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Double Attribute Frames:  
Implications for Theory and Practice

A dissertation submitted in partial satisfaction of the requirements for the degree of 
Doctor of Philosophy

in

Psychology

by

Jessica Simone Thierman

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Professor Benjamin Bergen
Professor Christopher Bryan
Professor Victor Ferreira
Professor Ayelet Gneezy

2014
The Dissertation of Jessica Simone Thierman is approved, and it is acceptable in quality and form for publication on microfilm and electronically:

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Chair

University of California, San Diego

2014
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ABSTRACT OF THE DISSERTATION

Double Attribute Frames:
Implications for Theory and Practice

by

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Doctor of Philosophy in Psychology
University of California, San Diego, 2014
Professor Craig R. M. McKenzie, Chair

Framing effects are said to occur when equivalent descriptions of objects or events lead to different choices. Attribute frames refer to logically equivalent descriptions along a single dimension. For example, ground beef might be described as "85% lean" or, equivalently, "15% fat". Typically, one frame is positive and one is negative and people evaluate the object more favorably when presented with the positive frame (e.g., "85% lean" beef is viewed more positively than "15% fat" beef). This phenomenon is known as a valence-consistent shift in evaluations.

However, missing from the literature on attribute framing is a double frame condition, in which positive and negative frames are presented together. Because some industries (e.g. the FDA) use the double frame as the standard for communicating,
understanding how these frames are evaluated has practical implications. Additionally, how double attribute frames are evaluated has theoretical implications: The most common explanation of attribute framing, the Associative Account, predicts how double attribute frames will be evaluated. Such a prediction however, has not been well tested. This dissertation systematically explores the evaluation of double attribute frames, the implications for the Associative Account, and potential alternative explanations for such evaluations.

Experiments 1a – 1d examine how double attribute frames are evaluated across stimulus and procedure differences including context, quantitative information, frame descriptors, response question, and response measure. These experiments reveal a stable, consistent, and surprising pattern of results in the evaluation of double attribute frames. Experiments 2a and 2b examine methodological factors common to most attribute frame experiments that may account for the observed pattern of double attribute frame evaluation, possibly by affecting frame saliency. Finally, Experiments 3a and 3b examine whether an alternative explanation for attribute framing, the Information Leakage Account, as well as linguistic cues, can offer insight into the observed pattern of results in the evaluation of double attribute frames. Taken together, this body of work demonstrates a novel, unpredicted pattern of evaluations of attribute frames and raises questions for the standard theoretical explanation of such effects.
Introduction

Framing effects describe the fact that equivalent descriptions of an object or event can lead to different evaluations. Probably the most well known framing effect is the Asian Disease Problem (Kahneman & Tversky, 1979; Tversky & Kahneman 1981). In this problem, participants are given a choice between a certain outcome and a probabilistic outcome that have equal expected value. That is, the outcome of the two options will be the same in the long run. When such a choice is given in the context of gains, people prefer the certain outcome. However, when the same choices are rephrased in the context of losses, people prefer the risky (probabilistic) outcome. This preference reversal between the gain and loss domain sparked an extensive research program to investigate how people evaluate options in context (and with regard to reference points). Additionally, Prospect Theory (Kahneman & Tversky, 1979) has been used to explain such seemingly irrational behavior.

While framing effects were first demonstrated under conditions of choice between risky and riskless options, similar effects also occur in simpler tasks. Specifically, framing effects can also be seen with attribute frames. An attribute frame involves an object or event described along a single dimension in one of two equivalent ways. For example, Levin (1987b and Levin & Gaeth, 1988) used experimental stimuli in which ground beef was described as “75% lean beef” or “25% fat beef.” Such descriptions are logically equivalent because all beef that is 75% lean must also be 25% fat. Additionally, Levin and colleagues (Levin, Schnittjer, & Thee, 1988) used stimuli in which a medical treatment was described as having a “50%
success rate” or a “50% failure rate” between conditions. As with the ground beef, such descriptions are logically equivalent because a medical treatment with a 50% success rate entails that the treatment also has a 50% failure rate.

The most common effect of attribute frames in the experimental literature involves evaluations of the framed object/event. Specifically, Levin (1987b and Levin & Gaeth, 1988) found that people evaluated “75% lean beef,” more positively than “25% fat beef.” Additionally, people judged a medical treatment with a “50% success rate” as more effective than one with a “50% failure rate” (Levin et al., 1988; see also Marteau, 1989; McNeil, Pauker, Sox, & Tversky, 1982; Wilson, Kaplan, & Schneiderman, 1987), despite the fact that such descriptions are logically equivalent. Generally, experiments using attribute frames show that people evaluate an object more favorably when presented with a positive frame than when presented with a negative frame. This shift in evaluation in the direction of the description of the frame is called a valence-consistent shift in preference (i.e. positive frames lead to more positive evaluations). Levin, Schneider, and Gaeth (1998) reviewed over 35 published articles involving experiments with attribute frames (as well as more articles with risky choice and goal framing experiments) and showed a robust valence-consistent shift in evaluations for attribute frames.

Theories of Attribute Framing

While attribute framing effects have been repeatedly demonstrated, few studies have investigated their underlying mechanism. Notably, Levin and colleagues have proposed an Associative Account (Levin, et. al. 1988, 1998), which has come to be the most widely accepted explanation for attribute framing effects. This account claims
that positive frames evoke positive associations in our minds and negative frames evoke negative associations. These associations are based on the framing words (or “qualitative” components, e.g., “fat”) and create biased impressions of the object or event under consideration. Attribute frames contain both framing words and percentages. The percentages (or “quantitative components”) are used to adjust the initial, biased impressions towards the more objective quantitative information. However, because initial impressions carry over and influence subsequent evaluations (presumably due to an anchoring effect in this case, Tversky & Kahneman, 1974), the initial impressions are not sufficiently adjusted. The result of this insufficient adjustment is a valence-consistent shift in evaluations in which information framed positively is evaluated more positively than information framed negatively (Levin, et al., 1988).

Some evidence for this account comes from an experiment in which people were asked to endorse a number of complementary descriptors (e.g. “concerned” and “unconcerned,” “positive” and “negative”) after reading a positive frame or a negative frame. The results show that more positive descriptors (e.g. “unconcerned” and “positive”) are endorsed after hearing a positive frame and more negative descriptors (e.g. “concerned” and “negative”) are endorsed after hearing a negative frame (Levin, et al., 1998). Additional evidence for the Associative Account comes from the fact that evaluative differences are found not just for the one attribute that was framed, but more generally across various evaluations of quality (Levin & Gaeth, 1988, see Levin, et. al., 1998 for a discussion). Finally, support for the Associative Account comes from the intuitive appeal of the account (according to Levin, et al, 1998) and
reference to other effects in the literature that have some similarity to attribute framing effects such as priming (Higgins, Bargh, & Lombardi, 1985), stimulus-response compatibility (Slovic & Lichtenstein, 1968), and shifts in attending to different stimulus features (Shafir, 1993).

A similar account of attribute framing is van Schie and van der Pligт's (1995) Saliency Model, in which differences in frame salience guide framing effects. While these authors were primarily focused on explaining decisions involving risk (i.e. risky choices as defined by Kahneman & Tversky, 1979; Tversky & Kahneman, 1981), many contemporary authors of the time did not distinguish between risky choice frames and attribute frames (see Huber, Neale, & Northcraft, 1987 for example). As such, van Schie and van der Pligt proposed a distinction between “prospect framing” (using the context of gains versus losses for risky choices) and “outcome salience” (emphasizing the positive versus negative information regardless of context). They then describe how outcome salience can be used to explain the results of attribute framing experiments. Specifically, they propose that positive frames make the positive information in the scenario more salient while negative frames make the negative information more salient. This shift in outcome salience produces a shift in attention and a subsequent shift in evaluation.

This model has much overlap with the Associative Account since both accounts assume that a positive (negative) frame shifts focus to more positive (negative) features of the objet or event in question, and this shift in focus leads to a shift in evaluation. Both sets of authors in fact agree that the two models are similar, with van Schie and van der Pligt claiming that their model simply “corresponds” to
Levin’s Associative Account (van Schie & van der Pligt, 1995, p. 267). While the Associative Account and the Saliency Model make the same predictions for typical attribute framing experiments, depending on the factors that drive saliency (which are not specified), the two accounts may make different predictions in some circumstances. I will revisit this in Chapter 2.

While such accounts are useful in understanding and predicting many attribute framing effects, not all attribute frames involve negative and positive words that would cause corresponding negative and positive associations. A third account of attribute framing, which does not rely on associations from valenced frames, comes from Sher and McKenzie (2006, 2008, 2011). This account, called Information Leakage, suggests that framing effects occur because speakers select frame descriptors in a nonrandom way and listeners are sensitive to the regularities that guide a speaker’s choice of frame. More specifically, a speaker’s choice of frame is a signal to the listener to indicate the speaker’s attitude or background knowledge of the object or event being described. Thus speakers “leak” information to listeners in their choice of frame. Listeners in turn, “absorb” information about the background context or previous state of the world that was “leaked” by speakers and evaluate framed information differently. This account can explain framing effects from non-valenced attribute frames as well as more traditional valenced attribute frames.

For example, McKenzie and Nelson (2003) showed that speakers are more likely to describe the outcome of a new medical treatment as “50% of patients survive” rather than “50% of patients die” when the new treatment leads to more, rather than fewer, survivors compared to the standard treatment. In turn, listeners,
upon hearing the “50% of patients survive” frame are more likely to think that the medical treatment described is relatively successful compared to alternative or previous treatments options. Additionally, McKenzie and colleagues have shown that when a speaker refers to a cup as “half full”, listeners are more likely to think the cup was previously empty than to think the cup was previously full (McKenzie & Nelson, 2003; Sher & McKenzie, 2006). While the metaphor of half full or half empty may be valenced, in terms of predicting a cup’s previous state, this is not related to valence. In other words, it cannot be the positive associations from hearing about a half full cup that lead to the inference that the cup was previously empty. Such experimental results using non-valenced frames are in fact outside the scope of the Associative Account and the Saliency Model. McKenzie and colleagues suggest that there is something about linguistic regularity and how speakers choose to describe things that leads to the observed inference and helps explain framing effects.

In addition to the explanatory power for valenced and non-valenced attribute frames that the Information Leakage account provides, this account taps into a larger issue relevant to framing effects, namely, that language and framing should be considered in a situated context and analyzed in light of the way language is used, as a tool for people to communicate. As such, it is not just the associations or thoughts that a listener brings to frame interpretation. Rather, what the speaker brings to the communicative exchange for frame generation is relevant as well. Information Leakage deals with this explicitly by supposing that speakers “leak” information that listeners can “absorb.” However, there are additional features of language that may guide speaker selection of frames overall (as Information Leakage suggests) and even
individual framing words. While it is outside the scope of the current work to do a full review and analysis of all linguistic features that may be relevant to framing words, two such features of words will be discussed, that of negation and markedness.

Negation, or the expression of negative words and opposition (Horn, 1989/2001) is both a linguistic concept and a philosophical one. Formal logic describes the meaning of negation as, “If p is true, then \( \neg p \) is false. If p is false, then \( \neg p \) is true.” (Davis, 2007, p. 262). From a linguistic perspective, negation is a varied construct including using negative words to reverse word meaning (e.g. true versus not true), antonym pairs (e.g. true versus false), and various implications that follow from such words as well as the contextual constraints that drive negation permissibility. As it relates to framing effects, negation is of particular interest for the Associative Account. Specifically, the Associative Account relies on people forming associations from frames. However, one thing to consider is how these associations change if “not lean” was used in the frame opposed to using “fat.” Do these framing words evoke different associations? Additionally, how does the presence of a negative word such as “not” influence the associations of a positive frame? How individual word valence affects associations is undetermined and thus the current work will begin to address such questions in Chapters 1 and 3.

In addition to negation, markedness is an important linguistic concept for framing effects. Antonym word pairs typically have one word that is marked, while the other is unmarked (e.g. tall is unmarked while short is marked; Clark, 1969). Unmarked terms have the interesting property of being used more often (Holleman & Pander Maat, 2009) and being more easily remembered (Clark, 1969). Additionally,
children acquire unmarked words before their marked counterparts (Donaldson & Wales, 1970; Ehri, 1976) and unmarked terms lead to more variable inferences than their marked counterparts (Clark, 1969; Harris, 1973; Holleman & Pander Maat, 2009). In this manner, unmarked terms are the default term used to describe an attribute or feature. Importantly for attribute framing, the positive item in an antonym pair is typically the unmarked term (Holleman & Pander Maat, 2009). Thus it may be the case that the associations or evaluations of framing words are dependent not on the valence of the word, but rather on its markedness. Specifically, if an unmarked term leads to more varied, open-ended inferences, perhaps it also leads to more varied associations when used in a frame. Thus the associations of positive and negative words (frames) may be influenced in strength or number by whether the framing word is also unmarked. This question will be investigated in Chapter 3.

While neither negation nor markedness are theories of attribute framing in and of themselves, they are included in the current section due to the impact they may have on framing effects generally and how they may qualify or shape the predictions of the described theories of attribute framing. Additionally, along with Information Leakage, these linguistic features of words draw upon the fact that language is a tool used by individuals wishing to exchange information. In this manner, it is not just what a listener or evaluator perceives about a frame that is important, but rather, the linguistic context in which speakers form utterances also matters. Thus, these features of language may be part of a larger explanation of framing effects.

Double Frames

Missing from virtually all experimental demonstrations of attribute framing is
a condition in which listeners receive both the positive frame and the negative frame together, which I refer to as a double frame. As mentioned, participants rate the effectiveness of a medical treatment with a “50% success rate” as higher than one with a “50% failure rate” (Levin, et al., 1998). Missing from this experiment are the double frames: “50% success and 50% failure” would be the positive/negative double frame while the “50% failure and 50% success” would be the negative/positive double frame. While it will be important to test for order effects between negative/positive and positive/negative double frames, I will generally refer to double frame as the frame type that includes both the positive and negative components of the description, that has 100% of the probability explicitly stated, and that contains completely redundant information in each of the two frames. Importantly, any attribute frame can have a double frame condition, not just valenced attribute frames. However, because of the theoretical importance of valenced frames for the explanation of attribute framing (specifically for the Associative Account and Saliency Model), I will focus on valenced frames.

Including double frames in attribute framing experiments is important for both practical and theoretical reasons. Practically, certain industries use the double frame as the standard form for descriptions. The FDA, for example, now requires beef quality to be displayed as both the percent fat and percent lean (Animals and animal products, 2013). Additionally, certain medical treatment procedures are described with both positive and negative outcome probabilities and some researchers advocate using such language when discussing treatment options with patients (see Moxey, O’Connell, McGettigan, & Henry, 2003). This purposeful use of the double frame in
communication is presumably an attempt to communicate as clearly as possible so that patients and consumers have accurate information. For the medical decision work, the authors explicitly say as much, “Although few studies were carried out using a mixed [double] frame group, this is a feasible method of information framing that ensures patients form an accurate impression of treatment worth” (Moxey, et. al., 2003, p. 957). However, no explicit statement from the FDA on motivations for the creation of the mandate has been found. Regardless of intent, it is important to know how double frames are interpreted and evaluated so that the ramifications of such industry standards can be understood.

Theoretically, the Associative Account put forth by Levin and colleagues and van Schie and van der Pligt’s Saliency Model seem to predict that the evaluation of double frames would fall in between the evaluations of positive frames and negative frames. This is because the presence of both the positive and negative information should give rise to both positive and negative associations. Thus, evaluations will consider (or be anchored by) both associations and an average evaluation should emerge. Van Schie and van der Pligt’s Saliency Model may have a bit more flexibility because of the variable definition of saliency. For instance, an argument could be made for one of the two frames present in a double frame to be more salient. However, saliency would have to be well-defined so that frame saliency could be determined a priori in order to determine the account’s prediction on the evaluation of double attribute frames. Various features that may affect saliency will be examined in the current work.

Information leakage on the other hand, does not make a specific prediction as
to what evaluations of the double frame would be relative to evaluations of standard positive and negative frames. However, it does predict that listeners’ evaluations of double frames match the intent of speakers who choose to use the double frame. Such a prediction taps into the larger idea of language and frames as a tool for communicating and that both listeners and speakers should be considered.

However, experimental evidence on how double frames are evaluated is limited and somewhat mixed. There are a few lines of investigation from the medical decision and medical behavior modification domain which have included double attribute frames. Such experiments typically involve asking participants (both students and actual patients) about treatment options. The treatment options are framed using percent survival, percent mortality, or the double frame of percent survival and mortality. The majority of these studies show that evaluations and behavior change after seeing double frames is similar to evaluations and behavior change after seeing positive frames and that both positive and double frames differ from negative frames (O’Connor, 1989; O’Connor et al., 1985; Robberson & Rogers, 1988; Wilson, Wallston, & King, 1990). A more recent meta-review examining how framing affects medical decisions (Moxey et al., 2003) included a subset of 6 experiments that contained a double frame condition (called “mixed-frames” in their analysis), including many mentioned here. Based on their review, they conclude that in general, double frames are evaluated similarly to positive only frames, though not every experiment they examined conformed to this pattern (see Moxey et al., p. 956-957). They did not have enough experiments to conduct a formal analysis of this effect.

These medical decision making experiments offer some evidence that double
frames are not evaluated as neutral baselines in between evaluations of positive-only and negative-only frames. However, these experiments have some shortcomings. First, they all used a medical decision making context. As the authors suggest, there may be something unique about the mere presence of survival information in the context of medical decisions that leads to positive evaluations of framed treatment options containing this information (i.e. the positive-only and the double frame). Such an explanation sounds reminiscent of van Schie and van der Pligt’s (1995) Saliency Model, but the authors do not suggest why survival rates would be more salient than death rates, just that they may be. Second, these experiments were not from the traditional framing literature and thus do not necessarily conform to the procedure and stimuli formats typically used in that literature. Specifically, many medical decision making experiments use a repeated measures design asking people to evaluate multiple treatment options for the same disease. While some experiments in the traditional attribute framing literature use repeated measures, it is not as common. It is not clear if double frames would be evaluated similarly in a more traditional between-subjects design. Despite these differences, the medical decision making experiments suggest a pattern of frame evaluation different from that predicted by the Associative Account, namely, that the double frame may be evaluated similarly to the positive only frame and different from the negative only frame.

Two experiments from the traditional framing literature are relevant to the study of double attribute frames. First, Johnson (1987) examined how people evaluate products when information is missing. Using ground beef as his stimuli, he examined how products were evaluated based on price information only, quality information
only (represented as a fat/lean attribute frame), and both price and quality information. While his primary interest was in how the missing attribute (price or quality) affected evaluation, he included a sub-design in the experiment in which the quality information was represented with a positive frame (% lean), a negative frame (% fat), or a double frame (% lean and % fat) to “gather preliminary data on this unexplored topic” of double framing (Johnson, 1987, p. 73). Johnson notes, as I do, that despite the redundant information in the double frame, “both frames may be considered, resulting in responses that fall between those for positive and negative frames presented alone” (p. 73). While Johnson notes the prediction of the Associative Account, his results show, “more favorable ratings in both the positive and mixed conditions… than in the negative condition” (p. 77). As such, his results are in accord with the previously discussed work on double attribute frames from the medical decision making literature, however, and are inconsistent with the Associative Account. While Johnson lays out the prediction and the results, he does not follow up on the implications of these results for the Associative Account of attribute framing. We will follow up on this work by carefully examining the various factors that may affect evaluations of double attribute frames and by discussing the implications of such evaluations on the theories of attribute framing.

The second relevant paper in the attribute framing literature shows a different pattern of results. Levin, Johnson, and Davis (1987) were interested in how an initial framing of an event carries over to subsequent frames of the same event. These authors used the context of gambles and presented participants with either the probability of winning (the positive frame) or the probability of losing (the negative
frame). Additionally, for every gamble, the amount to be won and the cost to play the gamble were included. Participants reported whether they accepted or rejected each gamble. Finally, while the typical positive-only and negative-only frames were included, they also had a “mixed” condition in their design, which contained a positive and a negative frame together. Their results show a different pattern than the previously discussed work: Evaluations were highest in the positive condition, lowest in the negative condition, and evaluations of the double frame were in between. Such experimental evidence thus contradicts other studies using double attribute frames. However, there are a few noteworthy differences between this study and others involving double frames. First, this experiment used an accept/reject binary dependent measure. Thus analysis was based on the percent of gambles accepted in the first block of 18 gambles that shared the same framing. Binary response measures, repeated measures, and collapsed ratings across many trials are each atypical of attribute framing experiments. However, the most important difference between this experiment and other examples of double attribute frame evaluation is that the mixed frames in this experiment did not contain solely redundant information: “It should be noted that the two statements in the mixed [double frame] condition contain redundant probability information, but each statement also contains unique information. Thus, subjects cannot merely attend to only one of the statements without losing crucial information” (Levin et al., 1987, p. 45). The current interest in double frames lies in the very fact that the information is redundant except for the complementary (but logically equivalent) probability information and framing word. It is this critical case in which the Associative Account of attribute framing makes a prediction and thus it is
this form of the double frame that should be tested to see if the Associative Account’s predictions can be confirmed. Because of the structure of the stimuli in this experiment, Levin et al.’s (1987) results cannot speak directly to this question. The results do however suggest that there may be conflicting evidence of how people evaluate double attribute frames. As such, further work is needed to firmly establish the effect and examine the implications for the Associate Account of attribute framing. The current work will extend traditional attribute framing experiments to include the double frame condition.

Experimental Overview

The current work is a systematic investigation of how double attribute frames are evaluated, what factors (do not) contribute to such evaluations, the implications for current theories and interpretations of attribute framing experiments, and, finally, the implications for real world uses of attribute frames. Chapter 1 reports four experiments that investigate evaluations of double attribute frames by broadening the scope of previous attribute frame experiments and adding the double frame conditions. Additionally, typical variations in attribute framing paradigms in the domains of quantitative information, context, frame descriptors, response question, and response measure are considered to ensure evaluations are stable and robust. The relationship of such results to the Associative Account of attribute framing will be discussed.

Chapter 2 addresses two factors that may affect frame saliency and thus influence evaluations of the double frame in a manner different than that predicted by the Associative Account. Experiment 2a examines how quantitative information paired with the positive versus the negative frame affects evaluations, and Experiment
2b looks at the effect of leading response questions. In Chapter 2, I will manipulate methodological factors to address the issue of frame saliency and the possibility that methodological confounds are responsible for the previously observed pattern of evaluations of double attribute frames. The robustness of evaluations to double attribute frames in response to such changes and implications for eliminating bias from evaluations of framed information will be discussed.

Chapter 3 will examine the larger communicative context in which attribute frames arise. It will examine whether listeners’ expectations or speakers’ intentions (as outlined by the Information Leakage account of attribute framing) guide the evaluation of double attribute frames. Features of language that may affect frame saliency or provide additional communicative information to listeners will also be discussed. As the Conclusion will describe, this body of work details the conditions and limits of an unpredicted phenomenon in the attribute framing literature (that double attribute frames are evaluated similarly to positive-only frames and different from negative-only frames) and the implications of such a phenomenon on the current theories of attribute framing, bias in evaluations, and real world uses of such language.
Chapter 1:

Establishing Double Frame Evaluations

Introduction

How double attribute frames – attribute frames in which both the positive frame and negative frame are presented together – are evaluated is not well established empirically. Several studies from the medical decision making literature have found that double attribute frames are evaluated similarly to positive-only attribute frames (O’Connor, 1989; O’Connor et al., 1985; Robberson & Rogers, 1988; Wilson, Wallston, & King, 1990, see Moxey et al., 2003 for a review). However, because such studies are not from the traditional framing literature, their experimental procedures do not necessarily follow the typical attribute framing procedure. Additionally, such studies are limited in scope since they use a medical decision context exclusively. It may be the case that the observed pattern of evaluations in this literature is specific to the medical decision making context (or the presence of “survival” information per Moxey et al., 2003).

There are only two known experiments in the traditional framing literature that include double attribute frames, and they produced mixed results. The first study (Johnson, 1987) reported results in accord with the medical decision making literature: double attribute frames were evaluated similarly to positive-only attribute frames. However, another study (Levin et al., 1987) found that double attribute frames were given an intermediary evaluation with ratings lying in between ratings of negative-only and positive-only frames. However, as discussed earlier, this study differs in
many ways from typical attribute framing studies, limiting its relevance. Nonetheless, this second pattern of results is in accord with the predictions generated from the Associative Account of attribute framing. This account, which claims that positive (negative) frames evoke positive (negative) associations, which in turn influence judgments, suggests that the double frame (with both the positive and negative information) should evoke positive and negative associations and produce intermediary evaluations of such frames. Thus, establishing whether a consistent pattern of evaluations of double attribute frames exists, and if so, what that pattern is, will be helpful for establishing whether the predictions of the Associative Account are correct.

The current experiments aim to establish whether a consistent pattern of evaluations of double attribute frames exists, and what that pattern is, by creating a variety of stimuli and tasks for the evaluation of double attribute frames. The work will include both previously used attribute framing stimuli and novel stimuli with the inclusion of the double frame conditions (the positive/negative double frame and the negative/positive double frame). Because attribute frame stimuli and tasks vary widely across the literature, I will consider five different dimensions on which they can vary for the current set of studies: quantitative information, context, framing words, response question, and response measure.

**Quantitative information:** The quantitative information is the numbers or percentages used in the attribute frame (Levin et al., 1988). Across and within experiments in the framing literature, the quantitative information varies widely over the range of values (from 0 to 100%). The percentages of the two frames always add
to 100%. Some experiments step through the different percentages for the two frames in increments, holding all other features of the stimuli constant (O’Connor 1989; Sher & McKenzie, 2006; Teigen & Karevold, 2005). While the quantitative information does not seem to greatly affect attribute frame evaluations, there is some evidence that values closest to the middle of the spectrum (around 50/50) produce stronger framing effects (Levin et al., 1986; see Levin et al., 1998 for a discussion). The current work will utilize the full spectrum of values for the quantitative information.

**Context:** The context, or background scenario, is the environment in which the attribute frames are situated. For example, one of the limitations with the medical decision making literature is that all examples of double frames use medical contexts. Generally, there is little order to, and a wide variety of, contexts in the framing literature (see Levin et al., 1998 for an overview of different contexts from past experiments). The current work will utilize two previously tested contexts (sports and medical decisions), implemented as three distinct scenarios, and one completely new context (agriculture) to test the robustness of double attribute frame results.

**Framing Words:** The framing words (called “qualitative labels” by Levin et al., 1988) are the words associated with the percentages (quantitative information) that create the frame. Another way to think about the framing words is they are the two poles for the attribute that is being framed (i.e. “success” versus “failure” or “fat” versus “lean”). As discussed earlier, generally one frame word is positive and one is negative, but this is not always the case. However, what must be true of framing words is that they represent two complementary positions such that in specifying one, the other is entailed (see Sher & McKenzie, 2006 for a discussion of the logical
equivalence of frames). The current work uses three standard framing word pairs
(“made” versus “missed,” “survive” versus “die,” and “survive” versus “be
destroyed”) across three experiments plus a fourth pair of framing words in which the
positive frame contains a negation, or a negative word (“no longer” versus “continue”
to experience discomfort). Again, the intent of using a variety of framing words is to
ensure that no specific words are required for consistent evaluations of double
attribute frames.

**Response Question**: This refers to how judgments are elicited from
participants, or the task that people are asked to do. For attribute frames, this can be
anything evaluative, including ratings on an evaluative scale or binary accept/reject
judgments (see Levin et al., 1998 for a discussion of evaluative questions). For
example, Levin and colleagues gave participants information about a new medical
technique and asked them, “How would you rate the effectiveness of this new
technique?” (Levin et al., 1988). In another experiment, a gamble was described and
participants were asked, “Would you be willing to take this gamble?” (Levin et al.,
1986). Attribute frame experiments vary widely with respect to response question and
the experiments in Chapter 1 will utilize three different response questions. As I will
discuss in Chapter 2, an additional relevant characteristic of response questions is
whether or not it is a leading question or suggests relevant criteria for evaluation
(Levin’s 1987b experiment deals with this, though he does not explicitly address the
concern of biased response questions).

**Response Measure**: This is the scale used by participants to report their
response. The most common response measure in the attribute framing literature is a
scale with high and low anchors. For example, Levin and colleagues asked participants to rate the cheating incidence at their school on a scale from “very low” to “very high” (Levin et al., 1988). Another experiment asked participants to rate their satisfaction with a purchase on a scale from “very dissatisfied” to “very satisfied” (Levin et al., 1985). As Schwarz (1994) discusses, however, anchors and labels on scales can greatly influence evaluation (see also Tversky & Kahneman, 1974). As such, the response measure should be carefully considered in attribute frame experiments. Experiments reported in this chapter will use the general scalar response measure with high and low anchors for three of the experiments, while the fourth will use an entirely different measure to ensure that the measure itself is not influencing evaluations of double attribute frames.

Overall, the current chapter will investigate the evaluation of double attribute frames, while manipulating a variety of factors. Stimuli and task will vary across the four experiments with respect to the five dimensions outlined above (see Table 1.1 for a summary). The intent of these replications is to ensure that the observed pattern of evaluation of double attribute frames is stable and robust to various features of the task.

Experimental Overview

Four experiments will investigate how double attribute frames are evaluated. Beginning with attribute frame stimuli previously used in the literature, Experiments 1a and 1b will first replicate the standard attribute frame result (positively framed information is evaluated more favorably than negatively framed information). The crucial distinction between these two experiments and their predecessors is the
addition of the two double frame conditions: the positive/negative double frame and the negative/positive double frame. While both Experiments 1a and 1b will be capitalizing on already established stimuli for producing framing effects, the two experiments differ from each other on four of the five dimensions for attribute frame experiments including quantitative information, context, framing words, and response question (see Table 1.1 for a summary of choices in each dimension for Experiments 1a – 1d). The Associative Account suggests that positive associations are evoked when seeing positively framed information and negative associations are evoked when seeing negatively framed information and it is these associations that produce a shift in evaluations. The presence of both frames should, therefore, evoke both positive and negative associations, leading to a neutral evaluation that lies between the evaluation of positive-only and negative-only frames. If, however, negative associations are more impactful due to a mechanism such as loss aversion (Kahneman & Tversky, 1984; Tversky & Kahneman 1991), then the double frames should be evaluated similarly to the negative-only frames. On the other hand, if the demonstrations of the evaluation of double frames from the medical decision making literature are evidence of a more general pattern of responses, then the double frames should be evaluated similarly to the positive-only frames. Experiment 1c and 1d were designed to further explore the consistency and robustness of evaluations of double frames by utilizing an entirely novel scenario for evoking framing effects (Experiment 1c) and an entirely novel response measure coupled with a negative word as part of the positive frame (Experiment 1d) to ensure double frame evaluations do not require using extant framing scenarios or a particular response measure.
Table 1.1: Summary of stimuli and procedure variations across Experiments 1a – 1d.

<table>
<thead>
<tr>
<th></th>
<th>Experiment 1a</th>
<th>Experiment 1b</th>
<th>Experiment 1c</th>
<th>Experiment 1d</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Context</strong></td>
<td>Basketball player recruitment</td>
<td>Treatment for deadly disease</td>
<td>Protect valuable crop from weed</td>
<td>Knee surgery outcome</td>
</tr>
<tr>
<td><strong>Quantitative information</strong></td>
<td>60% (+); 40% (-)</td>
<td>85% (+); 15% (-)</td>
<td>80% (+); 20% (-)</td>
<td>95% (+); 5% (-)</td>
</tr>
<tr>
<td><strong>Framing descriptors</strong></td>
<td>Shots made (+); Shots missed (-)</td>
<td>Survive at least 5 years (+); Die within 5 years (-)</td>
<td>Crop would survive (+); Crop would be destroyed (-)</td>
<td>No longer experience discomfort (+); Continue to experience discomfort (-)</td>
</tr>
<tr>
<td><strong>Response question</strong></td>
<td>How valuable do you think this player is to your team?</td>
<td>How effective does this treatment seem?</td>
<td>How effective does this program seem?</td>
<td>Would you choose to undergo this treatment?</td>
</tr>
<tr>
<td><strong>Response measure</strong></td>
<td>Sliding scale with low and high anchor, no numbers displayed</td>
<td>Sliding scale with low and high anchor, no numbers displayed</td>
<td>Sliding scale with low and high anchor, no numbers displayed</td>
<td>Selection of one of 6 sentences describing attitude towards treatment</td>
</tr>
</tbody>
</table>
Experiment 1a

Experiment 1a was designed based on Levin’s attribute frame experiment evaluating basketball players (Levin, 1987a, see Levin et al., 1998 for discussion). While context and framing words were taken directly from Levin’s study, the quantitative information was chosen specifically to evoke a large framing effect. Because evaluations of quantitative information close to the midpoint of the probability scale (i.e. 50/50) produce larger framing effects (Levin et al., 1986; 1998) such stimuli create a better chance of obtaining double frame evaluations that fall in between evaluations of positive-only and negative-only frames. In other words, the larger the difference in evaluations of positive-only and negative-only frames, the larger the target in between the two for the evaluations of double frames. As such, the values of 60% and 40% were chosen for this experiment. Finally, because the response question and response measure used by Levin were not available, a standard evaluative response question was used (asking participants how valuable the described basketball player is), as well as a standard response measure with a low and high anchor.

Methods: Participants were 283 University of California, San Diego (UCSD) students, who received partial course credit. Participants completed this task as part of a series of unrelated experiments. All participants read the same background scenario describing a college basketball recruiter examining files of high school seniors who play basketball. The last sentence of each scenario contained an attribute frame describing the performance of a player and differed by condition (see Appendix for full text). The positive frame condition ended with, “The file you are currently looking
at shows a player who, last season, made 60% of his shots.” The negative frame condition ended with, “…missed 40% of his shots.” The positive/negative double frame condition ended with, “…made 60% of his shots and missed 40% of his shots.” Finally, the negative/positive double frame condition ended with, “…missed 40% of his shots and made 60% of his shots.” All participants were asked to evaluate how valuable the player would be to the basketball team using a sliding scale. The scale contained a low anchor, “Not at all valuable,” a high anchor, “Extremely valuable,” and a slider bar that moved along the scale based on mouse position. Pixel position of the slider (from 0 – 100) was recorded as the response measure, but the numerical value was not visible to participants. In the analyses below, the response was rescaled to range between 0 and 1.

Results: The results are shown on the far left side of Figure 1.1. Generally, the negative frame received a low evaluation, and the other three frames received similar, higher evaluations ($M_s = .47, .59, .56, \text{ and } .60$ for the negative, the negative/positive double, the positive/negative double, and the positive frame respectively). A one-way ANOVA reveals a significant effect of frame ($F(3, 279) = 6.90, p = .0002$), and pairwise comparisons show that the evaluation of the negative frame is different from evaluation of the positive frame, positive/negative double frame, and negative/positive double frame ($p < .0001, p = .003, p = .0003$ respectively) and that no other frame evaluations differ (all $ps > .3$). Additional demographic variables were recorded including participant age ($M = 20.4\ \text{years, } SD = 3.0$), sex (84% female), and native speaker status (51% native English speakers). None of these variables had a significant effect on participant ratings and were not included in the main analysis.
Figure 1.1: Results from Experiment 1a - 1d (with standard error bars). The same pattern of results appears across experiments - double attribute frames are evaluated similarly to the positive-only frame and different from the negative-only frame.

Experiment 1a replicated the standard attribute framing effect observed by Levin (1987a) (positive-only frames evaluated more positively than negative-only frames), and extended previous findings by revealing a double frame evaluation similar to the evaluation of the positive-only frame. Thus, results reveal the same pattern for the evaluation of double frames seen in the medical decision making literature (Moxey et al., 2003; O’Connor, 1989; O’Connor et al., 1985; Robberson & Rogers, 1988; Wilson, et al., 1990) despite not using a medical context. Additionally, results are in accord with Johnson (1987). However, such a pattern of results stands in contrast to the pattern observed by Levin et al. (1987) and predictions based on the Associative Account. To establish whether such a pattern of evaluations is consistent across variations in stimuli and task, Experiment 1b used another classic framing task,
but differed from the task used in Experiment 1a on four of the five dimensions of attribute framing described previously.

Experiment 1b

Past experimental work on double attribute frame evaluation is minimal and inconsistent. While Experiment 1a replicated the pattern of evaluation for double frames found in the medical decision making literature (in which the double frame is evaluated similarly to the positive-only frame) it is only one demonstration utilizing stimuli and a task from a known attribute frame experiment. As such, the current investigation will be expanded to include another past attribute frame experiment, this time involving treatment for a deadly disease, with the additional inclusion of the double frame conditions. By differing from Experiment 1a on four of the five dimensions of attribute frame experiments, Experiment 1b will investigate whether the observed pattern of results - in which the evaluation of negative frames alone look different from all other frame evaluations - is robust to changes in stimuli and task. Specifically, Experiment 1b utilizes the same context and specific scenario as well as framing words as McKenzie and Nelson (2003). The response question is the same as Levin et al.’s (1988) Experiment 2, Task A response question. The response measure is the same as Experiment 1a (see Table 1.1).

Methods: Participants were 104 University of California, San Diego (UCSD) students, who received partial course credit. Participants completed this task as part of a series of unrelated experiments. As discussed, stimuli were designed based on other attribute framing experiments using medical treatments (Levin et al., 1988; Marteau, 1989; McKenzie & Nelson, 2003; McNeil et al., 1982; Wilson et al., 1987). All
participants read the same background scenario describing a potentially deadly disease and a possible treatment. The last sentence of each scenario contained an attribute frame describing the treatment outcome and differed by condition (see Appendix for full text). The positive frame condition ended with, “In terms of outcomes, 85% of people undergoing this treatment survive at least 5 years.” The negative frame condition ended with “…15% of people undergoing this treatment die within 5 years.” The positive/negative double frame condition ended with “…85% of people undergoing this treatment survive at least 5 years and 15% of people die within 5 years.” The negative/positive double frame condition ended with… “15% of people undergoing this treatment die within 5 years and 85% of people survive at least 5 years.” All participants were asked to evaluate how effective the treatment seemed using a sliding scale. The scale contained a low anchor, “Not at all effective,” a high anchor, “Extremely effective,” and a slider bar that moved along the scale based on mouse position. Pixel position (from 0 – 100, rescaled to 0-1) of the slider was recorded as the response measure.

Results: The results are shown in the second series in Figure 1.1. Generally, the negative frame received a low evaluation, and the other three frames received similar, higher evaluations ($M_s = .38, .59, .51, \text{ and } .61$ for the negative, the negative/positive double, the positive/negative double, and the positive frame respectively). A one-way ANOVA reveals a significant effect of frame ($F(3, 100) = 6.85, p = .0003$), and pairwise comparisons show that the evaluation of the negative frame is different from evaluation of the positive frame, positive/negative double frame, and negative/positive double frame ($p = .0003, p = .03, p = .0002$ respectively).
and that no other frame evaluations differ (all $ps > .1$). Additional demographic variables were recorded including participant age ($M = 19.5$ years, $SD = 2.4$), sex (75% female), and native speaker status (56% native English speakers). None of these variables had a significant effect on participant ratings and were not included in the main analysis.

Results again replicated the standard framing effect, and double frame evaluations were again similar to the evaluation of positive-only frames. As with Experiment 1a, results are in accord with those observed in the medical decision making literature and with Johnson (1987) but differ from those observed by Levin et al. (1987) who found intermediary evaluations for double frames. Furthermore, the current results cannot be explained by the Associative Account, which would predict double frames are evaluated in between negative-only frame and positive-only frame evaluations. To further test the consistency of the pattern of results and to ensure that the results are not dependent on using previously tested attribute frame stimuli and tasks, Experiment 1c will use a novel context and scenario to examine double attribute frames.

**Experiment 1c**

Experiments 1a and 1b show the same pattern of results: the evaluation of the negative frame differs from the evaluations of all other frames, and the evaluations of double frames do not fall between the evaluations of negative and positive frames. However, both experiments utilized known and tested contexts for the evaluations of attribute frames. To establish how consistent and robust evaluations of double attribute frames are, a third experiment was conducted, this time with a completely novel
context involving the growth of a valuable crop that is threatened by a destructive weed. This novel context for Experiment 1c follows the same general format as that from Experiment 1b and other attribute framing experiments using medical treatments with the medical malady swapped out for the destructive weed. In addition to a new context, different quantitative information and framing descriptors were used. The response question was similar to the response question used in Experiment 1b (asking participants to evaluate the effectiveness of the described event) and the response measure was the same as that used in Experiment 1a and 1b (see Table 1.1 for a summary).

**Methods:** Participants were 183 University of California, San Diego (UCSD) students, who received partial course credit. Participants completed this task as part of a series of unrelated experiments. Stimuli were similar to those from Experiment 1b and other attribute framing experiments using medical treatments, but with information about a weed replacing information about the disease. All participants read the same background scenario describing an infestation of a dangerous weed in a valuable crop and a possible treatment program. The last sentence of each scenario contained an attribute frame describing the program outcome and differed by condition (see Appendix for full text). The positive frame condition ended with, “If this program is undertaken, 80% of the Bonase crop would survive.” The negative frame condition ended with, “… 20% of the Bonase crop would be destroyed.” The positive/negative double frame condition ended with, “…80% of the Bonase crop would survive and 20% would be destroyed.” The negative/positive double frame condition ended with, “… 20% of the Bonase crop would be destroyed and 80%
would survive.” All participants were asked to evaluate how effective the program seemed using a sliding scale. The scale had a low anchor, “Not at all,” a high anchor, “Extremely,” and a slider bar that moved along the scale based on mouse position. Pixel position (from 0 – 100, rescaled to 0-1) of the slider was recorded as the response measure.

**Results:** The results are shown in the third series in Figure 1.1. Generally, the negative frame received a low evaluation, and the other three frames received similar, higher evaluations ($M_s = .56, .69, .71, \text{and} .66$ for the negative, the negative/positive double, the positive/negative double, and the positive frame respectively). A one-way ANOVA reveals a significant effect of frame ($F(3, 179) = 5.84, p = .0008$), and pairwise comparisons show that the evaluation of the negative frame is statistically different from evaluations of the positive frame, positive/negative double frame, and negative/positive double frame ($p = .006, p = .0004, p = .003$ respectively) and that no other frame evaluations differ (all $p$s > .2). Additional demographic variables were recorded including participant age ($M = 20.0$ years, $SD = 1.8$), sex (71% female), and native speaker status (62% native English speakers). None of these variables had a significant effect on participant ratings and were not included in the main analysis.

Despite the fact that the context and scenario for Experiment 1c were entirely new, the same pattern of results was observed: There was a standard framing effect (in which the negative-only frame was evaluated as worse than the positive-only frame) and the pattern of evaluation for the double frame was replicated (the double frame was evaluated similarly to the positive-only frame and different from the negative-only frame). A final test of the consistency of evaluations of double frames involved
manipulating the last dimension of framing experiments yet to be manipulated – response measure – as well as using a negation (or negative word) for the positive framing word.

**Experiment 1d**

Because the same pattern of evaluations of double attribute frames was seen in Experiments 1a, 1b, and 1c, Experiment 1d was created using a different response measure to ensure that the observed pattern was not due to the manner in which people were reporting their evaluations. Additionally, to begin to test whether evaluations of the double frame are influenced by the choice of framing words, a negation was used to indicate the positive frame. The current experiment will use a negative word to form a negation, “*no longer experience discomfort*” (emphasis added) for the positive frame (the more desirable outcome). The negative frame will be “*continue to experience discomfort.*” In this manner this experiment will be able to tease apart the effect of a positive framing word from the positive frame (the more desirable outcome).

Similarly, Sanford et al. (2002) chose to use the frames of “75% fat” and “25% fat-free” in their experiments, rather than the more common pairing of the “lean” frame with the “fat” frame. Their results display a typical framing effect despite the atypical positive frame. However, “free” may not have the same consequences for positive frame evaluations or associations as “not.”

The context for the current experiment involved a medical treatment (similar to Experiment 1b) but it used a different scenario and had different quantitative information, framing descriptors (using a negative word for the positive frame), response question and, importantly, response measure. The response measure involved
participants selecting one of six sentences that described their attitude towards undergoing the described medical procedure (see Appendix for full text).

**Methods:** Participants were 288 University of California, San Diego (UCSD) students, who received partial course credit. Participants completed this task as part of a series of unrelated experiments. Stimuli were similar to those from Experiment 1b and other attribute framing experiments using medical treatments. All participants read the same background scenario describing a surgery to alleviate knee pain. The last sentence of each scenario contained an attribute frame describing the surgery outcome and differed by condition (see Appendix for full text). The positive frame condition ended with, “A recent study found that, after undergoing this treatment, 95% of patients no longer experience discomfort.” The negative frame condition ended with, “… after undergoing this treatment, 5% of patients continue to experience discomfort.” The positive/negative double frame condition ended with, “… after undergoing this treatment, 95% of patients no longer experience discomfort and 5% of patients continue to experience discomfort.” The negative/positive double frame condition ended with, “… after undergoing this treatment, 5% of patients continue to experience discomfort and 95% of patients no longer experience discomfort.” All participants were asked to indicate whether they would undergo the surgery by selecting one of six sentences that best described their attitude ranging from, “I would definitely not undergo this treatment” to “I would definitely undergo this treatment” (coded as 1 to 6, respectively).

**Results:** The results are shown on the far right side of Figure 1.1. Generally, the negative frame received a low evaluation, and the other three frames received
similar, higher evaluations ($M_s = 4.20, 5.04, 4.83,$ and 4.84 for the negative, the negative/positive double, the positive/negative double, and the positive frame respectively). A one-way ANOVA reveals a significant effect of frame ($F(3, 284) = 9.33, p < .0001$), and pairwise comparisons show that the evaluation of the negative frame is statistically different from evaluations of the positive frame, positive/negative double frame, and negative/positive double frame ($p < .0001$, $p = .0009$, $p < .0001$ respectively) and that no other frame evaluations differ (all $ps > .3$). Additional demographic variables were recorded including participant age ($M = 20.3$ years, $SD = 2.3$), sex (67% female), and native speaker status (72% native English speakers). None of these variables had a significant effect on participant ratings and were not included in the main analysis.

Despite the fact that a different response measure was utilized and a negative word indicated the positive frame, results followed the same pattern as the previous three experiments in which the double frame is evaluated similarly to the positive-only frame and the evaluation of negative-only frames differs from the evaluations of all other frames. Experiment 1d demonstrates that evaluations of the double frame as similar to the positive-only frame are not dependent on a certain response measure. Additionally, double frame evaluations cannot be driven by a focus on positive words since, in this case, the positive frame contained a negative word. If double frame evaluations were following the positive word, they should have been evaluated similarly to the negative-only frame in this experiment. This pattern was not observed and thus suggests that there is something about the positive frame, not the positive word that drives evaluations of double frames. Finally, these results suggest that if
associations drive frame evaluations, as the Associative Account states, then a positive frame containing a negative word must still elicit positive associations. A more complete discussion of linguistic features of frames, including experimental investigations of the (lack of) impact of wording choices for frames, can be found in Chapter 3.

Conclusions

Taken together, Experiments 1a – 1d show a consistent and robust pattern of results for the evaluations of double frames: Double frames are evaluated similarly to positive frames and it is only evaluations of negative frames that differ. The Associative Account of attribute framing predicts that the evaluations of double frames should lie between the evaluations of positive frames and negative frames. Because this is not the pattern of results observed in the current work, the medical decision making literature (Moxey et al., 2003; O’Connor, 1989; O’Connor et al., 1985; Robberson & Rogers, 1988; Wilson, et al., 1990), or by Johnson (1987), the Associative Account seems unable to account for evaluations of double attribute frames. An extension of the Associative Account might predict that only the first frame in the double frame would be used for evaluations (a primacy effect) or only the last frame (a recency effect), but we found no evidence of an order effect for the presentation of the two components of double frames in the current experiments (see Figure 1.1 and pairwise comparisons). An alternative extension of the Associative Account might predict that because losses loom larger than gains (Kahneman & Tversky, 1984; Tversky & Kahneman 1991), the presence of both positive and negative associations in a single stimulus may lead to preferential treatment of or
emphasis on the negative associations from the negative frame. Such an extension would predict that the double frame would be evaluated similarly to the negative-only frame. However, the opposite pattern of results was observed: Double frames are evaluated similarly to positive-only frames. An alternative account of attribute frame effects, the Information Leakage Account, does not make a direct prediction as to how double frames will be evaluated relative to positive-only and negative-only frames. Rather it makes a prediction about the evaluation of double frames in relation to the use of double frames by speakers, a prediction I will revisit in Chapter 3.

Beyond demonstrating the limitations of the Associative Account, the pattern of evaluations of double frames has ramifications for industries that use the double frame as the standard form of communication. The FDA mandates that beef quality be displayed as the percent fat and percent lean (Animals and animal products, 2013). While they do not explicitly state their reasoning behind choosing the double frame as the standard, examining packaging from before the mandate suggests that companies were using either the positive-only frame or the double frame to describe the quality of beef. As such, the mandate to use the double frame likely did not affect consumer understanding or evaluation of the product. Additionally, the medical decision making research explicitly states its motivation of trying to communicate most effectively and to inform patients of their options in medical treatments (Moxey et al., 2003). With this goal, it is not entirely clear that the double frame is the best way to achieve their goal. It may decrease ambiguity, but in evaluative terms, it appears to be no different than using the positive-only frame.

Experiments 1a – 1d dealt with variations that exist within the stimuli and
tasks of attribute framing experiments to ensure that the evaluations of double frames were stable and robust to such changes. Thus, all experiments manipulated components previously manipulated in the attribute framing literature. However, there exist regularities or conventions in the attribute framing literature that may be producing the observed pattern of results, possibly by altering frame saliency. If this were the case, it would suggest that the evaluation of double attribute frames as similar to the evaluation of positive-only attribute frames was the result of methodological confounds or features of the experimental paradigm that affect saliency of frames, and not about how double frames themselves are processed and subsequently evaluated by people. To address such a concern, two experiments were conducted to push the methodology of testing attribute frames beyond the current standards in the literature as well as manipulate frame saliency. The results, and how such methodological regularities may impact standard attribute frame results, will be discussed in Chapter 2.

Chapter 1 is, in part, being prepared for submission for publication of the material. Thierman, Jessica S.; McKenzie, Craig R. M. The dissertation author was the primary investigator and author of this material.
Chapter 2:

Saliency and Methodological Explanations

Introduction

The Associative Account of attribute framing hypothesizes that different frames evoke different associations that bias judgments. However, as discussed in Chapter 1, when both the positive and negative frames are presented (so-called double frames), people do not give the neutral evaluations as predicted by the presence of positive and negative associations. Rather, such frames are evaluated similarly to the positive-only frames. Before discounting the explanatory power of the Associative Account for double attribute frames, alternative explanations for the effect must be ruled out. One possibility is that the associations created by the positive and negative frames are not equal. Instead, as van Schie and van der Pligt’s (1995) model could be extended to suggest, the saliency of one of the two frames could be greater. In the double frame condition, this would lead to more or stronger associations for the more salient frame. These associations would in turn lead to unequal evaluations. The Associative Account and the Saliency Model make the same predictions for typical attribute framing experiments (positive-only frames compared to negative-only frames) and are generally considered to be similar accounts of attribute framing (van Schie & van der Pligt, 1995). However, the two accounts may make different predictions for the evaluation of double frames.

A more general explanation that could redeem the Associative Account is that the current experimental results may be due to the methodological practices typical of
the attribute framing literature and used in the experimental paradigms in Chapter 1. It may be the case that processing and evaluating double frames does not lead to positive evaluations, but rather, methodological confounds have led evaluations of double frames in the current work to be similar to evaluations of positive-only frames. Specifically, Chapter 2 will address the fact that larger quantitative information is typically paired with the positive frame (making the positive frame the more likely outcome) and the concern that response questions used to evoke evaluations are often leading questions. These confounds may affect evaluations by changing the saliency of the frames. In this way, the two explanations mentioned are in fact the same explanation. However, it could also be the case that these methodological confounds are influencing evaluations through other mechanisms such as task demand or implicit cues (Loftus, 1975; Schwarz, 1996) or through differences in the way in which the task is processed or completed (Glaholt & Reingold, 2009; Schotter et. al., 2010; Shafir, Simonson, & Tversky 1993). The current chapter will discuss various factors that may affect frame saliency and then turn to the methodological confounds in the experimental work.

As discussed earlier, van Schie and van der Pligt (1995) were primarily interested in explaining decisions involving risk (i.e. risky choices as defined by Kahneman & Tversky, 1979; Tversky & Kahneman, 1981). Many authors at the time did not distinguish between risky choice frames and attribute frames (see Huber et al., 1987 for example). Van Schie and van der Pligt however, argued for two distinct constructs: “prospect framing” (using the context of gains versus losses for risky choices) and “outcome salience” (emphasizing the positive versus negative
information regardless of context). These authors designed stimuli that combined both constructs by embedding attribute frames (e.g. the probability of winning a gamble compared to the probability of losing a gamble) in risky choice frames (e.g. the previous gain or loss of money). With these stimuli, they showed the independent contribution of both types of framing to acceptance rates of gambles.

Importantly for the current work, van Schie and van der Pligt describe how outcome salience can be used to explain the results of attribute framing experiments (a term coined later by Levin et al., 1998). They state that saliency leads to “differential attention to particular aspects of the decision” (van Schie & van der Pligt, 1995, p. 266) which in turn influence judgments. They also claim that their Saliency Model “corresponds” to Levin’s Associative Account (van Schie & van der Pligt, 1995, see p. 267). What they do not specify, however, is what influences or drives saliency and attention. The most thorough and clear definitions for saliency are found in the visual perception literature (Itti, Koch, & Niebur, 1998; Koch & Ullman, 1985) and the social psychology literature (Taylor & Fisk, 1978). However, none of the definitions from these literatures maps particularly well on to attribute frame stimuli. As such, the current work will revisit three dimensions from the initial five dimensions that attribute frames vary across (see Chapter 1) that may influence saliency of frame: quantitative information, response question, and framing words.

**Quantitative information**: Recall from Chapter 1 that the quantitative information is the numerical value associated with the framing words that describe the percentage of a given feature or the likelihood of an event outcome (Levin et al., 1988). As discussed, quantitative information varies across attribute framing
experiments and, the experiments in Chapter 1 sampled a variety of numerical pairs (always adding up to 100% to account for all outcomes). Typical to most attribute framing experiments, and those in Chapter 1, is the pairing of the larger numerical value with the positive outcome. While it was mentioned that there exists evidence that values closest to the middle of the scale (around 50/50) produce a larger framing effect (Levin, et. al., 1986), how quantitative information influences salience was not previously discussed.

Quantitative information may affect saliency by larger numbers garnering more attention, simply by being large (an appeal to the low level features of the stimuli that can drive salience, see Koch & Ullman, 1985; Taylor & Fisk, 1978; van der Pligt & Eiser, 1984). It could also be the case that larger numbers attract more attention because they indicate the more likely outcome for an event or the majority trait for an object and thus are more salient than their complement (an appeal to contextual saliency, see Taylor & Fisk, 1978). Thus when both frames are present in the double frame condition, they may not have equal salience. Instead, the frame associated with the larger numerical value may be more salient. This difference in salience between the two frames in the double frame condition may in turn affect the number and strength of associations formed from the frames and subsequent evaluations of double frames. The result would be evaluations of double frames similar to evaluations of the more salient (larger quantitative information) frame.

If numerical information is affecting saliency, not only would it change the prediction of the evaluation of double attribute frames, it would also change our understanding of typical attribute frame experiments (without the double frame
condition). Levin and colleagues (Levin et al. 1985, 1986) include demonstrations in which larger numerical values were associated with the negative outcome. Such experiments reveal that the standard framing effect (in which the positive frame is evaluated more favorably than the negative frame) still occurs. They do not however discuss how such stimuli may affect the varying effect sizes of framing seen in the literature or the fact that the baseline from which positive and negative frame evaluations deviate may be influenced by the quantitative information. More specifically, the baseline is the theoretically true evaluation of the described object/event, stripped of any framing effect. Thus, framing effects (measured as the difference between the evaluation of the positive-only frame and the negative-only frame) could be the result of different underlying patterns of evaluations or deviations of the positive-only and negative-only frame from the baseline. It may be the case, for example, that the theoretical baseline is exactly in between the evaluation of positive-only and negative-only frames (as implied by the Associative Account). Thus, the observed framing effect is due to an equal and opposite deviation of the positive-only frame from the baseline and the negative-only frame from the baseline. On the other hand, it may be the case that the baseline is the same as the positive-only (or negative-only) frame and the observed framing effect is due to only one frame deviating from the baseline. If large numerical values affect frame saliency, it may also be the case that the baseline is aligned with the less (more) salient frame and the observed framing effect is due to the more (less) salient frame alone deviating from the baseline. Such different underlying patterns of evaluation can be explored through the use of the double frame to better understand saliency differences (due to larger numerical values)
when both frames are presented together. The current chapter will explore this possibility.

**Response Question:** Recall from Chapter 1 that response question refers to the task that participants are asked to complete or the way in which evaluations are evoked. For example, Levin and colleagues gave participants information about a new medical technique and asked them, “How would you rate the effectiveness of this new technique?” (Levin et al., 1988). Conventionally, response questions for attribute frame experiments can be anything evaluative (see Levin et al., 1998). However, a careful analysis of the literature reveals that many response questions are not neutral but rather reference only one of the two poles that describe the attribute (see Levin et al., 1988, Experiment 2) or contain information about the relevant criteria for evaluation (see Levin et al., 1988, Experiment 1). This additional information contained in the response question may affect evaluations by shifting saliency. For example, it may be the case that by asking how effective a medical technique is, thus referencing only one of the two possible poles for describing the attribute (e.g. its effectiveness), that pole becomes more salient by participants believing the experimenter cares more about that pole. It may also be the case that such leading response questions don’t affect the frame saliency, but rather lead people to complete the task differently by referencing the different information contained in the different response questions (see Glaholt & Reingold, 2009; Schotter et. al., 2010; Shafir et al., 1993 for examples of task-relevant processing differences). Task demand or implicit cues (see Loftus, 1975; Schwarz, 1996) may also underlie an effect of response question on evaluations.
As with quantitative information, the effect of response questions on framing may be easiest to see in the evaluation of the double frame. Specifically, if it were the case that response question could affect the saliency of frames, then when both frames are present in the double frame condition, the saliency of one frame may be greater. Thus, the Saliency Model would make a different prediction than the standard Associative Account, namely, that double frame evaluation should follow the evaluation of whichever single frame is indicated in the response question. To test this prediction, as well as overcome the methodological concern of using the typical positive leading response question found in the literature, work in the current chapter will reverse the direction of the response question to include a negative leading response question which references the negative pole of the attribute. If the saliency of each of the two frames is differentially affected by the response question, we should see a reversal of the standard double frame effect when using the negative leading response question: The double frame should be evaluated similarly to the negative only frame.

At the same time, these leading questions also impact our understanding of typical attribute frame experiments (without the double frame condition). Instead of using response questions, Levin and colleagues used only scales with high and low anchors that they asked participants to mark (see Levin, 1987b and Levin & Gaeth, 1988). They still found the standard framing effect. Thus, while response questions are not solely responsible for creating framing effects, they may be responsible for setting the baseline from which the evaluations of the different frames deviate. In other words, it could be the case that, when the positive pole is referenced in the response
question, the framing effect is really a measure of how much the negative-only frame deviates from the theoretical baseline (aligned with the positive pole). Conversely, if the negative pole were referenced in the response question, the framing effect may be a measure of the deviation of the positive-only frame from the baseline (aligned with the negative pole). This difference in the underlying deviations from the theoretical baseline is similar to the one discussed earlier. However, in the earlier discussion, it was suggested that quantitative information may dictate the baseline. In this section, I am suggesting that response question may dictate the baseline. As before, the experimental results may not distinguish between the different explanations (when not including the double frame condition), but the underlying process or cause of the phenomena is different. By including the double frame conditions and manipulating response question, the current work will test the potential effect of response question on frame evaluations.

Framing words: As discussed in Chapter 1, framing words (also called “qualitative labels” by Levin et al., 1988) are the words that comprise the two poles used to describe the attribute (e.g. “success” and “failure”). Such words come in pairs that fully describe the outcome space such that when one word is specified, the other is entailed (see Sher & McKenzie, 2006 for a discussion of logical equivalence of frames). While various pairs of words are used in the experimental literature and in the current work, we have not yet considered the saliency differences that different words may have. For example, some words may be naturally more salient than others. As Moxey et al., (2003) suggest from their review of experiments with double frames in the medical decision making literature, “information on survival was more influential
in the decision-making process than information on mortality.” (Moxey et al., 2003, p. 952) If the two words used to describe the poles of the attribute do not have equal salience, then when the double frame is shown, people will pay more attention to the more salient word (frame). This extra attention could then influence evaluations such that the double frame would be evaluated similarly to the single frame with the more salient word. Chapter 3 will consider three factors that may affect framing word saliency.

Experimental Overview

In two experiments, I will investigate whether methodological regularities in the attribute framing literature may be responsible for driving the evaluation of double attribute frames to be similar to the evaluation of positive-only attribute frames. Both methodological practices may influence frames by creating differences in saliency. Experiment 2a will address two concerns about the quantitative information in the frame: First, that the larger numerical value is responsible for the evaluation of double attribute frames due to a low level feature-based increase of saliency for the frame associated with larger numbers. Second, that the more likely outcome for the described event (or majority component of the framed attribute) is responsible for the evaluation of double attribute frames through increased contextual saliency for outcome likelihood.

Starting with the stimuli and task used in Experiment 1a, I will flip the numerical values associated with the positive and negative frame so that the negative frame in Experiment 2a is associated with the larger numerical value and is thus the more likely outcome described. It could be the case that the double frame is evaluated
similarly to whichever single frame has the larger, and hence more salient, numerical value (an extension of van Schie & van der Pligt’s 1995 saliency model). If this were the case, stimuli like those for Experiment 2a, in which the negative frame is associated with the larger numerical value and the more likely outcome or majority attribute, should reveal a reversed pattern of evaluations from those previously observed: the double frame should be evaluated similarly to the negative-only frame.

If however, we see no effect of the larger numerical value, we can rule out the possibility that double frame evaluations are dependent on these constraints and we will have further evidence that it is something about the way in which double frames themselves, not numbers or likelihoods, are processed or evaluated that lead to evaluations of double frames that are similar to those of positive-only attribute frames.

Subsequently, Experiment 2b will tackle the issue that response question is driving the evaluation of double frames to be similar to the evaluation of positive frames. In the framing literature, response questions are typically leading questions (most often in the positive direction) or indicate only one of the two possible poles (typically the positive pole) for describing an attribute. In this sense, response measure is a confound in the experiments in Chapter 1. It could be the case that the double frame is evaluated similarly to whichever single frame/attribute pole is indicated by the response question (perhaps because of a shift in saliency based on the response question or cues present in the response question that shape evaluations). Experiment 2b will use a different set of stimuli and a different task, based on a classic attribute framing experiment that asks for an evaluations of ground beef (Levin, 1987b; Levin & Gaeth, 1988), with an additional factor added to the experimental design: Type of
response question. Specifically, I will include both a typical, positive leading response question and its reciprocal, a negative leading response question. If evaluations of double frames follow the response question, a negative leading response question should reverse the pattern of results previously observed, namely, it should show evaluations of the double frame as similar to evaluations of the negative-only frame.

Experiment 2a

Many attribute frame experiments pair the larger number (more likely outcome/majority attribute) with the positive frame. To ascertain if evaluations of double frames are due to pairing of the larger percent (more likely outcome or majority feature) with the positive frame, Experiment 2a will replicate Experiment 1a but will flip the percentages so that the more likely outcome will be the negative outcome. Participants will read the same background scenario as Experiment 1a about a basketball player, but for this experiment the player will have made 40% of his shots and missed 60% of his shots (rather than made 60% and missed 40% as in Experiment 1a). If double frames are still evaluated like positive frames, then we can conclude that it is the frame and not the likelihood of outcome or large numbers that is driving the evaluation of double frames. If, on the other hand, the pattern of results reverses (such that the double frame is evaluated like the negative frame), this would indicate that large numbers and typical outcomes dictate the evaluation of double frames.

**Methods:** Participants were 165 University of California, San Diego (UCSD) students, who received partial course credit. Participants completed this task as part of a series of unrelated experiments. Stimuli for this experiment were the same as those used for Experiment 1a with one important difference: For Experiment 2a, the larger
percentage (the quantitative information indicating the more likely outcome) was matched with the negative or less desirable outcome (opposed to being matched with the positive outcome like in Experiment 1a-d). Additionally, while Experiment 1a was completed on the computer, Experiment 2a was completed on paper.

For this experiment, all participants read the same background scenario describing a college basketball recruiter examining files of high school seniors who play basketball. The last sentence of each scenario contained an attribute frame describing the performance of a player and differed by condition (see Appendix for full text). Notably, the positive frame condition ended with a positive outcome occurring less frequently, “The file you are currently looking at shows a player who, last season, made 40% of his shots.” The negative frame condition ended with a negative outcome occurring more frequently, “…missed 60% of his shots.” The double frame condition ended with either “…made 40% of his shots and missed 60% of his shots” or “…missed 60% of his shots and made 40% of his shots.” The order of the components of the double frame was randomly assigned so that half the participants in the double frame condition received the positive frame first and half received the negative frame first.

All participants were asked to evaluate how valuable the player would be to the basketball team by indicating their response on a 0 to 10 scale marked in increments of whole numbers and with a low anchor, “Not at all valuable” and a high anchor, “Extremely valuable.” Demographic information followed on the last page of the task packet.

**Results:** The results are shown on the left side of Figure 2.1. Generally, we
observe a similar pattern of results as in Experiment 1a (as well as 1b-d): the negative frame received a low evaluation while the other frames receive high evaluations ($M$s = 3.7, 4.9, 4.6, and 5.3 for the negative, the negative/positive double, the positive/negative double, and the positive frame respectively).

A one-way ANOVA reveals a significant effect of frame ($F(3, 161) = 8.94, p < .0001$). Pairwise comparisons show that the evaluation of the negative frame is statistically different from evaluations of the positive frame, positive/negative double frame, and negative/positive double frame ($p < .0001, p = .0270, p = .0030$ respectively), that the positive frame is marginally different from the positive/negative double frame ($p = .0541$), and that no other frame evaluations differ (all $ps > .3$). Additional
demographic variables were recorded including participant age ($M = 20.4$ years, $SD = 2.3$), sex (65% female), and native speaker status (72% native English speakers). None of these variables had a significant effect on participant ratings and were not included in the main analysis.

While Experiments 1a and 2a were conducted at different times, because of the similarity of stimuli and response measures, I conducted an analysis using experiment as an independent variable (see Figure 2.1 for the data from both experiments). A 2 (Experiment: 1a, 2a) x 4 (Frame: negative, negative/positive double, positive/negative double, positive) ANOVA on ratings of player value reveal a main effect of Frame ($F(3, 440) = 14.84, p < .0001$), a main effect of Experiment ($F(1, 440) = 26.97, p < .0001$), and no significant interaction ($F(3, 440) = 0.36, p = .78$). Again, demographic variables did not have a significant effect on participant ratings and were not included in the analysis.

These results indicate that the overall pattern of participant evaluations in which the negative frame alone is evaluated worse than the positive and double frames, does not differ between the two experiments. Further, both analyses indicate that the evaluation of the double frame (as similar to the evaluation of positive frames and different from the evaluation of negative frames) is not driven by (or dependent on) a large percentage/more likely outcome. The results of the analysis comparing Experiment 1a and 2a reveal a main effect of experiment. This suggests that participants are sensitive to the quantitative information generally: The basketball player who is objectively worse (makes only 40% of his shots, described in Experiment 2a) is rated on average as worse than the player who is objectively better
(makes 60% of his shots, described in Experiment 1a), even though no individual participant evaluated both players. Thus while quantitative information did not change the overall pattern of evaluations of double attribute frames, this analysis shows it is not because participants are insensitive to the quantitative information. If the saliency of the two frames is not equal and the difference in salience in the double frame condition is driving the evaluation of double frames to be similar to the evaluation of positive-only frames, the current experimental results indicate that large numerical values do not affect saliency. Alternatively, the Saliency Model of attribute framing, like the Associative Account, may be insufficient to predict or account for the observed pattern of evaluations.

Experiment 2b

Most attribute frame experiments ask participants to rate the object or event being framed on a scale from negative to positive (left to right). Typically, such scales are coupled with a question asking how positive or good the object or event is. For example, Levin et al. (1988) asked participants to rate the effectiveness of the medical treatment from “very ineffective” to “very effective.” Such biased questions may affect evaluations of framed information, and more specifically, may be responsible for the previously observed pattern of evaluations in which double frames are evaluated similarly to positive-only frames. As discussed, it may be the case that the response question posed to participants affects the saliency of the two frames in the double frame condition differently (by increasing the saliency of the referenced pole or by providing evaluation criteria more relevant to one frame). It may also be the case that people use cues from the response question to guide their evaluations (Glaholt &
Reingold, 2009; Loftus, 1975; Schwarz, 1996; Schotter et. al., 2010; Shafir et al., 1993). In either case, if response question influences evaluations of double frames, the double frames should be evaluated similarly to whichever single frame/attribute pole is indicated by the response question used in a task.

Experiment 2b was designed to test this possibility. By keeping the context scenario and frames constant but changing the response measure for half of the participants from the standard positive leading question to a negative leading question, the current work will be able to determine if the evaluation of the double attribute frame is driven by response question. If evaluations of double frames follow the response question, a negative leading response question should reverse the pattern of results previously observed, namely, it should show evaluations of the double frame as similar to evaluations of the negative-only frame.

**Methods:** Participants were 298 University of California, San Diego (UCSD) students, who received partial course credit. Stimuli were based on Levin’s (1987b and Levin & Gaeth, 1988) classic attribute framing experiment involving the evaluation of ground beef. All participants read the same background scenario describing a friend who is knowledgeable about food in attendance at a dinner party. The last sentence of each scenario contained an attribute frame describing the ground beef and differed by condition. The positive frame condition ended with, “Your friend happens to mention that the ground beef you are using is 80% lean.”, the negative frame condition ended with “…20% fat.”, the double frame condition was evenly divided between the positive/negative double frame (ending with “…80% lean and 20% fat”) and the negative/positive double frame (ending with “…20% fat and 80%
lean”). For every frame condition, half of the participants were asked to evaluate how lean they believed the beef to be (on a “0 – Not at all lean” to a “10 – Extremely lean” scale) while the other half were asked to evaluate how fatty they believed the beef to be (on a “0 – Not at all fatty” to “10 – Extremely fatty” scale). Participants circled a number to indicate their response. (See Appendix for full stimuli.)

Results: The results are shown in Figure 2.2. The left side shows responses to the positive (standard) dependent measure and reveal the standard double frame result: The negative frame receives a low evaluation and the other frames receive similar, higher evaluations ($M$s = 5.1, 6.8, 7.1, and 7.2 for the negative, the negative/positive double, the positive/negative double, and the positive frame respectively). The right side shows responses to the negative dependent measure reverse coded so that larger numerical values indicate leaner/less fatty evaluations (to directly compare evaluations across dependent measures). In this case, we see a different pattern of results: While the negative frame receives a lower (more fatty) evaluation and the positive frame receives a higher (less fatty) evaluation, the two double frame conditions lie in between ($M$s = 5.2, 5.6, 6.2, and 6.5 for the negative, the negative/positive double, the positive/negative double, and the positive frame respectively). A 4 (Frame: negative, negative/positive double, positive/negative double, positive) x 2 (DV: how lean, how fatty) ANOVA on evaluations of the beef shows a significant effect of the dependent measure ($F(1, 291) = 9.32, p = .0025$), a significant effect of frame ($F(3, 291) = 16.17, p < .0001$), but no significant interaction ($F(3, 291) = 1.76, p = .16$). Thus, while the pattern of evaluations across the frames is different for the positive leading versus the negative leading dependent measures, this difference is not sufficient to reach
Figure 2.2: Results from Experiment 2b (with standard error bars). While the pattern of results appears different across the two dependent measures, it does not reach statistical significance. Additionally, if dependent measure alone were driving the double frame result, a reverse pattern for the Negative DV would be expected; yet this was not observed.

More detailed pairwise comparisons show that for the positive leading dependent measure, the negative frame is statistically different from the evaluation of the positive frame, positive/negative double frame, and negative/positive double frame ($p < .0001, p < .0001, p = .0002$ respectively) thus replicating the previously observed pattern of results. However, for the negative leading dependent measure, the negative frame is statistically different from the positive frame ($p = .0004$) and the positive/negative double frame ($p = .0258$) but not from the negative/positive double frame ($p = .3464$). Additionally, while the positive frame is statistically different from the negative frame and the negative/positive double frame ($p = .0438$), it is not
different from the positive/negative double frame \((p = .4889)\). Finally, the double frames are not statistically different from each other \((p = .3464)\). Taken as a whole, we can see that for the negative leading dependent measure, the double frames are evaluated in between the positive-only and negative-only frames – the first time we have observed this pattern – but we do not have statistical evidence that this pattern is different than the pattern observed with the positive leading dependent measure.

Additional demographic variables were recorded including participant age \((M = 20.1\) years, \(SD = 2.0)\), sex (72% female), and native speaker status (69% native English speakers). None of these variables had a significant effect on participant ratings and were not included in the main analysis.

These results indicate that the evaluation of the double frame as similar to the evaluations of positive frames (and different from the evaluation of negative frames) is not driven solely by the response question. If it were driven by the response question alone, we would expect a significant interaction term in the main analysis and pairwise comparisons would reveal that the positive frame was statistically different from all other frames and that the double frames were \textit{not} statistically different from the negative frame (a reversal of the standard pattern), for the negative leading dependent measure. The results do, however, suggest that we may be able to produce a pattern of evaluations of double frames that more closely matches the predictions from the Associative Account if we consider and manipulate some of the standard methodological practices found in the attribute frame literature. Additionally, they suggest that response question may impact frame evaluations. While the current work does not distinguish between saliency differences, implicit cues, and available criteria
for evaluation as potential drivers of the effect, it does suggest that future work should be conducted to tease apart these different factors as well as examine effects of response question on framing effect magnitudes (as a qualitative difference in magnitude is seen here). Finally, results from Experiment 2b suggest that the double frame effect is sensitive to response question, although not entirely driven by it, since a full reversal was not observed.

Conclusions

Taken together, experiment 2a and 2b offer us a more complete picture of the evaluation of double attribute frames. First, I considered the quantitative information of the frames. By recognizing that larger numerical values and more likely outcomes may affect evaluations (possibly through salience differences), Experiment 2a decoupled the large percentage from the positive frame. Results indicated no effect of the large numerical value on the evaluation of double frames – they were still evaluated similarly to positive-only frames. Next, I considered response question and examined how a typical positive leading question compared to a negative leading question may affect evaluations. Multiple theories predict that response question matters including saliency (van Schie & van der Pligt, 1995), implicit cues (Loftus, 1975; Schwarz, 1996), and task-relevant processing (Glaholt & Reingold, 2009; Schotter et al., 2010; Shafir et al., 1993). A reversal in the pattern of results, which would have been expected if response question alone were driving double frame evaluations, was not observed. However, a somewhat different pattern of evaluations was observed. Specifically, evaluations of double frames were in between evaluation of positive-only and negative-only frames for the negative (atypical) response question
only. While I did not find overall statistical evidence that the evaluations of double frames change for different response questions, the qualitative pattern of results suggests response question may influence evaluation of double frames and framed information generally, perhaps by affecting the baseline for evaluations or by changing the way in which the task is completed. Chapter 3 will expand upon potential differences that exist between frames by focusing on framing words and listener (or evaluator) expectations. Thus the evidence here that atypical response questions influence evaluations may be part of the larger impact of contextual and conversational expectations that drive evaluations.

Chapter 2 is, in part, being prepared for submission for publication of the material. Thierman, Jessica S.; McKenzie, Craig R. M. The dissertation author was the primary investigator and author of this material.
Chapter 3:  
Linguistic Regularity and Expectation

Introduction

Double attribute frames are evaluated similarly to positive-only frames and different from negative-only frames. Manipulations of various features of attribute frames yielded this same pattern of results (see Chapter 1). These results, however, stand in contrast to the predictions of the Associative Account. Two methodological confounds including larger numerical information paired with the positive frame and leading response questions were examined (see Chapter 2). Such confounds may be influencing frames via saliency. Results show that neither confound alone was responsible for the evaluations of double frames because a reverse pattern of results (in which double frames are evaluated similarly to negative-only frames) was not observed. However, using an atypical, negative leading response question produced evaluations of double frames that were in between evaluations of positive-only and negative-only frames (see Experiment 2b). This suggests response question can influence framing effects and may be partially responsible for the previously observed pattern of double frame evaluations.

Yet to be examined is how a speaker’s choice of frame and framing words may be signaling listeners and providing additional information that guides attribute frame evaluation. Five different pairs of framing words or phrases have been employed in the current work (including shots “made” versus “missed,” “survive” versus “die,”
survive” versus “be destroyed,” “no longer” versus “continue” to experience discomfort, and “lean” versus “fat”). These framing words were chosen based on past attribute frame experiments and not necessarily based on their linguistic features or practical communicative implications. It may be the case that linguistic features impart information beyond the literal dictionary definition of the word and that this information is informative for frame evaluations. Additionally, as the Information Leakage account of attribute framing describes, it may be the case that speakers choose frames based on background knowledge and that context and this choice of one frame over another is informative to listeners as to how they should evaluate frames. Chapter 3 will investigate these possibilities.

Two linguistic features of framing words (or antonym pairs that fully describe the possible outcome/attribute space) that may influence evaluations will be considered: negation and markedness. Neither negation nor markedness are theories of attribute framing and thus do not make direct predictions for how double attribute frames are evaluated. However, these two features are examined because they may be informative for listeners in frame evaluation. For example, whether a frame is marked or unmarked may contribute to its evaluation and double frame evaluations may simply follow the (un)marked frame. Understanding these features of framing words may help us understand evaluations of double attribute frames. The discussion of negation will lead to a reexamination of the stimuli and results of Experiment 1d; the discussion of markedness will motivate Experiment 3a.

Information Leakage is the last theory of attribute framing that may inform evaluations of double attribute frames. Information Leakage approaches attribute
framing from the perspective that speakers are not random language producers and
listeners are not purely literal comprehenders, but rather, both operate with respect to
an environment that contains regularities. While this view of attribute framing does
not make a direct prediction about how double attribute frames should be evaluated
with respect to positive-only and negative-only frame evaluations, it does make
predictions about the communicative intent of speakers using the double frame, based
on how the double frame is understood and evaluated by listeners. The potential
matching of speaker intention and listener interpretation for double frames will be
experimentally tested and discussed.

Negation: A negation involves changing a word (or lexical item) into one with
the opposite meaning (Crystal, 1991). This can be done in numerous ways within a
language and often differs across languages. Consider for example the opposite of
“alive.” There is in fact more than one choice in selecting its opposite. For example,
one could say that “dead” is the opposite, since dead or alive are the two states of
being and they are mutually exclusive and exhaustive. These are called bounded
adjectives (see Paradis, 2001 for a discussion).

On the other hand, one could say “not alive” is the opposite of alive since we
can simply negate the term (with “not” in English) to indicate the opposite state for
bounded adjectives. This method for negating does not apply to unbounded adjectives
since these adjectives are scalar and describe attributes that can have more than two
states. For example, Paradis and Willners (2006) describe how the unbounded
adjective “hot” cannot be negated with the addition of a “not” since “not hot” could
mean warm, lukewarm, cool, cold, etc. For attribute frames, there exist only two
possible states or outcomes with respect to the attribute. Therefore all framing words chosen for attribute frame experiments are either bounded or used in a bounded manner (i.e. used in a way in which there are only two outcomes). If this were not the case, then the two frames would not be logically equivalent (e.g., describing a bucket of water that contains “20% cold water” does not entail that the remaining 80% is hot water and “20% young people” at the event does not entail “80% old people” at the event). Paradis and Willners’ (2006) research suggests that negated framing words (bounded adjectives) should be understood similarly to antonyms (e.g. “dead” should be understood similarly to how “not alive” is understood).

Negation, however, raises an interesting question for framing words. Specifically, does adding a negative word change the associations of the (positive) frame? Typically, framing word pairs involve antonyms (e.g. alive versus dead) in which the positive word indicates the positive frame and the negative word indicates the negative frame. Somewhat less common, but still present, are negations in which the positive adjective indicates the positive frame and the negated positive adjective indicates the negative frame (e.g. alive versus not alive). Less well studied is a negation in which the negated negative adjective indicates the positive frame and the negative adjective indicates the negative frame (e.g. not dead versus dead). It may be the case that the presence of the negative word in the positive frame (true for only this third type of framing word pair) changes the interpretation of the frame. While Sanford et al. (2002) used “25% fat” and “75% fat-free” for their stimuli, “free” is not a negative word and may not have the same ramifications for positive frames as “not.” It may also be the case that double frames follows the low-level valence of the framing
word such that typical double frame evaluations (in which the double frame is evaluated similarly to positive-only frame) may be disrupted if the positive frame contains a negative word (or a negation).

This experimental investigation has already been conducted in the current work. In Experiment 1d, atypical framing words were used to denote the positive and negative frames. Specifically, the positive frame was indicated by the percent of people who “no longer experience discomfort” and the negative frame was indicated by the percent of people who “continue to experience discomfort” (emphasis added for both). For this experiment, the positive frame was a negation of a negative state (experiencing pain). Despite the use of a negative word (“no”), the double frame was still evaluated like the positive-only frame (see Figure 1.1). This indicates that evaluations of double frames do not simply follow the low-level valence of individual words. Rather, it is the higher-level conceptual valence of the frame (i.e., no longer experiencing a negative is equivalent, at least to some degree, to experiencing a positive). Thus, while we can use a previous experiment to show that a negative word or a negation does not impact the evaluation of double frames, negation operates differently for unbounded adjectives, and so the negation might make more of a difference in cases where the boundedness of the adjectives is ambiguous (see Paradis & Willners, 2006).

**Markedness:** As many researchers and scholars have pointed out, antonyms are rarely symmetrical. Rather, one is typically used more often (Holleman & Pander Maat, 2009), is more easily remembered (Clark, 1969), and is even acquired first by children during language acquisition (Donaldson & Wales, 1970; Ehri, 1976). This
term in the antonym pair is described as the unmarked term while the complement, which is less often used, harder to remember, and acquired later by children, is called the marked term. Clark (1969) describes the different inferences that follow from marked versus unmarked adjectives:

A speaker asking "How good is the food?" can merely be asking for an evaluation of the food. He will be satisfied whether he is told the food is good or bad. But the speaker asking "How bad is the food?" is implying something more: rightly or wrongly, he is pronouncing the food to be bad and is asking about the extent of its badness. (p. 389)

In this example, “good” is the unmarked adjective and is more open ended in the responses or evaluations it elicits. On the other hand, “bad” is the marked adjective and has a more narrow scope for appropriate responses because it comes along with some presuppositions about the situation. (See also Harris, 1973 for experimental evidence of greater variability in responses to questions containing unmarked terms.)

Importantly for attribute framing, the positive item of the antonym pair is typically the unmarked term (Holleman & Pander Maat, 2009). Dovetailing with the discussion in Chapter 2 of the current work, Givón (1995) claims that the more perceptually or culturally salient word of an antonym pair is typically unmarked. However, Holleman and Pander Maat (2009) argue that less common or negative words in an antonym pair can become unmarked by creating scenarios in which the negative or less common outcome is expected (see Holleman & Pander Maat, 2009, p. 2210). Markedness may have important ramifications for attribute framing generally, and particularly for double frame evaluation. According to Clark’s (1969) example described above as well as the work by Holleman and colleagues (2009), unmarked (positive) terms lead to more open-ended, neutral inferences and marked (negative)
terms lead to narrower inferences. Because the positive term is typically unmarked, it could be the case that the standard attribute frame effect arises from the different or more narrow evaluations of the marked term, compared to the neutral baseline (similar to the unmarked term). In other words, using a more atypical, less expected framing word (the marked term, e.g., “25% fat”) as part of the frame may lead listeners/evaluators to evaluate the frame differently than neutral baseline evaluations and evaluations of the typical and expected framing word (e.g., “75% lean”).

For double attribute frames, it may be the case that the presence of the unmarked term in the double frame creates the open-ended, neutral response space similar to the unmarked term alone. If this were the case, we would expect double frame evaluations to follow the unmarked term, which is typically, but not necessarily, the positive term. Experiment 3a will tease apart whether the positive frame or the unmarked frame is driving double frame evaluations. To do this, Experiment 3a will use a negative word as part of the typical negative frame, and importantly, create a scenario in which this negative frame and negative word become the unmarked frame. This will be accomplished by creating a scenario in which the negative term is the expected frame or contains the expected information (per Holleman & Pander Maat’s discussion). Thus Experiment 3a will show whether it is the positive frame or the unmarked frame that drives the evaluations of double frames. This experiment will also provide insight into listener understanding and consideration of word typicality in frame evaluations.

**Information Leakage:** Markedness and negation both appeal to linguistic features of words that may influence listener comprehension. Similarly, the third
theory for explaining attribute framing effects, Information Leakage, considers regularities in the environment that guide speakers and that, in turn, listeners are sensitive to. Thus, both the linguistic considerations of the framing words and this larger theory of framing effects (Information Leakage) deal with cues that exist in language that listeners of attribute frames may be sensitive to. Recall that the Information Leakage account proposed by McKenzie and colleagues (McKenzie & Nelson, 2003; Sher & McKenzie, 2006, 2008, 2011) assumes that speakers have a choice of frame when they speak. Rather than choose randomly between saying “80% lean beef” and “20% fat beef” for example, speakers are influenced by background context. McKenzie & Sher (in prep) for example have shown that beef that is relatively fatty compared to most other ground beef is more likely to be described as “20% fat beef” than “80% lean beef.” Listeners in turn are sensitive to this preference by speakers and thus infer that “20% fat beef” is fattier, and generally of lower quality, than “80% lean beef”.

Unlike the Associative Account and Saliency Model, the Information Leakage account does not make a direct prediction of how double attribute frames should be evaluated relative to the evaluation of positive-only and negative-only frames. It does, however, predict that listeners are sensitive to the regularities and contexts that guide speakers’ choices. As previous experiments in the current work have repeatedly demonstrated, double frames are evaluated similarly to positive-only frames (except when paired with a negative leading response question). If listeners are interpreting the use of the double frame to indicate a generally good outcome/attribute, then speakers should prefer to use the double frame when the thing they are describing is relatively
good. Experiment 3b will test this prediction by conducting a “speaker study” in which participants are asked to choose the frame to describe the object/event (see McKenzie & Nelson, 2003 and Sher & McKenzie, 2006 for examples of speaker studies). Background context will be manipulated so that for half of the participants the object/event they are describing looks relatively good and for the other half of participants the object/event they are describing looks relatively bad. If listeners’ evaluations match speakers’ choices, speakers should have a stronger preference to use the double frame to describe the object/event when the background context makes it appear relatively good.

Experimental Overview

In two experiments I will investigate the impact of listener knowledge and expectation of individual word use and of attribute frame choices. Both experiments start with the fact that listeners interpret the double attribute frame as similar to the positive-only frame and seek to understand if it is the unmarked descriptor words that drive this evaluation (Experiment 3a) and/or if regularities in speakers’ choice of the double attribute frame drives this evaluation (Experiment 3b). First, as discussed, Experiment 3a will tease apart the unmarked term from the positive frame to see which is driving evaluations of double attribute frames. By using a scenario in which the most relevant and expected information is the negative frame, we will be able to flip the typical markedness for a pair of framing words. In this case, the negative framing word will become the unmarked frame. If double frames are evaluated like the negative-only, unmarked framed, this would suggest that it is not the positive frame, but rather the unmarked frame, that influences evaluations. If, on the other
hand, double frames continue to be evaluated like the positive-only frame (marked in this case), it would suggest that some characteristic of the positive information drives the effect.

Experiment 3b will use a classic paradigm from the Information Leakage literature to ask if speakers choose to use double frames non-randomly. Specifically, I will ask if speakers show a preference for the double frame versus a positive-only or a negative-only frame given different background contexts. Without being able to explore every possible background, we know that listeners interpret double frames to indicate relatively good outcomes/scenarios. As such, I will use one background context in which the information to be framed looks relatively good and another context in which the information to be framed looks relatively bad to see whether speakers shift their choice of frame and thus match listener interpretations. Additionally, this specific manipulation of background context has been shown to shift speakers’ preferences for the positive-only and negative-only frames (McKenzie & Sher, in prep). As a whole, both Experiment 3a and 3b will explore the possibility that there is something about language – and more specifically, language use, expectation, and informativeness – that guides evaluations of double attribute frames.

Experiment 3a

As discussed, the positive term in an antonym pair is typically the unmarked term (Holleman & Pander Maat, 2009). As such, it is unclear whether the previous demonstrations of double attribute frame evaluations showed the double frame being evaluated similarly to the positive-only frame or they showed the double frame being evaluated similarly to the unmarked frame. Experiment 3a will decouple the unmarked
frame from the positive frame to see which cue double frame evaluations follow. In order to have an unmarked frame be the negative frame, I will make use of context. As Holleman and Pander Maat (2009) discuss, if a word (frame) is expected, more informative, and typically used in the context, it becomes the unmarked word (frame). For this experiment I chose to use the context of birth control. When describing different methods of birth control, the most informative and expected statistic is the failure rate of the method. In addition to every day conversation, the Center for Disease Control and Prevention (CDC, 2013), the U.S. Department of Health and Human Services (HHS, 2014), and Planned Parenthood (Planned Parenthood, 2014), to name a few, compare birth control methods in terms of each method’s failure rate. Thus, the negative frame of “X% failure rate” is the unmarked frame in this context.

**Methods:** Participants were 245 Mechanical Turk participants (Amazon.com’s subject pool), who were paid $0.10 for completion of the experiment. Participants were required to have completed at least 500 other tasks/experiments in the Amazon system and to have a 95% approval (completion) rating for their past participation. Additionally, IP addresses were restricted to only those within the United States. The procedure was similar to other experiments in the current work except that Amazon participants first agreed to complete the task (called a “HIT” in Amazon’s system) and then were provided with a link to another website where the experiment was hosted. Upon completion of the experiment, a verification code was provided to participants. This code was then given to Amazon as evidence of completion of the experiment.

All participants read the same background scenario describing a health class that covered various topics including diet and exercise, sleep, and sexual health.
Information about a birth control method stated to be unfamiliar to the participant was described as part of the sexual health unit. The last sentence of each scenario contained an attribute frame describing the birth control’s failure rate and differed by condition (see Appendix for full text). The positive frame condition ended with, “…with respect to preventing pregnancy, this method of birth control has a 97% success rate.” The negative frame condition ended with, “…has a 3% failure rate.” The positive/negative double frame condition ended with, “…has a 97% success rate and a 3% failure rate.” The negative/positive double frame condition ended with, “…has a 3% failure rate and a 97% success rate.” All participants were asked to evaluate how effective they believed the birth control to be by indicating their response on a 0 to 10 scale marked in increments of whole numbers and with a low anchor, “Not at all effective” and a high anchor, “Extremely effective.” The following two screens of the experiment each contained one multiple choice question regarding the content of the scenario. The first question asked which class the scenario previously described took place in: Math, English, Health, or Physical Education. The second one asked what the item evaluated was: a textbook, a birth control method, a reading program, or a math class. These questions were used to ensure participants were paying attention, had read the scenario (which they could not re-read after indicating their response since it was on a previous screen), and were not responding randomly. The final screen contained demographic questions.

**Results:** Results for the 237 participants who answered both catch questions correctly (97% of all participants) can be seen in Figure 3.1. Initial analysis including all variables (the frame condition as well as all demographic information recorded)
revealed a significant effect of participant sex, and therefore the main analysis includes sex as a factor. Overall, the negative frame received a low evaluation, and the other three frames received similar, higher evaluations ($M$s = 6.63, 7.83, 7.54, and 7.89 for the negative, the negative/positive double, the positive/negative double, and the positive frame respectively). Additionally, women, on average, rated the effectiveness of the birth control higher than men ($M$s = 7.8 and 7.1).

A 2 (Sex: male, female) x 4 (Frame: negative, negative/positive double, positive/negative double, positive) ANOVA reveals a significant effect of frame ($F(3, 229) = 4.30, p = .0057$), and a significant effect of sex ($F(1, 229) = 6.08, p = .0144$), but no significant interaction term ($F(3, 229) = .25, p = .8647$). Pairwise comparisons reveal that the evaluation of the negative frame is different from evaluation of the
positive frame, positive/negative double frame, and negative/positive double frame ($p = .0017, p = .0265, p = .0030$ respectively) and that no other frame evaluations differ (all $ps > .4$). Additional demographic variables recorded include participant age ($M = 32.4$ years, $SD = 10.9$), native speaker status (72% native English speakers), and education level (82% had completed some college or more education). None of these variables had a significant effect on participant ratings and were not included in the main analysis. As discussed, sex (46% female) was significant and was included in the main analysis.

Beginning with the significant effect of sex, it is not surprising that men and women evaluate birth control methods differently. The ramifications of birth control failure differ for the different sexes (at the very least in terms of physical effects). The current experiment described a reasonable, but fairly good (low) failure rate for the birth control method. It may be the case that women are generally more informed about the failure rates of birth control methods thus leading them to evaluate the birth control described in the current experiment as more effective than men.

The persistent pattern of evaluations for double frames (in which the double frames are evaluated similarly to the positive-only frame) despite the expectation of, focus on, and relevance of the negative frame in the current stimuli suggest that these factors are not driving the effect. I have assumed that describing a scenario in which the negative information is more expected and informative has led to a change in markedness such that the negative frame is the unmarked frame. If this is the case, we can conclude that double frames are evaluated similarly to the positive-only frame and not to whichever frame contains the unmarked term. Future experiments in which
framing words are more carefully calibrated for various linguistic components such as length, familiarity, and markedness should be conducted to better understand if, or how, such linguistic components interact with framing effects. Additionally, using a pair of framing words in which the negative word is unmarked by default (rather than by context) may be more informative as to the effect of markedness on double attribute frame evaluations.

Experiment 3b

Recall that the Information Leakage account proposed by McKenzie and colleagues (McKenzie & Nelson, 2003; Sher & McKenzie, 2006, 2008, 2011) offers an additional explanation for attribute framing beyond the Associative Account and the Saliency Model. Information Leakage suggests that speakers have a choice in frame when they speak (e.g., between “80% lean beef” and “20% fat beef”) and that their frame selection is not random, but rather influenced by their background knowledge and opinions. For example, Sher and McKenzie (2006) show that speakers are more likely to describe a glass as “half empty” (as opposed to “half full”) when it was previously full compared to when it was previously empty. In other words, an object or event is described in terms of how X it is (e.g., how empty it is) when the speaker perceives it as relatively X (e.g., relatively empty). In this way, speakers “leak” information about the object/event being described through their choice of frame. Listeners in turn, are sensitive to this choice and can use the frame as a signal of how they should respond to and evaluate the object in question. For example, listeners are more likely to infer that a glass was previously full when a speaker describes it as “half empty”. In this way, listeners “absorb” the “leaked” information.
Information Leakage does not make a direct prediction as to how double frames should be evaluated in relation to standard positive or negative frames, but it does make predictions about the speaker, listener, and context that would lead to the observed evaluation of double frames. Past work (McKenzie & Nelson, 2003; Sher & McKenzie, 2006) has shown that when given the two typical (positive-only and negative-only) frames, speakers prefer to select the positive-only frame when the information to be framed looks relatively good. Conversely, speakers prefer to select the negative-only frame when the information to be framed looks relatively bad. Given that listeners interpret double frames as positively as positive-only frames, speakers should have a preference to choose the positive-only frame and the double frame when the object/event they are describing looks relatively good compared to when it looks relatively bad.

To test if speakers are indeed using the double frame as a signal of the relatively good standing of the described object/event, Experiment 3b was conducted as a speaker study, modeled after other attribute framing speaker studies (McKenzie & Nelson, 2003; McKenzie & Sher, in prep; Sher & McKenzie, 2006). Previous experiments in the current work asked participants to evaluate frames, thus having them take the role of the listener. In this experiment, participants were asked to choose between different frames to describe an event, thus becoming the “speaker.” To ensure that the scenario would be informative as to how listeners interpret double frames, Experiment 3b tests the same scenario as Experiment 2b involving ground beef. Results from Experiment 2b, a listener study, showed that listeners evaluate beef described with the double frame similarly to beef described with the positive frame.
(when using the typical, “how lean do you think the beef is” response question). Since we know that listeners evaluate the beef described with the double frame as relatively good, we can ask if speakers choose the double frame to describe beef that is relatively good, thus matching listener’s interpretations as the Information Leakage account would predict.

**Methods:** Participants were 122 University of California, San Diego (UCSD) students, who received partial course credit. Stimuli were designed based on other attribute frame speaker studies (McKenzie & Nelson, 2003; McKenzie & Sher, in prep; Sher & McKenzie, 2006) and to correspond to the listener study from Experiment 2b (based on Levin & Gaeth 1988). All participants were asked to describe new ground beef on the market that was 20% fat / 80% lean by selecting one of three frames: the positive frame “80% lean,” the negative frame “20% fat,” or the negative/positive double frame “20% fat and 80% lean.” The order of response options (negative, double, positive versus positive, double, negative) was randomly assigned. Additionally, half of the participants were given a background context in which the target beef was relatively lean (all other ground beef was 30% fat / 70% lean) while the other half were given a background context in which the target beef was relatively fatty (all other ground beef was 10% fat / 90% lean). See Appendix for complete stimuli.

**Results:** The results are shown in Figure 3.2. Overall, there is no significant effect of background context ($\chi^2(2, N = 122) = 3.99, p = .136$) showing that whether the target beef was made to appear relatively lean or relatively fat did not influence frame selection. Examining just those who selected the double frame, there is no
difference in preference for this frame when the target beef is relatively lean compared
to relatively fat. In other words, $p(\text{double frame|relatively lean}) = .47$ and $p(\text{double
frame|relatively fat}) = .53$, shows no difference by the binomial test, $p = .694$. Thus,
background context does not seem to influence selection of the double frame.

Collapsing across background contexts, participants demonstrated an overall
preference to select the double frame ($\chi^2(2, N = 122) = 15.07, p = .0005$). This
suggests that in general, people prefer using double frames to describe objects,
perhaps due to the added specificity or lack of ambiguity compared to the standard
single attribute frame.

Figure 3.2: Results from Experiment 3b. Preference for the positive and negative
frame by background context replicates previous findings. However, background
context does not affect selection of the double frame.

Examining just those who selected the negative frame or the positive frame
(and not the double frame), descriptively, we see the pattern predicted by the
information leakage account (and observed by McKenzie & Sher, in prep):
participants are more likely to describe the beef as “20% fat” (the negative frame),
rather than as “80% lean”, when the beef is relatively fatty compared to when it is
relatively lean (see Figure 3.2). However, this trend is only marginally significant
($\chi^2(1, N = 64) = 3.27, p = .070$). This suggests that although background context did
not influence selection of the double frame, it is not because participants were
insensitive to the context manipulation.

Order of response options did influence participants’ choice of frame (see
Figure 3.3). Using context (relatively lean, relatively fat), response order (order 1:
positive, double, negative; order 2: negative, double, positive), and the interaction
term to predict frame selection we see an overall effect that is marginally significant
($\chi^2(6, N = 122) = 12.11, p = .060$). Frame selection was affected by response order
($\chi^2(2, N = 122) = 7.96, p = .019$), marginally significantly affected by context ($\chi^2(2, N$
$= 122) = 5.34, $p = .070$), and the interaction term was not significant ($\chi^2(2, N = 122) =$
$1.20, p = .549$). If we again examine just those who selected the double frame, we see
no difference in preference for this frame when the target beef is relatively lean
compared to relatively fat for either response order. For response order positive,
double, negative, $p$(double frame$|$relatively lean) = .46 and $p$(double frame$|$relatively
fat) = .54, shows no difference by the binomial test, $p = .851$ and for response order
negative, double, positive, $p$(double frame$|$relatively lean) = .47 and $p$(double
frame$|$relatively fat) = .53, shows no difference by the binomial test, $p = .856$. Thus,
background context does not seem to influence selection of the double frame in either
response order. Rather, the significant effect of response order is driven by the relative
shift in preference for the fat versus lean frame, depending on which response option appeared first (i.e., while response order had no effect on selection of the double frame, which always appeared in the middle, when the fat frame appeared first it was chosen more often than the lean frame, and when the lean frame appeared first it was chosen more often than the fat frame), see Figure 3.3. Finally, additional demographic variables were recorded including participant age ($M = 20.3$ years, $SD = 1.7$), sex (79% female), and native speaker status (64% native English speakers). None of these variables had a significant effect on participants’ choice of frame and were not included in the main analyses.

Figure 3.3: Results of Experiment 3b, separated by the two response orders. While order significantly affected the selection of the positive and negative frames, it did not affect the selection of the double frame.

While the Information Leakage account does not make a direct prediction for
how double frames should be evaluated relative to standard positive or negative frames, it does make predictions for the evaluations of double frames based on speaker-listener interactions. Experiment 3b was a speaker study designed to ascertain whether or not speakers are “leaking” positive information to listeners about the described object/event when choosing the double frame. Based on the prediction of the Information Leakage account, if people evaluate double frames positively (as the current work shows) we would expect speakers to choose to describe an object with a double frame when the object is relatively good. However, the current results show that speakers are not more likely to use double frames when an option is relatively good and thus listeners’ positive evaluations from double frames are likely due to factors other than a signal from speakers. Additionally, the results show an overall preference for speakers to select the double frame. This may be informative for listener interpretations more generally. It could be the case, for example, that speakers prefer to describe objects/events with the double frame simply because it has less ambiguity. All the information is explicitly communicated and all 100% of the outcome possibilities are accounted for. In turn, listeners may prefer to evaluate double frames because they are easier to process and/or seen as more informative. Thus, a mediation effect could be at work in which positive evaluations based on double frames are due not to the positive value indicated from the use of the double frame, but rather due to the fact that the task is easier and/or listeners can be more confident in their judgments. Future experiments will need to be conducted to answer this question.

Conclusions
The current chapter asked if there is any information available to listeners in speakers’ choice of frames or framing words themselves that may be driving evaluations of double attribute frames to be similar to evaluations of positive-only frames. First, I considered whether low-level word valence may drive the effect and I revisited Experiment 1d in which the positive frame contained a negation. Because the same pattern of evaluations was found (that double frames are evaluated similarly to positive-only frames) I concluded that evaluations of double frames are not driven by low-level word valence. Instead, it is likely that the conceptual level understanding of positive and negative frames (i.e., considering the overall more/less desirable outcome and not just word valence) is at work.

Next, I asked if the markedness of framing words could be driving evaluations. Because the positive frame tends to also be the unmarked frame, the presence of such framing words in the double frame condition (or their absence in just the negative-only frame condition) could be driving the evaluation of double frames. Evaluations could be affected by how common a framing (unmarked) word is, how easily it is processed and remembered, or how open-ended the inferences it leads to are. By using context to lead listeners to expect negative information, I found that the negative frame (unmarked in this case) was still evaluated differently from all other frames and that double frames were evaluated similarly to positive-only frames. Assuming that the markedness manipulation was successful, these results suggest that double frame evaluations are not driven by this linguistic feature.

Finally, by asking participants to switch roles from listeners to speakers and asking them select the frame they would use to describe an object, I tested whether the
communicative intent and regularities of context that guide frame selection, described by the Information Leakage account, could explain the evaluation of double attribute frames. Results showed that speakers’ preference for selecting the double frame to describe an object was unaffected by background context. The double frame was preferred overall, and did not change when the to-be-described object appeared relatively bad. Thus, the Information Leakage account does not seem to offer any additional explanatory power for the evaluation of double attribute frames: it is unlikely that listeners are picking up on a true signal in the speaker’s choice to use the double frame. Overall, the current chapter attempts to understand language in context and how language is used in conversation. By testing different cues in language that might be guiding evaluations of double attribute frames, the current work shows that negation, markedness, and background/comparative contexts do not affect the evaluation/use of double attribute frames. Rather, they continue to be evaluated similarly to positive-only frames.

Chapter 3 is, in part, being prepared for submission for publication of the material. Thierman, Jessica S.; McKenzie, Craig R. M. The dissertation author was the primary investigator and author of this material.
Conclusion

Eight experiments systematically investigated double attribute frame evaluations and tested the explanatory power of three theories of attribute framing including the Associative Account, the Saliency Model, and Information Leakage. Results indicate that double attribute frames are evaluated similarly to positive-only frames and different from negative-only frames. These results stand in contrast to predictions of the Associative Account, the most widely accepted explanation of attribute frame effects. These results remain unexplained by the Saliency Model and the Information Leakage accounts as well.

There are five dimensions across which attribute frame experiments typically vary: quantitative information, context, framing words, response question, and response measure. As described in Chapter 1, the current work varied all five dimensions in a series of four experiments. All four experiments yielded the same consistent and robust pattern of results in which double frames were evaluated similarly to positive-only frames. The Associative Account claims that framed information evokes associations in our minds (positive associations from positive frames, negative associations from negative frames). These associations are adjusted based on the quantitative information in the frame (the percentages), but adjustments are anchored by initial impressions (Tversky & Kahneman, 1974) and thus are insufficient. The result is a valence-consistent shift in which positive frames are evaluated more positively than negative frames (Levin, et. al. 1988, 1998). Because it is associations from frames that lead to biased evaluations, this theory predicts that
double frames (which have both the positive and the negative frame) should be given evaluations that fall in between evaluations for positive-only and negative-only frames. Thus, the experimental results described in Chapter 1, in which double frames are evaluated similarly to positive-only frames, stand in contrast to the predictions of the Associative Account.

The results of double frame evaluations call into question the explanatory power of the Associative Account for standard attribute frames as well. Specifically, if associations from frames drive evaluations, then positive associations have to be either stronger or more plentiful than negative associations. Otherwise, the results of double frame evaluations cannot be reconciled with this account of attribute framing. If the Associative Account cannot explain double frame evaluations, it suggests that the underlying mechanism hypothesized by this account to explain attribute frame evaluations (i.e. associations) is not the true mechanism.

Saliency differences may explain double frame evaluations while maintaining the underlying mechanism of associations. This is because saliency differences may change the number and/or magnitude of associations from positive and negative frames. The Saliency Model (van Schie & van der Pligt, 1995) hypothesizes that positive (negative) frames make the positive (negative) information more salient, and this shift in saliency shifts evaluations. This model is generally considered to be similar to the Associative Account (van Schie & van der Pligt, 1995). While the two accounts make the same prediction for typical attribute frame experiments, they may make different predictions for double frame evaluations. Specifically, if the saliency of the positive frame were greater than the saliency of the negative frame, then when
both frames appear in the double frame, evaluations would follow the more salient frame (the positive frame) rather than fall in between evaluations of positive-only and negative-only frames. In this way, associations may still underlie frame evaluations. Van Schie and van der Pligt do not discuss what can make a frame more salient. Chapter 2 investigated two possibilities. In so doing, it also addressed two methodological confounds.

These two methodological confounds are commonly found in attribute framing experiments, and exist in the experiments in Chapter 1. Such confounds may affect attribute frame evaluations via saliency. The first confound is that the larger numerical value is often paired with to the positive outcome. Thus, it is unclear whether larger quantitative information or positive frames drive saliency. Experiment 2a showed that pairing the larger numerical information with the negative frame does not affect double frame evaluations. As such, quantitative information is either not affecting frame saliency or saliency differences are not responsible for the observed pattern of evaluation of double attribute frames.

The second methodological confound is response question. Attribute frame experiments, including those in Chapter 1, typically use positive leading response questions or response questions that reference the positive pole of the framed attributed. Thus, it is unclear whether evaluations of double attribute frames are dictated simply by the response question or by the positive frame (or redundant information). Experiment 2b manipulated response question to have both the typical positive leading question and an atypical negative leading question. If response questions were solely responsible for driving evaluations of double attribute frames, a
reverse pattern would have been observed for the evaluation of double frames with the negative leading dependent measure. This reversal was not observed. Rather, a different pattern of evaluations emerged in which double frames were evaluated in between positive-only and negative-only frames. This suggests that response question may be partially driving evaluations of double attribute frames. Leading response questions may affect frame saliency and thus saliency may be contributing to the evaluation of attribute frames. However, the effects of a leading response question could be explained by other mechanisms such as task demand and implicit cues (Loftus, 1975; Schwarz, 1996) or differences in task processing or completion (Glaholt & Reingold, 2009; Schotter et. al., 2010; Shafir et al., 1993). In this way, saliency may not be contributing to frame evaluations, but rather the effect of response question is operating via other mechanisms. Future work should tease apart these different mechanisms and to broaden our understanding of framing effects.

Finally, Chapter 3 took the approach of considering information available in frames beyond dictionary definitions. Experiment 3a investigated markedness to see if such a linguistic feature may be providing a signal to evaluators and guiding evaluations of double attribute frames. By manipulating the context for the framed information, the negative frame became the expected (unmarked) frame. However, this manipulation did not change evaluations: Double frames were still evaluated similarly to positive-only frames. Thus, this specific linguistic feature did not seem to impart extra information to listeners that would guide evaluations. However, it is possible that this contextual manipulation was not sufficient to change markedness, and future experiments should be conducted in which the negative frame is the
unmarked frame by default (and not by context). Additionally, many linguistic features were not examined in the current work including word familiarity, ease of processing, and boundedness. Future work should probe how such linguistic features influence both typical framing effects and evaluations of double frames.

Experiment 3b considered signals that may exist in language as described by the Information Leakage account. This experiment asked participants to take the role of a speaker to see if background context (in which the to-be-framed object looked relatively bad versus relatively good) affected the preference for the double frame. However, preference for this frame was high overall and did not differ by condition. As such, it is unlikely that evaluations of double frames as relatively good is based on a signal that speakers “leak” by their choice of frame. It may be the case that Information Leakage cannot provide explanatory power for the evaluation of double frames. However, it may also be the case that this experiment, which manipulated only the relative standing of the object being framed, did not accurately capture the difference in context required for speaker to show a preference in their use of double frames. Additionally, the overall preference for the double frame in Experiment 3b may be swamping any smaller, relative shifts in double frame use, based on background condition. Future experiments considering different contexts that may show such preferences as well as examining inferences from double frames (not just evaluations) should be conducted to further test the explanatory power of this theory.

The current research has shown that no single manipulation of the framing paradigm except response question changed evaluations of double attribute frames. Additionally, no single manipulation was responsible for producing the observed
pattern of evaluations of double frames. However, because there are so many individual features of frames, it may be the case that this effect is multiply determined. Standard demonstrations of framing effects confound many components of frames including the larger quantitative information, the positive term, the unmarked term, background context in which the object looks relatively good, a positive leading response question, etc. It could be the case that the current experiments were not able to detect changes in evaluations of double frames when only one factor was individually manipulated. However, a set of naturalistic stimuli in which many (or all) of the features typical to attribute frame stimuli were reversed to align with the negative frame may reverse the double frame effect. Future work should explore this possibility.

Another possibility for why double frames are evaluated similarly to positive-only frames, is that framing effects generally may be the result of a negative evaluation of negative-only frames. It could be the case, for example, that double frames and positive-only frames evoke evaluations that reflect the true, baseline evaluation of the described object/event. A description using the negative-only frame on the other hand, drives evaluations downward, away from the baseline, and creates both the standard framing effect (in which the positive-only frame is evaluated better than the negative-only frame) and the double frame effect (in which the double frame and positive-only frame are evaluated similarly and both are different from evaluations of negative-only frames). Other programs of research have examined the disproportionate effect of negative information (i.e. negative information has been shown to weight more heavily than positive information on decisions and evaluations,
Kahneman & Tversky, 1979; Rozin & Royzman, 2001) and such a mechanism may underlie typical and double attribute framing effects. Further experimental work should test whether or not negative-only frame evaluations deviate from the true baselines and thus are responsible for framing effects generally.

On a more applied note, these experimental evaluations of double frames have ramifications for the industries that use (or are considering using) such frames. Specifically, the FDA and medical professionals should be aware of how double attribute frames will likely be understood by consumers/patients. If the intention of the speaker of the frame (or the organization mandating its printing) is to make all information explicit and fully disclose all available options, then the double frame may be a good candidate for describing outcomes. If however, the intent is to get a neutral evaluation, as explicitly stated in the medical decision making literature (Moxey et al., 2003), the double frame is not necessarily a good form of communication. This is because the double frame and the positive-only frame elicit similar positive evaluations. Instead, coupling the double frame with a negative leading response question may produce evaluations that are in between positive-only and negative-only frames.

The way in which information is presented changes how that information is perceived, evaluated, and understood. Research in the domain of framing effects seeks to understand how framing effects arise as well as how to overcome the biased impressions that frames create in our minds. Double frames provide an interesting experimental test case for theoretical and practical reasons. These frames have allowed us to test the predictions of various theories of attribute framing. Results show that,
contrary to predictions, double frames are evaluated similarly to positive-only frames and different from negative-only frames. None of the accounts of attribute framing, including the Associative Account, the Saliency Model, and Information Leakage, was able to make accurate predictions of or provide an explanation for the evaluation of double attribute frames. As such, more work should be conducted to devise a comprehensive theory of attribute frames that can explain both typical positive-only versus negative-only frame evaluations and double frame evaluations.
Appendix

Experimental Stimuli

Experiment 1a

Scenario (Double frame condition shown):

Imagine that you are a recruiter for a college basketball team. Your job is to search for promising high school basketball players and try to recruit them to your college. You are looking through files for players from local high schools, and you are especially interested in players who can score many points. The file you are currently looking at shows a player who, last season, made 60% of his shots and missed 40% of his shots.

Response Question:

How valuable do you think this player would be to your basketball team?

Response Measure:

Sliding scale with low anchor, “Not at all valuable” and high anchor, “Extremely valuable.”

Experiment 1b

Scenario (Double frame condition shown):

Imagine a rare disease that leads to many unpleasant symptoms and can even cause death. The method by which this disease is contracted has been studied, but scientists have yet to identify the exact cause. For the past decade, the same treatment has been used to treat people with the disease. In terms of outcomes, 85% of people undergoing this treatment survive at least 5 years and 15% of people die within 5 years.

Response Question:

How effective does this treatment seem?

Response Measure:

Sliding scale with low anchor, “Not at all” and high anchor,
“Extremely.”

**Experiment 1c**

Scenario (Double frame condition shown):

Recently it was discovered that the rapid growth of the toxic weed Malum is threatening the highly valued crop Bonase. If no action is taken, the entire Bonase crop could be lost to the Malum weed. This could result in significant financial and humanitarian problems. A program to save the Bonase crop has been proposed. If this program is undertaken, 80% of the Bonase crop would survive and 20% would be destroyed.

Response Question:

How effective does this treatment seem?

Response Measure:

Sliding scale with low anchor, “Not at all effective” and high anchor, “Extremely effective.”

**Experiment 1d**

Scenario (Double frame condition shown):

Imagine that you are suffering from a common medical condition that causes mild but frequent knee discomfort. Various treatments for this condition are available, and your insurance covers all available treatments. You recently learned that a new treatment for this condition has been developed. A recent study found that, after undergoing this treatment, 95% of patients no longer experience discomfort and 5% of patients continue to experience discomfort. This new treatment involves a brief medical procedure that requires general anesthesia.

Response Question:

Based on the information above, would you choose to undergo this treatment?
Response Measure:

Selection of one of the following 6 sentences

I would **definitely not** undergo this treatment.
I would **most likely not** undergo this treatment.
I would **slightly lean towards** not undergoing this treatment.
I would **slightly lean towards** undergoing this treatment.
I would **most likely** undergo this treatment.
I would **definitely** undergo this treatment.

**Experiment 2a**

**Scenario (Double frame condition shown):**

Imagine that you are a recruiter for a college basketball team. Your job is to search for promising high school basketball players and try to recruit them to your college. You are looking through files for players from local high schools, and you are especially interested in players who can score many points. The file you are currently looking at shows a player who, last season, made 40% of his shots and missed 60% of his shots.

**Response Question:**

How valuable do you think this player would be to your basketball team?

**Response Measure:**

Selection of a number (0 through 10) on a scale marked in increments of whole numbers and with a low anchor, “Not at all valuable” and a high anchor, “Extremely valuable.”

**Experiment 2b**

**Scenario (Double frame condition shown):**

Imagine that you have a friend over for dinner and you are preparing the meal. You know little about food products, but your friend is quite knowledgeable. One of the ingredients you are cooking with is ground beef. You are trying to learn a little about food from your friend and you two begin discussing meat, ground beef in particular. Your friend
happens to mention that the ground beef you are using is “80% lean and 20% fat”.

Response Question:

(Positive leading condition)
How lean do you think the beef is, relative to other ground beef on the market?

(Negative leading condition)
How fatty do you think the beef is, relative to other ground beef on the market?

Response Measure:

Selection of a number (0 through 10) on a scale marked in increments of whole numbers.

(Positive leading condition)
Low anchor of, “Not at all lean,” high anchor of “Extremely lean.”

(Negative leading condition)
Low anchor of, “Not at all fatty” high anchor of “Extremely fatty.”

Experiment 3a

Scenario (Double frame condition shown):

Imagine that you are taking a health class. In the class you cover topics ranging from diet and exercise to sleep. One section of the class is dedicated to sexual health. During this section of the class, you hear about a form of birth control that you are not familiar with. You learn that with respect to preventing pregnancy, this method of birth control has a 97% success rate and 3% failure rate.

Response Question:

How effective do you consider this method of birth control?

Response Measure:

Selection of a number (0 through 10) on a scale marked in increments of whole numbers and with a low anchor, “Not at all effective” and high anchor, “Extremely effective.”
Experiment 3b

Scenario:

(Target is relatively good condition)
Imagine that all ground beef is 30% fat / 70% lean. Recently, you heard that a new ground beef is going to be sold on the market that is 20% fat / 80% lean.

(Target is relatively bad condition)
Imagine that all ground beef is 10% fat / 90% lean. Recently, you heard that a new ground beef is going to be sold on the market that is 20% fat / 80% lean.

Response Question:

You happen to be talking to a friend about the new beef. How would you describe the new ground beef to your friend?

Response Measure:

Selection of one of the following 3 frame descriptions (order reversal not shown)

20% fat
20% fat and 80% lean
80% lean
References


McKenzie & Sher, in prep. Product Attribute Framing and Information Leakage.


