

Biased Assimilation and Attitude Polarization in Response to Learning About Biological Explanations of Homosexuality

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Abstract According to attribution theory stigmatized behaviors with biological explanations will be perceived more positively than those with psychological explanations, but informing people of the biological explanations of homosexuality has produced mixed results on attitudes. To examine if biased processing could explain previous findings we tested whether biased assimilation (initial attitudes' effect on perceived persuasiveness) and attitude polarization (initial attitudes' effect on reported attitude change) affected learning about biological explanations of homosexuality among 210 U.S. undergraduates. General Linear Model analyses showed that (1) individuals with positive attitudes toward homosexuality saw biological explanations as a more persuasive reason to accept homosexuality than those with negative attitudes, and (2) initial attitudes generally led to a strengthening of those attitudes after learning about biological explanations.

Keywords Homosexuality (attitudes toward) · Biased assimilation · Attitude polarization · Attitude change

Introduction

According to attribution theory, attitudes about stigmatized behaviors are affected by the perceived causes of those behaviors. More favorable attitudes are held when the causes of a behavior are attributed to uncontrollable rather

than controllable factors, which means that stigmatized behaviors that are viewed as having biological or physical causes are seen more favorably than stigmatized behaviors that are viewed as being behaviorally caused (Dijker and Kooman 2003; Weiner et al. 1988). For example, in a study by Weiner and colleagues the behaviorally caused stigmas of AIDS, child abuse, drug abuse, obesity, and Vietnam War Syndrome were responded to with less assistance, less pity, less liking, and more anger than the physically caused stigmas of Alzheimer's Disease, blindness, cancer, heart disease, and paraplegia. The underlying cause of this difference in attitudes appears to be the relative lack of personal responsibility when biology is the causal mechanism (Dijker and Kooman 2003; Madon et al. 2005; Weiner et al. 1988). An obvious application of this research is that educating individuals about the uncontrollable (i.e., biological) explanations of stigmatized behaviors may be an effective method for reducing negative attitudes. Unfortunately, the assumption that beliefs about biological causation unilaterally lead to positive attitudes may not be true. The purpose of this article is to show that learning about the biological explanations of homosexual behavior is interpreted through the lens of preexisting attitudes and may actually increase or decrease negative attitudes about homosexuality. In order to demonstrate the effects of biological explanations of homosexuality on attitudes we measured participants' initial attitudes and then exposed them to educational material outlining the physical and genetic correlates of homosexual behavior. Afterward, participants' reported how persuasive the material was in showing that homosexuality is legitimate and how much their attitudes had changed due to the material. This study is important because it will test a direct application of attribution theory and will inform efforts at reducing the stigma of homosexuality, which may be misguided by current applications of attribution theory.

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Biology and Attitudes About Homosexuality

Although homosexuality may have lost some of its stigma in recent decades, negative attitudes toward lesbians, gay men, and bisexuals is still prevalent in the United States (Herek 2000; Yang 1997). One of the most important predictors of negative attitudes toward homosexuality is belief about whether or not it is biologically caused (Herek 1996). For example, correlational studies in both the U.S. and other countries have consistently illustrated that believing that same sex orientation is not biologically based leads to negative attitudes about homosexuality (Aguero et al. 1984; Ernulf et al. 1989; Horvath and Ryan 2003; Landen and Innala 2002; Sakalli 2002; VanderStoep and Green 1988; Whitley 1990). In turn, the belief that sexual orientation is biologically based (i.e., not controllable) predicts positive attitudes toward lesbians and gay men (Herek and Capitano 1995; King 2001; VanderStoep and Green 1988). These results fit with attribution theory, which predicts that stigmatized behaviors that are uncontrollable and biological are perceived more favorably than controllable, non-biological stigmatized behaviors.

Correlational research suggests that learning about homosexuality and its biological explanations could decrease negative attitudes. In fact, education is generally acknowledged as increasing tolerance toward homosexuality (Lottes and Kuriloff 1994; Schellenberg et al. 1999; Stevenson 1988; Tucker and Potocky-Tripodi 2006). Unfortunately, only a handful of researchers have attempted to experimentally alter attitudes toward homosexuality by manipulating information about its cause, and their results have been mixed. Learning about biological explanations for homosexuality can reduce negative attitudes (Oldham and Kasser 1999; Piskur and Degelman 1992), increase negative attitudes (Oldham and Kasser 1999), or have no effect (Pratarelli and Donaldson 1997). Thus, despite the clear trend in correlational research, experimental studies have not borne out the effectiveness of learning about biological explanations of homosexuality in reducing negative attitudes.

Biased Assimilation and Attitude Polarization

Social psychology research could help to clarify the inconsistent effects of learning about biological explanations of homosexuality because it contains clearly demonstrated mechanisms by which individuals' attitudes can be differentially influenced by the exact same information. One of the most cited mechanisms is biased assimilation and attitude polarization (Lord et al. 1979). Attitude polarization is the tendency for individuals' to report that their original attitude has become stronger after evaluating supportive and contradictory evidence related to that attitude. The underlying cause of attitude polarization is said to be biased

assimilation of information. Biased assimilation occurs when supportive evidence is seen as more convincing than contradictory evidence even when they are of the same quality.

In the original attitude polarization study, Lord et al. (1979) selected participants for their extreme views on capital punishment and had them read summaries of fictional studies about the effects of capital punishment. The studies were identical except for the results which were manipulated so that they either supported or refuted the effectiveness of capital punishment. Participants were asked to rate the quality of the studies and the amount of attitude change they experienced after reading them. Participants tended to rate the study consistent with their attitudes as more convincing and also indicated that their attitudes actually became stronger because of the evidence presented to them. These effects occurred despite the researchers' careful counterbalancing of evidence supporting and contradicting capital punishment. Subsequent research has replicated Lord and colleagues' results with attitudes about capital punishment (Lord et al. 1984; Miller et al. 1993; Pomerantz et al. 1995), abortion (Pomerantz et al. 1995), environmental issues (Pomerantz et al. 1995), the John F. Kennedy assassination (McHoskey 1995), presidential debates (Munro et al. 2002), technology failures (Plous 1991), the femininity and masculinity of homosexuals (Munro and Ditto 1997), and the relation between mental illness and homosexuality (Munro et al. 2004). In every study the basic finding that exposure to both sides of an argument leads to biased assimilation and attitude polarization was replicated. In addition, the biased assimilation and attitude polarization processes are generally more robust among individuals with extreme attitudes (Miller et al. 1993) indicating that the stronger an individuals' attitude the more likely they are to bolster that attitude when faced with conflicting evidence.

Biased assimilation and attitude polarization stand out as a possible reason why, despite the predictions of attribution theory (Weiner et al. 1988), learning about biological explanations of homosexuality does not universally increase positive attitudes. Preexisting attitudes predispose information processing. Biological explanations of homosexuality interpreted in the light of established attitudes could, theoretically, be perceived as evidence for the acceptability of homosexuality among individuals with positive attitudes toward homosexuality and as evidence against the acceptability of homosexuality by those with negative attitudes toward homosexuality. This biased assimilation could then lead to attitude polarization, and thus, increased acceptance and rejection of homosexuality among those with preexisting positive and negative attitudes, respectively. Furthermore, this process could be more pronounced for individuals with extreme attitudes than it is for individuals with moderate attitudes; thus, individuals with extremely negative views may be the least

likely to perceive biological explanations as persuasive evidence to accept homosexuality and the most likely to have their attitude grow more negative from such information.

Demonstrating biased assimilation and attitude polarization in response to biological explanations of homosexuality would represent an important extension of the external validity of the attitude polarization concept, which is typically tested by having individuals consecutively consider two opposing arguments of equal strength. Only one other study has examined the effects of ambiguous, non-persuasive information on biased assimilation and attitude polarization (Plous 1991). Plous exposed supporters and opponents of a specific technology, such as nuclear arms, to information about incidences of near catastrophe when that technology failed. After being exposed to the same factual information about near catastrophes, both supporters and opponents reported that their original attitudes about the technology had become even stronger. Supporters believed that the prevention of the catastrophe supported their attitudes, and opponents believed that the occurrence of a near catastrophe itself supported their attitudes. Although this study illustrated that the same information can have divergent effects based on preexisting attitudes, its topic prevents generalization to homosexuality. Thus, illustrating that these processes occur when presenting people with the objective biological explanations of homosexuality would be an important extension of the research and would involve an attitude that is more central to many people's identity.

The Current Study

The current study attempts to answer the question: How does learning about biological explanations of homosexuality affect attitudes about homosexuality? We constructed several hypotheses related to this question based on previous biased assimilation and attitude polarization research (Lord et al. 1979; Miller et al. 1993). Specifically, based on previous biased assimilation results we hypothesized that the preexisting attitude a person has about homosexuality will affect their perceptions of biological explanations of homosexuality. Individuals with positive attitudes toward homosexuality will perceive biological explanations as more persuasive evidence for the legitimacy and acceptability of homosexuality than individuals with negative attitude toward homosexuality, and individuals with negative attitudes toward homosexuality will perceive biological explanations as more persuasive evidence against the legitimacy and acceptability of homosexuality than individuals with positive attitude toward homosexuality.

We also hypothesized based on previous attitude polarization research that the preexisting attitude a person has about homosexuality will affect their perceived attitude change after learning about the biological explanations of

homosexuality. Individuals with positive attitudes toward homosexuality will report that their attitudes are more positive after learning about biological explanations, and individuals with negative attitudes toward homosexuality will report that their attitude are more negative after learning about biological explanations. Finally, we hypothesized that both biased assimilation and attitude polarization would be stronger as the extremity of individuals' attitudes increases. Specifically, individuals with extreme preexisting attitudes about homosexuality will show significantly more biased assimilation and attitude polarization than individuals with moderate preexisting attitudes about homosexuality.

This study is important because it will test a direct, practical application of attribution theory and expand the external validity of the biased assimilation and attitude polarization phenomena. Efforts to improve attitudes toward homosexuality informed by attribution research may utilize anti-stigma procedures emphasizing biological explanations of homosexuality. However, such efforts may be counterproductive for some individuals if their negative attitudes allow biological explanations to be perceived as persuasive evidence against the legitimacy of homosexuality leading to strengthening of those negative attitudes.

Method

Participants

Participants consisted of 210 (male=86; female=120; four not reporting a sex) undergraduates at a large Midwestern university in the United States. Participants volunteered in exchange for credit in psychology courses. The ethnic makeup of the sample was 88% European American, 6% African American, 4% Asian American, 1% Latino/a, and 1% of other ethnicity. The average participant was 20 years old ($SD=3$) and had completed two semesters of college ($SD=2$). Participants were primarily heterosexual (heterosexual=204; homosexual=1; bisexual=4; two not reporting a sexual orientation), and the average number of close relationships participants had with lesbian, gay, or bisexual people was low ($M=1$, $SD=2$).

Measure

Attitude Toward Homosexuality

Following the research procedure set forth in the literature (Lord et al. 1979; Miller et al. 1993) all attitude measures consisted of Likert scales. The initial attitude measure asked participants to rate their agreement with the statement

“Homosexuality is a legitimate and acceptable sexual orientation” on a scale from -4 (*extreme disagreement*) to 4 (*extreme agreement*) with 0 being neutral.

Biased Assimilation

consistent with past research (Lord et al. 1979; Miller et al. 1993) the biased assimilation measures consisted of evaluations of the persuasiveness of the materials. Participants rated “How persuasive was the reading on homosexuality in showing that homosexuality is a legitimate and acceptable sexual orientation?” and “How persuasive was the reading on homosexuality in showing that homosexuality is not a legitimate and acceptable sexual orientation?” on a scale ranging from -8 (*extremely unpersuasive and unconvincing*) to 8 (*extremely persuasive and convincing*) with 0 being a neutral response.

Attitude Polarization

Following the established procedure (Lord et al. 1979; Miller et al. 1993) attitude polarization was measured using self-reported attitude change. Participants rated “How would you compare your current attitude on the legitimacy and acceptability of homosexuality as a sexual orientation with the attitude you had at the very start of this experiment?” on a scale from -8 (*much more against the legitimacy and acceptability of homosexuality*) to 8 (*much more in favor of the legitimacy and acceptability of homosexuality*) with 0 being a neutral response. A response of 0 indicates that attitude polarization did not occur. Reported attitude change greater than 0 in the same direction of the initial attitude signifies attitude polarization, and reported attitude change greater than 0 in the opposite direction of the initial attitude signifies attitude depolarization.

Reading Material

The reading material consisted of a selection from an introduction to psychology textbook that contained 1.5 pages of text and a table at the end of second page outlining the main points of the text. It discussed the evidence for biological influences on homosexual behavior. Topics included summaries of scientific studies of brain anatomy, genetics, and parental hormones. No language in the text indicated a bias for or against the legitimacy or acceptability of homosexuality.

Procedure

The procedures were completed in small groups. After reading and signing the informed consent document

participants completed some demographic questions and the initial measure of their attitude. They were then informed that they would be reading a selection from a psychology textbook and that they would be tested on the material. The experimenter asked them to read the selection as they would if they were studying for an exam and to feel free to write on the paper, highlight, or take notes. To identify students who did not pay attention to the information in the reading, five multiple-choice items about the material in the reading were then asked. Participants correctly answering fewer than three out of five questions were eliminated from the analyses. Twenty individuals were eliminated for high error rates on the attention measure. After completing the reading, participants completed the measures of attention, biased assimilation, and attitude polarization.

Results

We utilized participants' initial attitude toward homosexuality in order to construct groups for analysis. Using the procedures established by Miller et al. (1993) to study biased assimilation and attitude polarization participants were separated based on the direction and extremity of their initial attitudes. Specifically, the procedure of Miller et al. categorizes attitude direction as either positive ($1, 2, 3,$ or 4) or negative ($-1, -2, -3,$ or -4) based on participants' initial self-report. In turn, extremity is categorized as extreme ($-4, -3, 4,$ or 3) or moderate ($-2, -1, 2,$ or 1) with participants indicating 0 s being excluded from analysis. It should be noted that splitting continuous variables into groups can lead to statistical artifacts, and we did conduct a regression analyses with the biased assimilation and attitude polarization items left as continuous variables. The regression replicated all of the major findings of this study; however, we present group comparisons here because it is the standard procedure in the literature and because it better illustrates the divergent effect learning about biological explanations can have on attitudes about homosexuality. In addition, we conducted exploratory analyses to determine if sex or number of close relationships with lesbians, gay men, and bisexuals had an effect on biased assimilation or attitude polarization. Although men and individuals with no close relationships had more negative attitudes toward homosexuality than women and individuals with close relationships, no effect on biased assimilation or attitude polarization was evident.

Biased Assimilation

We conducted multivariate analysis of variance (MANOVA) to determine if individuals' ratings of the persuasiveness of

the materials varied by the direction and extremity of their preexisting attitude toward homosexuality. According to the biased assimilation hypothesis the direction of participants' preexisting attitudes toward homosexuality should significantly affect their perception of the persuasiveness of the materials. In addition, according to the extremity hypothesis this process should be more pronounced among individuals with extreme attitudes leading to significant differences between individuals with moderate and extreme preexisting attitudes. Persuasiveness ratings (how persuasive the biological materials were in showing that homosexuality is legitimate and acceptable; how persuasive the materials were in showing that homosexuality is not legitimate and acceptable) served as the dependent variables in a 2 (Direction of Attitude: Positive vs. Negative) \times 2 (Extremity of Attitude: Extreme vs. Moderate) MANOVA. The analyses indicated that the main effect of direction, $F(3, 157)=75.73$, $p<.001$, $\eta_p^2 = .50$, and the main effect of extremity, $F(3, 157)=6.33$, $p<.002$, $\eta_p^2 = .08$, were significant. In addition, these main effects were qualified by a significant interaction, $F(3, 157)=7.00$, $p<.001$, $\eta_p^2 = .08$. See Table 1 for means and standard deviations.

Post hoc Tukey analyses were used in order to better understand the significant interaction. Analysis of the items assessing how persuasive the reading was in showing that homosexuality *is* legitimate and acceptable indicated that all means were significantly different, all $ps<.001$, with the exception of the difference between the extreme positive and moderate positive groups, $p=.85$. Thus, extremity was only a factor for individuals with negative attitudes. As hypothesized, however, individuals with negative attitudes toward homosexuality found the material less persuasive in showing that homosexuality is legitimate and acceptable than individuals with positive attitudes. Post hoc analyses of participants' ratings of how persuasive the materials were in showing that homosexuality *is not* legitimate and acceptable indicated that individuals with extreme positive attitudes found the materials significantly less persuasive

than individuals with extreme negative attitudes, $p=.006$, and moderate negative attitudes, $p=.008$, but not those with moderate positive attitudes, $p=.14$. The other comparisons were not significant ($ps>.66$). In contrast to the previous item, extremity was only a factor for individuals with positive attitudes. Also, a close examination of the means illustrates that no group found the biological explanations persuasive in showing that homosexuality is not legitimate; however, biased assimilation was still exhibited in the expected direction. Individuals with positive attitudes toward homosexuality found the material less persuasive in showing that homosexuality is not legitimate and acceptable than individuals with negative attitudes. Generally, the results support the biased assimilation hypothesis by showing attitudes toward homosexuality significantly affect perceptions of the persuasiveness of biological explanations, but they do not fully confirm the extremity hypothesis because extreme scores were not consistently related to a more pronounced biased assimilation process.

Attitude Polarization

We conducted analysis of variance (ANOVA) to determine if individuals' reported attitude change varied by their initial attitude toward homosexuality. According to the attitude polarization hypothesis the direction (positive or negative) of participants' attitude toward homosexuality would significantly affect the degree and direction of reported attitude change. Furthermore, according to the extremity hypothesis these processes should be more pronounced among individuals with extreme attitudes leading to significant differences between individuals with moderate and extreme preexisting attitudes. Reported attitude change served as the dependent variables in a 2 (Direction of Attitude: Positive vs. Negative) \times 2 (Extremity of Attitude: Extreme vs. Moderate) ANOVA. The groups were constructed using the previously described procedure. The results indicated that the main effect of direction was

Table 1 Means and standard deviations for biased assimilation and attitude polarization.

Attitude	<i>n</i>	Biased assimilation				Attitude polarization	
		Is legitimate		Is not legitimate		<i>M</i>	SD
		<i>M</i>	SD	<i>M</i>	SD		
Extreme negative	31	-4.13 ^{ab}	3.37	-1.32 ^c	5.07	-1.45 ^{ef}	3.26
Moderate negative	30	-0.87 ^{ab}	2.89	-1.34 ^d	3.00	0.27 ^{fg}	0.98
Extreme positive	61	3.72 ^b	2.95	-4.05 ^{cd}	3.48	2.56 ^{eg}	2.91
Moderate positive	36	3.22 ^a	2.51	-2.36	3.17	1.71 ^f	2.12

Is legitimate = ratings of how persuasive the biological material was in showing that homosexuality is legitimate and acceptable. Is not legitimate = ratings of how persuasive the material was in showing that homosexuality is not legitimate and acceptable. High scores in the Biased Assimilation columns indicate high perception of persuasiveness. Polarization = self-reported change in attitudes toward homosexuality with positive scores indicating more acceptance of homosexuality. ^{a, b, c, d, e, f, g}, $p<.05$.

significant, $F(3, 157)=40.81$, $p<.001$, $\eta_p^2 = .21$, but the main effect of extremity was not significant, $F(3, 157)=6.93$, $p=.31$, $\eta_p^2 = .01$. The interaction between direction and extremity was significant, however, $F(3, 157)=59.34$, $p<.003$, $\eta_p^2 = .06$. See Table 1 for means and standard deviations.

Once again, post hoc Tukey tests were used to better understand the interaction. Analyses indicated that individuals with extreme negative attitudes reported attitude change that was significantly less accepting of homosexuality than the moderate negative, extreme positive, and moderate positive groups, all $ps<.05$. In addition, individuals with moderate negative attitudes reported attitude change that was significantly less accepting of homosexuality than individuals with extreme positive attitudes, $p<.001$. The other comparisons were not significant ($ps>.11$). Thus, the extremity hypothesis was only confirmed for individuals with extreme negative attitudes. The means illustrate that while individuals with moderate negative, extreme positive, and moderate positive attitudes all reported at least slight positive attitude change, individuals with extreme negative attitudes reported that their attitude became more negative. In summary, although the attitude polarization hypothesis was generally confirmed because of the significant differences in self-reported attitude change based on preexisting attitude, it was only partially confirmed for the extremity hypothesis because only extreme negative attitudes led to more pronounced attitude polarization.

Frequency of Attitude Polarization and Depolarization

Although there was not a specific hypothesis, we also explored the frequency with which people reported attitude polarization and depolarization. One criticism of the previous analyses is that mean differences may not reflect the actual number of people reporting attitude change. For example, the mean negative attitude polarization could be the result of a small number of individuals reporting extreme attitude change while the mean positive attitude polarization could be the result of a larger number of people reporting a similar medium sized attitude change. As such, attitude polarization may occur at different frequencies depending on direction of attitude, which would contradict the notion that the same information is leading to opposite effects depending on initial attitude. Therefore, examining the frequency of polarization and depolarization provides the opportunity to determine if initial attitude determines how often individuals report attitude polarization.

To determine if the proportion of attitude polarizations toward acceptance of homosexuality and rejection of homosexuality was the same among individuals with positive and negative initial attitudes toward homosexuality we transformed initial attitudes into a binary variable

representing positive or negative attitudes and transformed positive and negative attitude polarization ratings into a binary variable representing attitude polarization and depolarization (see Table 2 for frequency counts). Attitude polarization, defined as a reported attitude change greater than 0 in same direction as the initial attitude, occurred in 45% of the participants. Depolarization, defined as a reported attitude change greater than 0 in opposite direction as the initial attitude, occurred in 4% of cases and never occurred among individuals with positive attitudes (extreme negative=3%; moderate negative=1%). We used a chi square test for independence to determine if the proportion of polarization among individuals varied significantly among these groups. The chi square test was not significant, $\chi^2(1, N=161)=2.78$, $p=.13$. These results indicate that the frequency of reported attitude change did not differ based on the direction of initial attitudes, which further supports the contention that biological explanations of homosexuality can be interpreted differently based on preexisting attitudes.

We also examined attitude polarization based on extremity of initial attitudes (see Table 2 for frequency counts). Individuals with extreme positive and extreme negative attitudes constituted the extreme group and individuals with moderate positive and moderate negative attitudes constituted the moderate group. Chi square analysis indicated that attitude polarization was significantly more frequent in the extreme group than in the moderate group, $\chi^2(1, N=161)=5.78$, $p=.02$. This result provides further evidence for the extremity hypothesis.

Table 2 Frequency of attitude polarization by direction and extremity of initial attitude.

Attitude	Polarization	No polarization
Attitude direction		
Negative	25	37
Positive	52	47
Attitude extremity*		
Extreme	41	52
Moderate	43	25
Attitude direction and extremity*		
Extreme negative	14	12
Moderate negative	1	24
Extreme positive	33	28
Moderate positive	19	16

Attitude polarization is a reported attitude change greater than 0 in same direction as the initial attitude. Attitude Direction represents initial attitude toward homosexuality categorized as positive or negative. Attitude Extremity represents initial attitude toward homosexuality categorized as extreme or moderate using the four most extreme positive and negative scale points or the four middle positive and negative scale points, respectively. Attitude Direction and Extremity represents initial attitude toward homosexuality categorized by both the direction and extremity. * $p<.01$.

Finally, we examined the frequency of attitude polarization based on combined attitude extremity and direction (see Table 2 for frequency counts). Attitude polarization occurred with similar frequency among individuals with extreme negative (54%), extreme positive (54%), and moderate positive (54%) attitudes, but was much lower among individuals with moderate negative attitudes (4%). We used a chi square test for independence to determine if the proportion of polarization among individuals varied by significantly among these groups. The chi square test was significant, $\chi^2(3, N=147)=21.00, p<.001$. These frequency analyses generally support the concept of attitude polarization; however, it does appear that only individuals with extreme negative, extreme positive, and moderately positive attitudes toward homosexuality are equally likely to report attitude polarization.

Discussion

Attribution theory predicts that behaviors caused by forces such as biology that are out of a person's control should be seen more positively than behaviors that are under a person's control. Logically then, learning about the biological explanations of homosexuality should decrease negative attitudes. However, the results of the current study clearly contradict this assumption because evidence for the biological basis of homosexuality was filtered through preexisting attitudes leading to biased assimilation and attitude polarization. Individuals with positive attitudes toward homosexuality tended to see biological evidence as reason for acceptance and those with negative attitudes tended to take the exact opposite view. Although no group found the biological explanations to be a persuasive reason to reject homosexuality, assimilation was still biased by preexisting attitudes in the expected direction. Furthermore, both groups reported more certainty in their original attitudes after reviewing the same ambiguous, non-persuasive information. Finally, these processes were especially pronounced among individuals with extreme negative attitudes. Overall, the informational intervention focusing on biology had almost no net effect on attitudes because while it increased acceptance among some it decreased acceptance among others.

These results are consistent with two separate lines of research. First, the phenomena of biased assimilation and attitude polarization are well documented (Lord et al. 1979, 1984; Miller et al. 1993). Individuals do not consider arguments relating to strongly held beliefs fairly. Quite the contrary, they view supporting evidence favorably and contradicting evidence unfavorably leading to increased confidence in their original attitude. Furthermore, the current study adds to this literature by replicating the one

previous study that demonstrated that the attitude polarization phenomena can occur with non-persuasive, factual information (Plous 1991). Second, attempts to change individuals' attitudes about homosexuality by providing information about biological explanations have shown only mixed effectiveness (Oldham and Kasser 1999; Piskur and Degelman 1992; Pratarelli and Donaldson 1997). This study offers a simple explanation for these results. Our study indicates that biological information may lead to self-reported changes in attitude but that the changes tend to be in the direction of the initial attitude. Therefore, when presenting biological explanations of homosexuality the increases in acceptance were canceled out by concomitant increases in rejection, and this leads to no net change in the sample.

This study has important applied implications. When presenting information on the biological aspects of sexuality, which is a common practice in human sexuality and psychology courses, instructors should be aware that they might actually be increasing negative attitudes in some students. In addition, the "homosexuality is not a choice" argument based on biology is unlikely to be broadly effective as an anti-stigma intervention. Examinations of biological beliefs about homosexuality illustrate that they are multifaceted and can have complex implications. While beliefs that homosexuality is stable within a person and universal across time and culture are associated with positive attitudes, perception of a distinct boundary between homosexuality and heterosexuality, as might occur when something is biologically caused (e.g., sex, species), is associated with negative attitudes (Haslam and Levy 2006; Haslam et al. 2002; Hegarty 2002). Theoretically then, experiences that reduces the separation of homosexuality and heterosexuality in individuals' minds should be included if biological information is used in anti-stigma efforts. For example, personal information or social contact that humanizes lesbians, gay men, and bisexuals could be useful for this purpose. However, such strategies need to be empirically tested. Finally, this study illustrates that individuals who are arguably the most important targets for anti-stigma interventions are also the least likely to benefit from them. Individuals with extreme negative attitudes had more pronounced biased assimilation and attitude polarization than individuals with moderate negative attitudes; therefore, individuals' extreme negative attitudes toward homosexuality may actually be strengthened by efforts to present them with seemingly unquestionable evidence for the acceptance of homosexuality.

The results of this study offer a unique perspective on the difficulty in using biological explanations of homosexuality to reduce stigma. However, there were some limitations. The central idea of the study was to use only one explanation of

homosexuality, but documenting biased assimilation and attitude polarization with other (i.e., sociocultural) explanations would allow greater generalizability. Future research could also examine the role of biological explanations on attitudes more complex than general acceptance and rejection. Finally, these processes should be documented in a more representative sample of the population.

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