Influences of Evidence, Beliefs, and Emotion

A Thesis Submitted to the College of Graduate and Postdoctoral Studies

In Partial Fulfillment of the Requirements for the Degree of Master of Arts

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By

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Abstract

Within the reasoning literature, most investigations of motivated reasoning, belief-biased reasoning and the effects of emotional material have all been conducted separately from each other. Motivated reasoning theories state that reasoning can be goal-directed, and all future processing is allocated towards achieving an end goal or justifying a position. Dual process theories of reasoning, on the other hand, allow for analytic thinking to discriminate between strong and weak arguments. Additionally, theories of emotion in reasoning state that emotional content can negatively impact future processing. Our goal was to investigate the interaction of argument strength, prior belief and emotional content in argument evaluation over the course of three experiments ($N = 360$). Participants completed questionnaires that involved reading conversation transcripts and ranking the strength of the evidence presented in the conversation. Conversations were varied on their argument strength, believability, and emotional content. Following the conversations, we asked participants to personally rank the believability and emotionality of the topics used within the experiment. We found that most participants were sensitive to the strength of the evidence presented in the conversations, but a small minority were more likely to appraise the evidence based previous beliefs. The impact of emotional versus neutral content was found to minimally impact the appraisal of presented evidence. These data suggest an explanation based on both motivated reasoning theories and dual process theories of reasoning. Most individuals were able to discriminate between strong and weak evidence, as predicted by dual process theories. However, some individuals were more sensitive to the believability of the presented statements and exhibited examples of belief bias phenomena. As motivated reasoning theories would predict, their appraisal of evidence may have been guided towards an end-goal that was congruent with their previous beliefs. Individual differences played

a large role in our current findings, and future directions should investigate the driving forces

behind these differences.

Acknowledgments

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1. Introduction

An individual's previous beliefs have the potential to greatly impact future cognitive processing (Thompson & Evans, 2012). Belief bias refers to the phenomenon of previous beliefs impacting the ability of a reasoner to appropriately appraise the validity and strength of evidence in favour of a proposal or argument (Kraft et al., 2015). Along with beliefs, reasoners can be influenced and affected by emotional content, which can interfere with the ability to respond according to normative criteria such as rules of probability or logic (Blanchette et al., 2014). Such influences impact the ability of a reasoner to appropriately appraise the validity and strength of evidence in favour of a proposal or argument (Kraft et al., 2015). Along with the influences of belief and emotion, individuals may be separately inclined or motivated to direct their cognitive resources towards a specific outcome that is in-line with prior beliefs and ignore evidence that is contrary to said biases (Kunda, 1990; Kraft et al., 2015). The roles of belief and emotion in reasoning have been part of three separate lines of investigation; the goal of the current paper is to integrate and reconcile the differences into a unified framework.

1.1 Belief Bias

The phenomenon of belief bias occurs when an individual appraises a deductive argument problem based on their a priori beliefs rather than reasoning based on logical judgments or evidence (Evans et al., 1983). Klaczynski and Robinson (2000) note that a belief effect can be present when an individual is presented with evidence that does not conflict with their prior beliefs. In such cases, individuals may be less likely to engage cognitive resources to accurately appraise the evidence and instead accept it at face value.

Much of the past work investigating the belief bias phenomenon has involved testing through formal reasoning paradigms, such as syllogistic reasoning problems (E.g., Evans et al., 1983). Syllogistic reasoning problems are deductive arguments that consist of two premise statements followed by a conclusion, written in the form 'all *a* are *b,* all *b* are *c,* therefore all *a* are *c*'. Participants are instructed to assume the premises to be true and to determine whether the conclusion logically follows them. (Evans et al., 1983). Syllogisms vary the believability of the conclusion orthogonally to the validity of the statements. However, participants may fall prey to the influence of previous beliefs when attempting syllogistic reasoning problems. When a syllogistic conclusion that is congruent to beliefs does not logically follow the premises, participants may not appraise the problem based on the validity of the premises (Thompson & Evans, 2012). As noted by Klaczynski and Robinson (2000), evidence that is congruent to previous beliefs may not trigger further analysis of a claim. If the premises logically follow yet lead to an unbelievable conclusion, the subjective believability of the conclusion may lead to an incorrect evaluation of the problem's validity. In their investigations involving political arguments and participant ideologies, Gampa et al. (2019) noted that individuals rated arguments as more logically sound if the presented conclusions aligned with their ideological beliefs. However, conclusions that were counter to participant ideology were judged much more harshly compared to congruent conclusions.

An expansion on the syllogistic paradigm involving belief bias was presented by Thompson and Evans (2012) through the context of dual process theories of reasoning, which are an integral component in comparing belief bias and motivated reasoning.

1.2 Dual Process Theories

Dual process theories of reasoning posit that judgements are mediated by two distinct systems or processes that work in tandem with each other (Evans & Stanovich, 2013). Type 1 processes are characterized by autonomous processes that do not require working memory, and are correlated with fast, biased responses (Evans & Stanovich, 2013). Type 1 responses are influenced by previously held knowledge or beliefs that shape processing output (Evans, 2008). In contrast, Type 2 processes are defined by requiring working memory to generate more deliberate and thoughtful responses (Evans & Stanovich, 2013). As a result, Type 2 processes are said to follow a more analytical approach and instead rely on more active appraisal of information. According to dual process theories, a combination of Type 1 and Type 2 processes are utilized to generate a representative model of content appraisal (Evans, 2003).

The mechanism by which belief bias operates can be described by the default-interventionist model of dual process theories (Evans, 2007). Type 1 responses utilize default heuristic cues to quickly appraise a stimulus, such as a reasoning problem. The default cue that is generated is utilized unless a more thoughtful Type 2 response intervenes. Typical reasoning problems include categorical syllogisms, which involve two premises followed by a conclusive statement that may or may not logically follow based on the premises (Stupple et al., 2017). Problems typically involve a mix of valid-believable, valid-unbelievable, invalid-believable, and invalid-unbelievable problems. Previous research has found that individuals are better able to discriminate valid from invalid conclusions when presented with an unbelievable argument (Trippas et al., 2013).

The engagement of Type 2 processing is moderated by a metacognitive judgment termed the Feeling of Rightness (Thompson et al., 2011). A higher Feeling of Rightness is associated with a higher tendency to accept the initial Type 1 response and a lower tendency to engage in

further (Type 2) processing. As such, if a reasoning problem has a believable conclusion an internal judgement of Feeling of Rightness may be quite high and an individual may be less inclined to engage Type 2 thinking and instead accept the conclusion at face value, regardless of logical validity (Evans et al., 1983; Thompson & Evans, 2012; Thomspon et al., 2013).

1.3 Motivated Reasoning Theories

Similar to belief bias effects, motivated reasoning theories state that individuals may be influenced by prior knowledge or beliefs in their decision making process. However, the role that motivated reasoning plays is slightly different when compared to belief bias. Referring back to the model presented by Klaczynski and Robinson (2000), belief bias effects occur when presented evidence is congruent to an individual's previous beliefs. Such an instance may lead said individual to accept the evidence without engaging analytical processing.

In the case of motivated reasoning, Kunda (1990) stated that individuals may be motivated to reason towards a particular (not necessarily correct) conclusion based on available evidence and previous experiences or beliefs. As such, evidence and analytical processing is engaged to recruit evidence to achieve the reasoning goal. Kunda (1990) notes that individuals display motivated reasoning to the extent that they can gather evidence to support their position. Individuals engage analytical thinking to selectively recruit information to support their prior biases (Kraft et al., 2015; Flynn et al., 2017). Kunda (1990) argues that individuals do not consciously seek to arrive at their motivated goal; instead they perceive themselves as maintaining an objective outlook due to their inability to recognize their bias and the end goal. Individuals may be persuaded to accept information that is incongruent with their directed goal,

but strong evidence, arguments, and personal relevance may be necessary. Petty and Cacioppo (1979) used an example of participants being presented evidence in favour of standardized testing, which was counter-attitudinal to participants. Participants were less likely to counter-argue the presented evidence when the evidence itself was strong and when the evidence was framed in the context of a personally relevant scenario.

Much of the work surrounding motivated reasoning theories has involved political science research and the liberal/conservative divide (Drummond & Fischoff, 2017). Work in the field of political science is notable in its counter to Petty and Cacioppo's (1979) claim of counter-attitudinal information being accepted if the evidence is compelling enough. Kraft et al. (2015) noted that individuals are instead quick to counter-argue and discount the strength of evidence that is contrary to their prior belief and political views. However, information that supports their prior beliefs and views is more likely to be accepted unconditionally, regardless of validity (Klaczynski & Robinson, 2000). Such a model of motivated reasoning runs analogous to work on the belief bias effect and the acceptance of believable but logically invalid syllogisms (Thompson & Evans, 2012).

It is important to note that such errors in processing are not limited to individuals with a lack of information or facts – recent evidence suggests individuals with higher education have been shown to actually widen the divide between liberal and conservative thinking (Drummond & Fischoff, 2017). Individuals with greater education are better equipped to argue their position and counter arguments against their position (Drummond & Fischoff, 2017; Calvillo et al., 2020). Along with reinforcing previous beliefs, motivated reasoning may also be utilized by individuals to confirm their position with a group. Kahan et al. (2017) presented the "identity-protective cognition thesis" (ICT), which states that individuals conform their appraisal of

evidence to match that of the group (e.g., a political party or liberal versus conservative viewpoints). Kahan (2013) notes that some individuals have a proclivity to simply resort to Type 1 processing and passively accept their group membership, such as being receptive to individuals in power. However, other individuals will engage Type 2 processing and specifically recruit data and counter arguments to cement their position within the group.

Similar to belief bias effects as predicted by dual process theories, motivated reasoning can be influenced by how personally relevant content is to participants (Blanchette et al., 2014). Kraft et al. (2015) note that the salience of a topic or claim is increased when that topic or claim is framed to be more personally relevant to participant beliefs. The example noted by Kraft et al. (2015) is presenting Republican participants with content referring to 'global warming' or 'climate change', with climate change being more salient and in-line with beliefs than global warming. Conversely, information or content that is dissonant to an individual's previous beliefs or notions can also generate a negative affective response, further reinforcing their beliefs (Nisbet et al., 2015). In the above example provided by Kraft et al. (2015), Republican participants viewed the topic of climate change more negatively than Democrats when it was framed as "global warming". Democrats did not display such behaviour in either framing context. When a topic is more personally relevant, an individual may not discriminate between strong and weak evidence; they may instead opt to assimilate the presented evidence to fit their pre-determined end goal.

1.4 Moderating Role of Affect

Another variable that differentiates motivated reasoning and dual process theories in regards to the belief bias phenomenon is the emotional content of the material being reasoned with. Affectively charged content can impact an individual's ability to appraise evidence (Kahneman, 2003). When provided syllogistic reasoning problems that involved emotional content, individuals were less likely to provide correct responses based on logic regardless of whether the emotional content was positive or negative (Blanchette et al., 2014). Such claims are consistent within the dual process and motivated reasoning literature; the presence of conflict and negative affect has been noted to lead to less correct logical appraisals (E.g., Klaczynski and Robinson, 2000; Nisbet et al., 2015). In our current investigation, emotional content was explicitly introduced as a means to directly compare dual process theories of reasoning and motivated reasoning theories. Both theoretical backgrounds predict that emotional material would have an impact on reasoning ability; dual process theories predict that emotional content would influence Type 1 responses, but motivated reasoning theories predict that emotional material will impact thoughtful appraisal and will be utilized to arrive at a pre-determined conclusion.

Affective reasoning research in the past has involved the utilization affective words or images to investigate their role in moderating responses; Blanchette at al. (2014) note that emotional effects are moderated by the relevance of the reasoning material and whether or not an affective state is related to the semantic contents of a reasoning problem (for example, an individual reasoning about a problem about happiness while being in a positive mood). The researchers further note that relevance determination is relegated to an implicit heuristic process in the context of goals. Information that is relevant to an end goal (e.g., a specific conclusion to a reasoning problem) is recruited, and the relevance of the information may be considered greater

than actual logical validity (Blanchette et al., 2014). It is important to note that the claims

presented by Blanchette et al. (2014) are similar to both the motivated goals of motivated

reasoning theories and the heuristic processing of belief bias effects.

Blanchette and Richards (2010) note the concept of integral affect, which is an affective

state that is induced by target materials such as emotional words or images. In the context of

integral affect, the researchers note that emotion interacts with reflective cognitive processes

such as argument appraisal. Previous research involving argument appraisal showed that

individuals who were not in a neutral mood showed little systematic processing and were unable

to differentiate between strong and weak arguments (Mackie & Worth, 1989). In contrast, Jain

and Maheswaran (2000) found that negative affect has been shown to induce more effortful

processing, which would result in individuals engaging more analytic process processing in their

critical appraisal.

1.5 Experimental Design and Predictions

The current investigation aimed to compare predictions from motivated reasoning and

dual process theories as to how appraisal of evidence is moderated by argument strength,

argument believability, and emotionality. Furthermore, we wished to investigate whether

individuals would recruit information to maintain previous beliefs without regards to logic and

argument strength as predicted by the identity-protective cognition thesis (Kahan et al., 2017).

This theory predicts that the strength of the evidence should carry little weight when reasoning

about topics that may impact their previous beliefs or identity. When presented with evidence

that is contrary to their identity, an individual should reject the evidence regardless of conclusion believability or strength of the evidence.

In contrast to motivated reasoning theories, we wished to investigate if individuals would instead display a belief bias effect to affective information that is congruent to their beliefs, which would predict minimal analytical processing for believable conclusions but increased analytical processing for unbelievable conclusions (Thomson & Evans, 2012; Klaczynski & Robinson, 2000). If an individual is presented with evidence that is believable and congruent to their beliefs, the individual may accept the conclusion regardless of the strength of evidence. Additionally, if an individual is presented with evidence that is instead unbelievable and contrary to a priori beliefs, an individual should actively engage analytical processing to appraise the evidence (Thompson & Evans, 2012).

For the purposes of the current investigation, our hypotheses were made in the context of dual process theories of reasoning. We predicted that individuals would be able to discriminate between problems with believable or unbelievable conclusions and participants would rate the strength of the evidence of unbelievable problems lower than believable problems. The rationale for our prediction is informed from the context of belief bias effects: information that is congruent to belief may be subject to minimal appraisal and accepted as is, compared to incongruent information that would undergo more scrutiny (Thompson et al., 2013).

Our predictions were in-line with the default-interventionist model of dual process theories, whereby deliberate processing (Type 2) of evidence would intervene on intuitive (Type 1) responses as a result of affective content (Evans & Stanovich, 2013). We also predicted that participants would not be directionally motivated to reason to justify previous beliefs, as would be predicted by motivated reasoning theories such as identity-protective cognition (Kahan et al.,

2017). Furthermore, we wished to expand on the findings of Thompson and Evans (2012) that indicate belief effects and reasoning interact based on the type of task. Thompson and Evans (2012) note that while conclusions that are congruent to belief in syllogistic reasoning problems may not lead to active appraisal of evidence, such findings are not consistent in alternative belief bias tasks such as the law of large numbers task. Our experimental setup was designed as a new method to compare Type 2 reasoning and belief effects while manipulating argument evidence to be either clearly strong or weak based on evidence source and the size of the sample presented in favour of the evidence.

The current investigation involved using a single-response paradigm that we adapted from the mixed evidence task presented by Corner and Hahn (2009). Our paradigm involved generating and utilizing conversation-style transcripts to present a topic, supporting evidence, and a source. Emotional content within each task was generated to induce an affective, integral response (Blanchette & Richards, 2010). All three experiments utilized the conversation-style task, with argument strength, content believability and affective content being our variables manipulated throughout the three experiments. The objective of Experiment 1 was to establish a baseline comparison between belief bias and motivated reasoning theory in the context of evidence appraisal. Emotional and neutral topics were used to examine if participants would be able to appraise the strength of presented evidence above and beyond the influence of emotional items, previous beliefs, or pre-determined reasoning end goals. Experiment 2 involved using a similar conversation-style paradigm to Experiment 1, but trials were designed to be only strong- or only weak-evidence items, to ensure participants were actually appraising evidence strength. Experiment 3 then expanded upon Experiment 1 through the use of images to determine if

images would influence the ability of participants to appraise evidence independent of beliefs, emotional content, and pre-determined end goals.

2. Experiment 1

The goal of the first experiment was to examine the impact of prior beliefs and emotional content on ratings of argument strength. Motivated reasoning theory predicts that evidence presented in support of an idea or claim would be recruited and reframed to justify previously held positions or to promote reasoning towards a specific goal. (Kahan et al., 2017; Kunda, 1990). In contrast, dual process theories posit that reasoning and judgements can be influenced by a priori beliefs, but individuals should be able to recruit information and generate a response based on presented evidence (Evans & Stanovich, 2013). Finally, we wanted to compare both motivated reasoning and dual process theories on the effects of emotional content. Our investigation was based on previous work that found that individuals are less likely to correctly appraise information when said information involves emotional content (Blanchette & Richards, 2004).

To test the similar theories and the effects of emotion on both, we generated arguments that varied orthogonally with respect to argument strength, believability of the claims and emotionality. These arguments followed a simple conversational style, presented in the form of a conversation transcript. We modelled our stimuli on those by Corner and Hahn (2009) where each conversation we generated involved a central claim that was backed up by either weak or strong supporting evidence. Our conversations lead to conclusions that were intended to be believable or unbelievable, involve emotional or neutral content, and contain either strong

supporting evidence and sources or weak supporting evidence and sources. We asked

participants to appraise the strength of the evidence and to respond with their initial, intuitive

response and to avoid spending time thinking on their answer. After evaluating all of the

arguments, participants were asked to respond with their degree of belief and rating of emotion

for each central theme presented and encouraged to take their time in responding.

Both dual process theories and motivated reasoning make similar predictions about the

effects of belief; both theories would predict that participants would be sensitive to the

believability and emotional relevance of argument themes. However, dual process theories

would predict that participants would be sensitive to evidence strength after engaging Type 2

processing. In contrast, motivated reasoning would predict that evidence would instead be

recruited to solidify previous beliefs. Arguments that presented strong evidence but involved

unbelievable or emotionally-charged conclusions would be rated as weaker than those with

believable or neutral conclusions. It was also predicted that participants would be able to

discriminate between strong and weak evidence; however we also predicted that accuracy would

be lower for emotional items compared to neutral items. The interaction between emotionality

and believability should negatively impact a participant's ability to reason normatively.

We originally planned for a 2(strong/weak evidence) x 2(believable/unbelievable claims)

x 2(emotional/neutral content) factorial design for all three of our experiments. However,

following significant pre-testing, we could not achieve a strict emotional/neutral divide for our

emotional materials. We therefore implemented the manipulation check of asking participants to

rate the believability and emotionality of each topic statement following argument appraisal,

thereby allowing us to better account for potential individual differences.

2.1 Methods

2.1.1. Participants

One hundred and twenty undergraduate psychology students at the University of Saskatchewan (79.2% female, M_{age} = 20.28 years) received partial course credit for their participation.

2.1.2. Design

A within-subjects design was utilized. The independent variables were evidence strength (strong/weak), argument believability (believable/unbelievable), and emotional content of the argument (emotional/neutral). The dependent variables examined were participant ratings of evidence strength, participant ratings of argument believability, and participant ratings of emotion.

2.1.3. Materials

Twenty-four conversation transcripts were presented on a computer screen using the online survey platform by SurveyMonkey (Momentive Inc., 2020). Twelve of the conversations were pretested to involve emotional topics, or topics that people may feel strongly about (e.g., vaccinations, abortion, climate change). The remaining twelve conversations involved more neutral topics that people may feel less strongly about (e.g., vegetables, sodium content, caffeine consumption). Both the neutral and emotional topics were pre-tested with a separate group of undergraduate psychology students at the University of Saskatchewan and selected based on pre-test emotional ratings. Pre-testing involved utilizing a similar survey-style questionnaire in which participants were asked to rate how strongly they felt about various topics. Each conversation began with a statement affirming a position, followed by a response, presentation of evidence in

support of the initial statement, another response and finally a source for the evidence. An

example is presented below:

> Amy: Vaccines should be mandatory for everyone who is physically able.
> Brittany: Why do you say that?
> Amy: There have been dozens of studies and decades of research showing that vaccines like those used to prevent measles are at least 90% effective. If everyone was required to get vaccinated, that number could be closer to 99%.
> Brittany: Where did you read that?
> Amy: I read it in a published article from the journal Infectious Disease Research and Prevention.

Each trial required participants to read through the conversation transcript and to rate the

strength of the evidence in favour of the initial statement of each conversation on a scale of 0 to

100. Evidence in support of each topic was manipulated by changing the amount of data or

studies that supported each initial statement along with the source of said evidence. Participant

ratings of belief and emotion also utilized the same 0-100 sliding scale. Initial statements were

designed to be either believable or unbelievable, with supporting evidence being either strong or

weak based on pre-testing.

2.1.4. Procedure

The experiment consisted of two parts. In part 1, participants were presented with four

webpages each consisting of six problems. Prior to beginning the task, participants were given an

example problem that informed them to focus on the strength of the evidence in favour of each

initial statement. Participants rated the strength of the arguments by moving a slider on a scale

between 0 and 100 for weak and strong, respectively. Participants were asked to respond with

their first answer and to avoid thinking about the problems to elicit a Type 1 response, in-line

with dual process theories. Problems were presented in a random order for each participant.

Participants completed three problems in each of the 8 cells of the design; each conversation

version was presented equally as often in each cell of the design, counterbalanced across participants. After viewing all conversations, participants were presented with part two of the experiment. Part two involved participants viewing only the initial topic statement from each conversation and rating their degree of belief for each statement on a scale of 0 to 100. Following belief ratings for each statement, participants were asked to rate whether or not each statement was an emotional topic for them, on a scale of 0 to 100. All problems were presented in 12-point Arial font on a white background.

2.2 Results

We used Stanovich and West's (1997) method of analyzing argument quality as a guide for own analysis of participant ratings of argument strength due to their analogous analyses involving participant appraisals of argument quality. A separate multiple regression was run for each participant, with participant ratings of argument strength serving as the dependent variable being predicted for each of the 120 multiple regression analyses. Pre-determined classification of argument strength (strong/weak), participant ratings of believability and participant ratings of emotion served as predictor variables and were regressed on participant ratings of argument strength. Additionally, each regression included a second model that added interaction terms of belief and emotion, belief and pre-determined argument strength, and emotion and pre-determined argument strength. The aforementioned variables were centered and combined to form interaction terms that were regressed separately from the individual variables. The regression models resulted in six beta weights for each participant: one each for argument strength, believability, emotionality, the interaction between belief and emotion, the interaction between belief and strength, and the interaction between emotion and strength. The beta weights for argument strength, believability and emotionality were indicators of how well each variable

predicted its respective participant's rating of argument strength. For example, a large, positive

beta weight would indicate a participant was sensitive to evidence presented in the conversation

transcripts, independent of the influence of previous beliefs or the emotional content of the

experiment.

The mean multiple correlation (r) across all 120 regressions was .611 ($SD = .167$). With

the addition of centered interaction variable terms, the mean multiple correlation across all 120

regressions was .690 ($SD = .137$). Fisher's r-to-z test indicated no significant difference between

correlations ($z = -1.05$, $p = .294$).

Figure 1 plots the frequency distribution of the standardized beta weights of pre-

determined argument strength. As indicated by Figure 1, most participants in Experiment 1 were

sensitive to the strength of the evidence presented in the conversation transcripts. Across the 120

regressions, the mean standardized beta weight for pre-determined argument strength was .383

($SD = .023$). The mean for standardized beta weights was also significantly different from zero,

$t(119) = 16.94$, $p < .001$, with values ranging from -.35 to .78.

Figure 1
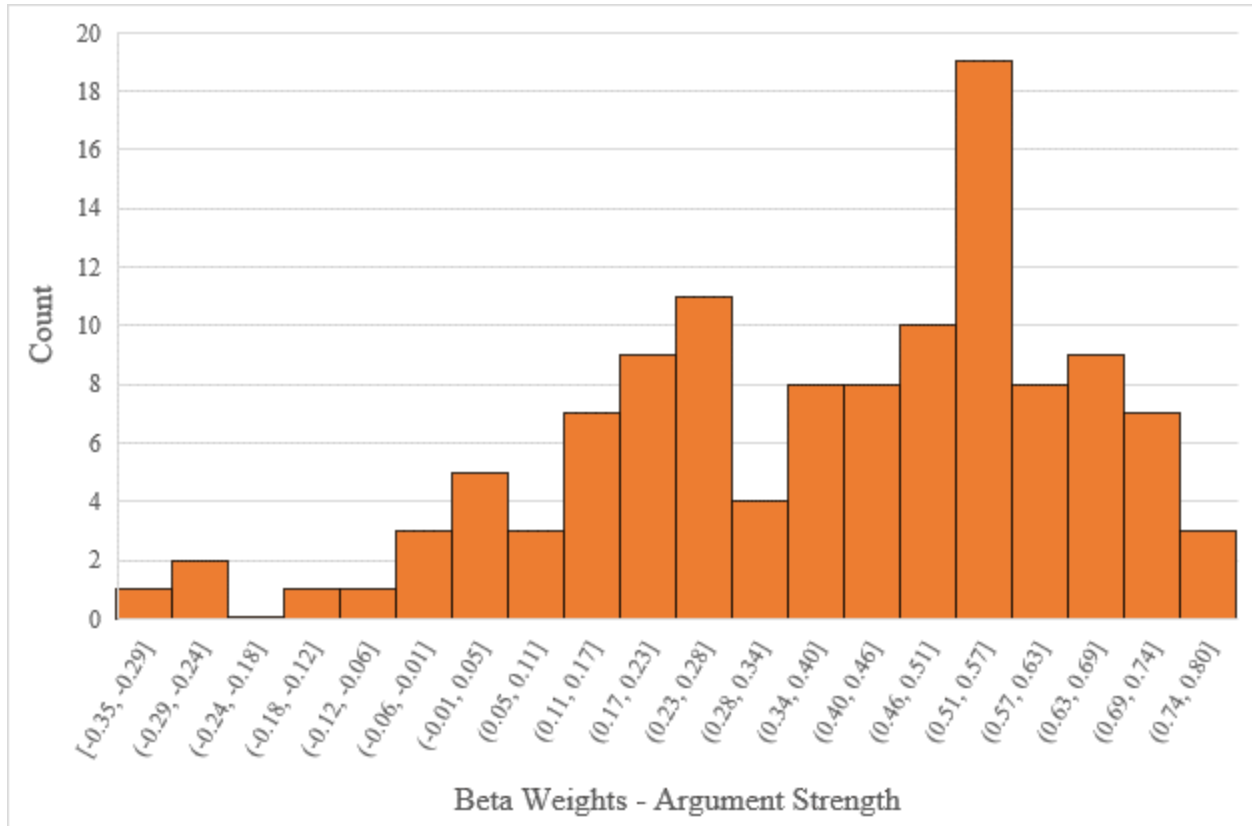
Distribution of Beta Weights – Pre-Determined Argument Strength.

Note. Frequency distribution of the beta weights for pre-determined argument strength (strong/weak) in the multiple regressions conducted on each participant's responses.

Participant ratings of belief were also found to be significant predictors of participant ratings of argument strength. The mean standardized beta weight across all 120 regressions was .307 (SD = .281), and the mean was significantly different from zero ($t(119)$ = 11.95, p < .001). Beta values of belief ratings ranged from -.49 to .96. Compared to Figure 1, ratings of belief showed a less asymmetrical distribution (Figure 2).

Figure 2

Distribution of Beta Weights – Participant Ratings of Belief (Experiment 1).
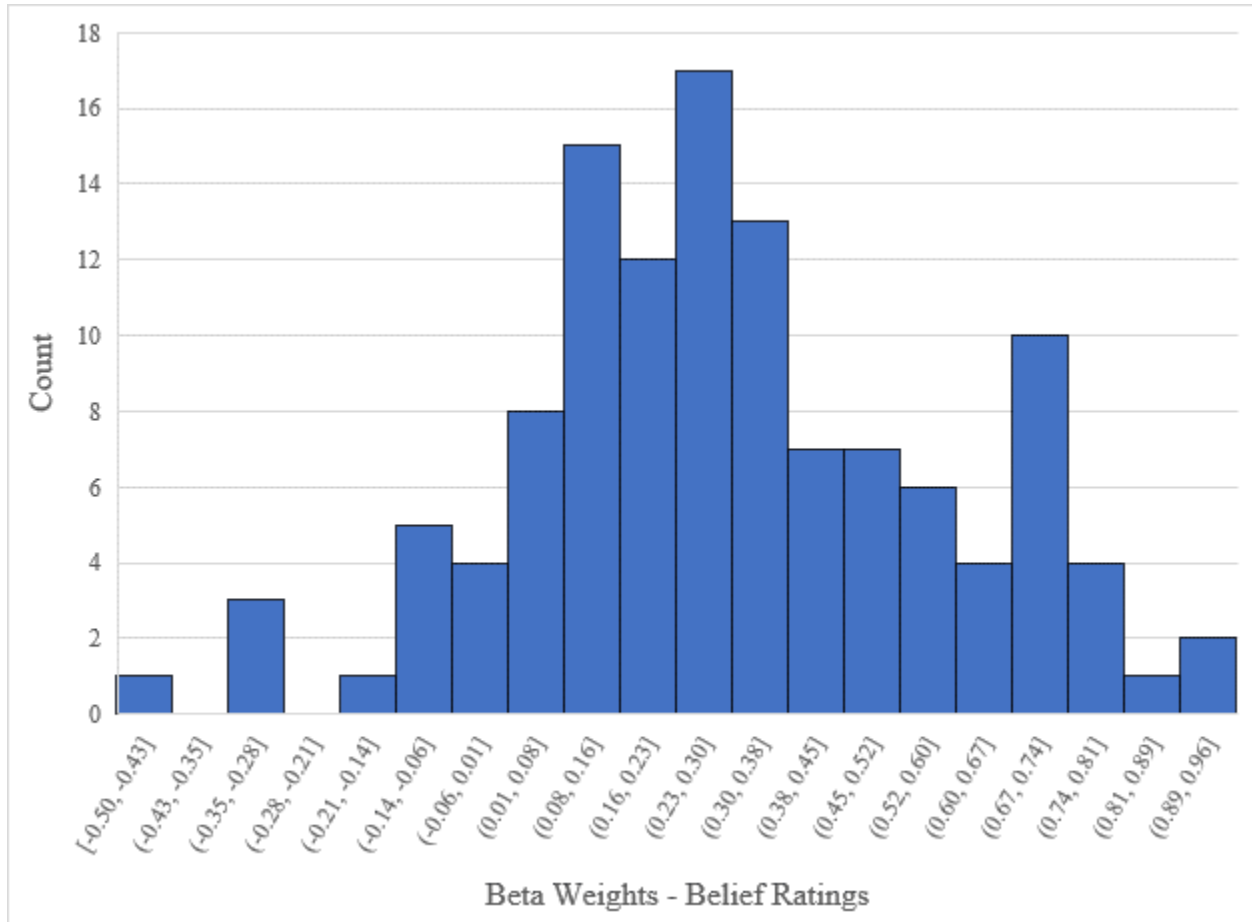
Note. Frequency distribution of the beta weights for ratings of belief in the multiple regressions conducted on each participant's responses.

Participant ratings of emotion and the centered interactions between emotion and belief, belief and pre-determined strength, and emotion and pre-determined strength did not significantly differ from zero (Figures 3, 4, 5, and 6, respectively (all $t(119) < 1.28$, all $p > .204$).

Figure 3

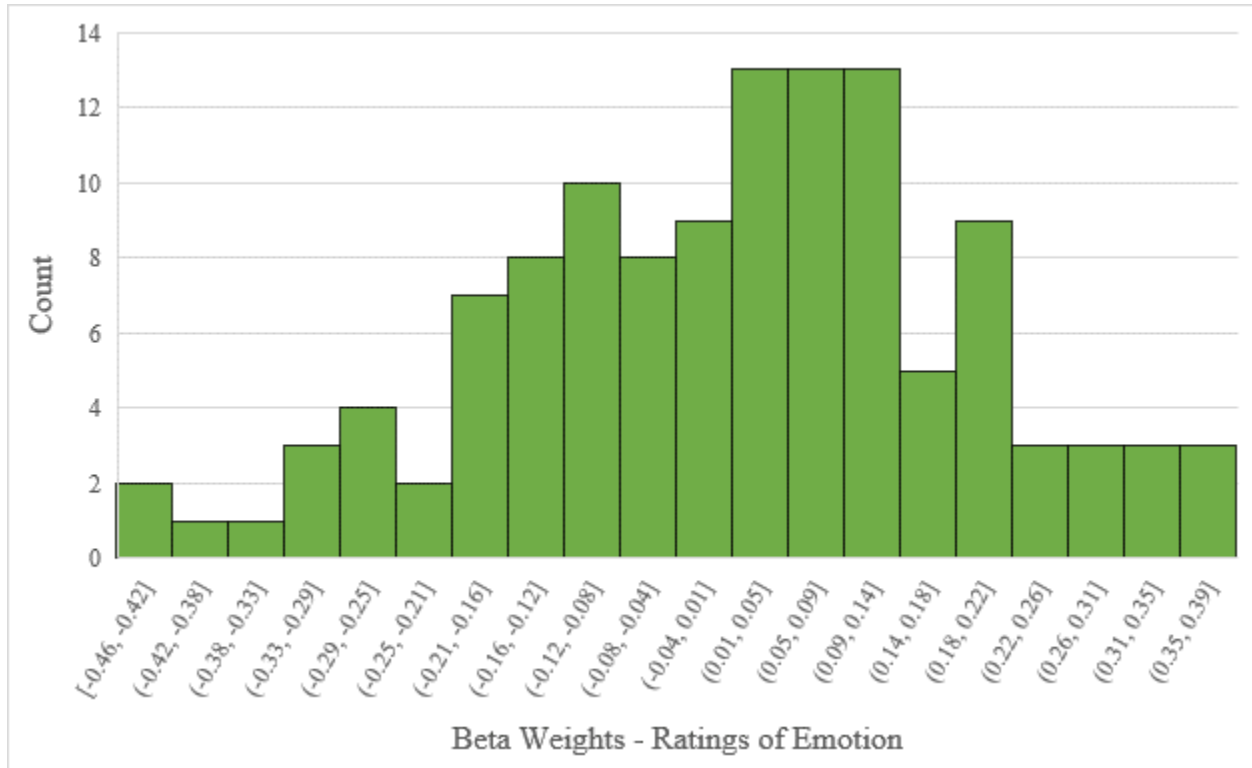*Distribution of Beta weights – Participant Ratings of Emotion (Experiment 1).*

Note. Frequency distribution of the beta weights for ratings of emotion in the multiple regressions conducted on each participant's responses.

Figure 4

Distribution of Beta Weights – Centered Interaction of Participant Ratings of Belief and Emotion

(Experiment 1).
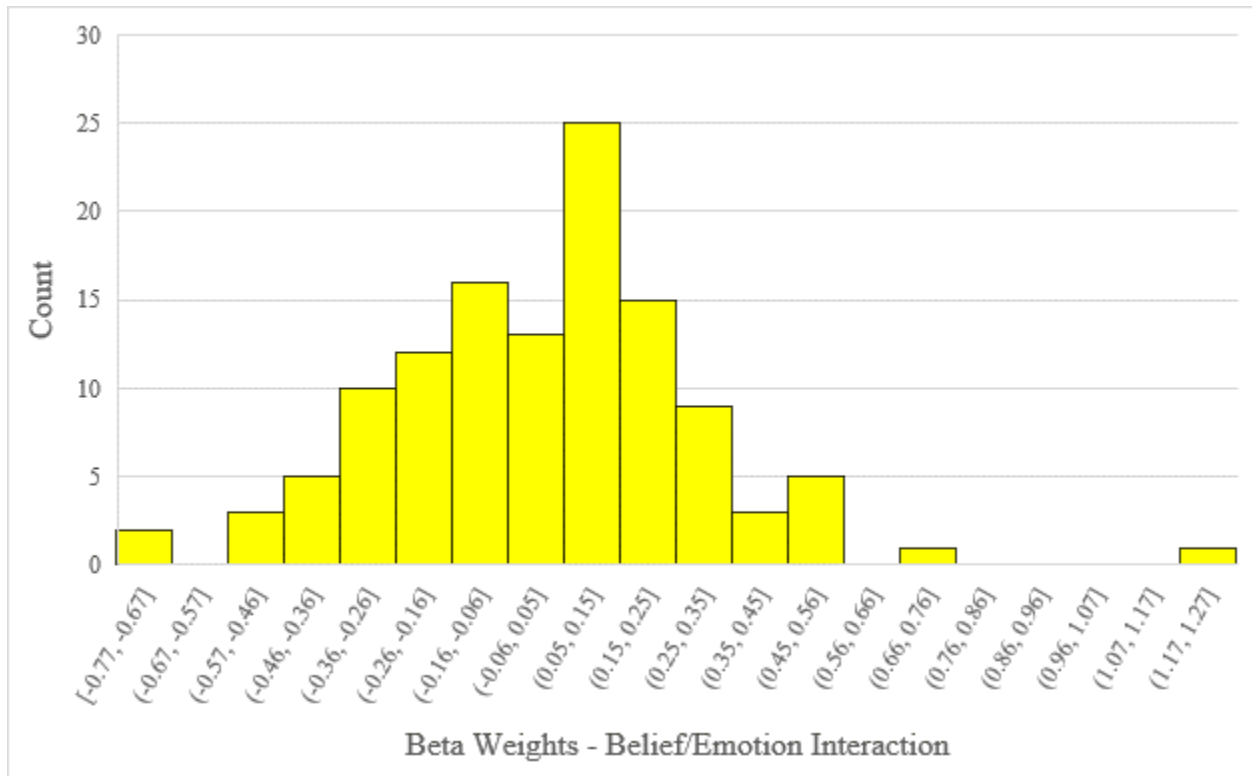
Note. Frequency distribution of the beta weights for ratings of the centered interaction between belief and emotion in the multiple

regressions conducted on each participant's responses.

Figure 5

Distribution of Beta Weights – Centered Interaction of Participant Ratings of Belief and Pre-Determined Strength (Experiment 1).
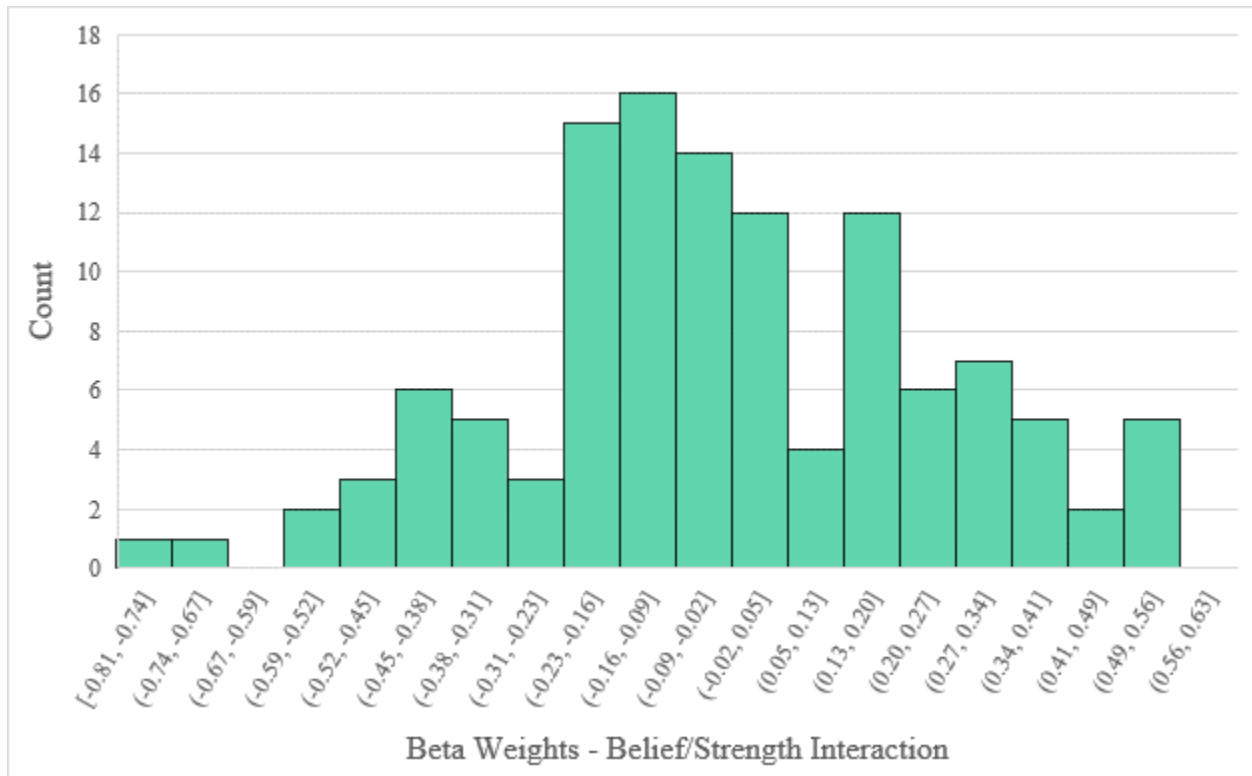
Note. Frequency distribution of the beta weights for ratings of the centered interaction between belief and pre-determined strength in the multiple regressions conducted on each participant's responses.
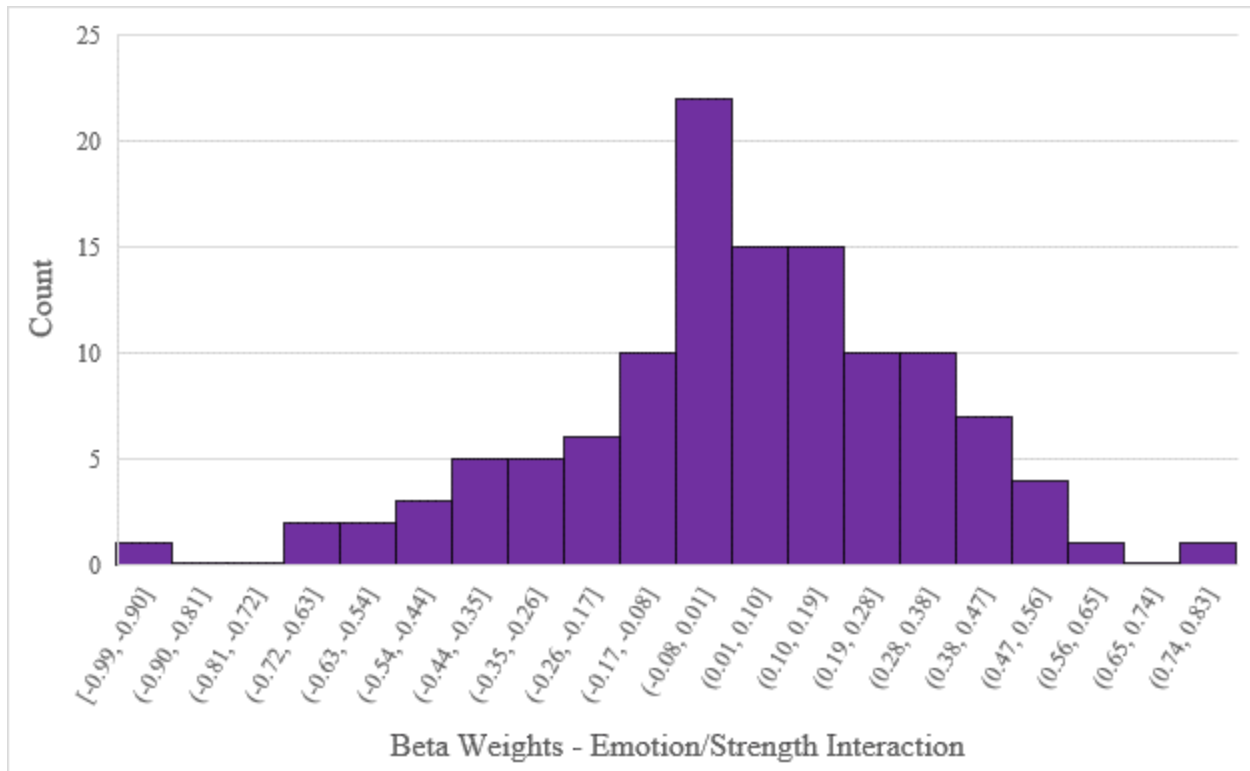
Figure 6

Distribution of Beta Weights – Centered Interaction of Participant Ratings of Emotion and Pre-Determined Strength (Experiment 1).

Note. Frequency distribution of the beta weights for ratings of the centered interaction between emotion and pre-determined strength in the multiple regressions conducted on each participant's responses.

3. Experiment 2

The effect of emotional content on reasoning ability was found to be non-significant in Experiment 1, with the emotional content of an argument having little to no effect on a participant's ability to assess evidence strength. Argument strength was found to be the greatest predictor for participants' ratings of argument strength, which may have overwhelmed the potentially more subtle effect of emotion. For Experiment 2, we decided to keep argument

strength constant in the hope of observing an effect of emotion on the evaluation of argument strength. To achieve this, we deviated from the design of Experiment 1 and ensured that half of our participants only saw strong supporting evidence while the other half only saw weak supporting evidence. The rationale for this choice was informed by the notion of motivation-directed reasoning, which entails an individual purposefully directing all reasoning resources to achieve a specific, pre-deterimined reasoning conclusion. (Kunda, 1990). If evidence is kept consistently strong or weak, it was hypothesized that individuals would instead fall back on beliefs or the emotional relevance of the chosen topics when appraising the strength of the evidence.

3.1. Methods

3.1.1. Participants

One hundred and twenty undergraduate psychology students at the University of Saskatchewan (85.8% female, $M_{age} = 20.71$ years) who did not participate in Experiment 1 received partial course credit for their participation.

3.1.2. Design

Every participant viewed each topic once. Half of the participants saw only strong-evidence arguments and the other half saw only weak-evidence arguments. The independent variables for Experiment 2 were argument believability (believable/unbelievable) and emotional content of the argument (emotional/neutral). The dependent variables examined were participant ratings of evidence strength, participant ratings of argument believability, and participant ratings of emotion.

3.1.3. Materials

The twenty-four conversations used in Experiment 1 were again utilized for Experiment 2. Participants were required to read through the conversation transcripts and evaluate the strength of the presented argument for each. Participants viewed either only strong-evidence conversations or weak-evidence conversations for the entire experiment. Argument strength, believability, and ratings of emotion were evaluated on a sliding scale from 0 to 100. Initial statements were determined to be either believable or unbelievable, based on prior pre-tests.

3.1.4. Procedure

Initial instructions were re-used from Experiment 1, informing participants that they would be evaluating argument strength regarding a written conversation. The rest of the experiment followed the same procedure as Experiment 1, with participants viewing a block of conversations followed by a block of statement. Participant ratings of strength, believability and emotion were given on the same sliding scale of 0 to 100.

3.2. Results

Similar to Experiment 1, a separate multiple regression was run for each participant. Data from two participants in both the strong and the weak group were removed due to invalid responses (final participant counts were $n = 58$ for strong evidence and $n = 58$ for weak evidence). In each of the 116 multiple regression analyses, ratings of argument strength serves as the dependent variable. Regression analyses were split between the pre-determined classification of argument strength (strong/weak), with half of the participants ($n = 60$) viewing only strong evidence problems and the other half ($n = 60$) viewing only weak evidence problems. Participant ratings of believability and participant ratings of emotion served as predictor variables that were regressed on participants' ratings of argument strength. Each regression

included a second model that added the centered interaction term of belief and emotion. The

multiple regression models resulted in three beta weights for each participant: one each for

believability, emotionality, and the interaction between belief and emotion. The beta weights in

Experiment 2 were indicators of how well each variable predicted its respective participant's

rating of argument strength while the evidence presented in the conversation transcripts was kept

constant. For example, if a participant viewed only strong-evidenced problems and their results

indicated a large positive beta weight for belief, it could potentially indicate that their previous

beliefs had a significant role in their appraisal of evidence. Such an outcome would indicate that

said participant rated both believable and unbelievable items as believable, which could point to

the influence of evidence strength on believability.

3.2.1. Strong Evidence Problems

The mean multiple correlation (r) for the 58 multiple regressions of the strong-evidenced

problems was .492 ($SD = .213$). With the addition of a centered interaction variable term, the

mean multiple correlation was .542 ($SD = .188$). Fisher's r-to-z test indicated no difference

between correlations ($z = -.36$, $p = .719$).

Figure 7 plots the frequency distribution of the standardized beta weights of participant

ratings of belief. As can be seen in Figure 7, participants who only viewed examples of strong

evidence tended to rate the conversation topics as generally believable. Across the 58

regressions, the mean standardized beta weight for participant belief ratings on strong-evidence

items was .429 ($SD = .267$). The mean standardized beta weight was significantly different from

zero, $t(57) = 12.254$, $p < .001$, with values ranging from -.19 to .93.

Figure 7

Distribution of Beta Weights – Participant Ratings of Belief (Strong Items Only) (Experiment 2).
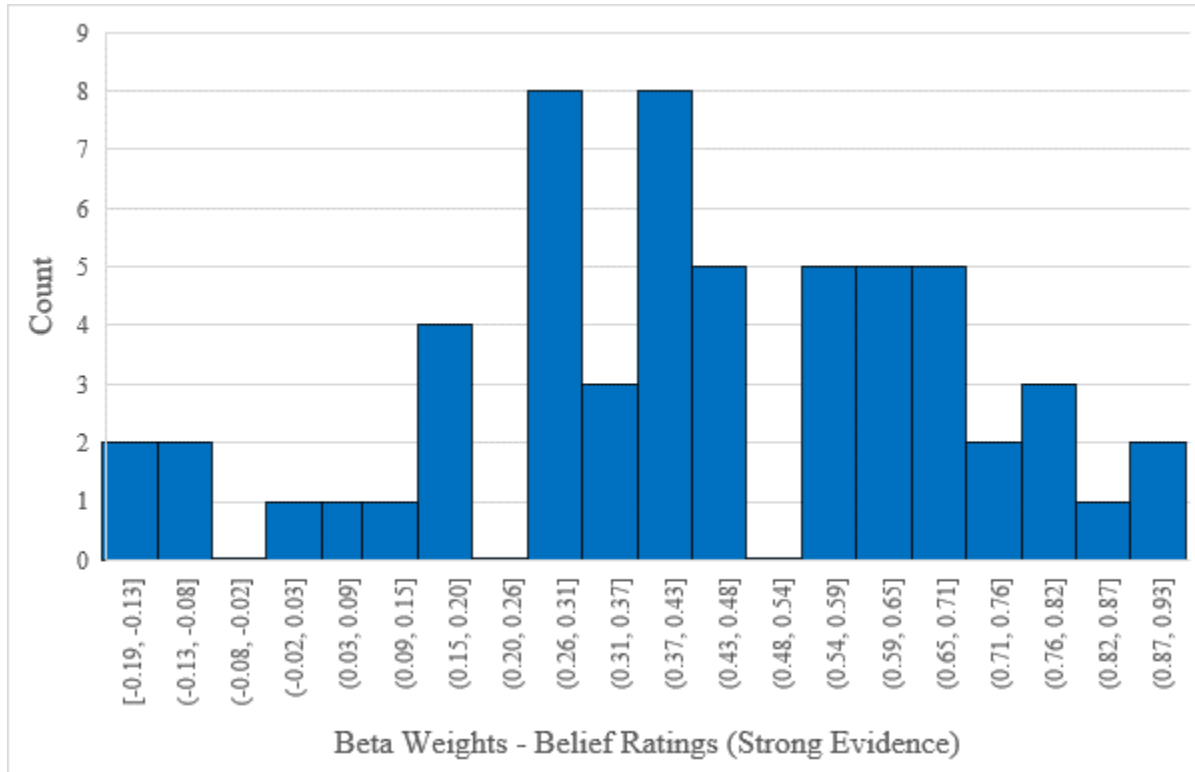
Note. Frequency distribution of the beta weights for ratings of belief in the multiple regressions conducted on each participant's responses (strong evidence items only).

Beta weights of participants' ratings of emotion and the centered interaction between belief and emotion ratings for strong-evidence items did not differ significantly from zero (Figures 8 and 9, respectively (all $t(57) < 1.167$, $p > .229$).

Figure 8

Distribution of Beta Weights – Participant Ratings of Emotion (Strong Items Only) (Experiment 2).
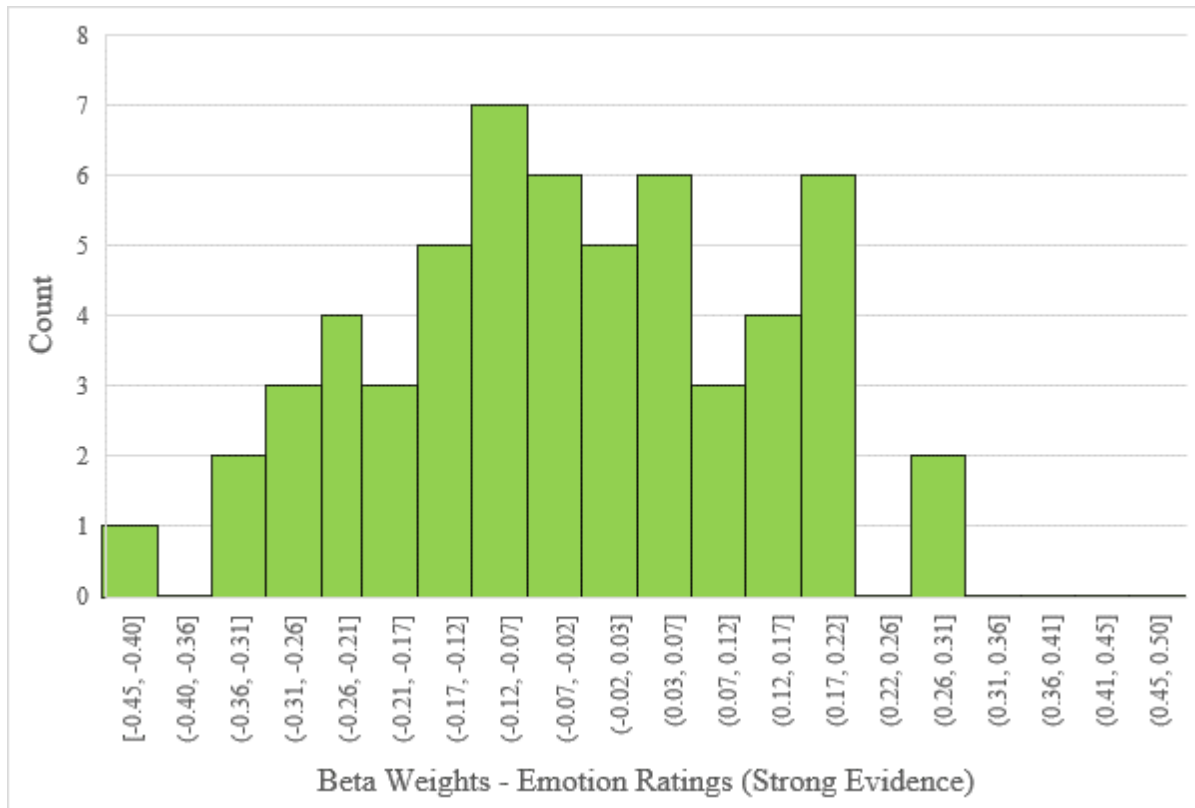

Note: Frequency distribution of the beta weights for ratings of emotion in the multiple regressions conducted on each participant's responses (strong evidence items only)

Figure 9

Distribution of Beta Weights – Centered Interaction Between Participant Ratings of Belief and Emotion (Strong Items Only) (Experiment 2).
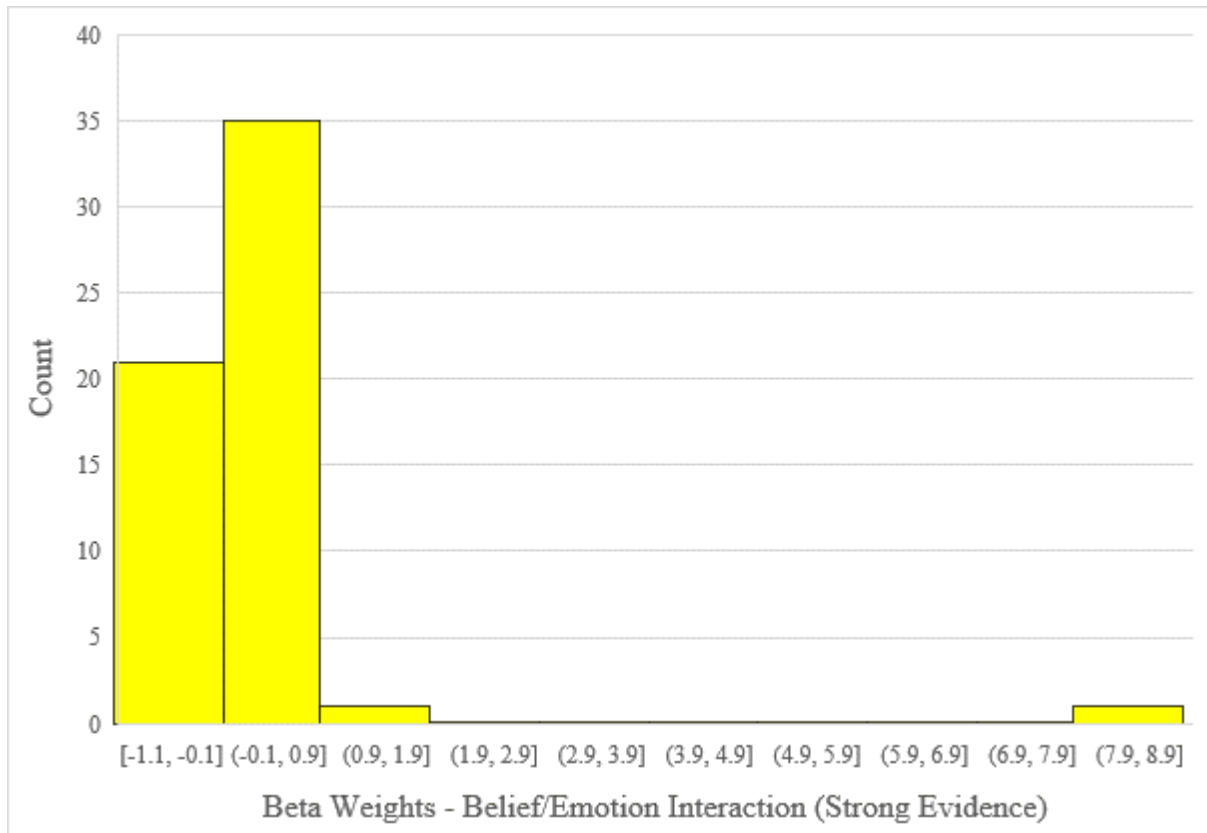
Note. Frequency distribution of the beta weights for the centered interaction between belief and emotion in the multiple regressions conducted on each participant's responses (strong evidence items only).

3.2.2. Weak Evidence Problems

The mean multiple correlation (*r*) for the 58 multiple regressions of only weak-evidenced problems was .423 (*SD* = .167). With the addition of the centered belief interaction variable

term, the mean multiple correlation was .475 (SD = .159). Fisher's r-to-z test indicated no

difference between correlations (z = -.34, p = .734).

Figure 10 plots the frequency distribution of the standardized beta weights of participant

ratings of belief. Similar to the belief ratings of strong evidence items, participants who viewed

only viewed examples of weak evidence tended to rate the conversation topics as believable,

although to a slightly lesser degree. Across the 58 regressions, the mean standardized beta weight

for participant belief ratings on weak-evidence items was .288 (SD = .263). The mean

standardized beta weight was significantly different from zero, $t(57)$ = 8.345, $p < .001$, with

values ranging from -.19 to .87.

Figure 10

Distribution of Beta Weights – Participant Ratings of Belief (Weak Items Only) (Experiment 2).
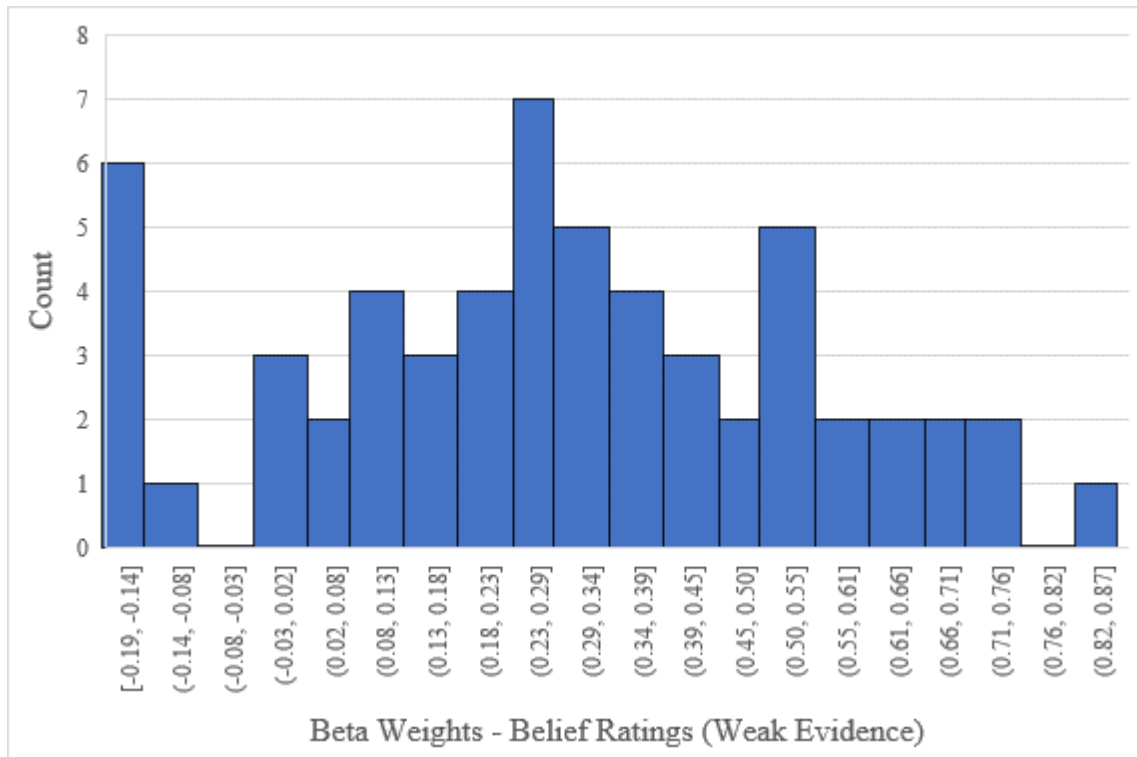
Note. Frequency distribution of the beta weights for ratings of belief in the multiple regressions conducted on each participant's responses (weak evidence items only).

Unlike the strong-evidence items, participant ratings of emotion on the weak-only problems were significantly different from zero ($M = .288$, $SD = .263$, $t(57) = 2.868$, $p = .006$), with values ranging from -.52 to .53 (Figure 11).

Figure 11

Distribution of Beta Weights – Participant Ratings of Emotion (Weak Items Only) (Experiment 2).
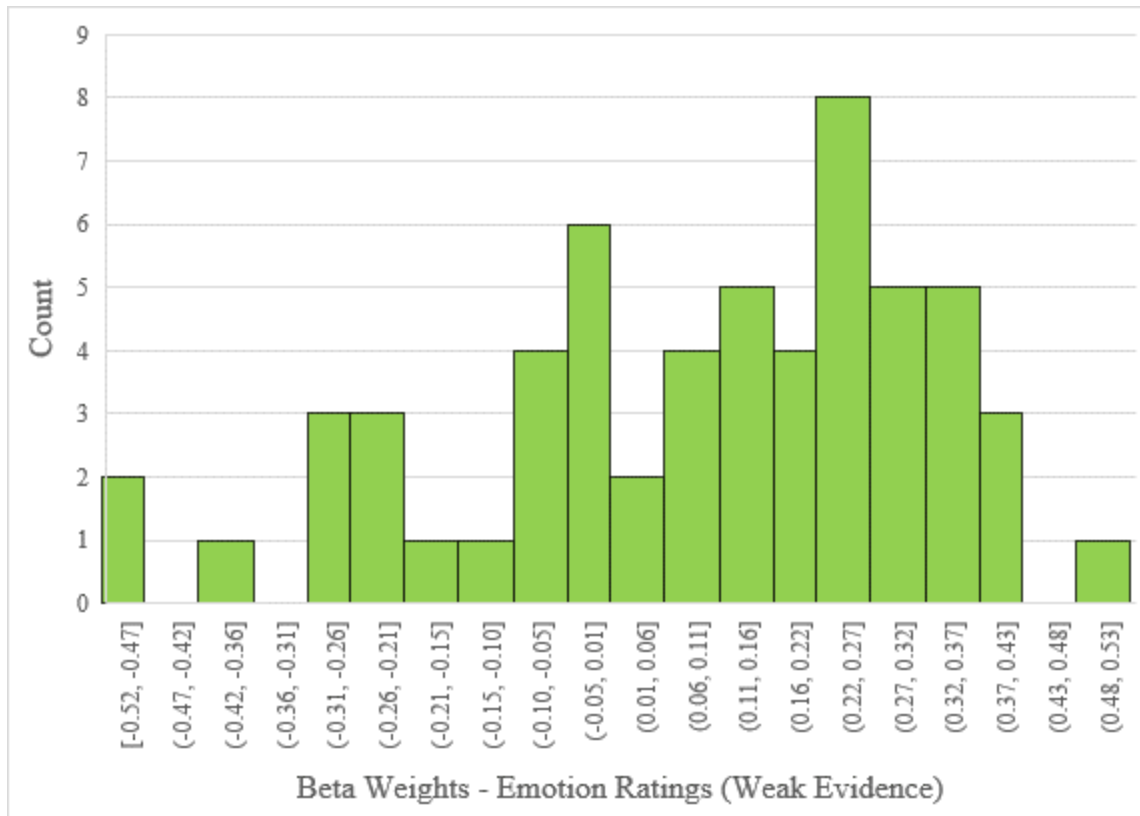

Note. Frequency distribution of the beta weights for ratings of emotion in the multiple regressions conducted on each participant's responses (weak evidence items only).

The centered interaction between participant ratings of belief and emotion for weak-evidence items was not significantly different from zero (Figure 12, $t(57) = .362$, $p = .719$).

Figure 12

Distribution of Beta Weights – Centered Interaction Between Belief and Emotion Ratings (Weak Items Only) (Experiment 2).
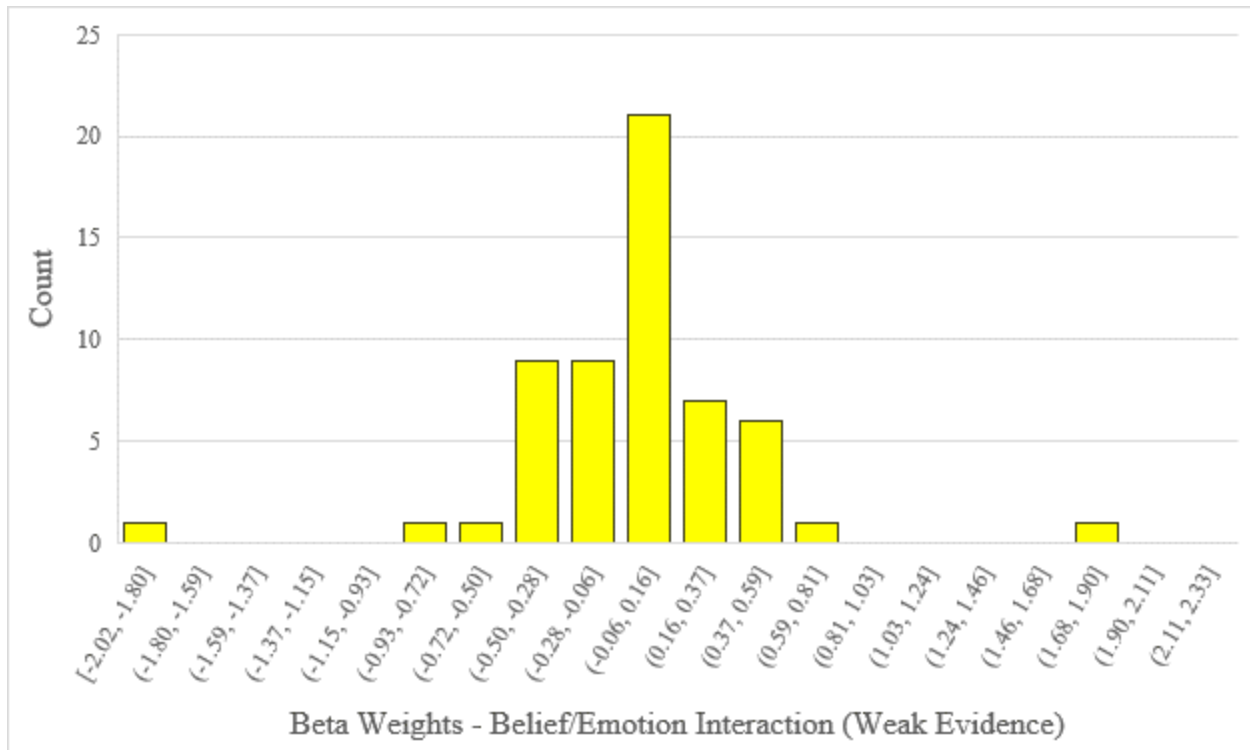
Note. Frequency distribution of the beta weights for the centered interaction between belief and emotion in the multiple regressions conducted on each participant's responses (weak evidence items only).

4. Experiment 3

Experiment 2 resulted in similar findings in regards to the lack of an effect of emotional topics on participant ratings of argument strength for the strong-evidence group; that is to say that the effect of emotion or any combination of interactions between argument strength, believability or emotionality were not statistically significant. Participants who viewed only strong arguments were not found to be any more sensitive to the emotional relevance of the

topic, However, when evidence strength was kept weak, participants were more sensitive to the emotional content of the arguments.

The goal of the final experiment was to try an alternative means to strengthen the effect of emotion. To achieve this, we decided to supplement all conversation topics with an image accompaniment. All images were chosen to specifically relate to the initial statement in each conversation transcript and be free-use images. Our hope was that with the addition of a visual stimulus to accompany the conversations, participants would experience a greater emotional reaction to the previously deemed emotional topics.

4.1. Methods

4.1.1. Participants

One hundred and twenty participants were recruited through the online recruitment platform Prolific (2020) (40.3% female, $M_{age} = 25.82$ years). All participants were compensated £5 for their time.

4.1.2. Design

The same within-subjects design from Experiment 1 was used for Experiment 3. The independent variables of argument strength, believability and emotional content of arguments were also kept constant from Experiment 1. The dependent variables examined were participant ratings of strength, participant ratings of believability, and participant ratings of emotion.

4.1.3. Materials

The twenty-four conversation transcripts from Experiments 1 and 2 were again used for Experiment 3, with the same 12 emotional and 12 neutral topics being used. An image pertaining

to each individual topic was presented above the respective conversation transcript to ensure participants viewed the images first (see Appendix B). Images were selected from the Open Affective Standardized Image Set (Kurdie et al., 2017) based on the criteria of explicitly showing or being directly related to the topic of each conversation. Supplemental images that were labelled free for commercial use were collected online. Conversation format remained the same as in Experiment 1 and 2, with the central topic of each argument being presented in the first sentence. Participant ratings were given on the same sliding scale from 0 to 100.

4.1.4. Procedure

Initial instructions informed participants that they would be asked to evaluate the strength of evidence presented in favour of the initial statement for each conversation. The same example given in Experiment 1 and 2 was given for Experiment 3. Six conversations were presented per webpage, with an image pertaining to each conversation preceding each transcript. Each conversation transcript was followed by the 0 to 100 sliding scale used in previous experiments. Participants were again asked to evaluate the strength of the evidence presented with their initial, gut reactions. Problems were presented in a random order, and every participant viewed all 8 cells of the experiment two times throughout the experiment. After viewing all conversations and their associated images, participants proceeded to part 2 of the experiment, which involved participants evaluating their levels of belief and emotion associated with each conversation topic. Images associated with each topic were again presented preceding each statement. Participants were asked to rate the believability and emotionality of each statement using a sliding scale from 0 to 100 as per experiments 1 and 2. Statement order was again randomized for each participant. All problems were presented in size 12 Arial font on a white background.

4.2. Results

We once again utilized Stanovich and West's (1997) method of analyzing participant argument appraisal and ran a separate multiple regression for each participant. One participant was removed from analysis due to incomplete responses. Analysis for Experiment 3 closely matched the analysis method from Experiment 1, with participant ratings of argument strength serving as our dependent variable being predicted for each of the 119 multiple regression analyses. Pre-determined argument strength (strong/weak), participant ratings of belief and participant ratings of emotion were once again regressed on participant ratings of argument strength. Similar to Experiment 1, each regression included a second model that added the centered interactions between belief and emotion, belief and pre-determined argument strength, and emotion and pre-determined argument strength. Six beta weights were obtained for each participant.

The mean multiple correlation across all 119 regressions was .624 ($SD = .167$). With the addition of centered interaction variable terms, the mean multiple correlation across all 119 regressions was .700 ($SD = .134$). Fisher's r-to-z test indicated no significant difference between correlations ($z = -1.03$, $p = .303$).

Figure 13 plots the frequency distribution of the standardized beta weights of the pre-determined argument strength. As can be seen in Figure 13, most participants in Experiment 3 were sensitive to the strength of the evidence throughout the task – similar previous findings in Experiments 1 and 2. Across the 119 regressions, the mean standardized beta weight for pre-determined argument strength was .334 ($SD = .249$). The mean standardized beta weight was significantly different from zero ($t(118) = 14.618$, $p < .001$). Beta values ranged from -.24 to .85.

Figure 13

Distribution of Beta Weights – Pre-Determined Argument Strength (Experiment 3).
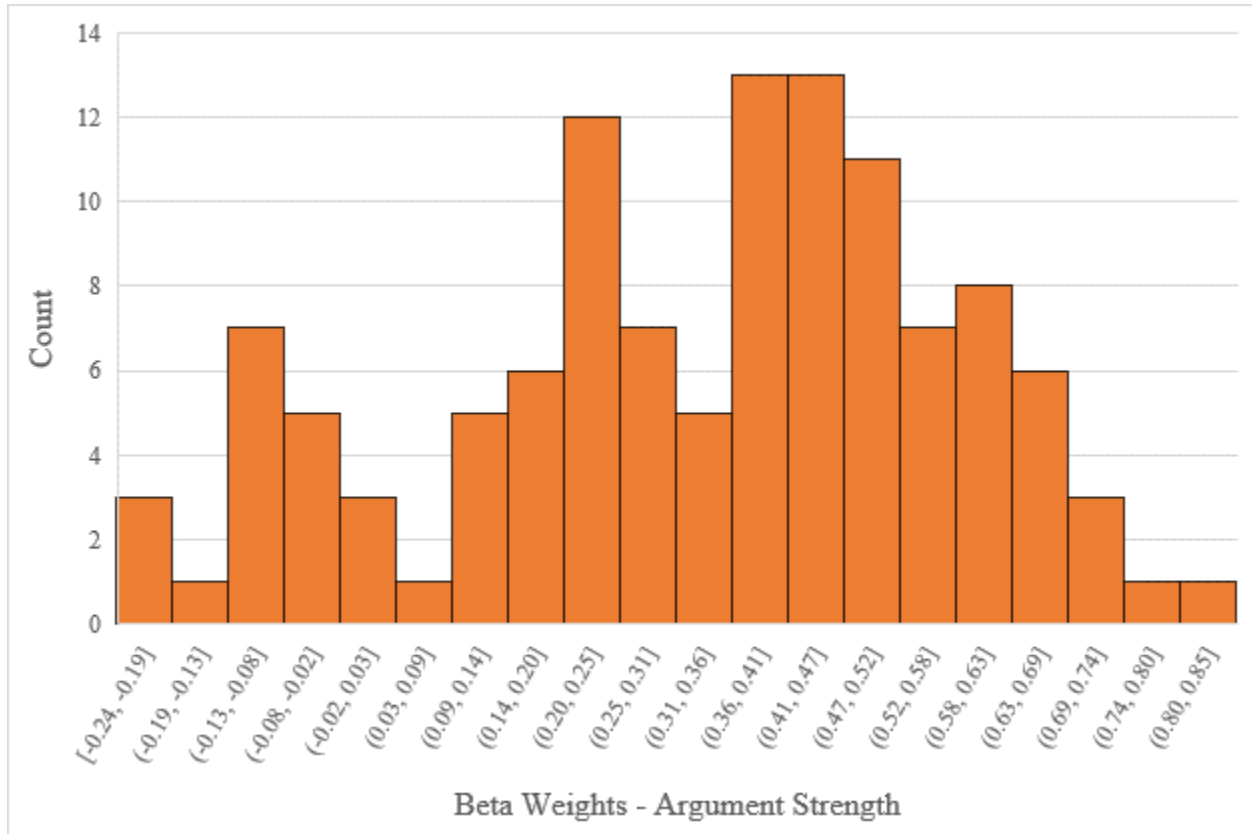
Note. Frequency distribution of the beta weights for predetermined argument strength in the multiple regressions conducted on each participant's responses.

Participant ratings of belief were also found to be significant predictors of participant ratings of argument strength. Mean standardized beta weights across the 119 regressions for belief ratings was .393 (*SD* = .264). Mean rating of belief was significantly different from zero ($t(118) = 16.259$, $p < .001$), and values ranged from -.37 to .95 (Figure 14).

Figure 14

Distribution of Beta Weights – Participant Ratings of Belief (Experiment 3).

Note. Frequency distribution of the beta weights for participant ratings of belief in the multiple regressions conducted on each participant's responses.

Contrary to results of Experiments 1 and 2, the mean of the centered interaction between belief and emotions was also found to be significantly different from zero ($M = .112$, $SD = .551$) ($t(118) = 2.214$, $p = .029$). However, following removal of two extreme outliers the interaction was not found to be significantly different from zero ($M = .057$, $SD = .345$) ($t(116) = 1.775$, $p = .079$). Beta values for the centered interaction between belief and emotions ratings ranged from -1.59 to 3.97 (Figure 15).

Figure 15

Distribution of Beta Weights – Centered Interaction of Participant Ratings of Belief and Emotion (Experiment 3).

Note. Frequency distribution of the beta weights for the centered interaction between participant ratings of belief and participant ratings of emotion in the multiple regressions conducted on each participant's responses.

Participant ratings of emotion, along with the centered interaction between participant ratings of belief and pre-determined argument strength and the centered interaction between participant ratings of emotion and pre-determined argument strength did not significantly differ from zero (Figures 16, 17, and 18, respectively (all $t(118) < .829$, all $p > .323$).

Figure 16

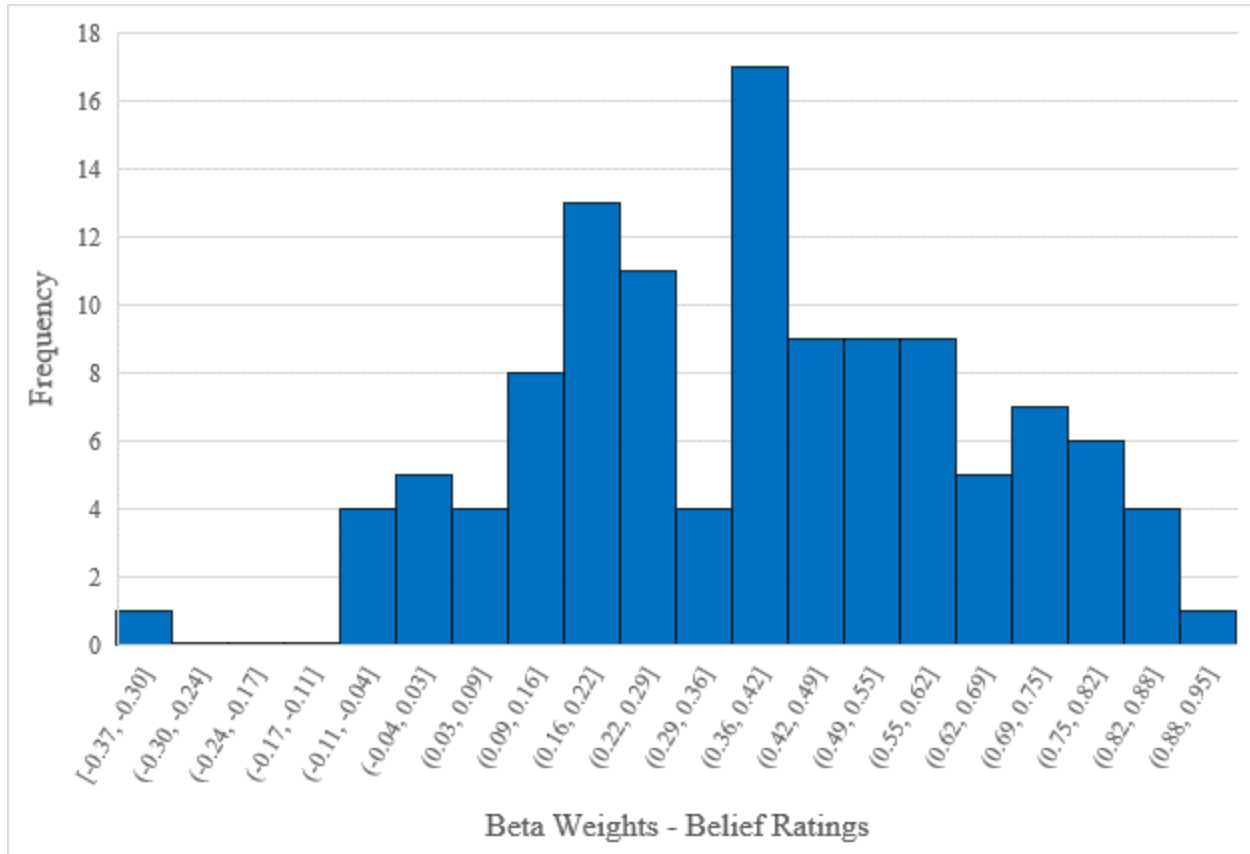*Distribution of Beta Weights – Participant Ratings of Emotion (Experiment 3).*
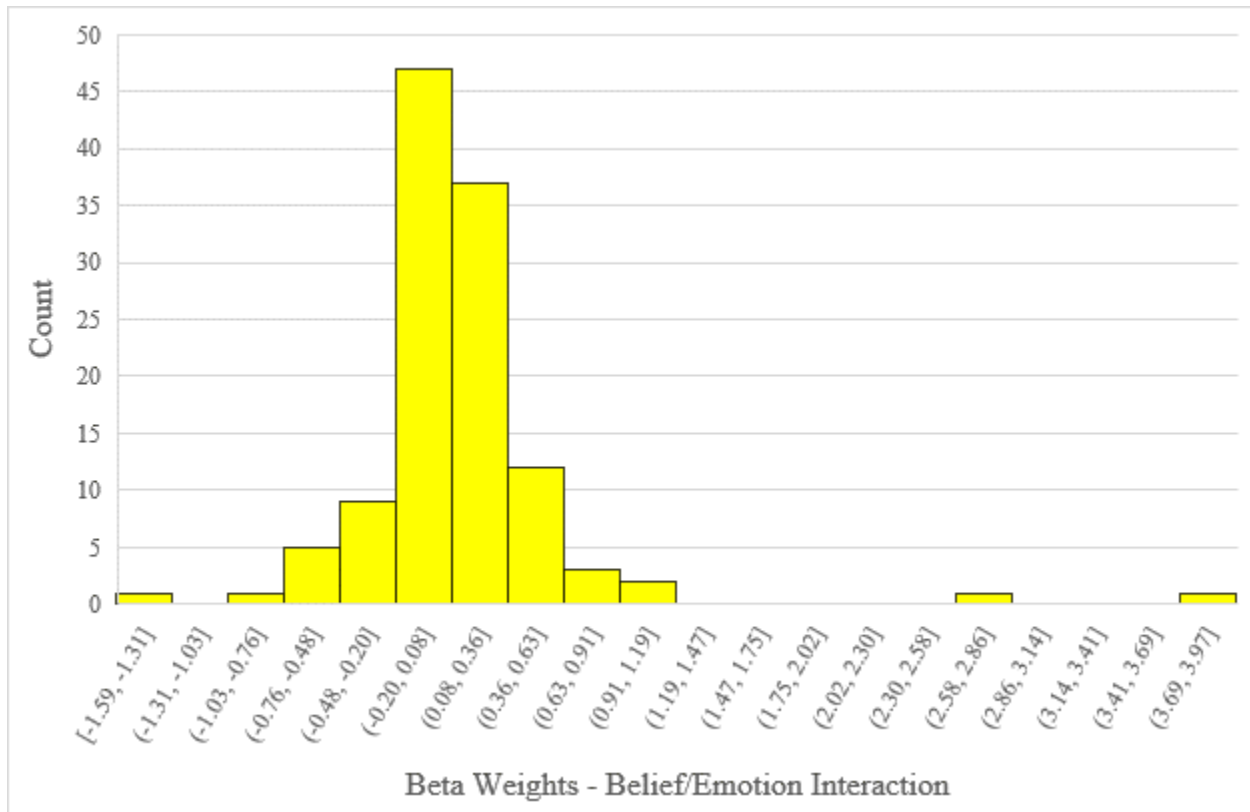

Note. Frequency distribution of the beta weights for participant ratings of belief in the multiple regressions conducted on each participant's responses.

Figure 17

Distribution of Beta Weights – Centered Interaction of Participant Ratings of Belief and Pre-

Determined Argument Strength (Experiment 3).
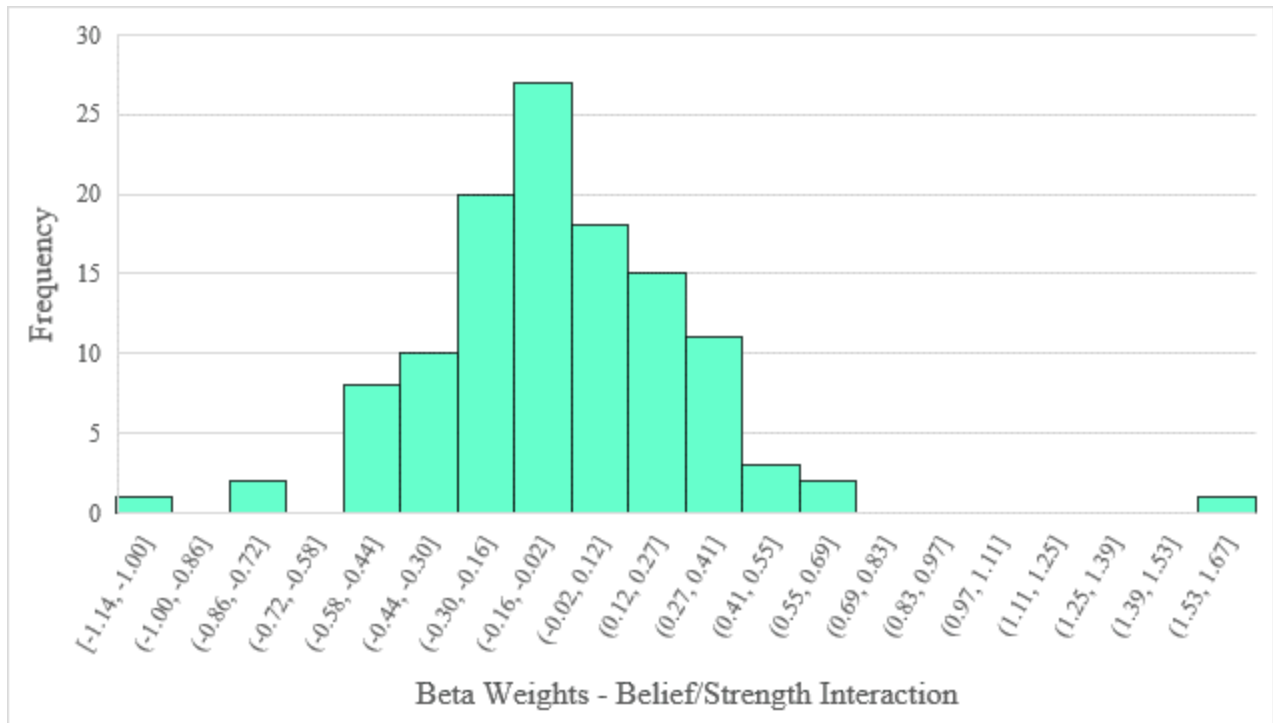
Note. Frequency distribution of the beta weights for the centered interaction between participant ratings of belief and pre-

determined argument strength in the multiple regressions conducted on each participant's responses.

Figure 18

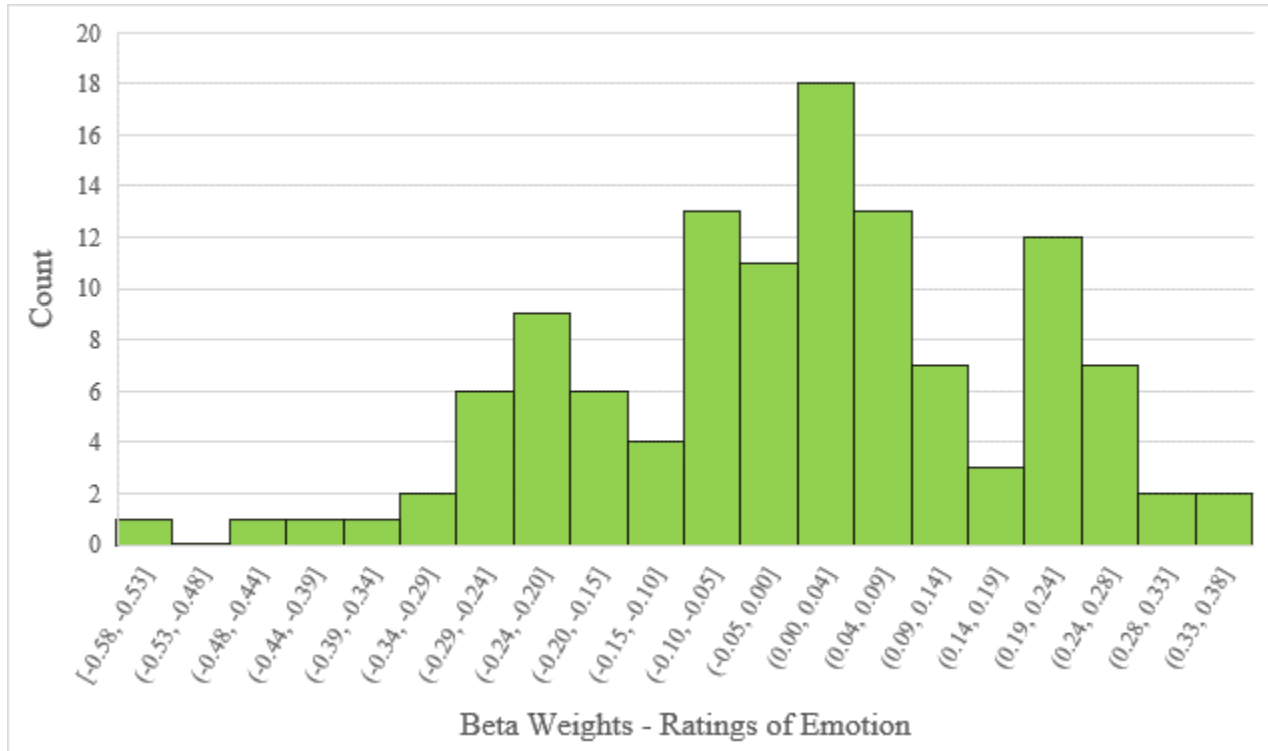*Distribution of Beta Weights – Centered Interaction of Participant Ratings of Emotion and Pre-Determined Argument Strength (Experiment 3).*
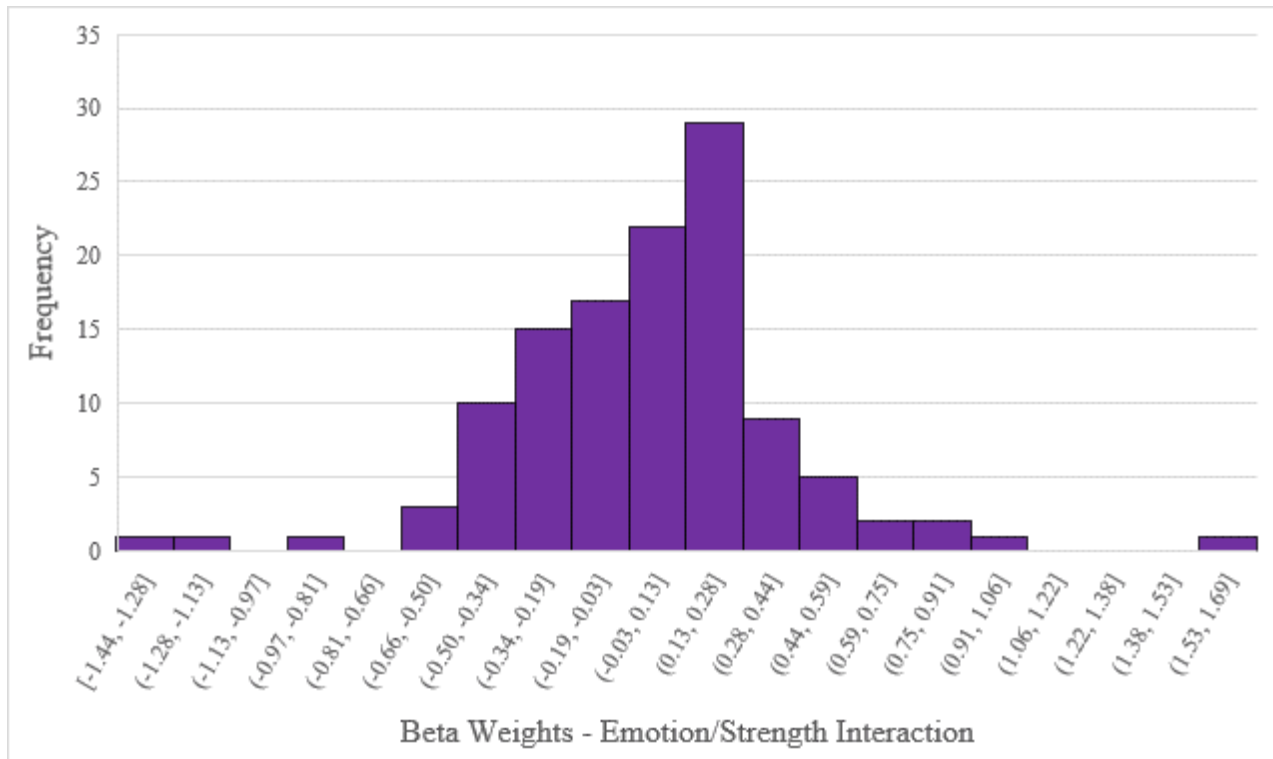
Note. Frequency distribution of the beta weights for the centered interaction between participant ratings of emotion and pre-determined argument strength in the multiple regressions conducted on each participant's responses.

5. Discussion

Belief bias theories and motivated reasoning theories have in the past remained separate fields of investigation with little cross-talk between the two literatures. Both areas of research seek to explain the influence of prior beliefs on future processing, and the extent to which said future processing is moderated by internal factors such as emotional content. The current investigation sought to compare and contrast belief bias and motivated reasoning theories

through the lens of dual process theories of reasoning. Using an adapted method of Corner and Hahn's (2009) presentation of arguments with differing levels of evidence strength, we attempted to test the impacts of evidence strength, conclusion believability, and emotional content on argument appraisal. Our results indicated that participants were able to discriminate between believable and unbelievable conclusions and strong and weak evidence. Additionally, we found that emotional content did not significantly impact participants' ability to appraise arguments.

Our predictions were informed by the default-interventionist model of dual process theories; deliberate Type 2 processing may or may not intervene on intuitive, default Type 1 processes (Evans & Stanovich, 2013). We posited that individuals would be sensitive to the believability of claims, the strength of the evidence in favour of the claims, and the emotional content of the claims. As such, we predicted that participants would rate the strength of the evidence presented in unbelievable problems as lower than believable problems, due to the influences of previous beliefs and the conflict between beliefs and conclusions. However, we also predicted that participants would continue to evaluate argument strength based on the evidence beyond the effects of belief and emotion. Our predictions ran contrary to the theory of identity-protective cognition and motivated reasoning as noted specifically by Kahan et al. (2017).

Participant beta weights for ratings of believability across all three experiments indicated that most participants rated believable problems as believable and unbelievable problems as unbelievable. In experiments 1 and 3, beta weights were at least as large, if not larger for argument strength compared to participant belief rating beta weights, indicating that participants were generally able to discriminate between instances of weak and strong evidence independent

of prior belief. The evidence that supports this assertion is the lack of a significant interaction between participant belief ratings and argument strength. Furthermore, beta weights for belief ratings were significant across all three experiments, indicating participants were able to discriminate between the believable and unbelievable conclusions. Our findings are consistent with those presented by Stanovich and West (1997) in their tests of argument evaluation. The researchers used the argument evaluation test, which involves participants indicating their degree of agreement with target statements. The researchers noted that individuals were able to evaluate the quality of evidence for an argument beyond the influence of one's feelings or biases for individuals with greater cognitive ability.

Our results do not necessarily support the identity-protective cognition theory of motivated reasoning posited by Kahan et al. (2017). Identity-protective cognition is typically engaged to selectively recruit and appraise information to ensure maintenance of a personal or group identity (Kahan et al., 2017). Based on the results of Experiments 1 and 3, participants were able to discriminate between strong and weak evidence without necessarily utilizing the information to maintain identity when they disagreed with the conclusions as would be predicted by identity-protective cognition (Kahan et al., 2017). If participants had been recruiting information to serve as a means to protect identity they would have display greater difficulty in discriminating between strong and weak evidence.2 Interestingly, Kahan (2013) notes that individuals with higher scores on the cognitive reflection test (CRT), a test that measures an individual's disposition to rely on heuristics (Frederick, 2005), exhibit greater Type 2 process engagement and therefore greater displays of identity-protective cognition. Future expansion upon the current findings should involve utilizing a division of high-CRT score individuals

versus low-CRT score individuals in order to determine if previous beliefs and highly emotional content interact to significantly affect either group.

Beta weights for participant ratings of belief were significantly different from zero, indicating support for belief bias effects. Some participants were influenced in their appraisal of evidence by the believability of the topic. However, no significant interaction between belief ratings and argument strength was observed, mirroring the findings of Thompson and Evans (2012). The researchers noted that participants were sensitive to evidence regardless of the believability of problem conclusions. Thompson and Evans (2012) utilized the law of large numbers task (Klaczynski & Robinson, 2000; Kahneman & Tvserky, 1972), which involves presenting participants with a hypothetical discussion and requiring them to evaluate the evidence presented within the hypothetical discussion. Similar to the stimuli utilized in the current investigation, conclusion believability and the amount of evidence are manipulated for law of large numbers tasks. The findings from the current investigation provide support for the conclusions presented by Thompson and Evans (2012), who noted that belief effects are not consistent across informal reasoning tasks. Belief effects are noted to be present (as was discussed with significant beta weights for participant ratings of believability), but they do not manifest as a general negative impact on the ability to evaluate argument evidence. In regards to the current investigation, it was determined that individuals did display some effect of belief in their appraisal of evidence, but it did not significantly impact their ability to correct discriminate between strong and weak evidence. However, it is important we acknowledge a potential caveat in regards to ratings of belief as well as ratings of emotion. Across all three experiments, participants viewed the conversation transcripts prior to giving their ratings of belief and emotion to each topic statement. As a result of this design, it is possible that carry-over effects of viewing

the conversations first impacted participant ratings of belief and emotion. Such carry-over effects may have resulted in topics not achieving the desired believable or, more likely, desired emotional valence that they otherwise would have had.

Furthermore, a significant negative impact on reasoning ability due to emotional content was not found across all three experiments. Participant ratings of emotion were not a significant predictor of participant ratings of argument strength with only a marginally significant interaction between belief and emotion ratings in Experiment 3 showing any indication that emotion was having any effect. However, after removing extreme outliers from the analysis, the interaction between argument strength and ratings of emotion was not found to be significant. The lack of significant emotion effects may be a result of a lack of plausible yet unbelievable statements to counter participant emotion. Statements that are patently false may be so unbelievable that any belief or emotion effects that could be associated with them are simply not present. Asking a participant to focus on evidence for a claim, such as texting and driving posing no danger, may simply allow said participant to ignore the wild claim and focus only on the evidence. Future work would therefore need to ensure that unbelievable claims remain unbelievable, but that there yet exists some aspect of plausibility and emotionality.

Another important caveat to recognize in the current work involving belief bias effects was the lack of a strictly imposed deadline for participant responses. While we did ask participants to respond with their first, initial answer, there was no strict time limit or timeout and we did not measure reaction times during the argument appraisal task and therefore no evidence that participants responded quickly. As a result, participants would have been able to engage thoughtful Type 2 processing that would have aided them in recognizing strong versus weak arguments (Lobato & Zimmerman, 2019). Mackie and Worth (1989) also note that when

regarding an emotional problem, participants are more likely to examine the problem longer and therefore less likely to respond based on heuristic cues, which may be an explanation for the lack of significant belief effects in our analysis. Belief bias effects would provide a fast, intuitive response to a problem, but the potential for Type 2 processes to intervene may have resulted in participants critically examining the unbelievable conclusions and therefore reducing belief bias effects above and beyond the effects of any emotional content (Thompson & Evans, 2012; Klaczynski & Robinson, 2000).

Previous work involving emotional content has involved using affective photos or emotional words in a syllogistic reasoning format (Blanchette & Richards, 2004) or modified the relevance of the reasoning material to be more relevant to participants (Blanchette et al., 2014). The stimuli generated for the current experiment was designed with integral affect (affective response generated by target materials) in mind, with the intention of expanding upon the claims presented by Blanchette and Richards (2004) involving decreased logical processing abilities in regards to emotional content. Blanchette and Richards (2004) used emotional words and states such as anxiety and happiness along with classically conditioned word pairings to evoke emotional responses from participants when they solved logical syllogisms. The researchers noted that affective material can negatively impact logical processing, and that participants are less likely to draw logically valid inferences when reasoning about emotional content. In an attempt to expand upon their findings, we attempted to use emotionally-charged topics that participants would have strong feelings about in order to evoke an emotional response. We purposely chose current hot-button topics for our emotional items, such as vaccine use and climate change, to generate a strong emotional response in participants. Furthermore, in Experiment 3 we went beyond using words and introduced images to coincide with the topics,

building upon work performed by Blanchette et al. (2014) whereby the researchers presented images along with conditional reasoning problems. The researchers noted that affective ratings were higher in problems that were paired with an image, and we attempted to replicate similar results in our Experiment 3 (e.g., pairing an image of a syringe with a problem regarding vaccine use).

All three of our experiments were designed to have a clear divide between emotional and neutral content, with the intent that emotional content would impact reasoning ability based on previous work involving emotional material (e.g., Blanchette & Richards, 2010; Blanchette et al., 2014). However, across all three experiments, the effect of emotion was only significant in the weak evidence condition of experiment 2. Items that were designated as emotional topics in the pre-test phase by a separate pre-test group of participants (topics such as vaccine use, climate change, gun control) did not evoke a consistent emotional rating across participants. When comparing Experiments 1 and 2 to Experiment 3, the addition of images generated only marginal differences in emotional ratings, with only the interaction between belief ratings and emotion ratings reaching significance. We note that our analysis approach to run a separate regression for each participant took into account individual variability in emotional responses; however there were not consistent ratings on emotional and neutral items across participants. While some participants rated emotional items and neutral items as such, many of our participants did not rate emotional items as emotional. Future research should involve either choosing topics that are significantly more emotionally-charged or introducing specific language to generate specific responses such as those used by Blanchette and Richards (2004).

The current findings indicate that determining a common middle-ground between motivated reasoning theories and belief bias theories and the effects of emotional content on both

is a significantly greater challenge than originally anticipated. The relation between belief biases and motivated reasoning is complex, with further complexity coming from the addition of emotional versus neutral content. Emotional content did not significantly impact the ability of participants to appraise evidence in the conversation-style problems. Participants were able to discriminate between strong and weak evidence along with believable and unbelievable conclusions. As such, there was not significant evidence that individuals attempted to reason toward specific conclusions or utilized identity-protective cognition. The conversation-style method of presenting evidence about an emotional or neutral topic did not accurately represent or contrast the intricacies of belief biases or motivated reasoning, and future reconciling work would need a more concrete measure of comparison. A potential starting future endeavor should involve focusing on individual differences in personally relevant content – ensuring content is relevant may lead to increased effects of emotion or a more concrete display of individuals exhibiting identity-protective cognition. More research is needed to accurately meld the fields of belief biases, motivated reasoning, and emotion.

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Appendix A

Conversation Transcripts

Vaccines

Believable, strong, emotional

> Amy: Vaccines should be mandatory for everyone who is physically able.

> Brittany: Why do you say that?

> Amy: There have been dozens of studies and decades of research showing that vaccines like those used to prevent measles are at least 90% effective. If everyone was required to get vaccinated, that number could be closer to 99%.

> Brittany: Where did you read that?

> Amy: I read it in a published article from the journal *Infectious Disease Research and Prevention.*

Believable, weak, emotional

> Amy: Vaccines should be mandatory for everyone who is physically able.

> Brittany: Why do you say that?

> Amy: There have been a few experiments and a couple years of research showing that vaccines like those used to prevent measles are effective. If everyone was required to get vaccinated, it would ensure continued effectiveness.

> Brittany: Where did you read that?

Amy: I read it in a science magazine from the newsstand.

Unbelievable, strong, emotional

Amy: Vaccines should not be mandatory for everyone who is physically able.

Brittany: Why do you say that?

Amy: There have been dozens of studies and decades of research showing that vaccines like those used to prevent measles are only 20% effective. If everyone was required to get vaccinated, disease rates would hardly be affected.

Brittany: Where did you read that?

Amy: I read it in a published article from the journal *Infectious Disease Research and Prevention.*

Unbelievable, weak, emotional

Amy: Vaccines should not be mandatory for everyone who is physically able.

Brittany: Why do you say that?

Amy: There have been a few experiments and a couple years of research showing that vaccines like those used to prevent measles are ineffective. If everyone was required to get vaccinated, disease rates would hardly be affected.

Brittany: Where did you read that?

Amy: I read it in a science magazine from the newsstand.

Green Vegetables

Believable, strong, neutral

> Jake: Green vegetables provide many health benefits.

> Eric: Why do you say that?

> Jake: There have been dozens of studies and decades of research showing that green vegetables like kale are full of vitamins and antioxidants. Eating more greens would help an individual's overall health.

> Eric: Where did you read that?

> Jake: I read it in a published article from the journal *Food and Health.*

Believable, weak, neutral

> Jake: Green vegetables provide many health benefits.

> Eric: Why do you say that?

> Jake: There have been a few studies and a couple years of research showing that green vegetables are healthy. People should eat more greens.

> Eric: Where did you read that?

> Jake: I read it in a health magazine from the newsstand.

Unbelievable, strong, neutral

> Jake: Green vegetables do not provide many health benefits.

> Eric: Why do you say that?

Jake: There have been dozens of studies and decades of research showing that green

vegetables like kale contain no more vitamins or antioxidants than other foods. Eating

more greens would not impact an individual's overall health.

Eric: Where did you read that?

Jake: I read it in a published article from the journal *Food and Health.*

Unbelievable, weak, neutral

Jake: Green vegetables do not provide many health benefits.

Eric: Why do you say that?

Jake: There have been a few studies and a couple years of research showing that green

vegetables are not that healthy. People should not eat more greens.

Eric: Where did you read that?

Jake: I read it in a health magazine from the newsstand.

Climate Change

Believable, strong, emotional

Rosa: Carbon dioxide emissions should be drastically reduced.

Patrick: How do you know that?

Rosa: A group of the world's top climate scientists examined the estimated carbon

dioxide emissions and temperature data from the past 100 years. They noted that the

increased level of atmospheric carbon dioxide typically associated with climate change is

one of the leading factors contributing to global temperature increases.

Patrick: Where did you find their results?

Rosa: They compiled and published their data in the journal *Climate Sciences*.

Believable, weak, emotional

Rosa: Carbon dioxide emissions should be drastically reduced.

Patrick: How do you know that?

Rosa: A group of the world's top climate scientists examined the estimated carbon dioxide emissions and temperature data from the past 5 years. They noted an increase in atmospheric carbon dioxide.

Patrick: Where did you find their results?

Rosa: I found the article in a pop science magazine.

Unbelievable, strong, emotional

Rosa: Carbon dioxide emissions should not be drastically reduced.

Patrick: How do you know that?

Rosa: A group of the world's top climate scientists examined the estimated carbon dioxide emissions and temperature data from the past 100 years. They noted that the increased level of atmospheric carbon dioxide typically associated with climate change is not a significant factor contributing to global temperature increases.

Patrick: Where did you find their results?

Rosa: They compiled and published their data in the journal *Climate Sciences.*

Unbelievable, weak, emotional

> Rosa: Carbon dioxide emissions should not be drastically reduced.

> Patrick: How do you know that?

> Rosa: A group of the world's top climate scientists examined the estimated carbon
> dioxide emissions and temperature data from the past 5 years. They noted no increase in
> atmospheric carbon dioxide.

> Patrick: Where did you find their results?

> Rosa: I found the article in a pop science magazine.

Sodium Content

Believable, strong, neutral

> John: High levels of sodium are present in many processed food items.

> Gary: How do you know that?

> John: A group of the world's top food scientists tested over 100 processed food items for
> their sodium levels. They noted that nearly all of the items had unhealthy levels of
> sodium content.

> Gary: Where did you find their results?

> John: They compiled and published their data in the journal *Food Sciences.*

Believable, weak, neutral

> John: High levels of sodium are present in many processed food items.

Gary: How do you know that?

John: A group of the world's top food scientists tested 5 processed food items for their sodium levels. They noted that nearly all of the items had unhealthy levels of sodium content.

Gary: Where did you find their results?

John: I found the article in a pop science magazine.

Unbelievable, strong, neutral

John: High levels of sodium are not present in many processed food items.

Gary: How do you know that?

John: A group of the world's top food scientists tested over 100 processed food items for their sodium levels. They noted that almost none of the items had unhealthy levels of sodium content.

Gary: Where did you find their results?

John: They compiled and published their data in the journal *Food Sciences.*

Unbelievable, weak, neutral

John: High levels of sodium are not present in many processed food items.

Gary: How do you know that?

John: A group of the world's top food scientists tested 5 processed food items for their sodium levels. They noted that almost none of the items had unhealthy levels of sodium content.

Gary: Where did you find their results?

John: I found the article in a pop science magazine.

Abortion

Believable, strong, emotional

Alex: Safe abortions should be accessible to everyone.

Taylor: What makes you say that?

Alex: Researchers from the International Organization for Health gathered information from around the world and found that there were 25 million unsafe abortions between 2010 and 2014. They noted that almost every death associated with unsafe abortions could be prevented if the women would have had access to safe abortions.

Taylor: Where did you find their results?

Alex: They published articles in multiple journals and compiled them on their website.

Believable, weak, emotional

Alex: Safe abortions should be accessible to everyone.

Taylor: What makes you say that?

Alex: Medical students from the University of Carthage gathered information from around the city and found that there were hundreds of unsafe abortions in the year 2014. They noted that almost every death associated with unsafe abortions could be prevented if the women would have had access to safe abortions.

Taylor: Where did you find their results?

Alex: They published an article in the *Carthaginian Student Journal*.

Unbelievable, strong, emotional

Alex: Safe abortions should not be accessible to everyone.

Taylor: What makes you say that?

A: Researchers from the International Organization for Health gathered information from around the world and found that there were millions of abortions that unnecessarily diverted resources away from critical care between 2010 and 2014. They noted that almost every instance could have been better used in treating individuals in critical conditions.

Taylor: Where did you find their results?

Alex: They published articles in multiple journals and compiled them on their website.

Unbelievable, weak, emotional

Alex: Safe abortions should not be accessible to everyone.

Taylor: What makes you say that?

Alex: Medical students from the University of Carthage gathered information from around the city and found that there were hundreds of abortions that unnecessarily diverted resources away from critical care in 2014. They noted that almost every instance could have been better used in treating individuals in critical conditions.

Taylor: Where did you find their results?

Alex: They published an article in the *Carthaginian Student Journal*.

Seat Belt Use

Believable, strong, neutral

> Joey: Wearing seat belts helps prevent serious injury.

> Monica: What makes you say that?

> Joey: Researchers from the International Organization for Health gathered information from around world and found that there 200 million vehicle injuries between 2010 and 2014. They noted that cases where seat belts were worn lowered the severity of injury relative to cases where they were not.

> Monica: Where did you find their results?

> Joey: They published articles in multiple journals and compiled them on their website.

Believable, weak, neutral

> Joey: Wearing seat belts helps prevent serious injury.

> Monica: What makes you say that?

> Joey: Statistics students from the University of Carthage gathered information from around the city and found that there were hundreds of vehicle injuries in 2014. They noted that about half were only minor injuries due to individuals wearing their seat belts before the accident.

> Monica: Where did you find their results?

> Joey: They published an article in the *Carthaginian Student Journal*.

Unbelievable, strong, neutral

Joey: Wearing seat belts do not help to prevent serious injury.

Monica: What makes you say that?

Joey: Researchers from the International Organization for Health gathered information from around world and found that there 200 million vehicle injuries between 2010 and 2014. They noted that seatbelts did not impact the severity of injuries sustained.

Monica: Where did you find their results?

Joey: They published articles in multiple journals and compiled them on their website.

Unbelievable, weak, neutral

Joey: Wearing seat belts do not help to prevent serious injury.

Monica: What makes you say that?

Joey: Statistics students from the University of Carthage gathered information from around the city and found that there were hundreds of vehicle injuries in 2014. They noted that seat belts did not impact the severity of injuries sustained.

Monica: Where did you find their results?

Joey: They published an article in the *Carthaginian Student Journal*.

Plastics

Believable, strong, emotional

Summer: Micro-plastics are a significant threat to marine and human life alike.

April: Why do you say that?

Summer: A group of expert researchers from Canada have collected samples of 30 different marine species and discovered plastic in the stomachs of most of those tested. They note the possibility that humans who consume afflicted species are at risk of ingesting the plastic as well.

April: What do they suggest?

Summer: It is a necessity that less plastic material ending up in the oceans, and for people to be cautious regarding consumption. It's all in their article in the journal *Conservation.*

Believable, weak, emotional

Summer: Micro-plastics are a significant threat to marine and human life alike.

April: Why do you say that?

Summer: A group of climate activists from Canada collected samples of 3 different marine species and discovered plastic in the stomachs of most of those tested. They note the possibility that humans who consume afflicted species are at risk of ingesting the plastic as well.

April: What do they suggest?

Summer: It is a necessity that less plastic material ending up in the oceans and more sustainable alternatives. It's all in their article on the website www.plasticawareness.com.

Unbelievable, strong, emotional

Summer: Micro-plastics are not a significant threat to marine life and humans.

April: Why do you say that?

Summer: A group of expert researchers from Canada have collected samples of 30 different marine species and did not discover plastic in the samples, contrary to previous claims. They note that humans are free to consume marine species without risk.

April: What do they suggest?

Summer: No changes to current conservation methods are required and people are free to eat as much seafood as they wish. It's all in their article in the journal *Conservation.*

Unbelievable, weak, emotional

Summer: Micro-plastics are not a significant threat to marine life and humans.

April: Why do you say that?

Summer: A group of climate activists from Canada collected samples of 3 different marine species and did not discover the plastic in the samples. They note that humans are free to consume marine species without risk.

April: What do they suggest?

Summer: No changes to current conservation methods are required and people are free to eat as much seafood as they wish. It's all in their article on the website www.plasticawareness.com.

Caffeine

Believable, strong, neutral

Philip: Caffeine consumption is high among young adults.

Jonathan: Why do you say that?

Philip: A group of expert researchers from Canada have examined 30 different beverages that are popular with young adults and found high levels of caffeine in most of those tested. They note the possibility of sleep disorders with high levels of consumption.

Jonathan: What do they suggest?

Philip: They propose that people limit their consumption of high caffeine drinks. It's all in their article in the journal *Managing Health*.

Believable, weak, neutral

Philip: Caffeine consumption is high among young adults.

Jonathan: Why do you say that?

A: A group of undergraduate students from Canada have examined 5 different beverages that are popular with young adults and found high levels of caffeine in most of those tested. They note the possibility of sleep disorders with high levels of consumption.

Jonathan: What do they suggest?

Philip: They propose that people limit their consumption of high caffeine drinks. It's all in their article on their website www.caffeineconscious.org.

Unbelievable, strong, neutral

Philip: Caffeine consumption is low among young adults.

Jonathan: Why do you say that?

Philip: A group of expert researchers from Canada have examined 30 different beverages that are popular with young adults and found minimal levels of caffeine in most of those tested. They note limited risk of sleep disorders with high levels of consumption.

Jonathan: What do they suggest?

Philip: Little change is required and people are free to drink their favourite beverage as much as they wish. It's all in their article in the journal *Managing Health.*

Unbelievable, weak, neutral

Philip: Caffeine consumption is low among young adults.

Jonathan: Why do you say that?

Philip: A group of undergraduate students from Canada have examined 5 different beverages that are popular with young adults and found minimal levels of caffeine in most of those tested. They note limited risk of sleep disorders with high levels of consumption.

Jonathan: What do they suggest?

Philip: Little change is required and people are free to drink their favourite beverage as much as they wish. It's all in their article on their website www.caffeineconscious.org.

Gun Control

Believable, strong, emotional

Sam: Stricter gun control laws lead to less gun violence.

Kate: How is that the case?

Sam: 18 European statistical researchers compiled data on gun violence in 50 countries over the past 15 years. They found that countries like Australia, where access to firearms is more heavily controlled, had significantly lower rates of gun violence than countries with less firearm restrictions.

Kate: Where could I read these findings?

Sam: They released an open report on their website at www.statseuro.eu.

Believable, weak, emotional

Sam: Stricter gun control laws lead to less gun violence.

Kate: How is that the case?

Sam: 8 European activists compiled online data on gun violence in 4 countries over the past 5 years. They found that countries like Australia, where access to firearms is more heavily controlled, had significantly lower rates of gun violence than countries with less firearm restrictions.

Kate: Where could I read these findings?

Sam: They released an open report on their website at www.noguns.eu.

Unbelievable, strong, emotional

Sam: Stricter gun control laws do not lead to less gun violence.

Kate: How is that the case?

Sam: 18 European statistical researchers compiled data on gun violence in 20 countries over the past 15 years. They found that countries like Australia, where access to firearms

is more heavily controlled, had no significant difference in rates of gun violence than

countries with greater firearm restrictions.

Kate: Where could I read these findings?

Sam: They released an open report on their website at www.statseuro.eu.

Unbelievable, weak, emotional

Sam: Stricter gun control laws do not lead to less gun violence.

Kate: How is that the case?

Sam: 8 European activists compiled online data on gun violence in 4 countries over the

past 5 years. They found that countries like Australia, where access to firearms is more

heavily controlled, had no significant difference in rates of gun violence than countries

with greater firearm restrictions.

Kate: Where could I read these findings?

Sam: They released an open report on their website at www.noguns.eu.

Socialized Medicine

Believable, strong, neutral

Luna: Socialized medicine leads to a better standard of care for everyone.

Lorenzo: How is that the case?

Luna: 18 European statistical researchers compiled data on standards of medical care in

20 countries over the past 15 years. They found that that countries like Sweden, where

healthcare is free and universal, had significantly lower rates of patient stress and

mortality than countries with private healthcare.

Lorenzo: Where could I read these findings?

Luna: They released an open report on their website at www.statseuro.eu.

Believable, weak, neutral

Luna: Socialized medicine leads to a better standard of care for everyone.

Lorenzo: How is that the case?

Luna: 8 European activists compiled online data on standards of medical care in 4

countries over the past 5 years. They found that countries like Sweden, where healthcare

is free and universal, had significantly lower rates of patient stress and mortality than

countries with private healthcare.

Lorenzo: Where could I read these findings?

Luna: They released an open report on their website at www.med-all.eu.

Unbelievable, strong, neutral

Luna: Socialized medicine does not lead to a better standard of care for everyone.

Lorenzo: How is that the case?

Luna: 18 European statistical researchers compiled data on standards of medical care in

20 countries over the past 15 years. They found that that countries like Sweden, where

healthcare is free and universal, did not have significantly lower rates of patient stress

and mortality than countries with private healthcare.

Lorenzo: Where could I read these findings?

Luna: They released an open report on their website at www.statseuro.eu.

Unbelievable, weak, neutral

Luna: Socialized medicine does not lead to a better standard of care for everyone.

Lorenzo: How is that the case?

Luna: 8 European activists compiled online data on standards of medical care in 4 countries over the past 5 years. They found that countries like Sweden, where healthcare is free and universal, did not have significantly lower rates of patient stress and mortality than countries with private healthcare.

Lorenzo: Where could I read these findings?

Luna: They released an open report on their website at www.med-all.eu.

Texting and Driving

Believable, strong, emotional

Lana: Texting while driving is dangerous.

Frank: How do you know?

Lana: American government researchers examined reported vehicle collisions across the country from the past 5 years. They reported that individuals who text and drive are 800% more likely to get into an accident.

Frank: Where was this reported?

Lana: It was published as a governmental report on www.autosafety.gov.

Believable, weak, emotional

Lana: Texting while driving is dangerous.

Frank: How do you know?

Lana: American government researchers examined reported vehicle collisions across the country from the past year. They reported that individuals who text and drive are more likely to get into an accident.

Frank: Where was this reported?

Lana: It was released as a report on www.autosafety.gov.

Unbelievable, strong, emotional

Lana: Texting while driving is not dangerous.

Frank: How do you know?

Lana: American government researchers examined reported vehicle collisions across the country from the past 5 years. They reported that individuals who text and drive are only 8% more likely to get into an accident.

Frank: Where was this reported?

Lana: It was published as a governmental report on www.autosafety.gov.

Unbelievable, weak, emotional

Lana: Texting while driving is not dangerous.

Frank: How do you know?

Lana: American government researchers examined reported vehicle collisions across the country from the past year. They reported that individuals who text and drive are only slightly more likely to get into an accident.

Frank: Where was this reported?

Lana: It was released as a report on www.autosafety.gov.

Tuition

Believable, strong, neutral

Cheryl: Tuition prices are at an all-time high.

Kenny: How do you know?

Cheryl: American government researchers examined tuition prices across the country from the past 5 years. They reported that tuition has increased by an average of 12% from 2015 to 2019.

Kenny: Where was this reported?

Cheryl: It was published as a governmental report on www.edu-info.gov.

Believable, weak, neutral

Cheryl: Tuition prices are at an all-time high.

Kenny: How do you know?

Cheryl: American government researchers examined tuition prices across the country in

the past year. They estimated that tuition has increased from 2015 to 2019.

Kenny: Where was this reported?

Cheryl: It was released as a report on www.edu-info.gov.

Unbelievable, strong, neutral

Cheryl: Tuition prices are at an all-time low.

Kenny: How do you know?

Cheryl: American government researchers examined tuition prices across the country

from the past 5 years. They reported that tuition has decreased by an average of 12%

from 2015 to 2019.

Kenny: Where was this reported?

Cheryl: It was published as a governmental report on www.edu-info.gov.

Unbelievable, weak, neutral

Cheryl: Tuition prices are at an all-time low.

Kenny: How do you know?

Cheryl: American government researchers examined tuition prices across the country in

the past year. They estimated that tuition has decreased from 2015 to 2019.

Kenny: Where was this reported?

Cheryl: It was released as a report on www.edu-info.gov.

Homeopathy

Believable/Strong/Emotional

Sienna: Homeopathy is an illegitimate form of medical treatment.

Tom: How do you know?

Sienna: Doctors from the *National Institute for Health Research* tested 200 different homeopathic remedies on minor illnesses to test their efficacy. None of the remedies worked any better than results obtained from a placebo and were less efficacious than standard medical treatments.

Tom: Where did you see all this?

Sienna: It was published in the medical journal *Health and Sciences*.

Believable/Weak/Emotional

Sienna: Homeopathy is an illegitimate form of medical treatment.

Tom: How do you know?

Sienna: Social bloggers tested 20 different homeopathic remedies for minor illnesses on themselves. None of the remedies seemed to make any difference in their conditions.

Tom: Where did you see all this?

Sienna: It was written on the blog *Health Now.*

Unbelievable/Strong/Emotional

Sienna: Homeopathy is a legitimate form of medical treatment.

Tom: How do you know?

Sienna: Doctors from the *National Institute for Health Research* tested 200 different homeopathic remedies on minor illnesses to test their efficacy. All of the remedies were found to be just as efficacious as standard medical treatments.

Tom: Where did you see all this?

Sienna: It was published in the medical journal *Health and Sciences*.

Unbelievable/Weak/Emotional

Sienna: Homeopathy is a legitimate form of medical treatment.

Tom: How do you know?

Sienna: Social bloggers tested 20 different homeopathic remedies for minor illnesses on themselves. All of the remedies seemed to improve their conditions.

Tom: Where did you see all this?

Sienna: It was written on the blog *Health Now*.

Exercise

Believable, strong, neutral

Danny: Regular exercise is a good way to maintain a healthy lifestyle.

Brian: How do you know?

Danny: Doctors from the *National Institute for Health Research* asked 200 participants about their exercise habits. They found that those who did at least 30 minutes of exercise

a day had significantly fewer physical health issues, compared to those who did not

exercise.

Brian: Where did you see this?

Danny: It was published in the medical journal *Health and Sciences.*

Believable, weak, neutral

Danny: Regular exercise is a good way to maintain a healthy lifestyle.

Brian: How do you know?

Danny: Social bloggers exercised over a period of 20 days for half an hour a day. They

found that they had lost weight and felt healthier overall.

Brian: Where did you see all this?

Danny: It was written on the blog *Health Now.*

Unbelievable, strong, neutral

Danny: Regular exercise is not a good way to maintain a healthy lifestyle.

Brian: How do you know?

Danny: Doctors from the *National Institute for Health Research* asked 200 participants

about their exercise habits. They found that those who did at least 30 minutes of exercise

a day had significantly poorer physical health, compared to those who did not exercise.

Brian: Where did you see this?

Danny: It was published in the medical journal *Health and Sciences.*

Unbelievable, weak, neutral

> Danny: Regular exercise is not a good way to maintain a healthy lifestyle.

> Brian: How do you know?

> Danny: Social bloggers exercised over a period of 20 days for half an hour a day. They found that they had not lost weight and did not feel healthier overall.

> Brian: Where did you see all this?

> Danny: It was written on the blog *Health Now.*

Mental Health

Believable, strong, emotional

> Andrew: Many university students suffer from mental health issues.

> Pamela: Where's your proof?

> Andrew: Clinical psychologists from *Hope University* ran a study looking at mental illness prevalence in a sample of 1000 university students and 1000 adults not currently enrolled in post-secondary education. Using self-report survey data, the researchers found that a significant proportion of the university students suffered from illnesses such as depression.

> Pamela: Where did they publish their findings?

> Andrew: They published an article in the journal *Mental Health.*

Believable, weak, emotional

Andrew: Many university students suffer from mental health issues.

Pamela: Where's your proof?

Andrew: Clinical psychologists from *Hope University* ran a study looking at mental illness prevalence in a sample of 10 university students currently enrolled in post-secondary education. Using self-report survey data, the researchers found that university students suffered from illnesses such as depression.

Pamela: Where did they publish their findings?

Andrew: They published an article in the periodical *University Health.*

Unbelievable, strong, emotional

Andrew: Few university students suffer from mental health issues.

Pamela: Where's your proof?

Andrew: Clinical psychologists from *Hope University* ran a study looking at mental illness prevalence in a sample of 1000 university students and 1000 adults not currently enrolled in post-secondary education. Using self-report survey data, the researchers found that a significant proportion of university students did not suffer from illnesses such as depression.

Pamela: Where did they publish their findings?

Andrew: They published an article in the journal *Mental Health.*

Unbelievable, weak, emotional

Andrew: Few university students suffer from mental health issues.

Pamela: Where's your proof?

Andrew: Clinical psychologists from *Hope University* ran a study looking at mental illness prevalence in a sample of 10 university students currently enrolled in post-secondary education. Using self-report survey data, the researchers found that few university students suffered from illnesses such as depression.

Pamela: Where did they publish their findings?

Andrew: They published an article in the periodical *University Health.*

Social Media

Believable, strong, neutral

Erica: Social media is the main source of news for many people.

Michael: Where's your proof?

Erica: Social psychologists from *Hope University* ran a study looking at news consumption in a sample of 1000 university students and 1000 adults not currently enrolled in post-secondary education. Using self-report survey data, the researchers found that a significant amount of participants used social media as their primary news source.

Michael: Where did they publish their findings?

Erica: They published an article in the journal *Social Insight.*

Believable, weak, neutral

Erica: Social media is the main source of news for many people.

Michael: Where's your proof?

Erica: Social psychologists from *Hope University* ran a study looking at news consumption in a sample of 25 university students. Using self-report survey data, the researchers found that participants used social media as their primary news source.

Michael: Where did they publish their findings?

Erica: They published an article in the periodical *University Insight.*

Unbelievable, strong, neutral

Erica: Social media is not the main source of news for many people.

Michael: Where's your proof?

Erica: Social psychologists from *Hope University* ran a study looking at news consumption in a sample of 1000 university students and 1000 adults not currently enrolled in post-secondary education. Using self-report survey data, the researchers found that a significant amount of participants did not use social media as their primary news source.

Michael: Where did they publish their findings?

Erica: They published an article in the journal *Social Insight.*

Unbelievable, weak, neutral

Erica: Social media is not the main source of news for many people.

Michael: Where's your proof?

Erica: Social psychologists from *Hope University* ran a study looking at news consumption in a sample of 25 university students. Using self-report survey data, the researchers found that few participants used social media as their primary news source.

Michael: Where did they publish their findings?

Erica: They published an article in the periodical *University Insight.*

Veganism

Believable, strong, emotional

Violet: Veganism is a more environmentally sustainable lifestyle than a diet that includes animal products.

Rachel: Based on what evidence?

Violet: Agricultural researchers from Besade University investigated 2000 farms across the country and compared their land and water usage to their agricultural output. They found that farms with livestock used significantly more land and water, making them much less environmentally friendly.

Rachel: Where was this written?

Violet: They published in the journal *Besade Science*.

Believable, weak, emotional

Violet: Veganism is a more environmentally sustainable lifestyle than a diet that includes animal products.

Rachel: Based on what evidence?

Violet: Agricultural researchers from the Besade Vegan Society investigated 5 farms across the country and compared their land and water usage to their agricultural output. They found that farms with livestock used more land and water, making them much less environmentally friendly.

Rachel: Where was this written?

Violet: They published in the journal *Besade Vegan Science.*

Unbelievable, strong, emotional

Violet: Veganism is not a more environmentally sustainable lifestyle than a diet that includes animal products.

Rachel: Based on what evidence?

Violet: Agricultural researchers from Besade University investigated 2000 farms across the country and compared their land and water usage to their agricultural output. They found that farms with livestock used significantly less land and water, making them much more environmentally friendly.

Rachel: Where was this written?

Violet: They published in the journal *Besade Science*.

Unbelievable, weak, emotional

Violet: Veganism is not a more environmentally sustainable lifestyle than a diet that includes animal products.

Rachel: Based on what evidence?

Violet: Agricultural researchers from the Besade Vegan Society investigated 5 farms across the country and compared their land and water usage to their agricultural output. They found that farms with livestock used less land and water, making them much more environmentally friendly.

Rachel: Where was this written?

Violet: They published in the journal *Besade Vegan Science.*

Video Streaming

Believable, strong, neutral

Derek: Viewing content on video streaming services is a very popular pastime.

Chris: Based on what evidence?

Derek: Researchers from Besade University surveyed 2000 people from across the country and asked them about how they spent their free time. They found that a significant majority of those surveyed preferred to spend more of their time streaming movies and television shows than watching traditional television.

Chris: Where was this written?

Derek: They published in the journal *Besade Science*.

Believable, weak, neutral

Derek: Viewing content on video streaming services is a very popular pastime.

Chris: Based on what evidence?

Derek: Researchers from Besade University surveyed 20 people from across the country and asked them about how they spent their free time. They found that many of those surveyed preferred to spend their free time streaming movies and television shows.

Chris: Where was this written?

Derek: They published in the journal *Besade Media*.

Unbelievable, strong, neutral

Derek: Viewing content on video streaming services is not a very popular pastime.

Chris: Based on what evidence?

Derek: Researchers from Besade University surveyed 2000 people from across the country and asked them about how they spent their free time. They found that a significant majority of those surveyed did not prefer to spend more of their time streaming movies and television shows than watching traditional television.

Chris: Where was this written?

Derek: They published in the journal *Besade Science*.

Unbelievable, weak, neutral

Derek: Viewing content on video streaming services is not a very popular pastime.

Chris: Based on what evidence?

Derek: Researchers from Besade University surveyed 20 people from across the country and asked them about how they spent their free time. They found that few of those surveyed preferred to spend their free time streaming movies and television shows.

Chris: Where was this written?

Derek: They published in the journal *Besade Media*.

Contraceptives

Believable, strong, emotional

Larissa: Easily accessible contraceptives leads to fewer accidental pregnancies and sexually transmitted infections.

Nicolas: What makes you come to that conclusion?

Larissa: The Social and Health Workers Association gathered data from 2500 health care centers from across the country. The data looked at rates of teenage pregnancies and prevalence of sexually transmitted infections in a broad sample from the general population, and they found that easily accessible contraceptives led to lower rates of unwanted pregnancies and STIs.

Nicolas: Where can I find this information?

Larissa: It's all in their article in *Health Quarterly*.

Believable, weak, emotional

Larissa: Easily accessible contraceptives leads to fewer accidental pregnancies and sexually transmitted infections.

Nicolas: What makes you come to that conclusion?

Larissa: The Social and Health Workers Association gathered data from 25 health care centers from across the country. After talking with staff, they found that easily accessible

contraceptives led to lower rates of unwanted pregnancies and sexually transmitted

diseases.

Nicolas: Where can I find this information?

Larissa: It's all in their article in *Health Quarterly*.

Unbelievable, strong, emotional

Larissa: Easily accessible contraceptives leads to more accidental pregnancies and

sexually transmitted infections.

Nicolas: What makes you come to that conclusion?

Larissa: The Social and Health Workers Association gathered data from 2500 health care

centers from across the country. The data looked at rates of teenage pregnancies and

prevalence of sexually transmitted diseases in a broad sample from the general

population, and they found that easily accessible contraceptives led to higher rates of

unwanted pregnancies and STIs.

Nicolas: Where can I find this information?

Larissa: It's all in their article in *Health Quarterly*.

Unbelievable, weak, emotional

Larissa: Easily accessible contraceptives leads to more accidental pregnancies and

sexually transmitted infections.

Nicolas: What makes you come to that conclusion?

Larissa: The Social and Health Workers Association gathered data from 25 health care centers from across the country. After talking with staff, they found that easily accessible contraceptives led to higher rates of unwanted pregnancies and STIs.

Nicolas: Where can I find this information?

Larissa: It's all in their article in *Health Quarterly*.

Cannabinoids

Believable/Strong/Neutral

Danielle: Cannabinoids are a safe pain relief alternative to opioids.

Tyler: What makes you come to that conclusion?

Danielle: The Social and Health Workers Association gathered data from 2500 health care centers from across the country. The data looked at methods of pain management, and they found that alternatives like cannabinoids were effective and less addictive than opioids.

Tyler: Where can I find this information?

Danielle: It's all in their article in *Pain Management*.

Believable/Weak/Neutral

Danielle: Cannabinoids are a safe pain relief alternative to opioids.

Tyler: What makes you come to that conclusion?

Danielle: The Social and Health Workers Association gathered data from 25 health care centers from across the country. Medical center staff reported lower levels of addiction to cannabinoids compared to opioids.

Tyler: Where can I find this information?

Danielle: It's all in their article in *Pain Management*.

Unbelievable/Strong/Neutral

Danielle: Cannabinoids are a more dangerous pain relief alternative to opioids.

Tyler: What makes you come to that conclusion?

Danielle: The Social and Health Workers Association gathered data from 2500 health care centers from across the country. The data looked at methods of pain management, and they found that alternatives like cannabinoids were effective but more addictive than opioids.

Tyler: Where can I find this information?

Danielle: It's all in their article in *Pain Management*.

Unbelievable/Weak/Neutral

Danielle: Cannabinoids are a more dangerous pain relief alternative to opioids.

Tyler: What makes you come to that conclusion?

Danielle: The Social and Health Workers Association gathered data from 25 health care centers from across the country. Medical center staff reported higher levels of addiction to cannabinoids compared to opioids.

Tyler: Where can I find this information?

Danielle: It's all in their article in *Pain Management*.

Taxes

Believable, strong, emotional

Luke: Taxing the wealthy is beneficial to the general public.

Veronica: What's the basis of your claim?

Luke: A large group of independent economists examined the annual earnings of the top 10% richest people across the country and how much they paid in taxes from the past 10 years. Their data showed that if the wealthy paid more taxes, there would be substantially more money for public projects like hospitals.

Veronica: Did they publish this information?

Luke: They released a publicly available report titled *Money Talks*.

Believable, weak, emotional

Luke: Taxing the wealthy is beneficial to the general public.

Veronica: What's the basis of your claim?

Luke: A large group of independent economists examined how much money in taxes was collected last year. They explained that if the wealthy paid more taxes, there would be more money for public use.

Veronica: Did they publish this information?

Luke: They wrote an article in the magazine *Money Talks.*

Unbelievable, strong, emotional

Luke: Taxing the wealthy is detrimental to the general public.

Veronica: What's the basis of your claim?

Luke: A large group of independent economists examined the annual earnings of the top 10% richest people across the country and how much they paid in taxes from the past 10 years. Their data showed that if the wealthy paid more taxes, there would be substantially less money for public projects like hospitals.

Veronica: Did they publish this information?

Luke: They released a publicly available report titled *Money Talks*.

Unbelievable, weak, emotional

Luke: Taxing the wealthy is detrimental to the general public.

Veronica: What's the basis of your claim?

Luke: A large group of independent economists examined how much money in taxes was collected last year. They explained that if the wealthy paid more taxes, there would be less money for public use.

Veronica: Did they publish this information?

Luke: They wrote an article in the magazine *Money Talks.*

Self-Driving Cars

Believable/Strong/Neutral

Paul: Self-driving cars will make the roads safer.

Lisa: How do you know?

Paul: American engineers examined vehicle collision data from the past 10 years and found that over 90% of collisions were due to human error. They argue that if driving decisions were left to a computer there would be significantly less accidents occurring.

Lisa: Did they publish this information?

Paul: They released a publicly available report titled *Car Talk.*

Believable/Weak/Neutral

Paul: Self-driving cars will make the roads safer.

Lisa: How do you know?

Paul: American engineers examined vehicle collision data from last year and found that a majority were due to human error. They explain that if driving decisions were left to a computer there would be significantly less accidents occurring.

Lisa: Did they publish this information?

Paul: They wrote an article in the magazine *Car Talk.*

Unbelievable/Strong/Neutral

Paul: Self-driving cars will make the roads more dangerous.

Lisa: How do you know?

Paul: American engineers examined vehicle collision data from the past 10 years and found that less than 10% of collisions were due to human error. They explain that if driving decisions were left to a computer there would be significantly more accidents occurring.

Lisa: Did they publish this information?

Paul: They released a publicly available report titled *Car Talk.*

Unbelievable/Weak/Neutral

Paul: Self-driving cars will make the roads more dangerous.

Lisa: How do you know?

Paul: American engineers examined vehicle collision data from last year and found that a minority were due to human error. They explain that if driving decisions were left to a computer there would be significantly more accidents occurring.

Lisa: Did they publish this information?

Paul: They wrote an article in the magazine *Car Talk.*

Violent Media

Believable, strong, emotional

Lulu: Consuming violent media does not make people violent.

Zoe: How can you be certain?

Lulu: An American researcher from a prestigious school performed a literature review of 100 studies that looked at the effects of violent media consumption. The researcher

concluded that, according to past research, consuming violent media does not specifically

lead people to be more violent.

Zoe: Where can I read this review?

Lulu: The review was published in the peer-reviewed journal *Investigating Violence*.

Believable, weak, emotional

Lulu: Consuming violent media does not make people violent.

Zoe: How can you be certain?

Lulu: An American researcher performed a literature review of 1 study that looked at the

effects of violent media consumption. The researcher concluded that consuming violent

media does not specifically lead people to be more violent.

Zoe: Where can I read this review?

Lulu: The review was published in the magazine *Investigating Violence*.

Unbelievable, strong, emotional

Lulu: Consuming violent media makes people violent.

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Zoe: Where can I read this review?

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Lulu: Consuming violent media makes people violent.

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Zoe: Where can I read this review?

Lulu: The review was published in the magazine *Investigating Violence*.

Smoking

Believable/Strong/Neutral

Jesse: Smoking cigarettes negatively impacts an individual's health.

Frankie: How can you be certain?

Jesse: An American researcher from a prestigious school performed a literature review of 100 studies that compared the health outcomes for smokers and non-smokers. The researcher concluded that, according to past research, consuming cigarettes can directly cause diseases like lung cancer.

Frankie: Where can I read this review?

Jesse: The review was published in the journal *Investigating Health*.

Believable/Weak/Emotional

Jesse: Smoking cigarettes negatively impacts an individual's health.

Frankie: How can you be certain?

Jesse: An American researcher performed a literature review of 1 study that looked at the effects of cigarette consumption. The researcher concluded that consuming cigarettes can directly cause diseases like lung cancer.

Frankie: Where can I read this review?

Jesse: The review was published in the magazine *Investigating Health*.

Unbelievable/Strong/Emotional

Jesse: Smoking cigarettes minimally impacts an individual's health.

Frankie: How can you be certain?

Jesse: An American researcher from a prestigious school performed a literature review of 100 studies that compared the health outcomes for smokers and non-smokers. The researcher concluded that, according to past research, consuming cigarettes does not lead to negative health outcomes.

Frankie: Where can I read this review?

Jesse: The review was published in the journal *Investigating Health*.

Unbelievable/Weak/Emotional

Jesse: Smoking cigarettes minimally impacts an individual's health.

Frankie: How can you be certain?

Jesse: An American researcher performed a literature review of 1 study that looked at the effects of cigarette consumption. The researcher concluded that consuming cigarettes does not lead to negative health outcomes.

Frankie: Where can I read this review?

Jesse: The review was published in the magazine *Investigating Health*.

Appendix B

Images used in Experiment 3

Vaccines

Figure B1. Retrieved from "Introducing the open affective standardized image set (OASIS)," by

Kurdi et al., 2017, *Behavior Research Methods, 49*(2), 457-470. 10.3758/s13428-016-0715-3.

CC BY-NC.

Green vegetables

Figure B2. Retrieved from flickr. (2020, May 25). *Vegan Photo*. [Image].

https://www.flickr.com/photos/141397992@N02/27360755456, CC BY-NC.

Climate change

Figure B3. Retrieved from "Introducing the open affective standardized image set (OASIS)," by

Kurdi et al., 2017, *Behavior Research Methods, 49*(2), 457-470. 10.3758/s13428-016-0715-3.

CC BY-NC.

Sodium content

Figure B4. Retrieved from flickr. (2020, May 25). *Spam*. [Image].

https://www.flickr.com/photos/jeepersmedia/14010924432. CC BY-NC.

Abortion

Figure B5. Retrieved from "Introducing the open affective standardized image set (OASIS)," by

Kurdi et al., 2017, *Behavior Research Methods, 49*(2), 457-470. 10.3758/s13428-016-0715-3.

CC BY-NC.

Seat-belt use

Figure B6. Retrieved from Wikimedia Commons. (2020, May 25). *Car seat belt 20160810*.

[Image]. https://commons.wikimedia.org/wiki/File:Car_seat_belt_20160810.jpg. In the public

domain.

Plastics

Figure B7. Retrieved from "Introducing the open affective standardized image set (OASIS)," by

Kurdi et al., 2017, *Behavior Research Methods, 49*(2), 457-470. 10.3758/s13428-016-0715-3.

CC BY-NC.

Caffeine

Figure B8. Retrieved from "Introducing the open affective standardized image set (OASIS)," by

Kurdi et al., 2017, *Behavior Research Methods, 49*(2), 457-470. 10.3758/s13428-016-0715-3.

Gun control

Figure B9. Retrieved from "Introducing the open affective standardized image set (OASIS)," by

Kurdi et al., 2017, *Behavior Research Methods, 49*(2), 457-470. 10.3758/s13428-016-0715-3.

Socialized medicine

Figure B10. Retrieved from "Introducing the open affective standardized image set (OASIS)," by

Kurdi et al., 2017, *Behavior Research Methods, 49*(2), 457-470. 10.3758/s13428-016-0715-3.

Texting and driving

Figure B11. Retrieved from "Introducing the open affective standardized image set (OASIS)," by Kurdi et al., 2017, *Behavior Research Methods, 49*(2), 457-470. 10.3758/s13428-016-0715-3.

Tuition

Figure B12. Retrieved from Wikimedia Commons. (2020, May 25). *Global Feminist Art class at University of Washington, 2015-04-2301* . [Image]. https://commons.wikimedia.org/wiki/File:Global_Feminist_Art_class_at_University_of_Washington,_2015-04-23_01.jpg. In the public domain.

Homeopathy

Figure B13. Retrieved from Pixy.org. (2020, May 25). *Globuli Homeopathy*. [Image].

https://pixy.org/5869983/. CC BY-NC.

Exercise

Figure B14. Retrieved from "Introducing the open affective standardized image set (OASIS)," by

Kurdi et al., 2017, *Behavior Research Methods, 49*(2), 457-470. 10.3758/s13428-016-0715-3.

Mental Health

Figure B15. Retrieved from "Introducing the open affective standardized image set (OASIS)," by

Kurdi et al., 2017, *Behavior Research Methods, 49*(2), 457-470. 10.3758/s13428-016-0715-3.

Social media

Figure B16. Retrieved from flickr. (2020, May 25). *Social Media Icons With Paint Splash Effect*.

[Image]. https://www.flickr.com/photos/bitsfrombytes/43617178595. CC BY-NC.

Veganism

Figure B17. Retrieved from pixabay. (2020, May 25). *[Untitled]*. [Image].

https://pixabay.com/nl/photos/rundvlees-koe-slachthuis-verwerking-1884301/. CC BY-NC.

Video streaming

Figure B18. Retrieved from flickr. (2020, May 25). *Apple Video Streaming*. [Image].

https://www.flickr.com/photos/cerillion/46494351855. CC BY-NC.

Contraceptives

Figure B19. Retrieved from flickr. (2020, May 25). *800px-Pilule_contraceptive*. [Image].

https://www.flickr.com/photos/paille-fr/7159892518. CC BY-NC.

Cannabinoids

Figure B20. Retrieved from Pxfuel. (2020, May 25). *[Untitled]*. [Image].

https://www.pxfuel.com/en/free-photo-xvmou. CC BY-NC.

Taxes

Figure B21. Retrieved from "Introducing the open affective standardized image set (OASIS)," by

Kurdi et al., 2017, *Behavior Research Methods, 49*(2), 457-470. 10.3758/s13428-016-0715-3.

Self-driving cars

Figure B22. Retrieved from "Introducing the open affective standardized image set (OASIS)," by Kurdi et al., 2017, *Behavior Research Methods, 49*(2), 457-470. 10.3758/s13428-016-0715-3.

Violent media

Figure B23. Retrieved from "Introducing the open affective standardized image set (OASIS)," by Kurdi et al., 2017, *Behavior Research Methods, 49*(2), 457-470. 10.3758/s13428-016-0715-3.

Smoking

Figure B24. Retrieved from "Introducing the open affective standardized image set (OASIS)," by

Kurdi et al., 2017, *Behavior Research Methods, 49*(2), 457-470. 10.3758/s13428-016-0715-3.