.66	SE = 59.94	*t*(186) = -0.14	*p* = .885
Attitude	*B* = -4.21	SE = 46.97	*t*(186) = -0.09	*p* = .929
Objective x Subjective Extremity	*B* = 18.49	SE = 78.86	*t*(186) = 0.23	*p* = .815
Objective Extremity x Attitude	*B* = -52.33	SE = 43.71	*t*(186) = -1.20	*p* = .233
Subjective Extremity x Attitude	*B* = 88.83	SE = 70.77	*t*(186) = 1.26	*p* = .211
Subjective Extremity x Objective Extremity x Attitude	*B* = -34.45	SE = 63.69	*t*(186) = -.54	*p* = .589

We expected that individuals would spend more time reading information when they had extreme attitudes. Looking at rows 2 and 3 of Table 14, we did not find support for this

prediction. We did not find evidence for any other main effects on time spent reading information.

Turning to the interaction effects, we allowed for several possible interactions, such that objective and subjective extremity may have interacted to influence time spent reading information. Looking to row 5, we did not find evidence for this effect. We also tested the two possible independent interaction effects of objective and subjective extremity on attitudes to influence time spent reading. Looking to rows 6 and 7, we did not find evidence for either of these effects, though we note that the subjective extremity and attitude interaction was marginal.

Cognitive Response

Valence. In addition to capturing the amount of time spent reading varying types of information, we were also interested in the tendency to produce thoughts that were favorable or unfavorable with respect to GMOs. Consistent with findings from prior literature (e.g., see Lord et al., 1979), we expected that participants would generate more favorable (unfavorable) thoughts when reading information, and that these thoughts would be consistent with the valence of the participants' attitude. To test these effects, we entered the mean centered independent variables and all possible interaction terms into a multiple linear regression, regressing these variables and their interactions onto the dependent variable of thought favorability. The regression model was significant, $R^2 = .45$, $F(7, 186) = 21.66$, $p < .001$. The full results of the regression are outlined in Table 15.

Table 15.

Regression of Thought Favorability (Study 2).

	Coefficient	Standard Error	T Value	Significance
Intercept	$B = -.09$	SE = .03	$t(186) = -2.80$	$p < .001$
Attitude	$B = .19$	SE = .04	$t(186) = 5.07$	$p < .001$

Table 15 (continued).

Objective Extremity	*B* = .04	SE = .05	*t*(186) = 0.92	*p* = .358
Subjective Extremity	*B* = -.03	SE = .05	*t*(186) = -0.60	*p* = .562
Objective x Subjective Extremity	*B* = .09	SE = .06	*t*(186) = 1.50	*p* = .144
Objective Extremity x Attitude	*B* = .10	SE = .06	*t*(186) = 2.82	*p* = .005
Subjective Extremity x Attitude	*B* = .06	SE = .03	*t*(186) = 1.02	*p* = .309
Subjective Extremity x Objective Extremity x Attitude	*B* = -.04	SE = .05	*t*(186) = -0.83	*p* = .407

Prior to examining our expected effects, we first looked at the intercept of the model. The intercept suggests that when participants were average for each of the independent variables, they had a slight tendency to produce more negative thoughts in response to information about GMOs. Turning to the main effects of central interest, we expected that individuals would produce thoughts that were consistent with the valence of their attitude. In a regression model, this should manifest as a positive regression coefficient for a main effect of attitudes on the dependent

variable. This effect was significant and consistent with our theoretical expectations, suggesting that individuals who have a more favorable (unfavorable) attitude tend to produce thoughts that are favorable (unfavorable) when exposed to information about GMOs (row 4).

We also expected to find two interaction effects, one for each of objective and subjective attitude extremity interacting with attitudes to independently influence thought favorability. Looking to row 6, we found evidence in support of an objective extremity and attitude interaction effect, but we did not find evidence for a subjective extremity and attitude interaction (row 7). Given the significant objective extremity and attitude interaction, we further probed the simple slopes of this interaction.

The simple slopes analysis revealed that the effect of attitudes on the tendency to generate favorable thoughts was significant and stronger at higher levels of objective extremity, $B = .26$, $t(186) = 10.30$, $p < .001$. At lower levels of objective extremity, the effect of attitudes on thought favorability was weaker, $B = .11$, $t(186) = 1.94$, $p = .05$. Thus, individuals' attitude towards GMOs generates a tendency to produce thoughts that are consistent with the valence of their attitude, and this effect is strongest when individuals have objectively extreme attitudes.

Though we did not have explicit predictions for any interaction effects, we tested these interactions in the regression model for exploratory purposes. We did not find evidence to support any interactions (rows 5-8).

Extremity. We were also interested in capturing the tendency to generate more thoughts when presented with extreme information. In contrast to the prior valence analysis, we did not code for message-extremity consistency, instead looking to the sheer number of thoughts presented in response to extreme information. To capture this, we again used a multiple linear regression to examine the relationship between the mean centered independent variables and their interaction terms, regressing these variables onto the dependent variable of number of thoughts

generated in response to extreme information. The results of the regression are presented in Table 16. The regression model was not significant, $R^2 = .036$, $F(7, 186) = 1.56$, $p = .48$.

Table 16.

Regression of Thoughts Produced in Response to Extreme Information (Study 2).

	Coefficient	Standard Error	T Value	Significance
Intercept	*B* = .00	SE = .02	*t*(186) = 0.22	*p* = .824
Objective Extremity	*B* = -.09	SE = .03	*t*(186) = -3.06	*p* = .003
Subjective Extremity	*B* = -.01	SE = .03	*t*(186) = -.34	*p* = .738
Attitude	*B* = -.03	SE = .02	*t*(186) = -1.10	*p* = .276
Objective x Subjective Extremity	*B* = .06	SE = .04	*t*(186) = .1.43	*p* = .154
Objective Extremity x Attitude	*B* = .02	SE = .02	*t*(186) = 0.75	*p* = .452
Subjective Extremity x Attitude	*B* = -.01	SE = .04	*t*(186) = -.27	*p* = .791
Subjective Extremity x Objective Extremity x Attitude	*B* = -.01	SE = .03	*t*(186) = -.28	*p* = .779

We expected to find a main effect of attitude extremity on the number of thoughts generated in response to information about GMOs. Specifically, we expected that individuals would list more thoughts when reading extreme information, and that this effect would be exaggerated for individuals with objectively and subjectively extreme attitudes. We did not find evidence to suggest that individuals generated more thoughts in response to extreme information, $M = .1$, $SD = 0.2$, skew = 0.21, kurtosis = 3.27, nor did we find evidence of this effect when participants were of average objective extremity, subjective extremity, and attitude (row 1). We did, however, find evidence to suggest that individuals' objective attitude extremity affects the number of thoughts that participants generated, though the direction of the effect was counter to our expectations (row 2). Possible explanations for this finding are explored in more detail in the discussion section for this study. We did not find evidence in support of an effect of subjective extremity on thoughts generated in response to extreme information (row 3).

We also predicted a number of interaction effects; specifically, we expected that objective and subjective attitude extremity would interact to produce unique effects on the dependent variable. Though we did not have further interaction predictions, we explored all other possible interaction effects for exploratory purposes. Looking to rows 5 through 8, we did not find evidence for any significant interaction effects.

Amount of Processing. We tested the effect of objective and subjectively extreme attitudes on the amount of processing that participants engaged in. Specifically, we expected that individuals with more objectively or subjectively extreme attitudes would tend to produce more thoughts irrespective of the valence or extremity of information to which they were responding. To test this, we entered the mean centered independent variables used in the first two cognitive response analyses and all possible interactions into a multiple linear regression model. We then regressed each of the variables and their interactions onto the dependent variable, the total

number of thoughts listed (amount of processing). The results of the regression are presented in Table 17. The regression model was significant, $R^2 = .34$, $F(7, 186) = 14.19$, $p < .001$.

Table 17.

Regression of Number of Thoughts Listed (Study 2).

	Coefficient	Standard Error	T Value	Significance
Intercept	$B = 9.66$	SE = .18	$t(186) = 53.32$	$p < .0001$
Objective Extremity	$B = 0.20$	SE = .27	$t(186) = 0.76$	$p = .449$
Subjective Extremity	$B = 0.10$	SE = .27	$t(186) = 0.36$	$p = .717$
Attitude	$B = -0.96$	SE = .21	$t(186) = -4.48$	$p < .001$
Objective x Subjective Extremity	$B = -0.05$	SE = .36	$t(186) = -0.13$	$p = .900$
Objective Extremity x Attitude	$B = -0.28$	SE = .20	$t(186) = -1.42$	$p = .157$
Subjective Extremity x Attitude	$B = -0.42$	SE = .32	$t(186) = -1.30$	$p = .194$
Subjective Extremity x Objective Extremity x Attitude	$B = 0.15$	SE = .29	$t(186) = .53$	$p = .598$

We expected to find a main effect of objective and subjective attitude extremity on the amount of information processing, irrespective of extremity and valence of information. We did not find evidence for either effect (rows 2 & 3). Interestingly, though we did not predict as much, we found a significant effect of attitudes on amount of processing (row 4). Specifically, individuals who held more negative attitudes towards GMOs may have tended to list more thoughts than those who held positive attitudes, though the effect was not predicted, and we are thus reluctant to comment further.

In addition to the predicted main effects, we also expected that objective extremity and subjective extremity would interact with one another to produce independent effects on the amount of processing. We did not find evidence for this interaction (row 5). We did not predict further interaction effects.

Recall

Valence. Finally, we were interested in the tendency to recall pieces of information depending on our variables of interest. The first effect that we examined was the tendency to recall attitude-valence consistent information. To test this effect, we mean centered each of the independent variables and constructed all possible interaction terms, entering each of these variables into a multiple linear regression model. We then regressed each of the independent variables and their interactions onto the dependent variable, the valence-bias index. The full results of the regression model are presented in Table 18. The regression model was not significant, $R^2 = .06$, $F(7, 186) = 1.79$, $p = .09$.

Table 18.

Regression of Valence-Bias in Recall (Study 2).

	Coefficient	Standard Error	T Value	Significance
Intercept	$B = .03$	SE = .02	$t(186) = 1.42$	$p = .157$

Table 18 (continued).

Objective Extremity	*B* = .03	SE = .03	*t*(186) = 0.99	*p* = .323
Attitude	*B* = -.02	SE = .02	*t*(186) = -1.01	*p* = .209
Subjective Extremity	*B* = .04	SE = .03	*t*(186) = 1.26	*p* = .313
Objective x Subjective Extremity	*B* = .01	SE = .04	*t*(186) = .30	*p* = .764
Objective Extremity x Attitude	*B* = .03	SE = .02	*t*(186) = 1.41	*p* = .161
Subjective Extremity x Attitude	*B* = .07	SE = .04	*t*(186) = 1.87	*p* = .063
Subjective Extremity x Objective Extremity x Attitude	*B* = -.028	SE = .03	*t*(186) = -.85	*p* = .398

We predicted that attitudes would have an effect on the tendency to recall information, such that individuals would tend to recall more favorable (unfavorable) information matching the valence of their attitude. Looking to row 2, we did not find evidence to support an attitude main

effect on the tendency to recall favorable (unfavorable) information and, though non-significant, we note that the direction of the attitude main effect was the opposite of our predictions.

We also predicted a number of interaction effects, such that objective and subjective extremity would each interact with attitudes to independently influence the tendency for attitudes to predict valence-bias in recall. We did not find evidence for either interaction (Rows 6 & 7), though we note that the subjective extremity and attitude interaction effect was marginal. Given this, we probed the simple slopes of the interaction for exploratory purposes. At low levels of subjective extremity, attitudes had a negative influence on favorability of recall, such that individuals who felt that their attitudes were mild had a slight tendency to recall counter-attitudinal information, $B = -.071$, $t(186) = -1.99$, $p = .048$. In contrast, at high levels of subjective extremity, we found a non-significant, positive coefficient, $B = .022$, $t(186) = .64$, $p = .52$. Finally, we did not explicitly predict a three-way interaction, nor did our results support such an interaction (row 8).

Extremity. We also tested the tendency to recall extreme information, expecting primarily that individuals would be inclined to recall extreme information over mild information. To test this, we entered all mean centered independent variables and their interactions into a multiple linear regression model, regressing the independent variables and their interactions onto the index of extremity recall. The regression model was not significant, $R^2 = .06$, $F(7, 186) = 1.88$, $p = .08$.

Table 19.

Regression of Extremity-Bias in Recall (Study 2).

	Coefficient	Standard Error	T Value	Significance
Intercept	$B = -.08$	SE = .02	$t(186) = -3.71$	$p < .001$
Objective Extremity	$B = .03$	SE = .03	$t(186) = 0.83$	$p = .407$

Table 19 (continued).

Subjective Extremity	*B* = .00	SE = .03	*t*(186) = -0.10	*p* = .918
Attitude	*B* = .04	SE = .03	*t*(186) = 1.41	*p* = .161
Objective x Subjective Extremity	*B* = .01	SE = .04	*t*(186) = 0.20	*p* = .844
Objective Extremity x Attitude	*B* = .02	SE = .02	*t*(186) = 0.73	*p* = .464
Subjective Extremity x Attitude	*B* = .05	SE = .04	*t*(186) = 1.31	*p* = .193
Subjective Extremity x Objective Extremity x Attitude	*B* = -.06	SE = .04	*t*(186) = -1.64	*p* = .103

We expected to find that individuals would tend to recall extreme information more than mild information. To examine this hypothesized effect, we interpreted both the distributional properties of the extremity-bias index and the intercept of the regression model (row 1). Looking first to the distributional properties of the index, it does not appear that participants recalled extreme information more, instead exhibiting a slight tendency to recall mild information, *M* = -.08, *SD* = 0.3, skew = 0.08, kurtosis = 0.77. Indeed, the intercept – which represents the tendency

to recall extreme information when participants are of average objective extremity, subjective extremity, and attitudes – indicates that participants were significantly more likely to recall mild information when these conditions were true (row 1). Thus, we did not find evidence to support an effect of a tendency to recall extreme information.

We also expected that each of objective and subjective attitude extremity would affect the tendency to recall extreme information. Looking to rows 2 and 3 of Table 20, we did not find support for either main effect. Finally, we expected that objective and subjective extremity would interact with one another, demonstrating support for their independent effects on the tendency to recall extreme information (row 5). We did not find support for this effect, nor did we find support for any higher-order interactions.

Amount of Information Recalled. Finally, we were interested in the effects of objective and subjective attitude extremity on the amount of information recalled, indicating the extent to which participants processed information. For this analysis, we entered each of the mean centered independent variables and their interactions into a regression model, regressing these variables onto the index of the amount of information recalled. The full results of the multiple linear regression are found in Table 20. The regression model was not significant, $R^2 = .038$, $F(7, 186) = 1.04$, $p = .41$.

Table 20.

Regression of Amount of Information Recalled (Study 2).

	Coefficient	Standard Error	T Value	Significance
Intercept	$B = 8.42$	SE = .24	$t(186) = 35.25$	$p < .001$
Objective Extremity	$B = -0.31$	SE = .35	$t(186) = -0.89$	$p = .374$

Table 20 (continued).

Subjective Extremity	*B* = 0.14	SE = .36	*t*(186) = 0.38	*p* = .707
Attitude	*B* = -0.10	SE = .28	*t*(186) = -0.35	*p* = .727
Objective x Subjective Extremity	*B* = -0.41	SE = .47	*t*(186) = -0.87	*p* = .385
Objective Extremity x Attitude	*B* = -0.28	SE = .26	*t*(186) = -1.07	*p* = .287
Subjective Extremity x Attitude	*B* = -0.33	SE = .43	*t*(186) = -0.77	*p* = .440
Subjective Extremity x Objective Extremity x Attitude	*B* = 0.37	SE = .38	*t*(186) = 0.95	*p* = .341

We expected that objective attitude extremity and subjective attitude extremity would influence the amount of information recalled, such that individuals with more extreme attitudes would tend to recall more information than those with mild attitudes. Looking to rows 2 and 3 of Table 21, we did not find evidence for either of these main effects. We also predicted that objective and subjective attitude extremity would interact with one another to demonstrate independent effects of the number of pieces of information recalled. We did not find evidence for

this interaction effect (row 5). We did not predict any effect of attitudes on the dependent variable, nor did we find evidence for any effects (rows 4, 6, 7, 8).

Discussion

In study two, we explored the effect of objective extremity, subjective extremity, and attitudes on three key measures: time, cognitive response, and recall. In the first set of analyses, we explored the effect of each of these independent variables on the amount of time spent reading all information, the time spent reading valenced information, and the time spent reading extreme information. Across all three analyses, we did not find evidence of information processing effects for any of the independent variables on the amount of time spent reading each type of information. Though it may often be useful to interpret null findings, it is difficult in the context of time indices. For example, a lack of evidence supporting a valence bias could mean that participants are reading pro- and counter-attitudinal information for the same amount of time, but for different reasons. They may, for example, read counter-attitudinal information for a period of time because they are spending this time carefully scrutinizing the information, while simultaneously spending a comparable amount of time reading pro-attitudinal information because it is congenial and provides self-validation. Thus, interpretation of null findings of the time indices is largely speculative, which we are reluctant to engage in.

We also used cognitive responses in the form of a thought listing task to capture the amount and type of thoughts that were generated in response to information on the basis of valence, extremity, and amount of thinking. We found evidence supporting a valence bias of thoughts generated but did not find compelling evidence for either of the other two indices. A valence bias indicates that individuals tend to generate thoughts that are consistent with the valence of their attitude. More germane to the current research, however, we also found that the effect of attitudes in producing this valence bias was enhanced for individuals who held objectively extreme attitudes. While past research has not explicitly tested this finding, there is at

least one possible explanation for these results. That is, we expect that individuals who have objectively extreme attitudes may tend to immediately reject information that opposes their attitude, counter-arguing this information by generating attitude-consistent thoughts. Similarly, an objectively extreme attitude may lead individuals to actively reinforce attitude-consistent information through the generation of attitude-consistent thoughts. We did not find significant effects of subjective attitude extremity on any of our indices.

Finally, we explored the tendency to recall information on the basis of its valence and extremity, considering the role of the individuals' objective extremity, subjective extremity, and attitude in modifying their recall tendencies. Across all three analyses, we did not find evidence to support any differences in recall on the basis of any of our hypothesized effects. In general, though we found a small effect to suggest that individuals tended to recall mild information more than extreme, we are reluctant to interpret this effect as the effect was small and we did not have theoretical reasons to expect this effect. In addition, we do not feel that such an effect, qualified by each of the independent variables being at their means, is a particularly insightful interpretation.

Chapter 5

General Discussion

Summary

Across two studies, we examined the differential effects of measuring attitude extremity objectively and subjectively, exploring their effects on persuasion resistance and information processing. In general, we found support for three key findings; first, we demonstrated that it is possible to construct a reliable, subjective measure of attitude extremity. In pretesting, we demonstrated that the subjective extremity measure was reliable across two key topics and across multiple waves of pretesting (αs = .74-.87). As well, on the focal issue of GMOs, we demonstrated that the subjective extremity measure was consistently reliable across multiple datasets (αs = .76-.81).

Second, we predicted and found support for our hypothesis that the novel subjective extremity measure would be moderately related to the established objective extremity measure. Indeed, during pretesting we found modest correlations between the measures, both for our datasets that had two issues *r*s = .19-.58, as well as for the main studies which used a focal issue, *r*s = .26-.33. As we noted previously, one possible explanation for such low correlations is a lack of measure reliability. We have consistently demonstrated that this was not the case, however, as both the subjective extremity measure and the global attitude measure from which we calculated objective extremity demonstrated good reliability across all topics and studies. In addition to the reliabilities of our measures, we also corrected for attenuation, using a formula originally derived by Spearman (1904, in Muchinsky, 1996). This correction for attenuation calculates the degree to which the measures would be correlated if their reliabilities were perfect. The formula for this correction is calculated as the observed correlation divided by the square root of the product of the reliabilities of each of the measures. When calculating this correction, we find corrected

correlations between the measures on the issue of protein shakes of r = .23-.65 and on the focal issue of rs = .30-.40. Finally, we tested and found support for the theory that the measures are separable, but that each measure captures unique aspects of the functioning of attitudes. Indeed, in study one we found effects for objective and subjective extremity that were in opposite directions, producing independent effects.

In study two our results were mixed, finding no clear effects of either objective or subjective extremity on time or memory, though we did find an effect of objectively measured extremity on thought favorability (i.e., attitude-consistent thoughts produced in response to information) and on thoughts produced in response to extreme information. Specifically, individuals' attitudes were positively related to thought favorability, an effect which was moderated by objective extremity, such that the effect of attitudes was strongest at high levels of objective extremity. Across all analyses, we did not find evidence to suggest that subjective extremity played a role in influencing information processing.

Implications

There are a few implications of the results of this research. The first, and most central, implication is that this research has demonstrated that perspectives which have previously been explored only in other literature, such as cognitive and affective bases of attitudes, can be extended and applied to attitude extremity. Research in this area of attitude bases has suggested that objective and subjective measures of attitude bases may be moderately related to one another, but that each should produce meaningful processes. We extended this theory to attitude extremity, expecting that we may find comparable results. Indeed, we found support for this theory; in study one, we found that both measures produced main effects that were opposite directions and that the measures were modestly correlated to one another. If both measures were capturing the same construct, as this perspective has suggested, we would have expected that there would be no effects for either measure because a regression model would partial for one effect when

considering the effect of the other, thus severely limiting the variance on which to find an effect. The perspective that one measure is better suggests that one measure should produce effects, while the other measure would not, which we find some evidence to support.

Thus, the contributions of the current work to the literature are three-fold: First, our work tested and validated a measure of subjective attitude extremity. This is a novel contribution, as prior work which has considered the role of attitude extremity has tended not to capture subjective extremity. In some instances, effects such as persuasion resistance have been demonstrated for objective measures, but to our knowledge only one study has also captured subjective extremity (Bassili, 1996). Second, where subjective measures have been tested, they have exclusively used a global item measure (Bassili, 1996). In general, single item measures tend to be less reliable, in contrast to our current measure which uses multiple items and demonstrates good reliability. Finally, our research has demonstrated that subjective attitude extremity impacts persuasion resistance and that this effect is different from that produced by objective attitude extremity, a finding which has not yet been documented in the literature.

Although our research therefore provides some unique contributions, our results also raise some questions about how the findings relate to the broader literature. The first thing to note is that in study one, subjective attitude extremity, though marginal, produced results that were consistent with enhanced persuasion resistance. We speculated in study one that effects of subjective extremity may be due to consistency pressures, which should have been evident through examining the cognitive response indices. We did not find evidence for this mechanism, however, as neither of the cognitive response indices demonstrated significant results. As we note in the discussion for study one, this lack of findings may have been due to measurement issues.

In the first wave of data collection for study one, participants were allowed to list only five thoughts in the cognitive response text boxes. However, we corrected the number of thoughts that participants could list approximately halfway through our data collection, increasing this

number to ten thoughts, and we therefore collected sufficient data to conduct an exploratory analysis for each of the cognitive response indices. Looking to the effects of subjective extremity, the exploratory analysis suggested that those who were more subjectively extreme may have had a tendency to produce more thoughts. Surprisingly, this effect of greater thinking for subjectively extreme attitudes suggests that more attitude change should have occurred, given that the arguments presented were at least moderately strong, which is contradictory to our prior results. Given that the effect of subjective extremity on attitude change was marginal, however, and in light of the contradictory implications of this exploratory analysis, we exercise caution by not interpreting this result further.

Though the subjective extremity measure performed well in the persuasion resistance paradigm, we do note that the findings produced as a result of the objective extremity measure run contrary to some prior findings in the literature. Though there is not a great deal of research in this area, the research that has been conducted has found that increased attitude extremity is related to increased persuasion resistance (Osgood & Tannenbaum, 1955; Tesser et al.,1995; Bassili, 1996). In contrast, we demonstrated that increased objective extremity was related to decreased persuasion resistance (i.e., more attitude change). There are multiple differences that our study introduced which differentiates it from this prior research, and which may explain these discrepancies.

The first possible explanation is that the ways in which attitude change was calculated in this prior work was discrepant from how we captured attitude change in our study. While we captured participants' pre- and post-manipulation attitudes in order to compute an attitude change score, researchers can also capture exclusively post-manipulation attitudes when measuring persuasion. This difference in capturing attitude change could produce discrepant results. Looking to each of the studies outlined, however, it appears that all of this prior literature did indeed use attitude change scores.

Another way in which our study may have varied from past research is that we used counter-attitudinal messaging. Though this is one method used when studying persuasion, some research is on persuasion studies the effects of persuasion in the context of only pro-attitudinal information. Though all of the literature we review have included pre-attitude measures in their studies, it is unclear from Osgood and Tannenbaum (1955) whether participants had primarily favorable or unfavorable attitudes towards the topics presented to them. Thus, though many participants may have been receiving counter-attitudinal information, there is likely to be a portion of participants for whom the information received was pro-attitudinal. Tesser et al. (1995) and Bassili (1996), however, make clear that they presented participants with only counter-attitudinal information.

Beyond this, the length of the messaging that was used in our study varies substantially from some of the messaging used in prior research (Osgood & Tannenbaum, 1955; Bassili, 1996). For example, while we used multiple paragraphs presenting counter-attitudinal information about GMOs, Osgood and Tannenbaum used fabricated newspaper articles of an unclear length, though we can presume that a newspaper article is at least of moderate length. Bassili (1996) also used a different type of messaging in his persuasive appeals, presenting participants with a single, counter-attitudinal sentence. Unfortunately, it is unclear what length of messaging Tesser et al. (1995) used for their persuasive passages.

There are also important differences in the source of the messages used in our study and those reviewed here. Osgood and Tannenbaum (1955), for example, used messaging related to a concept (e.g., accelerated college programs), which was delivered by a source (e.g., senator Robert Taft), finding that persuasion resistance was stronger in response to persuasive attempts directed at the source than at the concept. Importantly, as previously noted, we also do not know the distribution of attitudes towards either the source or concept, so participants' attitudes towards each topic are unclear. Similarly, though not intending to present participants with a source,

Bassili (1996) also captures persuasion resistance in response to a source and a concept, having conducted his studies via telephone interview. While the content of the messaging was a concept in his studies (i.e., hate speech), the interviewer conducting the session delivered the content of the messages verbally. This delivery of the messaging via an interviewer therefore may have prompted persuasion resistance in response to the source rather than the concept, consistent with Osgood and Tannenbaum's findings. Both of these types of messaging are in contrast to our study, which used messaging targeted at a concept exclusively (i.e., GMOs) and no source. It is unclear from Tesser et al. (1995) if a source was included in their messaging.

Finally, it is unclear in the work cited whether the messages that were presented to participants were mild, moderate, extreme, or mixed. Our passages included both extreme and moderate information and were framed as advocacy for the position. Unfortunately, none of the research that we reviewed in this context provided sufficient information to speculate about the extremity of the messaging used, though we do know the verbatim materials from Bassili (1996) with which we could speculate about the extremity. However, without the distribution of participants' attitudes, it is difficult to know how participants would have perceived the information presented to them. Thus, it is unclear if message extremity played a role in affecting the results of any of the studies.

In general, there are a host of differences across each of the studies that attempt to capture the role of objective attitude extremity in persuasion resistance. While the results of the studies tell a similar narrative, that increased objective extremity is related to enhanced persuasion resistance, this large number of differences makes it difficult to know if the effect is the result of the same process. It is difficult to know which of the differences outlined are the primary contributing factor to the differences in results that we found, or perhaps if some combination of these factors might be the true difference. Thus, we are reluctant to comment on an exact cause of the differences in our findings, noting that more research and replication needs

to be conducted. Indeed, three key papers across multiple decades of research does not provide a compelling picture of a true effect.

While study one produced interesting results, both in support and in contrast to our hypotheses, the theoretical interest of the findings from study two were more modest. Here, we found significant results for only the cognitive response index of thought favorability and only for objective extremity and attitudes. This finding was interesting because, to our knowledge, this is a novel finding in the literature. Specifically, we found that participants tended to list thoughts that were consistent with the valence of their attitude, and that this effect was pronounced for more objectively extreme attitudes. Despite this finding, we did not demonstrate support for an effect of subjective extremity on thought favorability. One possible explanation for this is that an individual who feels that they are extreme may be more uncomfortable in response to counter-attitudinal information, thereby reducing the extent to which they are processing the information.

For the remaining analyses in study two, we found no significant results. One possible explanation for the lack of significant results on the amount of time spent reading information is that participants read pro- and counter-attitudinal information for the same amount of time, but for different reasons. Unfortunately, an index of amount of time spent reading is generally too ambiguous to attempt to explain or infer processes from a non-significant result, being interpretable largely with sound theoretical reasoning.

We did not find significant results for the amount of thinking either. A likely explanation for this lack of significant results is that participants were presented with relatively short passages of information, approximately one small paragraph in length. Since participants were able to list up to five thoughts after each paragraph of information, we may have been achieving ceiling effects with the amount of processing that participants engaged in. After the presentation of each passage, participants were asked to list their thoughts. After the initial request to list thoughts, it is likely that participants therefore expected to list their thoughts and may have been paying more

careful attention to the information. Consistent with this, at a maximum, participants could list up to 20 thoughts. At a minimum, with a mean of 12.4 thoughts and standard deviation of 4.2, most participants were listing a minimum of 8.2 thoughts and a maximum of 16.8 thoughts. This high number of thoughts lends support to the idea that participants were thinking more after the presentation of each passage.

Finally, we did not find significant results for the recall indices of memory. There are a few possible explanations; first, we had approximately 15 to 20 minutes of time between the first phase and the memory phase of the study. Though this time is not excessive, it may have led to more memory decay than we expected, reducing the number of pieces of information that a participant could recall, demonstrating floor effects. Alternatively, we may have provided participants with too few text boxes, thus exhibiting ceiling effects. We examined the distributional properties, finding that participants tended to list approximately 12 pieces of information. Given that the passages contained on average between 7 and 9 pieces of information, totaling between 30 and 36 pieces of information, this number does not suggest floor or ceiling effects as a likely explanation. However, it is nonetheless important to note that bias in memory is a somewhat controversial idea. Eagly et al. (1999), for example, note that the attitude-congruency bias which we attempted to test with the recall indices may not be a replicable effect and; thus, we may have been attempting to demonstrate an effect that does not exist. as strong an effect as initially thought in the literature.

Finally, a lack of significant results for the recall indices was also counter to our expectations. Based on the lack of significant bias for the other indices, there is not a strong reason to think that bias should be present in the recall index. Indeed, if participants are not demonstrating bias in their processing of information at earlier stages, it would be unlikely to expect that they would demonstrate bias in their recall of information.

Future Directions

The first, and most obvious, future direction for these studies is to replicate the findings from study one. We found strong effects for objective extremity and marginal effects for subjective extremity on attitude change. In order to replicate the findings from study one, and to further examine the cognitive response indices with appropriate changes, future research should replicate with the full range of ten thought listing spaces in the cognitive response task. This replication will help to ensure a true effect of attitude change, but will also highlight whether truncated data due to a smaller number of thought listings in the first half of data collection was reducing the size of potential effects.

In addition to replicating the results of study one, future research should also consider the role of elaboration in this persuasion resistance paradigm. Specifically, objective and subjective extremity may operate differently under conditions of high or low thoughtfulness. Though we do not have sufficient evidence to reliably predict the role of thought, an exploratory analysis could provide fruitful future research in determining the mechanisms underlying the findings in study one. One way that future research could manipulate thoughtfulness is through the use of cognitive load tasks. A cognitive load task serves to decrease elaboration by occupying participants' thinking, reducing their ability to think deeply about the information presented. If effects are primarily thoughtful, we would thus expect that any effects produced thoughtfully will be reduced or eliminated under these conditions, while effects produced non-thoughtfully should be enhanced. Conversely, in order to increase elaboration future research could consider forewarning participants about the topics that will be presented and that they will be asked for their opinion. This forewarning of the task therefore increases the scrutiny and level of thought of the participant, particularly for those who find the topic more personally relevant. This increased thought should therefore lead to the elimination of effects that occur primarily through non-thoughtful processes, while enhancing those that occur thoughtfully.

Indeed, though our data support the perspective that both measures are separable, and that both capture meaningful processes, the variability in the relationship of the measures across multiple topics prompts some interesting questions. For example, we note in pretesting that the correlations between the objective and subjective extremity measures for the topic of protein shakes were as high as $r = .65$ after correcting for measurement error, while the correlations when GMOs were the topic were no higher than $r = .40$ after correcting for measurement error, though typically lower. Future research should explore the characteristics of these objects to determine what may be leading to this variation and, conversely, what might govern when their correlations will be in alignment.

An additional consideration that arises out of this research is the extent to which objective attitude extremity could be calculated in different ways, rather than only as the deviation of the attitude from neutrality. Specifically, future research could consider computing objective extremity using an 'other issues' frame, such that participants' extremity on the focal issue is calculated relative to their extremity on a range of other issues[4].

Finally, longer term future research could consider expanding this line of research to explore documented effects, such as attitude-behavior consistency. Attitudes tend to be predictive of behaviors in a variety of circumstances, but past research has demonstrated that these effects may vary depending on the moderators, or mediators, that are present. In an exploratory study, future research could therefore examine the role of objective and subjective extremity on modifying the attitude-behavior consistency relationship.

[4] We note that although researchers could theoretically compute a normative frame of reference for objective extremity, such that a participants extremity is compared to others' objective extremity on the focal issue, this process simply involves the addition of a constant to the extremity calculation. Thus, this normative computation would shift everyone's scores by the same amount and would not provide additional insight.

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Appendix A

Consent Form

Consent Form

Food

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 the study called **Food.** I understand that this means I will be asked to read one or more written passages and then share my attitude about the passage or passages. I also understand that I may be asked to answer a few questionnaires.

3. I understand that every effort will be made to maintain the confidentiality of the data now and in the future. The data will be stored on a password protected computer in a locked room that only authorized personnel have access to.

4. 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.

5. I understand that this study has been granted clearance according to the recommended principles of Canadian ethics guidelines, and Queen's policies.

6. I understand that in the event that I have any complaints, ethical concerns, or questions about this research, I may contact Dr. Leandre Fabrigar, (613-533-6492; fabrigar@queensu.ca), Devin Fowlie, (17dif2@queensu.ca), or the General Research Ethics Board Chair at Queen's University (613-533-6081; chair.greb@queensu.ca).

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

Signature:_____ Date:_____

Appendix B

Letter of Information

The following is the LOI/Consent as it will be presented on the computer. There is a limit to how much text can be presented on each screen, as such a page break will indicate when participants will move on to another screen.

FOOD

Letter of Information and Consent

This research is being conducted by Dr. Leandre R. Fabrigar, Associate Professor, of the Department of Psychology at Queen's University in Kingston, Ontario.

In this study, you will be presented with questions that will ask for your opinions regarding a topic. You will also read a passage or passages describing this topic and will be asked to answer questions about the topic. We estimate that this experimental session, which includes this study as well as other short studies, will take approximately 60 minutes to complete in total. There are no direct benefits for participating in this study. At the end of the study we will provide you with an explanation of the purpose of the study so that you can gain some understanding about the research. There are no known physical, psychological, economic, or social risks associated with this study.

[page break]

Your participation is completely voluntary. Although it be would be greatly appreciated if you answer all the 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, or from any other tasks in this session, 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. However, because responses are anonymous, once the study is completed you can no longer withdraw your data.

[page break]

We will keep your responses confidential. Only authorized personnel will have access to the area in which the data is stored. The computers on which the data will be stored are password protected. Your responses are anonymous, therefore it will not be possible to match your responses to you personally. 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. Our intention is to retain this data indefinitely. If this research is published, the data may be released upon request to authorized researchers who may use the data to answer other research questions. However, no identifying information will be provided.

[page break]

In exchange for your participation in this session, we will indicate that you have earned 1.0 credit toward your Psychology 100 grade.

Any questions about study participation may be directed to Dr. Leandre Fabrigar (613-533- 6492, fabrigar@queensu.ca). Any ethical concerns about the study may be directed to the Chair

of the General Research Ethics Board at 1-844-535-2988 (Toll free in North America) or chair.GREB@queensu.ca (1-613-533-2988 if outside North America).

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

Leandre R. Fabrigar

Professor

[page break]

This Letter of Information provides you with the details to help you make an informed choice. All your questions should be answered to your satisfaction before you decide whether or not to participate in this research study. If you do not consent to participate in this study, please notify the researcher of your decision.

[page break]

By checking this box I have read the above statements, have had all my questions answered by the researcher, and freely consent to participate in this research.

[box to check]

Appendix C
Debriefing Form

First, it is important for you to understand that all of the information about GMOs or protein shakes that you received was designed as an experimental manipulation. The fictional story or the claims made through the informational passages should be considered as artificial, designed to persuade rather than to be truthful. All materials in this study were constructed purely for research purposes. With this said, some of the general ideas or claims may be reflective of actual thoughts or feelings on the topic. We do request that you do not discuss this information or other aspects of the experiment with people who may participate in the future. In order to obtain natural responses to our materials, it is necessary for participants to not be told about the hypotheses or procedures of the study prior to participating.

Social psychologists have long believed that the extremity of peoples' attitudes toward objects (i.e, their likes and dislikes) may be predicted by their levels of extremity. Psychologists have been interested in the differences between how extreme a person thinks their opinion is (subjective extremity) and how extreme their opinion actually is (objective extremity), as well as how these differences in extremity play a role in the processing of information that goes against their held beliefs. The aim of this experiment was to study how information that is different either in direction (valence) or extremity can affect a person's ability to process that information. Specifically, we wanted to find out if individuals holding more extreme beliefs would have a more difficult time processing information that didn't align with their beliefs than an individual who was presented with information that aligns with their beliefs.

The purpose of this study, in other words, was to understand how you would respond to information that was presented to you and how the extremity of these passages affected your ability to recall the material. It is important to remember that the information presented in the

passages was designed specifically to be varied in valence and extremity and is not intended to be truthful.

All information presented in this session was constructed by the experimenter for use in this study. Thus, you should be aware that the information communicated to you is not necessarily accurate.

Your participation in this study is greatly appreciated. In the event that you have any complaints, concerns, questions, or would like access to study results, please contact Dr. Leandre Fabrigar (613-533-6492, fabrigar@queensu.ca). Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board (chair.GREB@queensu.ca or (613) 533-2988 or 1-844-535-2988 (toll-free). You should feel free to raise any issues of interest or concern with the research assistant running the session. If the assistant cannot answer your question, he or she will refer you to Dr. Leandre Fabrigar.

This is an ongoing research project: please do not discuss this project with anyone, as knowledge of what we are trying to find may alter the results we obtain.

Thank you for your participation.

Dr. Leandre Fabrigar Devin I. Fowlie

Appendix D

Pretesting Verbatim Passage Materials

GMO

Neutral

1) Pros and Cons of GMOs

There are some good and some bad things about Genetically Modified Organisms (GMOs) and these should be carefully considered before any concrete decisions are made about them. For instance, while GMOs might help to solve the food shortage in the world through the decreased crop space required for growing them, there are some who argue that environmental issues such as potential "super weeds" are not fully emphasized. So, despite the possible positives of minimizing the global food shortage, it is difficult to gauge whether this rather large benefit outweighs the negative environmental concerns.

2) Not Much to Say When It Comes to GMOs

There are arguments on both sides of the fence regarding the potential use of Genetically Modified Organisms (GMOs), specifically as it relates to the types of food that we are consuming. These arguments cite the many environmental and public health issues on both sides, such as potential cross-pollination with weeds, the reduction in pesticide use, increased risk of health-related disorders such as allergies, and reduction of global food shortages. These issues and benefits are often overstated, however. GMOs are a non-issue and there should really be very little debate about them. They may not be good nor bad and, instead, they are nearly identical to the organisms that we currently consume.

Mildly Positive

1) GMOs Can Be More Beautiful

Genetically Modified Organisms (GMOs) have increasingly been seen in the media as the topic gains some traction. Specifically, we have been concerned with GMO's as they relate to the food that we eat. Though some concerns have been raised in opposition to GMOs, such as possible concerns regarding allergies, one of the largest benefits is the vast array of new, beautiful organisms that can be created. Genetically modifying things like flowers and trees allows scientists to create new and interesting designs, including nicer colours or shapes of trees to suit our design needs.

2) Genetically Modified Plants Might Taste Better

Genetically Modified Organisms (GMOs) are a popular topic in social and political circles today. Arguments for and against modifying organisms, specifically our food, include increased taste, and possible allergy concerns. One good thing about GMOs that should be considered is their ability to taste better than a natural growing plant. With GMOs we have the potential to do things such as making apples taste slightly sweeter or make peppers a bit spicier, which is a good reason for adopting them. With all of the unique ways that we can modify our foods to make them more interesting and better tasting, it makes sense to continue to use GMOs.

Moderately Positive

1) GMOs Might Help Food Shortage

Genetically Modified Organisms (GMOs) are a hot topic in social and political discussions. Though some have argued against the use of GMOs, it is possible that GMOs could have a positive impact on reducing the global food shortage. With reduced crop space due to a growing population, GMOs may help to provide enough food for the world's population, while still working within the decreasing space that we have. Sources such as the United Nations suggest that we may need to double our food production over the next few decades and it is possible that GMOs can be a tool in keeping pace with that.

2) GMOs Might Reduce Some Pesticides

Genetically Modified Organisms (GMOs) have become increasingly popular in environmental discussions. Though some have contested the use of GMO's, with the increase and prevalence of climate change scientists are looking for new ways to help combat rapid environmental changes. One of the ways to try to reduce climate change could come in the form of GMOs. GMOs might help to reduce pesticide use; because pesticides might hurt the environment, including some bugs, it's good if we're able to reduce their usage. If we can reduce GMOs, we might be able to reduce some of the effects of pesticides on the environment.

Extremely Positive

1) GMOs Prove to be Very Good Tools

Genetically modified organisms (GMO's) are not only a viable solution, they are the best option for solving some of the problems that we are experiencing in the world. The United Nations has said that we need to double food production in the next three to four decades in order to feed the world's growing population, and the only viable way to do that is with GMOs. Not only can GMO's solve the world's food shortage, they could also have direct, drastic, positive effects on our health. The adoption of GMOs, through solving the world's food shortage and increasing our health as a population is an incredible tool that will save countless lives.

2) GMO's are a Great Option for Eliminating Pesticides

Pesticides have long been a topic of conversation in environmental circles. Genetically Modified Organisms (GMOs) are a great, cost-effective option for eliminating the use of pesticides in crops, which can have multiple effects. By modifying plants to be resistant to pests, farmers no longer need to spray pesticides on their crops. Not only does this reduce the use of pesticides directly, but it also drastically decreases greenhouse gas emissions caused by the spraying of fields by the farmer. This single factor can have an incredible, lasting impact on reducing greenhouse gas emissions and preventing, or reversing, climate change.

Mildly Negative

1) Natural Food Might Taste Better than GMOs

Genetically Modified Organisms (GMOs) are a topic of discussion in social and political circles in the world, today. Although GMOs could have some positive impacts, they might not be the best solution. Some have suggested that GMOs can taste better than natural plants, but this might not be the case. We have grown up eating natural foods and so we develop a taste for this kind of food. Modifying the taste of food probably isn't a good idea because we should be teaching our kids to enjoy nature the way that it was intended.

2) GMOs May be Related to Allergies

Genetically Modified Organisms (GMOs) are often talked about in the media and in political circles, as they become used more and more. Though there are some good aspects to

GMOs, they could have some negative impacts on peoples' health. For example, Brazil nuts were once crossed with soybeans, which may have been related to a potential soybean allergy. Though they can be a good tool for some things, we might not want to adopt GMOs without knowing what other sorts of allergies or health issues that they can cause.

Moderately Negative

1) GMOs Might Impact Local Farmers

Genetically Modified Organisms (GMOs) are often a topic of discussion in social, political, and media circles. Though some have argued in favour of GMOs, there are too many negative consequences to be ignored. One of the largest negative impacts comes in the form of harm to the farmers. Because GMOs are usually owned by large corporations, and the demand for food is so high, this can drive the cost of maintaining farms, including buying seeds, to be too high for local farmers to keep pace with. Though it can sometimes be beneficial to have corporations take over, it is important to remember the risks that may be incurred to the local economy when this happens.

2) GMO's Pose Risk to the Environment

Genetically modified organisms (GMOs) are often discussed among environmentalists for their potential positive or negative environmental impacts. Though there may be those in favour of GMOs, there is potential harm to the environment that might outweigh some of the benefit. With the use of GMOs in crops, there is the potential for cross-pollination; this could increase the amount of pesticides that are used because we might encounter weeds that are more difficult to eliminate. More pesticides could be bad for the environment and so, rather than risk it, it makes more sense to play it safe and avoid the use of GMOs.

Extremely Negative

1) GMOs Pose Health and Environmental Risks

Genetically modified organisms (GMOs) pose immense health and environmental risks as they become increasingly introduced to our crops. The risk of cross-pollination leads to the development of pesticide-resistant weeds, devastating current crops and eliminating any means of combating them. This cross-pollination has already been shown to have large, negative impacts on butterflies in the US, leading to the destruction of other key members of the ecosystem. In addition, potential cancers, increased and severe allergies, and further antibiotic resistance will all have detrimental effects on our health. GMOs are much too dangerous to continue using and should be discontinued immediately.

2) GMO's Kill Local Farmers' Business and the Environment

Genetically modified organisms (GMO's) are incredibly harmful to the environment and can kill the business of local farmers. Cross-pollination from GMO's can create pesticide-resistant plants, leading to the destruction of crops. In addition, because GMO's are usually owned by large corporations, this can lead a monoculture, which further destroys the environment and economically ruins the farmers. Large corporations controlling the production of GMO seeds can cost farmers enormous amounts of money to continue to produce their crops, while also leaving them with nothing if pesticide-resistant weeds were to overtake their current crops. GMOs are incredibly harmful to the environment and destroy the economic stability of local communities and farmers.

Protein Shakes

Neutral

1.) Protein Shakes are Neither Good nor Bad

Protein shakes are sometimes a topic of discussion in health forums and other wellness circles. There are arguments on both sides of the protein shake discussion, with issues ranging from laziness to the convenience of protein shakes. Occasionally, conversations will arise about the apparent health benefits of increased protein, with some arguing that too much protein is not good. In reality, the benefits and concerns are dramatically overstated; protein shakes are just a health product and they are not really good nor bad. It is up to the individual to make a decision about them based on the things that they know about protein shakes.

2.) Protein Shake use is a Case-to-Case Decision

Protein shakes come in and out of the scope of health discussion groups and wellness circles, with interest in the topic increasing or decreasing in a fairly cyclical manner. Though there are divisions about whether protein shakes might be good or bad, the underlying consensus seems to be that it depends, and we don't really know. While protein shakes might be good for some people, like bodybuilders, they might not do much of anything for someone else. Protein shakes aren't really good or bad, they simply are. Any decision about protein shakes should weigh both the positives and the negatives and then determine what is right for the person.

Mildly Positive

1.) Protein Shakes Might be More Convenient

Protein shakes are a topic of interest in health, social media, and fitness circles. Some people have been interested with protein shakes as they relate to convenience. Though some concerns have been raised in opposition to protein shakes, such as possible concerns regarding decreased nutrition, one of the largest benefits is the slightly more convenient nature of protein shakes. For breakfast, some folks might enjoy the convenience of having some of their nutrients in a drinkable form. When we are in a hurry to get places, the modest increase in convenience offered by a protein shake can be good.

2.) Protein Shakes Might Taste Good

Protein shakes are a popular topic in some health and fitness discussions today. Arguments for and against protein shakes include the great taste, and possible weight gain concerns. One good thing about protein shakes that should be considered is their ability to taste as good or better than some foods that we eat. With protein shakes, there is the potential to create new flavours that can be difficult to find with other foods. Things like strawberry cheesecake or chocolate peanut butter flavours are easy to find in protein shake flavours. This makes them a good option because they might be more fun to drink than other health drinks.

Moderately Positive

1.) Protein Shakes Might Help Those with Deficiencies

Protein shakes have long been a topic of debate in health and fitness circles. Though some have argued against protein shakes, they have the potential to be a good tool for those that need it. Specifically, for individuals that have low levels of protein in their bodies, protein shakes are one method of making up for some of the protein that they need. By providing a fun, convenient method of consuming protein, these shakes are a good way to get these folks to consume more protein on their own, maybe reducing the need for some medical methods.

2.) Protein Shakes Might Help Weight Loss

Protein shakes are increasingly a topic of discussion in health and fitness circles. Though there are some who are opposed to protein shakes, they remain a good method for individuals who are trying to lose weight. Protein, fat, and carbs are important to good nutrition, but one of the benefits of protein is that it may be able to keep you full longer than fat or carbs, and can sometimes have fewer calories. This is good because it allows people who want to lose weight to have protein shakes, which are convenient and might be healthier than some convenient carbs or fats.

Extremely Positive

1.) Protein Shakes Lead to Healthier Lifestyle

Protein shakes are an incredibly useful and powerful tool for health and fitness, and can provide us with some convenient, healthy methods of gaining muscle, losing weight, and increasing our nutrition. For individuals with protein deficiency, protein shakes are a lifesaver; they are convenient and provide some of the most basic and necessary nutrients that these people need. For anyone else, they are a powerful method of living a healthy lifestyle. Protein shakes can keep you full longer, helping you lose weight, and they can provide you with some of the largest building blocks for gaining muscle. Protein shakes are a great health tool that everyone should be using.

2.) Protein Shakes are Key to Losing Weight

Protein shakes are one of the best, most convenient methods for gaining muscle and losing weight, while contributing to a healthy diet. Protein shakes provide large amounts of protein in a small package, which are key building blocks for gaining and repairing muscle. Not only that, but protein shakes are instrumental in helping those who are trying to lose weight. Protein is much better than both fats and carbs at keeping you full for longer, allowing you to eat less and lose much more weight than you would without protein shakes.

Mildly Negative

1.) Protein Shakes Might Not Taste Good

Protein shakes are a topic of discussion in health and fitness circles in the world, today. Although protein shakes could have some positive impacts, they might not be good for everyone. Some have suggested that protein shakes can taste better than other foods, this might not be the case. Protein shakes might use artificial flavours, which means that they might not taste as good as some other foods. Natural foods can be better for you than artificial foods, and so it might not be a good idea to use things like protein shakes that might use artificial flavours.

2.) Protein Shakes Might Decrease Balanced Diet

Protein shakes are often talked about in health and fitness circles, as they become used more. Though there are some good aspects to protein shakes, they could have some negative impacts on peoples' health. For example, protein shakes may lead to a less balanced diet. Because they are convenient, people might use protein shakes instead of eating regular meals. This means that they might not include all of the things that they need to eat. It is usually good to follow guidelines of a balanced diet and, since protein shakes aren't in those guidelines, maybe we should avoid them.

Moderately Negative

1.) Protein Shakes Might Contribute to Malnutrition

Protein shakes have become a popular topic in health and fitness circles. Though some have argued in favour of protein shakes, there have been some suggestions that protein shakes might not be good. Protein shakes might lead to incomplete nutrition in some individuals. If people are using protein shakes to replace some of their meals, which might be common for breakfast replacements, then there might be a risk of having too much protein and not enough other macronutrients like carbs and fats. Protein shakes are usually high in protein and don't contain much else, so if they are used too much then they might lead to a less balanced diet and malnutrition.

2.) Protein Shakes Not Good in Long Term

Protein shakes are a topic of increasing debate in the health and fitness world. While some have advocated for the use of protein shakes, they might be less beneficial than we think. One problem with protein shakes is that they might not be sustainable in the long term. Protein shakes might seem like a good idea to some folks, but long term use of protein shakes might lead some people to have nutrient deficiencies or to gain some weight once they stop using them. If an individual relies on protein shakes too much, they might find that they can't use them in the long run.

Extremely Negative

1.) Protein Shakes Extremely Dangerous to Health

Protein shakes are an extremely dangerous health phenomenon, that should be immediately discontinued. Protein shakes cause increased levels of protein in the body and, unless this protein is being used, this can lead to weight gain, nutrient deficiency, and even cancers. There are cancers that are specifically linked to higher levels of protein in the blood and this, coupled with the large potential for weight gain, can lead to heart disease, which can both have serious consequences. Protein shakes should not be used by anyone because the risks are far greater than any short term benefit that they might have.

2.) Protein Shakes Cause Premature Disease

Protein shakes are extremely dangerous to our health and wellness and should not be consumed by anyone. Not only does the use of protein shakes lead people to skip meals, meaning that they miss out on key nutrients in their diets, but they also can lead to some serious health risks. Increased levels of protein in the body can lead to malnutrition in other areas such as fats and carbs, while increasing the risk of heart disease, kidney complications, and high cholesterol. Protein shakes make it far too easy to consume too much protein and should be avoided.

Appendix E

Study One Passages

Positive Advocacy Message

Genetically Modified Organisms (GMOs) is a blanket term used to refer to the use of genetic modification of any organism, primarily crops and other food sources. As the issue of climate change is increasingly brought to the forefront of political and social concerns, GMOs have arisen as a remarkable and incredibly efficient method of reducing food shortages and climate change. To begin with, GMOs provide farmers with the ability to dramatically reduce their pesticide use on their crops; in fact, one study in Saskatchewan found that the use of GMOs in farmer's fields reduced their overall pesticide use by as much as 5.5%. This is an enormous reduction of pesticides and in itself provides ample justification for the adoption of GMOs.

Aside from the use of GMOs to reduce pesticides, there are incredible social benefits to be gained from the use of GMOs. The most noticeable example of this is to consider how GMOs affect crops; by allowing a particular crop to grow much larger than non-modified crops, there is the potential to feed so many more people! In fact, some have estimated that the use of GMOs to expand the size of crops could increase food production by as much as 8% for some crops. This additional crop yield can help to grow the amount of food that we have available and, as a result, will help those who are less able to afford produce.

Finally, GMOs have the potential to improve the way that food is consumed. That is, while we are currently limited by the types of fruits and vegetables that we are able to grow, the introduction of GMOs will allow us to vastly expand these fruits and vegetables! More specifically, some have suggested that we may be able to develop at least 4 different kinds of corn that we do not currently have. Though we do not know the use of these additional types of crops, it is not difficult to imagine the sorts of things that we could do with these new foods!

Negative Advocacy Message

Genetically Modified Organisms (GMOs) is a blanket term used to refer to the use of genetic modification of any organism, primarily crops and other food sources. As the issue of climate change is increasingly brought to the forefront of political and social concerns, GMOs have arisen as a primary target in the cause of climate change. Genetically modified organisms (GMOs) pose immense health and environmental risks as they become increasingly introduced to our crops. The risk of cross-pollination leads to the development of pesticide-resistant weeds in 8-10% of fields, creating the potential to devastate current crops and making any means of combating them harder. This cross-pollination has already been thought to have large, negative impacts on

butterflies in the US in the near future, potentially leading to the destruction of other key members of the ecosystem.

In addition to the negative effects of creating pesticide-resistant weeds, potential cancers, increased and severe allergies, and further antibiotic resistance will all have detrimental effects on our health. GMOs are much too dangerous to continue using and should be discontinued immediately. Importantly, GMOs have been linked to over 12 kinds of unique cancers; these cancers, though very rare, are potentially quite devastating for those who have them. Though it cannot be said for certain how much of a role GMOs play in developing these cancers, there is thought to be an increased risk of as much as 4% in those who consume GMOs.

Finally, it should be noted that GMOs are incredibly harmful to the environment and have the potential to severely damage the business of local farmers. Cross-pollination from GMO's can create pesticide-resistant plants, as previously discussed, leading to the destruction of crops. In addition, because 13% of GMOs farmers use are owned by large corporations, this can lead to a monoculture, which further destroys the environment and economically ruins the farmers. Large corporations controlling the production of GMO seeds can reduce farmers' profits by as much as 17% in order to continue to produce their crops, while also leaving them with nothing if pesticide-resistant weeds were to overtake their current crops. GMOs are incredibly harmful to the environment and can severely harm the economic stability of local communities and farmers.

Appendix F

Study Two Passages

Extremely Positive

GMOs Prove to be Very Good Tools

Genetically modified organisms (GMO's) are not only a viable solution, they are the best option for solving some of the problems that we are experiencing in the world. The United Nations has said that we need to double food production in the next three to four decades in order to feed the world's growing population, and the only viable way to do that is with GMOs. Not only can GMO's solve the world's food shortage, they could also have direct, drastic, positive effects on our health. The adoption of GMOs, through solving the world's food shortage and increasing our health as a population is an incredible tool that will save countless lives.

Moderately Positive

GMOs Can Be More Beautiful

Genetically Modified Organisms (GMOs) have increasingly been seen in the media as the topic gains some traction. Specifically, we have been concerned with GMO's as they relate to the food that we eat. Though some concerns have been raised in opposition to GMOs, such as possible concerns regarding allergies, one of the largest benefits is the vast array of new, beautiful organisms that can be created. Genetically modifying things like flowers and trees allows scientists to create new and interesting designs, including nicer colours or shapes of trees to suit our design needs.

Moderately Negative

Natural Food Might Taste Better than GMOs

Genetically Modified Organisms (GMOs) are a topic of discussion in social and political circles in the world, today. Although GMOs could have some positive impacts, they might not be the best solution. Some have suggested that GMOs can taste better than natural plants, but this might not be the case. We have grown up eating natural foods and so we develop a taste for this kind of food. Modifying the taste of food probably isn't a good idea because we should be teaching our kids to enjoy nature the way that it was intended.

Extremely Negative

GMOs Pose Health and Environmental Risks

Genetically modified organisms (GMOs) pose immense health and environmental risks as they become increasingly introduced to our crops. The risk of cross-pollination leads to the development of pesticide-resistant weeds, devastating current crops and eliminating any means of combating them. This cross-pollination has already been shown to have large, negative impacts on butterflies in the US, leading to the destruction of other key members of the ecosystem. In addition, potential cancers, increased and severe allergies, and further antibiotic resistance will all have detrimental effects on our health. GMOs are much too dangerous to continue using and should be discontinued immediately.

Appendix G

Measures

Subjective Attitude Extremity

1.) Other people might consider my opinion on X to be: (4-point scale, Neutral, Mild, Moderate, Extreme)

2.) I consider my opinion of X to be: (4-point scale, as above)

3.) Compared to my feelings on other issues, I would consider my feelings towards X to be:

Neutral, Mild, Moderate, Extreme

Objective Attitude Extremity

Following these instructions there will be a set of words that could be used to describe your overall evaluation of an issue. Please use the list provided to describe your evaluation of the use of X. 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 or two. Please begin.

Dislike

1 2 3 4 5 6 7

Not at all Definitely

Good

1 2 3 4 5 6 7

Not at all Definitely

Undesirable

1 2 3 4 5 6 7

Not at all Definitely

Bad

1 2 3 4 5 6 7

Not at all Definitely

Like

1 2 3 4 5 6 7

Not at all Definitely

Positive

1 2 3 4 5 6 7

Not at all Definitely

Negative

1 2 3 4 5 6 7

Not at all Definitely

Desirable

1 2 3 4 5 6 7

Not at all Definitely

Thought Listing Task

The thought listing task asks participants to “Please list any thoughts that came to mind while you were reading the passage. Work quickly, as your first reaction is often best. If you do not have any more thoughts simply type ‘None’ and continue until there are no boxes remaining.” Participants are then presented with boxes in which they may type as much as they wish.

Recall Task

The recall task also provides participants with a number of boxes in which they may respond, but instead asks them to “Please recall as much information as you can about GMO’s and list the information in the boxes below. If you do not have any more thoughts simply type ‘None’ and continue until there are no boxes remaining.” Participants are then presented with the boxes in which they may type their responses.