

Evidence of Biased Processing of Natural Resource-Related Information: A Study of Attitudes Toward Drilling for Oil in the Arctic National Wildlife Refuge

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The purpose of this study was to determine the extent to which individuals process natural resource-related information in a biased manner. Data were gathered using surveys administered to students enrolled in undergraduate classes at Colorado State University. Students' attitudes toward Arctic drilling were evaluated both before and after they were exposed to exaggerated information about both sides of the issue. Consistent with initial expectations, respondents' attitudes did not change as a result of exposure to new information. Respondents defended their initial attitudes in rating the quality of the information. Those who expressed initial support for drilling evaluated pro-drilling arguments more favorably and discounted anti-drilling arguments, while those in opposition to drilling tended to favor the anti-drilling arguments in their evaluations. Evidence of biased processing suggests that the provision of factual information may not be enough if the goal of education programs is to change attitudes toward controversial natural resource issues.

Keywords arctic national wildlife refuge, attitudes, biased processing, education, information, natural resource issues, oil drilling

Natural resource agencies face many challenges in developing effective education campaigns. A key question becomes, is the provision of factual information about a natural resource issue enough to produce desired attitude change? For example, if an individual obtains and reads information from a local wildlife agency on the benefits of cougar hunting, can we expect that this person would, as a result, agree with the need for cougar hunting? Typically, no—by simply exposing someone to new information, we can't be convinced that this will change his or her attitudes. Various factors confound our ability to persuade someone with informational messages (Wood 2000). For instance, the extent of attitude change may depend upon the channel of communication, the source of the message, the strength of the arguments

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presented, the subject's prior knowledge, and the strength and function of his or her existing attitude(s) (Eagly and Chaiken 1993; Petty and Cacioppo 1996; Wood 2000).

The broad focus of this study involves an application of social psychological theory to a natural resource issue to better understand the effects of existing attitudes on information processing and subsequent attitudes. More specifically, we examined biased processing, a phenomenon that typically results in little or no attitude change after exposure to new information. Biased processing can be defined as biased/nonobjective critical evaluation of information, or "defensive processing" (Wood, Rhodes, and Biek 1995). It is the processing of incoming information in such a way that it confirms and protects existing beliefs and attitudes. In other words, we maintain consistency with our preconceived notions by accepting information that is consistent with our attitudes and beliefs, and discounting evidence that contradicts them. One of the main explanations for why we process information in a biased manner is that it is easier for us not to have to question our own beliefs every time we are exposed to new information (Gilovich 1991). Cognitive dissonance can occur when confronted with a plausible argument that is inconsistent with prior beliefs because it raises the possibility that the "other side" may be right (Aronson 1999). To maintain consistency and thereby avoid this dissonance, we are quick to find fault with and to reject information that goes against what we already believe.

In a classic study on biased processing (Lord, Ross, and Lepper 1979), students at Stanford University were exposed to information from two studies, one providing evidence in support of capital punishment and the other providing evidence against it. The subjects, who included both opponents and proponents of the death penalty, were then asked to evaluate the quality of the information they read. Each group evaluated the study consistent with their position more highly than the study that contradicted their initial beliefs. More specifically, they found the study consistent with their prior attitudes to be a well-conducted piece of research, while they found numerous flaws in the study contradicting their prior judgments. Thus, both sides were able to bolster and protect their positions with the same set of data.

In another study on biased processing, Mahoney (1977) showed that social scientists' reviews of manuscripts for potential publication were heavily based on the degree to which the manuscripts agreed or disagreed with the reviewers' own theoretical orientations. In yet another study, Vallone, Ross, and Lepper (1985) asked members of pro-Arab and pro-Israeli student organizations to rate the fairness of televised news releases of conflict in Lebanon. Each group expressed that the reports were biased in favor of the other side and that the report contradicting their viewpoint was lacking in objectivity. In addition, this so-called "hostile media bias effect" was most prevalent among highly knowledgeable and highly emotionally involved participants.

Biek, Wood, and Chaiken (1996) demonstrated a similar effect when exposing subjects to information on the likelihood of contracting AIDS from sexual behavior. They found that study participants with high knowledge and considerable affect relative to the risk of contracting AIDS were motivated to defend their positions and therefore process AIDS risk estimates in a manner consistent with those positions.

A number of specific factors are thought to motivate biased processing. These include recipients' broader values (Eagly and Kulesa 1997; Maio and Olson 1998; Seligman, Olson, and Zanna 1996) and self-interests (Giner-Sorolla and Chaiken 1997), and attitude issues that are highly important and involving (Zuwerink and Devine 1996). High issue-relevant knowledge (i.e., referring to the amount of

knowledge in the form of beliefs about the issue; Giner-Sorolla and Chaiken 1994; Petty and Cacioppo 1986; Vallone et al. 1985), attitude accessibility (i.e., the extent to which attitudes are activated automatically from memory upon mere exposure to the issue; Houston and Fazio 1989), and affect (Biek et al. 1996) are also thought to influence biased reactions to new information. More generally, those with strong attitudes (i.e., attitudes that are well formed, resistant to change, and that guide behavior; Krosnick and Petty 1995) about an issue are more likely than those with weak attitudes to demonstrate attitude-defensive bias when presented with issue-relevant messages (Na 1999). Individuals with strong attitudes about a particular issue are likely to receive information about the issue in a biased manner (i.e., they only see or hear what they want to believe, a concept known as “biased reception”; Wood et al. 1995) and to further process incoming information defensively. The end result is minimal attitude change with exposure to information. Correlates, or attributes, of strong attitudes that we’ve already mentioned as factors influencing biased processing include affect, involvement, prior knowledge, and attitude accessibility (Krosnick et al. 1993; Krosnick and Petty 1995; Na 1999).

Study Purpose

The purpose of this study was to determine the extent to which biased processing occurs with exposure to natural resource-related information. We hypothesized that if exposed to information on both sides of a contentious issue, subjects would rate the information that is consistent with their existing attitudes more favorably than the information that goes against what they already believe. Furthermore, those possessing higher levels of issue-relevant knowledge and involvement should be more likely than their less knowledgeable or involved counterparts to process the information in a biased manner. Here are the hypotheses we tested:

- H1: The direction of subjects’ attitudes will not change as a result of exposure to new information on both sides of an issue.
- H2: Subjects’ evaluations of attitude-consistent information will be more favorable than their evaluations of inconsistent information.
- H3: Subjects with higher levels of issue-relevant knowledge will be more likely than those with less knowledge about the issue to evaluate attitude-consistent information more favorably than attitude-inconsistent information.
- H4: Subjects with higher levels of issue-relevant involvement will be more likely than those with less involvement to evaluate attitude-consistent information more favorably than attitude-inconsistent information.

Issue Description

The issue chosen for investigation was commercial drilling for oil in the Arctic National Wildlife Refuge (ANWR), an issue that has recently been under considerable debate in the United States. The ANWR, one of 539 refuges nationwide within the National Wildlife Refuge System administered by the U.S. Fish and Wildlife Service, is located in northeastern Alaska. Covering 8.9 million acres, the ANWR was established in 1960 to preserve unique wildlife, wilderness, and recreation values (Douglas, Reynolds, and Rhode 2002). The refuge is home to a diversity of wildlife species, including 130,000 caribou that form what is known as the Porcupine herd (Foster 2001).

Those in support of drilling argue that it may reduce our need to rely on foreign sources of oil and that it could help the economy of Alaska. Those opposed feel that the ANWR represents one of the last remaining “untouched” wilderness areas and that drilling could have devastating environmental impacts (Foster 2001). The reason for choosing this topic is that its controversial nature is likely to evoke an emotional response and to result in a diversity of opinions, diversity that is necessary for this type of experiment. Additionally, drilling for oil in the ANWR is a relatively broad natural resource-related issue, one that is currently salient to many in the United States.

Methods

Data Collection

Data were collected via self-report questionnaires administered to undergraduate students enrolled in classes at Colorado State University. Data collection occurred during fall semester, August–September 2001. We obtained an overall sample size of 360, distributed among classes in natural resource management, recreation and tourism, and social psychology.¹ Classes were selected on the basis of attempts to include both natural resource students and students enrolled in other disciplines, as well as instructor approval for use of class time. Subjects in each class were told that their input would be used to help understand how people feel about an important issue facing this country and to assist natural resource managers with important and difficult management decisions.

Survey Development and Administration

Our survey instrument and associated procedures are an adaptation of an approach used by Biek, Wood, and Chaiken (1996), who found evidence of biased processing in the context of perceived risk for contracting AIDS. Consistent with their approach, our survey consisted of two parts. We administered Part Two of the survey 2 to 3 weeks after Part One to the same subjects. Both parts requested the last four digits of subjects' phone numbers and the month and day of their dates of birth to allow us to match responses between the two administrations.

Part One of the survey consisted of questions designed to assess attitudes toward the issue of drilling in the ANWR and issue-relevant knowledge and involvement. Part Two consisted of two versions: (1) a treatment-group version and (2) a control-group version. The majority of participants ($n = 288$) belonged to the treatment group, which received information about drilling and was then asked to evaluate that information. In addition, attitudes toward drilling were measured again after exposure to the information. Subjects in the control group ($n = 72$) did not receive the information but were asked to indicate their attitudes toward drilling at Time Two. Subjects were assigned to treatment or control groups on the basis of the classes they were enrolled in. Two out of the four classes that participated in the study received the treatment and the other two served as the control.²

Treatment

Treatment information consisted of two documents, one containing pro-drilling arguments, and the other containing anti-drilling arguments. The order of document

presentation was randomized across subjects. Approximately half of all subjects (e.g., every n th person in class) received pro-drilling information first and the other half received anti-drilling information first. Documents were presented as if they contained factual information that was spoken to Congress (Figure 1). They were modeled after actual congressional documents appearing in the U.S. Library of Congress. We listed the names of fictitious congressional presenters on the cover of the documents. Subjects were led to believe that these sources were credible representatives for the two sides of the oil drilling issue: "Barry Knalding" was speaking before Congress on February 3, 2001, on behalf of the Oil Development Union, while "Andrea Gibson" presented on this day as a representative of Defenders of Wildlife. To compile document content, we obtained facts about drilling in the ANWR from relevant web sites and newspaper/magazine articles and then greatly exaggerated them. As an example, reported statistics regarding the amount of oil that could potentially be extracted and the time frame in which it would be available to support American energy supplies were vastly exaggerated in either direction for inclusion in each of the readings (e.g., "over a million-and-a-half barrels per day for at least a year's time" for the pro-drilling information vs. "American people will not see a drop of oil for at least 25 years

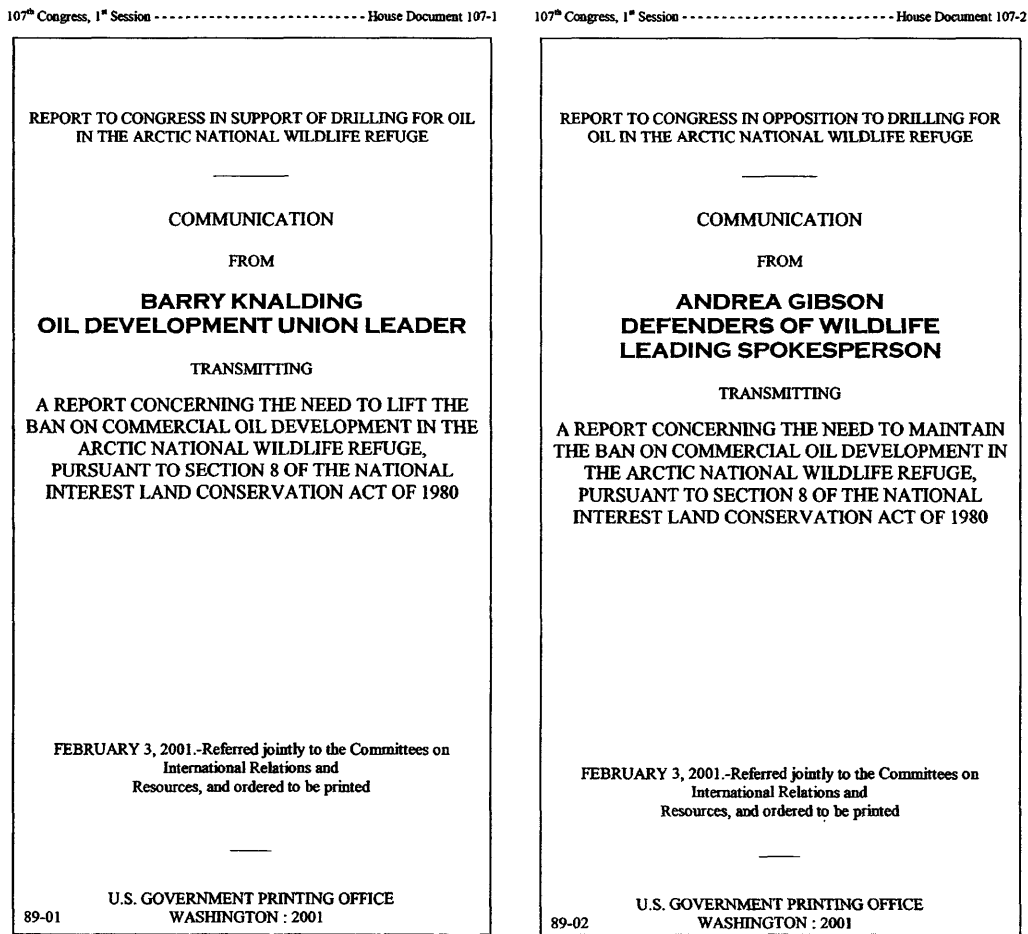


Figure 1. Document cover pages for treatment information.

after operations begin . . . only a 20 percent chance of finding a 9-month supply of oil for this country” for the anti-drilling information).

Due to the deception associated with the treatment, it was necessary to provide a debriefing after the completion of Part Two, telling subjects that the information they read was not factual and that the congressional presenters were fictitious characters. The goal of this deception from an experimental sense was to provide a context in which subjects would be unlikely to question the quality of the information (i.e., information was presented to Congress by “expert” sources; see Lord et al. 1979) as well as to ensure that the documents were providing “new” information to their readers (i.e., if the information was embellished solely for the purpose of this study, participants would not have had the chance to see it before).

Construct Measurement

Attitudes

Attitudes toward the issue of drilling for oil in the ANWR were measured using four survey items. Respondents were asked to indicate their overall level of approval of drilling, how “wise or foolish” they think it is, how “beneficial or harmful” they think it is, and their perceptions of how “good or bad” it is. All items used a 7-point response scale, with 1 = a negative evaluation, and 7 = a positive evaluation. Reliability analysis was used to assess the internal consistency of the four items. A Cronbach’s alpha coefficient of .95 for attitudes at Time One indicated good reliability (Nunnally and Bernstein 1994), justifying the creation of an index to represent attitudes toward the issue. The attitude measure was created as a mean composite of responses to each of the four items. This same 4-item index was used to represent attitudes toward the issue at Time Two (i.e., in Part Two of the survey instrument; Cronbach’s alpha coefficient = .96).

Involvement

Involvement with the issue was assessed by having respondents indicate how “personally important” the topic of drilling for oil in the ANWR is to them. The response scale ranged from 1, not at all important, to 7, extremely important. A median split was performed on this variable to allow for comparisons between subjects at high and low levels of involvement.

Knowledge

Two types of knowledge were assessed: “self-perception of knowledge” and “working knowledge” (Wood 1982). Self-perception of knowledge is a self-reported measure of how well informed people feel on a particular issue, while working knowledge “represents the attitude-relevant beliefs and prior experiences people can readily bring to mind when confronted with an attitude issue” (Biek et al. 1996, 548). As an example, an individual’s working knowledge regarding drilling for oil in the ANWR might consist of his or her beliefs about outcomes of drilling, including potential impacts on the environment, as well as specific behaviors that he or she has been involved in related to the issue (e.g., signing a petition). Similar to an approach used by Wood (1982), two items were used to measure self-perception of knowledge. First, respondents were asked to indicate how well informed they were about the topic of drilling on a 7-point response scale (1 = not at all informed, 7 = extremely informed). They were then asked to tell us how frequently in the past

year they had engaged in specific information-gathering behaviors related to drilling. These included talking with others about drilling, reading articles and books on drilling, taking courses and attending meetings about drilling, and watching television programs on drilling. Scores on participation in specific behaviors were averaged to provide an overall mean score for issue-related behaviors. We found respondents' ratings of how well informed they were to be highly correlated with this mean composite ($r = .81, p < .001$), allowing the creation of a single index (i.e., an average of the two measures) to represent subjects' self-perception of knowledge. A median split on this new variable would allow for a comparison of information processing at both high and low levels of knowledge.

As with self-perception of knowledge, working knowledge was based on two items borrowed from an approach used by Wood (1982) that was later repeated in the study by Biek, Wood, and Chaiken (1996). Subjects were asked to list everything they knew or believed to be true about the issue and then to list specific instances of times when they had engaged in actions related to the issue of drilling. In both cases, six boxes were provided, and subjects were asked to enter only one belief or behavior in each box. They were given the option to leave boxes blank. For each variable, the number of entries was tallied to provide both a belief and a behavior score. After finding a significant although moderate correlation ($r = .48, p < .001$) between these measures, we created a summative composite to provide an overall belief-behavior index to represent working knowledge. Subjects were classified as either high or low in working knowledge by a median split on this composite measure.³

Evaluation of Information

Following the approach used by Biek, Wood, and Chaiken (1996), participants in the treatment group were exposed to information and then asked to evaluate that information. After reading each of the two documents that contained information either for or against drilling for oil in the ANWR, subjects were asked to list the thoughts they had about the information. Specifically, subjects were provided with a series of six boxes following each reading and were asked to write only one thought in each box (allowing for approximately one line of written text); if they had less than six thoughts to list, subjects were asked to leave the remaining boxes blank. After the thought listing, subjects were asked to evaluate the information in each reading by indicating the following on a 1–7 scale: their level of agreement with the information (“strongly disagree” to “strongly agree”), the quality of the arguments (“not at all factual” to “extremely factual”), and the strength of the arguments that were provided in the document (“very weak” to “very strong”).

Data Analysis

Our data analysis procedures followed those used by Biek, Wood, and Chaiken (1996). To test for attitude change after exposure to the treatment, we conducted an ordinary least-squares multiple regression examining whether attitudes at Time One were a significant predictor of attitudes at Time Two. We then tested for evidence of biased processing through examination of the correlations between attitudes at Time One and each of the measures designed to assess respondent evaluation of the readings (i.e., level of agreement with the readings, ratings of the quality of the arguments in the readings, and ratings of the strength of the arguments

presented in the readings). Correlations were also identified across both high and low levels of involvement and knowledge.

To further determine evidence of biased processing, we conducted a content analysis of the thoughts that subjects listed about the readings. Similar to the approach used by Biek, Wood, and Chaiken (1996), thoughts were coded as positive, negative, neutral, or irrelevant. Inter-coder reliability, or agreement, between the two coders who performed this analysis ranged from 74 to 90%.

Results

Attitudes Toward Drilling for Oil in the ANWR

Overall attitudes toward drilling for oil in the ANWR were negative (Table 1). Over 80% of respondents at both Time One and Time Two expressed disapproval. This trend was consistent across treatment and control groups. In addition, we did not find a statistically significant difference in attitudes across undergraduate courses participating in the study ($F = 1.03$, 3 df, $p = .34$). An ordinary least-squares multiple regression revealed that initial attitudes significantly predicted attitudes measured after exposure to information about drilling ($R^2 = .65$, $\beta = .81$, $p < .001$), providing evidence of a lack of attitude change from the treatment. In addition, whether or not subjects belonged to the treatment or control group had no significant effect on attitudes at Time Two ($\Delta R^2 = .001$, $p = .432$).

Evidence of Biased Processing

To test for biased processing, we correlated initial attitudes toward drilling (i.e., attitudes before exposure to information) with each of the variables designed to measure subjects' evaluation of the readings. Evidence of "biased agreement" (Biek et al. 1996) was found in the identification of a significant relationship between

Table 1. Attitudes toward drilling for oil in the Arctic National Wildlife Refuge (ANWR), displayed across time and treatment and control groups

Group ^a	Percent expressing approval of drilling (+)	Percent expressing disapproval of drilling (–)
Overall		
Before	15	81
After	12	85
Treatment		
Before	17	79
After	13	85
Control		
Before	10	89
After	11	86

^a Members of the treatment group were exposed to information about drilling for oil in the ANWR, and were then asked to evaluate this information. Attitudes toward drilling were measured both before and after exposure to the information. The control group did not receive this information. However, as with the treatment group, attitudes toward drilling for oil were measured at both time 1 and time 2.

attitudes at Time One and respondents' level of agreement with each of the readings (Figure 2). Those with a pro-drilling attitude expressed greater agreement with the pro-drilling reading, while those with an anti-drilling sentiment were more likely to agree with the anti-drilling information.

We also found a significant relationship between initial attitudes and respondents' ratings of the quality of the arguments presented in each of the readings about drilling (Figure 2). As hypothesized, subjects with a pro-drilling attitude tended to assign a higher rating of quality to the pro-drilling reading and to discount the quality of the information presented in the anti-drilling reading, while those opposed to drilling tended to more positively rate the quality of the anti-drilling reading.

Further evidence of biased processing was found in a significant relationship between initial attitudes toward drilling and respondents' ratings of the strength of the arguments presented in the readings (Figure 2). Those with a pro-drilling attitude were likely to conclude that the pro-drilling reading consisted of stronger arguments about the issue than the anti-drilling reading, while the opposite was true for subjects with an anti-drilling sentiment.

To determine if biased processing was occurring only among those with high levels of knowledge and involvement, we correlated subjects' initial attitudes with their evaluations of the readings across high and low levels of these variables. Results indicate that while the majority of the correlations were significant ($p < .05$) at both high and low levels of involvement and knowledge, correlations

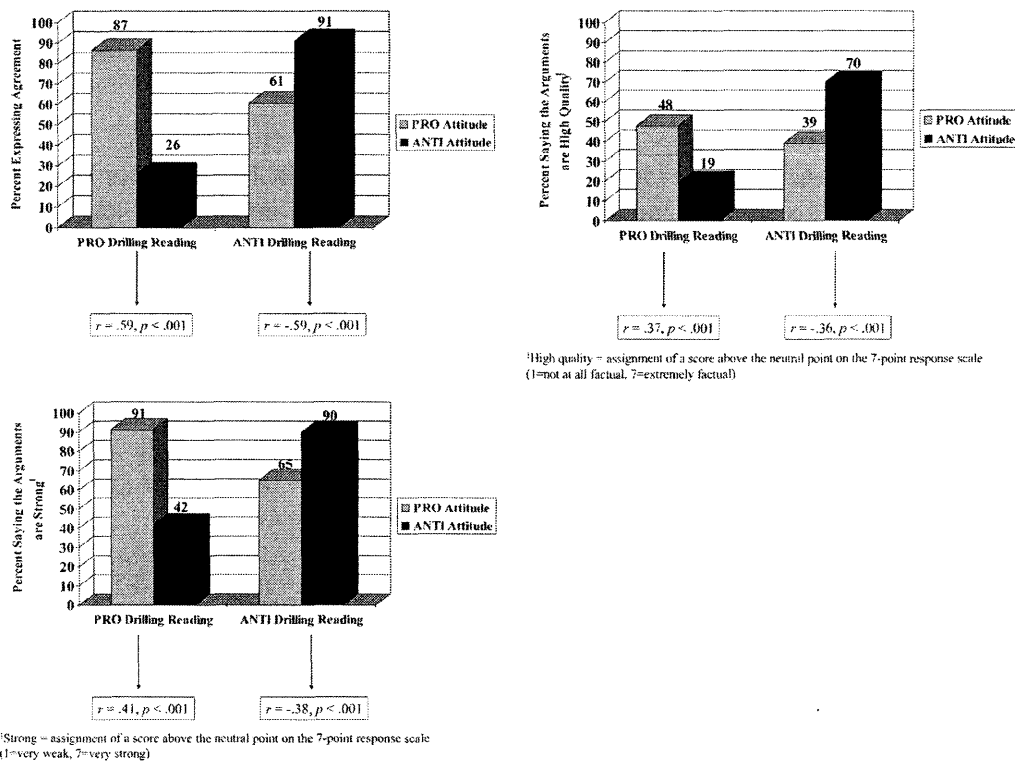


Figure 2. Relationship between attitudes measured prior to exposure to readings about drilling for oil in the Arctic National Wildlife Refuge (ANWR) and respondents' agreement with and evaluation of those readings.

Table 2. Correlations between attitudes measured prior to exposure to readings about drilling for oil in the Arctic National Wildlife Refuge (ANWR) and respondents' evaluations of those readings across high and low levels of involvement and knowledge

Evaluation	Pearson's <i>r</i>					
	Involvement		Working knowledge		Self-perception of knowledge	
	High (<i>n</i> = 141)	Low (<i>n</i> = 156)	High (<i>n</i> = 155)	Low (<i>n</i> = 144)	High (<i>n</i> = 150)	Low (<i>n</i> = 149)
Agree pro	.68*	.41*	.62*	.53*	.78*	.34*
Quality pro	.40*	.27*	.43*	.28*	.53*	.16
Strength pro	.40*	.28*	.45*	.33*	.60*	.18*
Agree anti	-.66*	-.50*	.62*	.57*	-.67*	-.51
Quality anti	.59*	-.15	-.50*	-.25*	-.52*	-.17
Strength anti	-.48*	-.30*	-.40*	-.39*	-.52*	-.24*

Note. Subjects were classified as "high" or "low" on the knowledge and involvement measures through the use of a median split on each variable (i.e., high = greater than median, low = less than median). Values represent correlations between prior attitudes and each of the following evaluation measures: Agree pro (level of agreement with pro-drilling reading), Agree anti (level of agreement with anti-drilling reading), Quality pro (rating of the quality of the arguments presented in the pro-drilling reading), Quality anti (rating of the quality of the arguments presented in the anti-drilling reading), Strength pro (rating of the strength of the arguments presented in the pro-drilling reading), and Strength anti (rating of the strength of the arguments presented in the anti-drilling reading). Asterisk indicates correlation is significant at $p < .05$.

tended to be larger at higher levels of these variables (Table 2). The *effect size* measure, r , indicates a small to moderate effect at low levels of involvement and knowledge but a moderate to large effect (suggesting a stronger association between initial attitudes and ratings of the information) at higher levels of these variables (Cohen 1988; Morgan, Griego, and Gloeckner 2001). As an example, Table 2 presents a significant relationship between prior attitudes and ratings of the quality of information provided in the anti-drilling reading across high and low levels of working knowledge. In other words, subjects at both levels of this variable were rating the information in a manner consistent with their prior attitudes. However, the correlation providing evidence of this phenomenon is twice as large at high versus low involvement ($r = -.50$ at high involvement, $r = -.25$ at low involvement).

Thoughts About the Oil Drilling Information

A content analysis of subjects' thoughts about the readings revealed further evidence of biased processing. Thoughts for each reading were categorized as either positive, negative, neutral, or irrelevant. Table 3 provides a few examples of the thoughts that subjects listed. We found a significant relationship ($p < .05$) between initial attitudes and the proportion of positive and negative thoughts listed for each reading. Specifically, individuals with a pro-drilling attitude were more likely than those with an

Table 3. Example thoughts that were listed after exposure to readings about drilling for oil in the Arctic National Wildlife Refuge (ANWR)

Respondent A (anti-drilling)	
Pro-drilling information	"this person is only concerned about money . . . not convincing argument" (N)
Anti-drilling information	"informative information . . . convincing argument" (P)
Respondent B (anti-drilling)	
Pro-drilling information	"typical Republican stance" (N)
Anti-drilling information	"confirmed my position of not drilling in the Arctic" (P)
Respondent C (anti-drilling)	
Pro-drilling information	"his arguments are weak and lack any true insight . . . LIAR" (N)
Anti-drilling information	"she makes a great emotional appeal about the issue . . . she seems honestly concerned about this issue" (P)
Respondent D (pro-drilling)	
Pro-drilling information	"we should drill in Alaska!" (P)
Anti-drilling information	"typical Democrat" (N)

Note. Subjects' attitudes (i.e., anti-drilling or pro-drilling) are listed in parentheses after their respondent code (i.e., A through D). Thoughts coded as positive are followed by a "P"; thoughts coded as negative are followed by an "N."

anti-drilling sentiment to express positive thoughts about the pro-drilling reading ($r = .48$), while individuals opposed to drilling were more likely to list positive thoughts about the anti-drilling reading ($r = -.18$). Alternatively, those who approved of drilling in the ANWR tended to list more negative thoughts about the anti-drilling reading ($r = -.45$), and those who disapproved listed more negative thoughts about the pro-drilling reading ($r = .31$).

Discussion

The broad focus of this study was to obtain a better understanding of what happens when people are exposed to information about both sides of a natural resource-related issue. Do their initial attitudes about the issue change, and if not, why not? More specifically, we tested for evidence of biased processing, a phenomenon that typically results in little or no attitude change after exposure to new information. Consistent with the social psychological literature on biased processing (e.g., see Biek et al. 1996; Lord et al. 1979; Mahoney 1977; Vallone et al. 1985), we hypothesized that if exposed to information on both sides of a contentious issue, subjects would rate the information consistent with their prior attitudes more highly than the information that goes against what they already believe. While several examples of this phenomenon have been documented in the psychological literature, little attention has been paid to its implications for communication about natural resource management-related issues.

Following an approach used by Biek, Wood, and Chaiken (1996), we exposed subjects to highly exaggerated information both for and against drilling for oil in

the ANWR. We found that subjects who were opposed to drilling tended to agree with the anti-drilling information and to think that it consisted of “high-quality” arguments while they discounted the validity of the pro-drilling messages. In contrast, subjects supportive of drilling in the ANWR were more impressed by the pro-drilling arguments. In other words, subjects processed arguments for both sides of the oil drilling issue in a biased manner regardless of the quality of the information *and what they were told* about the quality of the information. The information they were given was highly exaggerated (i.e., nonfactual), but they were told the information was factual and provided by credible sources.⁴ Thus, regardless of actual or reported quality, arguments consistent with existing attitudes were rated favorably while attitude-inconsistent arguments were perceived as being of lesser quality. The end result was that, as expected, attitudes did not change with exposure to issue-relevant information.

This study suggests to natural resource managers that providing information to the public about an issue may not be enough to persuade them to a certain way of thinking. If the goal of a particular education campaign is to change public attitudes toward recycling, for example, which might in turn lead to a change in recycling-related behaviors, an agency would need to do more than simply provide people with information about the pros and cons of recycling. When people are exposed to information (e.g., in the form of pamphlets, web sites, etc.) about both sides of an issue, they tend to defend their prior attitudes and rate the information in a manner consistent with those attitudes.

Additionally, as our study indicates, people may not necessarily need to be highly involved in or highly knowledgeable about a given issue to process information about it in a biased manner. Results indicated that relationships between initial attitudes and the rating of the quality of both the pro- and anti-drilling information (i.e., evidence of biased processing) were significant across levels of issue-relevant knowledge and involvement, two variables shown to influence biased reactions to new information (Giner-Sorolla and Chaiken 1994; Petty and Cacioppo 1986; Vallone et al. 1985; Zuwerink and Devine 1996). Persuasion theory identifies these variables as indicative of strong attitudes, which are in turn linked to a greater propensity to process information in a biased manner. In fact, research by Biek, Wood, and Chaiken (1996) suggests that having strong attitudes, defined in their study by high levels of issue-relevant knowledge and affect, is a necessary prerequisite for biased processing. Even though we did identify a greater effect size, suggesting a larger, more substantive relationship (see Cohen 1988; Morgan et al. 2001), between prior attitudes and evaluation of information at higher levels of these variables, evidence of biased processing existed irrespective of one's involvement with and knowledge of the issue. Thus, while it might be useful in situations of limited funding for education to target individuals with little or no issue-relevant knowledge or personal interest, even these people may be resistant to attitude change.

The results of our study may seem discouraging from a persuasion standpoint in that we show how people tend to ignore information that is presented to them and to maintain consistency in their cognitions regardless of the quality of the information. However, we can draw an important implication from this study—*persuasion attempts need to take into account factors that affect biased processing* (i.e., factors that make it more or less likely to occur). In other words, under what circumstances are people less likely to process information in a biased manner such that we can expect to influence their attitudes?

Recent research on biased processing in the context of the elaboration likelihood model (ELM) of persuasion (Petty and Cacioppo 1986) suggests it is important to ensure that message recipients are motivated and able to process information contained in messages, but motivated to do so in an *objective* manner. As an example, limiting situational distractions (Moore, Hausknecht, and Thamodaran 1986) and limiting the extent to which message recipients feel a need to maintain consistency or self-esteem (Petty, Wegener, and Fabrigar 1997) can be particularly effective in this respect, leading ultimately to lasting attitude change. Other factors that can enhance this form of processing include message clarity (i.e., messages that are easy to understand; Eagly and Kulesa 1997), message repetition (Cacioppo and Petty 1989), high “matching” between the message content and the attitude function (e.g., value-expressive function, utilitarian function, etc.; see DeBono 1987), and source credibility (Eagly and Kulesa 1997). This body of research highlights for natural resource managers first and foremost the importance of understanding the target audience. By knowing its characteristics, including the motivations and preferences of its members, managers are better informed about how to capture the attention of the audience and appeal to its interests. They are also better equipped to identify effective ways to reach their publics and develop messages that their audience can understand.

Finally, if biased processing is inevitable (as is probably the case with most controversial natural resource issues) due to the strength of the attitudes among those in the target audience, enhancing the extent to which the message appeals to and is consistent with message recipients’ broader values has proven to be an effective persuasion technique. As an example, researchers following the spotted owl controversy in the northwestern United States have argued that framing the issue as a debate between extreme versions of basic public values allowed communicators on both sides of the controversy to garner support for their positions (Eagly and Kulesa 1997; Lange 1993). The timber industry based its appeals on altruistic concerns for people whose jobs were in jeopardy, using the slogan “owls versus people,” while environmentalists focused on biospheric values as they conjured up images of forest devastation and destruction of habitat for countless species of wildlife due to logging. This technique of priming core concerns and portraying the opposing side as unconcerned about important values may be an effective tool for natural resource managers who wish to persuade their audience to a particular way of thinking on a controversial issue. Thus, while our findings highlight the challenges associated with persuasion, research suggests that certain kinds of appeals such as communications that prime core values may be effective in overcoming these challenges.

Study Limitations and Recommendations for Future Research

Our findings suggest that more insight may be needed into processing strategies of individuals with certain characteristics, including strong versus weak attitudes. Specifically, more research is needed to clearly determine if biased processing is largely driven by attitude strength-related factors. Our research documents biased processing across both high and low levels of knowledge and involvement, but are there other strength-related variables that more readily influence the extent to which people process natural resource-related information in a biased manner? Furthermore, are our findings relative to the effects of involvement and knowledge generalizable to other natural resource-related issues?

Given the attention the oil drilling issue has received in the United States in recent years, it is likely that, in addition to knowledge and involvement, other strength-related attributes of attitudes are present. That is, even those with low levels of knowledge and involvement relative to the issue may possess strong attitudes toward oil drilling due to the presence of these other attributes (e.g., strongly held values, affect, and attitude accessibility), which could in turn influence biased processing and result in resistance to change (Eagly and Kulesa 1997; Krosnick and Petty 1995). For example, did the political nature of this issue and the attention it has received evoke certain values or other psychological factors that in turn impacted the prevalence of well-formed attitudes among our respondents? References to political ideology in some of their thoughts about the readings (e.g., “typical Republican stance”) may be suggestive of this. It would be important to examine the relationship between other strength-related attributes of attitudes (besides knowledge and involvement) and processing of natural resource-related information across a variety of issues in future studies.

Further investigation in this area may benefit from exploring different types of involvement. Recent research reported in the social psychological literature (e.g., see Eagly and Chaiken 1998; Johnson and Eagly 1989) makes a distinction between two types of involvement—value-relevant involvement and issue-relevant involvement, the latter of which was the focus of our study. Value-relevant involvement, which refers to a motivation for information processing resulting from an association between an activated attitude and one’s values, is believed to be more closely linked to *biased* processing, while issue-relevant involvement may actually enhance persuasion by motivating critical thinking (Johnson and Eagly 1989).

Future research could also benefit from addressing certain limitations to the current study. First, a larger and more diverse sample could allow for adequate comparisons among groups defined by attitude strength-related characteristics (e.g., high knowledge/high involvement, high knowledge/low involvement, low knowledge/high involvement, low knowledge/low involvement). Unfortunately, we were limited to only broad comparisons between knowledge types and between involvement types (i.e., high vs. low). Future research should also try to ensure that approximately equal and adequate numbers of subjects are randomly assigned to treatment and control groups and to subgroups within these broad categories based on their initial attitudes. This study was biased toward those who opposed oil drilling, making it difficult to compare the reactions of those with a positive versus negative attitude toward the issue. As an example, in our study there appears to be a more “moderate” reaction to opposing arguments by those with a pro-drilling attitude and clearer evidence of biased processing among respondents with an anti-drilling position (see Figure 2). Is this suggestive of “liberal tolerance” and “conservative intolerance” and/or of a reduced ability to persuade those with a negative attitude? Maybe, but to adequately address these questions, a replication involving equal and adequate numbers of individuals on either side of the oil drilling issue would be necessary to allow for more in-depth comparisons.

Finally, it would be useful to determine if results are consistent across different types of samples. Our sample consisted primarily of college students enrolled in natural resource-related classes—a relatively homogeneous group. It would be important to determine if similar results would apply to a more diverse representation of the public.

Notes

1. Specifically, participants were drawn from the following undergraduate classes: "Foundations of Recreation and Tourism," "Public Relations of Natural Resources," "Starting and Managing a Tourism Enterprise," and "Social Psychology."
2. Of the four classes available for use in this study, "Foundations of Recreation and Tourism" and "Social Psychology" were selected to serve as the treatment group. Preference was given to these classes based on a desire to ensure adequate numbers were available for examining the effects of information (both classes were relatively large) and also to ensure the greatest diversity possible in attitudes toward the drilling issue in the treatment group (these classes contained larger numbers of students *not* enrolled in natural resource-related programs). The remaining two classes ("Public Relations of Natural Resources" and "Starting and Managing a Tourism Enterprise") served as the control group. Due to variables outside of our control (e.g., instructor approval for use of class time and specific class sizes), we were unable to approximate equal cell sizes across treatment and control groups. Study limitations, including sampling issues and group assignment, are discussed at the conclusion of this article.
3. To collect information about respondent knowledge of the issue, participants were asked to recall a number of thoughts and events. While one could argue that the accuracy of these memories is questionable, we found significant correlations among a diverse array of knowledge measures adapted from approaches developed and tested extensively by Wood (1982; Biek et al. 1996). Included in this array of measures was a self-reported rating of how well informed respondents felt they were about the issue, an item that did not require recall of specific events. It is also important to note that we were interested in measuring *levels of subjective knowledge* (e.g., self-perceptions of knowledge and number of issue-relevant beliefs), as opposed to evidence of possessing objective, factual information about the issue, due to establishment of the former construct's role as a correlate of attitude strength (Krosnick and Petty 1995; Wood et al. 1995).
4. One reviewer commented on the possible effects of gender based on our selection of a female to represent anti-drilling arguments and a male to represent the pro-drilling information. While we are unable to definitively "prove" that gender of our sources had *no* effect on responses, we were able to explore this issue in two ways using a measure of source credibility included on our survey (measured using a 1–7 scale, 1 = "very untrustworthy," 7 = "very trustworthy"). First, we examined the extent to which respondent gender was related to ratings of source credibility and found that the gender of the respondent was not a significant predictor ($F = .28$, 1 df, $p = .60$ for pro-drilling information; $F = 1.26$, 1 df, $p = .26$ for anti-drilling information). Second, we explored differences in credibility ratings between sources to determine if the common finding across numerous studies in the literature regarding a greater tendency for males to be perceived as credible and influential in a persuasive context (e.g., see meta-analysis reported by Carli 2001) was accurate for our sample. Results were inconsistent with this assumption, revealing that the female source representing the anti-drilling arguments was perceived as "more trustworthy" (e.g., 12% of respondents rated the female source as "very trustworthy," compared to only 2% in the same category for the male source). This pattern may in part be explained by a significant relationship between source credibility and respondent attitudes ($r = -.32$ for anti-drilling source, $r = .31$ for pro-drilling source, $p < .01$), which in our study were more heavily weighted toward a negative evaluation of drilling.

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