CAN PEOPLE’S ATTITUDES TOWARD HOMOSEXUALS BE INFLUENCED?
THE IMPACT OF NEED FOR COGNITION AND AMOUNT OF INFORMATION
ON THE PERSUASIVENESS OF INFOGRAPHICS

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in
Interdisciplinary Studies
International Cognitive Visualization

by
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Summer 2015
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By

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Summer 2015

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DEDICATION

For Oma.
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The present investigation aimed to determine whether implicit and explicit attitudes toward homosexuals can be influenced by the information contained in an infographic, moderated by peoples’ Need for Cognition (NFC). We were also interested in the degree to which learning from the infographic, and participants’ perceived personal involvement with homosexuality, were related to attitudes toward lesbians and gay men. Three infographics were designed that displayed different amounts of information about homosexuality (high vs. low vs. none).

Results revealed that an infographic with a high amount of information influences implicit attitudes only toward lesbians in a positive way, moderated by
people’s NFC. For the explicit attitude measures, we found a main effect for NFC. Perceived personal involvement was the only predictor of attitudes toward homosexuals under certain conditions.

Especially the attitudes of people high in NFC toward homosexuals can be influenced by an infographic; the high information infographic is most effective. Since involvement might play a role in attitude change, the relationship between involvement, attitude, and NFC requires further investigation.
CHAPTER I

INTRODUCTION

Background

Visual persuasive messages are prevalent in everyday life. Processed consciously and subconsciously, visual messages influence our behavior and thinking more than one would expect (Noar, 2006). Visual messages, such as posters and infographics, have been demonstrated to influence attitudes and specific behaviors in a socially beneficial way; this is especially the case in research in health promotion. For example, visual messages have been shown to positively influence stair use among overweighted individuals (Sugiyama, Okuda, Kinos hita, Inada, Tateishi et al., 2011; Soler, Leeks, Buchanan, Brownson, Heath et al., 2010; Olander, Eves, & Puig-Ribera, 2008; Kwak, Kremers, van Baak, & Brug, 2007; Kerr, Eves, & Carroll, 2001), incur safer sex practices among females and males (Carnaghi, Cadinu, Castelli, Kiesner, & Bragantini, 2007) and lead to decrease in drinking and driving behavior among adults and adolescents (Elder, Shults, Sleet, Nichols, Thompson et al., 2004). It is also well known that visual messages have been demonstrated to influence attitudes and behavior in marketing and advertisement (Costley & Brucks, 1992) as well as politics (Huddy & Gunnthorsdottir, 2000). And yet, there are important social issues in need of being addressed for which the potential influence of visual messaging is unclear. One such issue is social discrimination; in particular, the discrimination of homosexuals.
Discrimination of homosexuals is often based on negative attitudes toward lesbians and gay men, and in many countries, justice is still pervaded by negative attitudes and decisions that deny homosexual individuals equal rights (Ronner, 2005). This investigation was designed to demonstrate how visual messages in form of carefully designed infographics can change negative attitudes toward lesbians and gay men and diminish the discrimination of homosexuals.

Attitudes and their Relationship to Behavior

The overall goal of this study is to change negative attitudes toward homosexuals with an infographic. There are numerous definitions of attitudes; Ajzen (1993) defines attitudes as “[…] an individual’s disposition to react with a certain degree of favorableness or unfavorableness to an object, behavior, person, institution, or event […]” (p. 41). Other definitions distinguish between implicit and explicit attitudes. Implicit attitudes are generally defined as attitudes inferred from indirect, speed-based methods (e.g., the Implicit Association Test), so that participants do not know what is being measured. There are inconsistent findings whether people are aware of implicit attitudes (Strack & Deutsch, 2004) or not (Greenwald & Banaji, 1995). In contrast, explicit attitudes are measured mostly with self-report scales, so that respondents know their attitudes and report them consciously. The correlation between implicit and explicit attitudes is often low, indicating that implicit attitudes capture cognitive aspects of an attitude of which people are not aware (Hahn, Judd, Hirsh, & Blair, 2013). Implicit and
explicit attitudes complement each other, but they are not the same; therefore measuring explicit as well as implicit attitudes has research advantages.

Hovland and Rosenberg (1960) propose a three-component concept of attitudes, suggesting that an attitude consists of a cognitive aspect, an affective aspect and a behavioral aspect that interact with each other (Kroeber-Riel & Weinberg, 1996). Attitudes are manifested in behavior; therefore, the behavioral component is also addressed in other models, such as the Ajzen-Fishbein-model (Mumendey, 1988). This model postulates a close relationship between attitudes and behavior, and states that perceivers’ intention to show a specific behavior on a self-report scale might be the best predictor of the overt behavior (Carnaghi et al., 2007). Due to this close relationship between attitudes and behavior, it is reasonable to assume that, since discrimination is manifested in behavior, negative attitudes are likely precursors. Furthermore, studies have found a high correlation between antigay behavior and antigay attitudes (Tucker & Potocky-Tripodi, 2006). Due to these findings, it makes sense to determine whether negative attitudes toward homosexuals can be influenced by an infographic as a potential step toward reducing discrimination of sexual minorities.

**Negative Attitudes Toward Homosexuals**

Despite the fact that more and more countries have legalized same-sex marriage, many people still have negative attitudes toward homosexuals that can be manifested in hostility, verbal abuse, and violence (Herek, 2004). In the U.S., harassment
and discrimination of homosexuals still occur on a daily basis causing significant stress for sexual minority groups.

Previous research on attitude change toward homosexuals mostly focused on the reduction of prejudice by presenting anti-prejudice curriculum in courses within schools (Tucker & Potocky-Tripodi, 2006; Ben-Ari, 1998). These studies established that decreasing negative attitudes toward homosexuals was principally accomplished by increasing contact with homosexuals. Students who gained more knowledge about homosexuals by being exposed to, and interacting with, gay men and lesbians showed a decreased negative attitude toward homosexuals (Wright & Cullen, 2001). Providing the students with evidence of the biological origins of sexual orientation was also a critical variable to shift attitudes (Altemeyer, 2002). Most of this attitude-changing information about homosexuals was presented to the students in their textbooks. Certainly, providing information in textbooks is one strategy to convey a persuasive message. Another way is to design visual persuasive messages, such as posters and infographics. Visual persuasive messaging can be distributed more pervasively and reach more people at the same time.

**Infographics**

According to Perloff (2008), a persuasive message (e.g. a pro-social campaign) aims to inform, persuade, and motivate behavioral changes in large audiences for noncommercial benefits concerning individuals and/or society at large. For example,
a systematic review of 21 studies on stair use found that infographics with a persuasive message caused a mean increase in stair use of 2.4 percentage points (Soler et al., 2010) for overweight adults. The change from choosing to take the stairs, rather than an elevator or escalator, may have contributed to a modest improvement in daily physical activity. Further, the increase in stair use caused less energy use and lower costs.

Another study by Sugiyama et al. (2011) revealed that the number of correct answers in a pre- and post-intervention survey containing vegetable intake questions increased from 36-48% to 38-73%. A poster displayed in a worksite caused this shift in explicit attitudes. Both studies show that displaying an infographic or poster on health promotion can cause an effective attitude change and shift behavior.

Unfortunately, the influence of infographics on attitude change toward homosexuals has yet to be investigated. There is research on the type of information that is successful in changing negative attitudes toward homosexuals resulting in less discrimination; there is also research stating that visual messages on infographics are successful. However, there is no research on visual messages, such as infographics or posters, conveying information about homosexuality and an infographic’s impact on negative attitudes towards homosexuals. Thus, we aim to combine the established type of information with the successful method of visual messages in order to determine whether an infographic providing information about homosexuality can influence the attitudes of a student sample.
An infographic displayed in public areas reaches a larger audience than textbooks in school settings. Since negative attitudes toward homosexuals are a prevalent issue with high social relevance (Herek, 2000), we reasoned that it would be valuable to observe the potential effect of an infographic containing information about homosexuality on a large audience.

Need for Cognition

Dealing with a large audience includes dealing with a wide variance of features and individual differences. For example, some individuals are persuaded by an infographic with a low amount of information; others tend to prefer more information. Individuals preferring more information need to process the information more deeply in order to be persuaded. This individual difference is referred to as Need for Cognition. Need for Cognition (NFC) was defined by Cacioppo and Petty (1982) as “the (enduring) tendency for an individual to engage in and enjoy effortful analytic activity” (p. 116). In the last decades, researchers have focused on preferences of people with different levels of NFC and aimed to design visual messages capable of causing an attitude change in people high or low in NFC. For example, Carnaghi et al. (2007) investigated the effect of different formats of a visual message on attitude change: they compared the effectiveness of a written and a comic-strip format of a persuasive message regarding safer sex. The results of the study revealed that the extent to which individuals enjoy deep thinking, and to what degree they base their decisions on emotional appeals, is a relevant variable for
the effectiveness of the visual message relative to NFC. They found that people high in NFC perceived other visualizations (written format) as more convincing than did people low in NFC (comic-strip format). In short, people prefer specific visual messages based on their level of NFC. Based on the literature, people high in NFC prefer strong, high-quality arguments and information which they can process deeply, whereas people low in NFC prefer simple appeals and emotional cues in order to be persuaded by a message (Haugtvedt & Petty, 1992). Thus, an infographic dealing with a large audience including people high and low in NFC needs to integrate those individual preferences. There is little research on how to overcome differences in NFC in order to shift the attitude toward homosexuals with one visual message. However, dealing with a pro-social topic, such as the discrimination of homosexuals, the goal is to reach and persuade a large audience regardless of their individual differences. Therefore, this investigation examined whether it is possible to change people’s attitudes and behavior toward homosexuals with one infographic that integrates visual preferences to reach people high and low in NFC.

Perceived Personal Involvement

Another individual difference that needs to be taken into consideration when designing an effective infographic is perceived personal involvement. Perceived personal involvement can be defined as the personal relevance or importance of an attitude object for a person. In this investigation, homosexuals are the attitude object. People who know many homosexuals, or even are homosexual themselves, feel more personally involved in
the issue of discrimination of homosexuals than people whose familiarity and interaction with homosexuals is low.

Research on attitudes and persuasion indicates that the intensity with which an attitude is held – an attitude’s strength – is influenced by the involvement of the person: people with a high involvement have a stronger attitude and therefore their attitudes are less easy to shift (Petty, Cacioppo, & Schumann, 1983) relative to people with a low involvement. Therefore, it is important to consider involvement when examining attitude changes.

Involvement can change over time: Apsler and Sears (1968) state that people are likely to become personally involved with an issue when they expect it to have significant consequences for their own lives. Studies have found that high involved people need more issue-relevant arguments in order to be persuaded than people who are less involved (Petty, Cacioppo, & Goldman, 1981; Petty & Cacioppo, 1979). Since research has shown that an individual’s level of personal relevance of a message can cause different (and even opposite) effects, perceived personal involvement is an individual variable we reasoned to be involved in attitudes. Despite general agreement on the importance of involvement, the role of involvement on attitude change in the context of processing information about homosexuality is not well understood. We assume that involvement moderates attitude change regarding homosexuals.
Learning from Infographics

It is well known that contact with the attitude object can result in attitude change (Krahé & Altwasser, 2006; Tropp & Pettigrew, 2005). However, research has revealed that not only direct contact with an attitude object, but also indirect contact, can diminish negative attitudes (Pettigrew & Tropp, 2008). In this investigation homosexuals represent the attitude object.

In a meta-analysis, Pettigrew and Tropp (2008) revealed essential factors reducing negative attitudes – that learning information about homosexuals reduces anxiety about group contact and increases empathy and perspective taking. Further, gaining knowledge about homosexuals can lead to discovering inconsistencies in false negative beliefs which were held against the sexual minority. This results in the arousal of negative emotional states such as guilt, which motivates the development of more favorable attitudes (Dovidio & Gärtner, 1999). Research in a wide variety of groups and settings firmly establish that contact diminishes prejudices and leads to more positive attitudes (Pettigrew & Tropp, 2008). Even though direct contact with homosexuals is known to be most effective in attitude change, studies also show that indirect contact (a homosexual friend of a friend, or processing information about homosexuality) diminishes negative attitudes toward homosexuals, as well (Pettigrew, Tropp, Wagner, & Christ, 2011). The change is explained by the reduction of prejudices at levels comparable to direct contact (Pettigrew, Christ, Wagner, & Stellmacher, 2007). However, little research has investigated the influence of learning on implicit attitudes,
particularly when the learning is derived from the information contained in an infographic.

There *is* evidence that learning can influence attitudes. For example, research with advertisements has indicated that giving consumers information about a product or a person can influence the consumers’ behavioral decisions to make a purchase (Costley & Brucks, 1992). Other studies in the area of judgment and decision making also support this finding. Specifically, research has shown that the use of information for behavioral decisions is related to its accessibility in memory (Costley & Brucks, 1992). These findings led us to the assumption that people, who learn information about homosexuality, might use this information in interactions with homosexuals leading to a less negative behavior.

Thus, the goal of this study is to design an infographic with information about homosexuality capable of shifting people’s implicit and explicit attitudes toward homosexuals and to investigate whether people’s level of NFC, perceived personal involvement, and learning impact the persuasiveness of the infographic.

The Present Investigation

In order to determine whether an infographic can influence people’s implicit and explicit attitudes toward homosexuals, we designed a study to test the interaction between NFC and the Information Content on an infographic about homosexuality and the impact of both variables on the persuasiveness of the infographic.
For the present investigation, we designed three infographics which differed in their Information Content – more precisely they provided different amounts of information about homosexuals. One infographic had a high amount of information, displaying facts about homosexuality as well as evidence supporting these facts; another infographic contained just the facts about homosexuality; and, a third infographic contained facts and evidence unrelated to homosexuality. Based on the literature, we implemented facts and evidence for biological origins of sexual orientation because this information is known to influence negative attitudes toward homosexuals (Altemeyer, 2002). The rationale behind the three infographics is the following: for people high in NFC, the high information infographic should be the most convincing, because high NFC people prefer detailed information to think deeply about an issue; for people low in NFC, there should be no difference between the persuasiveness of the infographics with a high amount and a low amount of information, because people low in NFC will process the high information infographic selectively and ignore information that requires deeper thinking and understanding (Petty, Briñol, Loersch, & McCaslin, 2009). The control condition was implemented in order to test the effect of the infographic’s content about homosexuality.

In the present investigation, participants processed one of three infographics; then the participants’ implicit and explicit attitudes toward homosexuals were measured because research suggests that both attitude types capture different aspects of the concept of attitude, as a whole. We further assumed to find differences in
the gender of homosexuals. Specifically, a review of the research literature on attitudes toward homosexuals revealed differences toward lesbians and gay men indicating that homosexual men are targets of more negative attitudes than homosexual women (Herek & Capitano, 1999; Kite, 1984; Kite & Whitley, 1996). Thus, we included measurements for lesbians and gay men separately. Implicit attitudes were operationalized with the Implicit Association Test (IAT), whereas for the explicit attitude measure, we constructed a Scenario scale with everyday life scenarios (including lesbians and gay men, respectively). Based on the definition by Hovland and Rosenberg (1960), we measured all three aspects of an attitude (Kroeber-Riel & Weinberg, 1996) – we investigated the cognitive aspect implicitly, while the emotional and behavioral component were assessed explicitly with items of the Scenario scale. Finally, we compared the attitudes across experimental groups in order to determine which infographic was the most effective in changing people’s attitudes and behavior toward homosexuals in a positive way in regards of their level of NFC.

Based on the rationale that perceived personal involvement influences an attitude’s strength as well as the ease to change attitudes (Petty, Cacioppo, & Schumann, 1983), we reasoned that perceived personal involvement would affect the interaction between Information Content and NFC, as well as the persuasiveness of the infographic. Further, the amount of what participants learned from the infographic was examined in order to test whether our study confirms the literature by stating that people who learned
more about homosexuality have a less negative attitude toward homosexuals because indirect contact reduces negative explicit and implicit attitudes.

The review of the literature yielded the following four research questions and related hypotheses to solve the problems mentioned above.

*Research question 1.* Are there difference in the attitudes toward lesbians and gay men?

*Hypothesis 1.* The attitude toward gay men is more negative than the attitude toward lesbians.

*Research question 2.* Does NFC influence the persuasiveness of the infographic?

*Hypothesis 2a.* People high and low in NFC have the same attitude toward homosexuals (less negative relative to the control group) when processing the infographic with a high amount of information about homosexuality. The high-information infographic provides a high amount of information which is assumed to convince people high in NFC because the high NFC people think about the information deeply. People low in NFC select the information and process it partially, thus the infographic has the same effect for both groups.

*Hypothesis 2b.* People low in NFC have a less negative attitude toward homosexuals than people high in NFC when processing the infographic with a low amount of information about homosexuality. The low information infographic is convincing for people low in NFC because it contains simple and easy arguments,
whereas people high in NFC require more detailed information about homosexuality in order to be as persuaded as people low in NFC.

*Research question 3.* Does learning of information from an infographic play an important role in shifting attitudes toward homosexuals? Are the concepts of NFC and learning from infographics related?

*Hypothesis 3.* People high in NFC learn more information about homosexuality from the infographic than people low in NFC; therefore people high in NFC have a less negative attitude toward homosexuals.

*Research question 4.* Does involvement influence attitude change regarding homosexuals?

*Hypothesis 4.* People with a high involvement in homosexuality have a less negative attitude toward homosexuals than people with a low involvement in homosexuality.
CHAPTER II

LITERATURE REVIEW

Persuasive Messages

If you are arriving at an airport and you spend attention to all the displayed messages, you realize: persuasion is everywhere – and that’s not only the case at an airport. We meet persuasive messages in our everyday life. We process some of them consciously, and others subconsciously. There are print messages in newspapers or in form of posters, advertisement in the radio, and all kinds of persuasive messages on TV; we cannot avoid them. But what do we know about persuasive messages. Why are some of them effective and others not? Why do some messages influence a specific group of people and not everyone? What determines the effectiveness of persuasive messages?

Visual Persuasive Messages

Persuasive messages can be presented in different ways. Since the message is often combined with a visualization in order to get the audience’s attention, one way to convey a message are posters or infographics. Unnava and Burnkrant (1991) state that pictures are better remembered than words; this effect is known as the “picture superiority effect” (p.226). However, also words can cause high memorability. Unnava and Burnkrant (1991) distinguish between high imagery words (e.g., table) and low imagery words (e.g., freedom). The first ones are more likely to create a picture or an
internal representation in people’s mind when reading the word, relative to low imagery words. “This is called the ‘imagery value’ of the word[…]. High imagery words are remembered better than low imagery words” (Unnava & Burnkrant, 1991, p.227), because they generate verbal and imaginal codes in people’s memory. This is in line with the dual-coding theory by Paivio (1991). If dual-coding of a persuasive message can be reached, the memory of the persuasive message will be better, because the information is easier retrievable (Unnava & Burnkrant, 1991). This fact explains why persuasive messages often combine pictures and text. Persuasive messages aim to stay in people’s mind in order to change a specific behavior.

**Different Types of Persuasive Messages**

There are different kinds of persuasive messages: Some researchers differentiate between social persuasive messages and commercial ones. The latter ones are designed to make a profit to companies; they try to induce people to do something (Perloff, 2008) – most of the time to buy a certain product such as a car or a six-pack of beer. On the other side, social persuasive messages try to convince their audience not to perform a particular activity. They are designed to promote social ideas or improve public health (Perloff, 2008). Social persuasive messages face more obstacles than commercial ones, because it is usually easier to persuade someone to invest in a commercial product than to “invest” into an idea, like quit smoking (Perloff, 2008). People are often in a social dilemma whether they should behave pro-social or not,
because a pro-social behavior is associated with behavioral costs such as money, time, effort, or inconvenience (Cornelissen, Dewitte, Warlop, & Yzerbyt, 2007). Thus, creators of social persuasive messages are responsible and challenged to persuade individuals to act in a socially beneficial way instead of choosing the cost-saving, selfish choice (Cornelissen et al., 2007). The overall goal is to protect society and to evoke pro-social behavior that serves the interest of society in the long term (Cornelissen et al., 2007). In the area of public health, there are persuasive messages trying to convince people to reject drugs, to start working out, to use sun-screen lotion, to practice safer sex, not to drink and drive, to wear helmets and to buckle up (Perloff, 2008). Perloff (2008) defines social persuasive messages as

a) Purposive attempts

b) To inform, persuade, or motivate behavior changes

c) In relatively well-defined and large audience

d) Generally for noncommercial benefits to the individuals and/or society at large

e) Typically within a given time period

f) By means of organized communication activities involving mass media and

g) Often complemented by interpersonal support.

According to this definition, the overall goal of a social persuasion is to inform, persuade, or motivate behavioral changes regarding a social issue. Changing a behavior is a challenging task which is most of the time closely connected to changing an attitude underlying the behavior. Perloff (2008) states that persuasive messages “are
conducted to shape […] attitudes” (p.443). However, an attitude itself is a complex concept which cannot be changed easily.

Attitudes

The goal of every persuasive message is to change undesired behavior in order to make life in a society easier. In order to change behavior permanently, a change of the underlying attitude is required. There are numerous definitions of attitudes that focus on different aspects. Allport (1935) defines: “An attitude is a mental and neural state of readiness, organized through experience, exerting a directive or dynamic influence upon the individual’s response to all objects and situations with which it is related” (p. 810). He focuses on the mental process that leads to behavior, while Thurstone (1931) underlines the evaluative element of an attitude by stating, an attitude is an “[…] affect for or against a stimulus” (p. 261). Ajzen (1993) summarizes these elements and defines an attitude as “[…] an individual’s disposition to react with a certain degree of favorableness or unfavorableness to an object, behavior, person, institution, or event […]” (p. 41).

A famous definition of attitudes is the three-component concept by Hovland and Rosenberg from 1960 (Kroeber-Riel & Weinberg, 1996). According to their model, an attitude contains three different elements: a cognitive aspect, an affective aspect and a behavioral aspect that interact with each other (Kroeber-Riel & Weinberg, 1996). To summarize these definitions, one can say that an attitude is a learned, subjective, positive
or negative judgment toward an object that influences the behavior concerning this object. In this context people, a single person, a group, ideas and norms as well as things can act as an object.

**Attitude-Behavior-Relationship**

In the last decades, it has been a psychological goal to predict behavior by measuring attitudes. The correlation between attitudes and behavior varies under certain circumstances. Nevertheless, an attitude is the best single predictor of behavior (Kroeber-Riel & Weinberg, 1996). There are different models that try to explain the relationship between attitudes and behavior.

**The Theory of Reasoned Action.** The theory of reasoned action, also called Ajzen-Fishbein-model, postulates that a behavior toward an object is the result of an intention. This intention is constructed by the attitude toward the attitude object (Mummendey, 1988). For the prediction of a certain behavior, the authors take the variable *subjective norm* into consideration. Subjective norm contains (1) the subjective perception of a situation, (2) the social desirability of the behavior, as well as (3) the individual motivation to behave appropriately to the social norm. The interaction of the variables in the theory of reasoned action is shown in Figure 1. The rationale behind the theory is not the prediction of observable behavior but the prediction of intentions. The authors assume a close relationship between intention and behavior.
The Theory of Planned Behavior. In 1986, Ajzen and his colleague Madden modified the theory of reasoned action; they added the variable *perceived cognitive control* to the theory of reasoned action (Mummendey, 1988). This modified model is called theory of planned behavior (view Figure 2). The subjective norm is related to the perception of the situation, for example, to reactions of other people which, then, influence the behavior. However, the variable *cognitive control* contains earlier expectations, for instance, if the person is able to show the behavior, if there is enough space and time etc.

*Figure 1.* The theory of reasoned action by Ajzen and Fishbein (Mummendey, 1988, p.8).
Attitude Change Through the Effects of Persuasive Messages

Some persuasive messages emphasize an undesired behavior such as alcohol and drug use as intolerably frequent (Cialdini, 2003). But the creators of these messages forget that the statement “many people are doing this undesirable action” contains the message “many people are doing it” (Cialdini, 2003); this message states that the undesired behavior is common, it is a social norm. Therefore, the undesired behavior might be shown more often than the desired actions.

Figure 2. The theory of planned behavior – a modification by Ajzen and Madden (Mummendey, 1988, p. 13).
The usage of social norms is one strategy used for persuasive messages because it guides actions in direct and meaningful ways (Schultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007). This is especially the case, during times of uncertainty, when individuals look for social norms in order to gain an accurate understanding of the situation and to behave in a socially tolerated way (Cialdini & Goldstein, 2004). The normative meta-message of a persuasive message often expresses that the desired, pro-social behavior is a common behavior. Therefore, people who are looking for a social norm might show the desired behavior (Cialdini, 2003). Persuasive messages promote a desired behavior with the goal to make this behavior a social norm. In order to reach this goal and to convince individuals to persuade others to engage in a particular behavior, the social norm has to stay salient – “not only immediately following message reception, but in the future as well” (Cialdini & Goldstein, 2004, pp.597). Therefore, long-term studies are essential even though they are time- and cost-intensive.

Based on the attitude-definition by Hovland and Rosenberg (1960), persuasive messages have to address all three components of an attitude in order to change a behavior and the underlying attitude. First, changing the cognitive aspect involves informing the audience about the disadvantages of the undesired behavior. The goal is to conduct an awareness of the adverse effects of the socially invaluable behavior. Second, emotional motivators can reach the audience effectively (Ohme, 2000), for example through a fear appeal in an antismoking campaign. A fear appeal should contain positive information on one’s ability to overcome this addiction in order to be effective.
(Ohme, 2000). Third, the behavioral component can be changed by presenting behavioral instructions or by presenting others performing socially valuable behavior, for example, celebrities showing alternative behavior instead of the socially invaluable behavior can be encouraging for the audience in order to copy this behavior. These three aspects are essential to change an attitude; they determine the effectiveness of a persuasive message on attitude change.

To conclude, in order to make a social persuasive message effective, cognitive, affective as well as behavioral concepts must be applied (Ohme, 2000). This is one factor explaining why some messages are more effective than others. Even though it is difficult to persuade people to change their behavior and the underlying attitude, persuasive messages that rely on argumentation, sloganeering and emotional appeals as well as behavioral instructions can change attitudes (Perloff, 2008).

Learning to Reduce Negative Attitudes:

Intergroup Contact Hypothesis

Another strategy to make a persuasive message effective in changing attitudes is creating direct contact with the attitude object. Negative attitudes are often built on prejudices and stereotypes toward a group. “Considerable research has shown that greater intergroup contact corresponds with lower intergroup prejudice” (Tropp & Pettigrew, 2005, p.951). According to the intergroup contact hypothesis by Allport (1954), there are four factors that determine whether positive effects of intergroup contact
occur in a specific situation or not. The four key conditions in the theory are equal group status within the situation, common goals, intergroup cooperation, and support of authorities, law or custom (Pettigrew, 1998).

The first factor stresses that both groups should expect and perceive equal status within the situation. Further, common goals between the groups, such as winning the season within interracial teams, help to reduce prejudice; an active, goal-oriented effort is needed to reduce prejudices. Regarding the third condition, Pettigrew (1998) states that “attainment of common goals must be an independent effort without intergroup competition” (p. 67), indicating that cooperation instead of competition is required to change negative attitudes. Moreover, implementing social sanctions and authorities impacts the effect of intergroup contact positively and leads to more acceptance of the minority. This shows that support of authorities, law or custom is one condition required to reduce negative attitudes through contact.

Allport’s hypothesis specifies critical situation conditions for intergroup contact to reduce prejudices. Thus, the intergroup contact hypothesis has received great attention. Further, the theory is of social importance and has been applied in various settings, across different situations, groups and societies. Most of the studies report positive contact effects, even in situations in which key conditions were lacking (Pettigrew, 1998). Therefore, it is well known that contact with the attitude object can result in attitude change, reducing negative attitudes based on prejudices (Krahé & Altwasser, 2006; Tropp & Pettigrew, 2005).
In this study, the sexual minority of homosexuals represents the attitude object. Interactions and exposure to the attitude objects represent direct contact; however, a persuasive visual message can only provide indirect contact by conveying information about the attitude object. Even though direct contact with the attitude object is known to be most effective in attitude change, studies also have shown that indirect contact (a homosexual friend of a friend, or processing information about homosexuality) diminishes negative attitudes, as well (Pettigrew, Tropp, Wagner, & Christ, 2011). Thus, gaining knowledge about the attitude object is one way to get in indirect contact with it. Information conveyed by a visual persuasive message can result in the construction of knowledge and therefore reduce negative attitudes toward the attitude object.

In a meta-analysis, Pettigrew and Tropp (2008) revealed essential factors reducing negative attitudes – that learning information about homosexuals reduces anxiety about group contact and increases empathy and perspective taking. Further, gaining knowledge about homosexuals can lead to discovering inconsistencies in false negative beliefs which were held against the sexual minority. This results in the arousal of negative emotional states such as guilt, which motivates the development of more favorable attitudes (Dovidio & Gärtner, 1999). Research in a wide variety of groups and settings firmly established that contact diminishes prejudices and leads to more positive attitudes (Pettigrew & Tropp, 2008). The degree to which an attitude was changed is comparable for direct and indirect contact (Pettigrew, Christ, Wagner, & Stellmacher, 2007). However, little research has investigated the influence of learning on implicit
attitudes, particularly when the learning is derived from the information contained in an infographic.

Persuasive Messages to Change Negative Attitudes:

Further Influencing Factors

The effectiveness of a persuasive message can be influenced by many variables, e.g. source variables, such as credibility, authority, likability, physical attractiveness and perceived similarity with the person who states the message. Message variables such as the structure of the persuasive message impact the persuasiveness of a message. Messages variables are factors such as the order of arguments, if the message is one- or two-sided and if the conclusion drawing happens explicitly or implicitly. Moreover, the content of the message is influencing. Specifically, does the message contain evidence, a fear or a guilt appeal?

Furthermore, there are receiver characteristics which impact the effectiveness of a persuasive message, for example the self-esteem, the gender as well as the intelligence. But also other personality characteristics like NFC, Dogmatism and Self-monitoring can influence the effectiveness of a persuasive message. That’s why a campaign can affect some people but not others. Another effect that is often mentioned on the receiver side is the third-person effect. It examines the receiver’s assumptions that the persuasive message is more persuasive for others than for the receiver himself.
Need for Cognition

The personality construct Need for Cognition (NFC) was first mentioned by Cohen, Stotland and Wolfe in 1955. NFC is defined as “a need to structure relevant situations in meaningful, integrated ways. It is a need to understand and make the experiential world reasonable” (Cohen et al., 1955, p. 291). Cacioppo and Petty (1982) assessed and elaborated the construct more deeply, their definition states that NFC is an individual’s tendency to engage in and enjoy thinking (Cacioppo & Petty, 1982). It can be seen as the tendency to gain intrinsic rewards from thinking per se in a variety of situations. Cacioppo and Petty (1982) argue that NFC is more a tendency than a disposition. Nevertheless, it directs behavior toward a goal and causes tension when this goal is not attained. In the following, when we talk about NFC, we refer to the definition by Cacioppo, Petty, Feinstein and Jarvis (1996) that NFC is “a stable individual difference in people’s tendency to engage in and enjoy effortful cognitive activity” (p. 198).

Due to the fact that NFC forms an individual difference, people differ in their level of NFC, meaning that people have different tendencies to organize, abstract and evaluate information. Some people seek for information and like to elaborate on them, others are satisfied with less information and prefer simple to complex problems. In order to measure the level of NFC, in 1982 Cacioppo and Petty developed a scale containing 34 items. However, the most commonly used version of the NFC scale is a short version by Cacioppo, Petty and Kao (1984) consisting of 18 statements (Petty,
This reduced scale allows researchers to measure the different levels of NFC in their sample. It has to be mentioned that NFC is a continuous variable, even though often only the two ends of the continuum are described.

People with a high level of NFC are often called “thinkers”; they have a deeper and richer elaboration than people with a low level of NFC. Thinkers enjoy complex tasks, while individuals with a lower level of NFC prefer to perform repetitive, monotonous tasks. Further, high NFC people show less frustration and mental discomfort during a complex problem, their positive outcomes are more closely related with their cognitive effort relative to the outcome of people with low NFC (Cacioppo & Petty, 1982). Apart from that, people with a high level of NFC think abstractly but still keep the central task in mind. They generate a greater number of issue-related thoughts and therefore enjoy complex problem-solving activities more than people with a low level of NFC. Furthermore, the level of NFC is related to the formation of an attitude. Individuals high in NFC “tend to form stronger automatic associations among attitude objects” (Petty et al., 2009, p.321) relative to people low in NFC.

People with a lower level of NFC focus more on the way information is presented than on the message itself, while thinkers are more influenced by the quality of the information (Petty et al., 2009). The latter ones seek more information about complex issues, whereas people with low NFC are more persuaded if the message is stated by a celebrity. In general, individuals with a low level of NFC prefer cues saving them from effortful thoughts, therefore they are more influenced by clear and simple appeals as well.
as by peripheral cues (Cacioppo et al., 1996). People with a high NFC seek strong arguments and tend to think about the credibility of the persuasive message; they elaborate the information more deeply. In general, thinkers need more information in order to be persuaded than individuals with a lower level of NFC. In line with that, people high in NFC tend to “form attitudes on the basis of an effortful analysis of the quality of the relevant information in a persuasive message” (Petty et al., 2009, p.320).

Another important aspect is the medium. Thinkers are more transported into a narrative conveyed by print, while the transportation of people with a lower level of NFC is higher if the narrative is conveyed by film (Green, Kass, Carrey, Herzig, Feeney, & Sabini, 2008). Further, a study by Carnaghi, Cadinu, Castelli, Kiesner, and Bragantini (2007) showed that people with high NFC preferred a written text, while individuals with low NFC learned more from a comic strip-format conveying the same information.

To conclude, one can state, that depending on the target group the persuasive message has to contain more qualitative arguments and facts (for people high in NFC) and it has to be aesthetically appealing by implementing celebrities or other peripheral cues (for people lower in NFC), respectively.

Haugtvedt and Petty (1992) state that people high in NFC tend to have stronger attitudes (e.g., more accessible in memory, more resistant to change) and that their attitudes have a greater impact on the related behavior, relative to people low in NFC. This is another important aspect for the design of a persuasive message. The goal
of a persuasive message is to change the attitude and the behavior of a large audience at the same time. The satisfaction of people low in NFC seems easier for creators of persuasive messages, because they are persuaded by peripheral cues; whereas individuals high in NFC elaborate the information of a persuasive message more deeply and question the quality of the presented arguments. If a persuasive message achieves to change the attitudes of people high in NFC, the change is more stable, relative to attitude changes in people with a low level of NFC.

Involvement

Another individual difference that needs to be taken into consideration when designing an effective infographic is perceived personal involvement. Perceived personal involvement can be defined as the personal relevance or importance of an attitude object for a person. In this investigation, homosexuals are the attitude object. People who know many homosexuals, or even are homosexual themselves, feel more personally involved in the issue of discriminations of homosexuals than people whose familiarity and interaction with homosexuals is low.

Furthermore, people who are highly involved in the persuasive message are persuaded by the argument rather than peripheral cues. On the other hand, for people who are low involved the effectiveness of the messages is a function of peripheral cues such as the expertise of the message source. Therefore, Petty, Cacioppo and Goldman (1981) suggest that persuasive messages should consider peripheral cues as well as
arguments in order to persuade a large audience with different levels of personal involvement.

Involvement can change over time: Apsler and Sears (1968) state that people are likely to become personally involved with an issue when they expect it to have significant consequences for their own lives. Studies have found that high involved people need more issue-relevant arguments in order to be persuaded than people who are less involved (Petty, Cacioppo, & Goldman, 1981; Petty & Cacioppo, 1979). This is due to the fact that people who are more involved are more motivated to process arguments of a persuasive message because the issue has a higher personal relevance. Whereas people who are less involved, are less motivated to do the cognitive work necessary to evaluate the persuasive message and its arguments. Due to the deeper processing of people with high involvement, their attitude will be more stable. Research on attitudes and persuasion has shown that the intensity with which an attitude is held – an attitude’s strength – is influenced by the involvement of the person: people with a high involvement have a stronger attitude and therefore their attitudes are less easy to shift (Petty, Cacioppo, & Schumann, 1983) relative to people with a low involvement.

Another reason why the processing of issue-relevant information may be greater under high involvement than under low is that people have a greater ability to do so based on a higher prior knowledge about the topic. If an issue has high personal consequences, it is likely that the person has done considerable thinking about the issue in the past and “…has a large structure of preexisting information that can be useful in
evaluating new information. Thus, a person might find it easier to evaluate the cogency of an argument on a topic of high rather than low involvement” (Petty, Cacioppo, & Goldman, 1981, p.853). Studies have shown that people have a better developed schema or framework for thinking about issues that are relevant to the self than issues that are irrelevant. Since research has shown that an individual’s level of personal relevance of a message can cause different (and even opposite) effects, perceived personal involvement is an individual variable we reasoned to be involved in attitudes. Despite general agreement on the importance of involvement, the role of involvement on attitude change in the context of processing information about homosexuality is not well understood (Celsi & Olson, 1988). We assume that involvement moderates attitude change regarding homosexuals.

Summary

To sum up, research in psychology and persuasion shows different variables that determine the effectiveness of a persuasive message. According to the three-component concept of an attitude, there are three important components that need to be considered to change an attitude. More precisely, depending on how one defines the term “attitude”, one have to consider different aspects. Whether these aspects are influenced or not determines the effectiveness of a messages. The goal is to prevent socially invaluable behavior or to change it into a behavior which is pro-social, normative and widely accepted and therefore shown by the majority of people.
There are many source variables, message and recipient factors that also influence the effectiveness of a message. They determine which recipients are targeted and which are not impacted by the persuasive message. Of course persuasion has its limits, but this does not mean persuasion “is powerless or ineffectual […] Persuasion can be an instrument of […] social change” (Perloff, 2008, p.486). In the present investigation, we focused on infographics and their content, and how learning (as an indirect group contact which results in knowledge construction), NFC, and Involvement influence the persuasiveness of an infographic. The goal is to change negative attitudes toward homosexuals in order to reduce the socially invaluable behavior of discrimination.
CHAPTER III

METHODOLOGY

Design

Two factors, Infographic Content and Need for Cognition were crossed to yield six between-subjects cells. The resulting design was a 3 Infographic Content (high vs. low vs. none) x 2 Need for Cognition (high vs. low) fixed analysis of variance.

Participants

One hundred and sixty-four undergraduate students (aged 18 to 60 years, $M_{\text{age}} = 22.17$ years, male $n = 47$) voluntarily participated in the study in exchange for extra credit from a mid-size university in the Western United states. Participants were randomly assigned to the between-subjects conditions: 58 students processed the infographic with a high amount of information, and 53 participants each were assigned to either the condition low amount of information or no information, respectively. One hundred and forty-five participants reported their sexuality as heterosexual; eight identified themselves as homosexual; and seven reported that they are bisexual; four people refrained from reporting their sexuality.

Materials

The materials used in this investigation consisted of the experimental infographics, two scaled instruments – one designed to measure NFC, and the other
constructed to measure explicit attitudes toward homosexuality, and two techniques – one to estimate implicit attitudes toward homosexuality, and one to estimate comprehension of the infographics; the study was built with these materials in Qualtrics.

**Infographics**

The experimental infographic was a chromatic illustration measuring 1500 x 1300 pixels of eight multicolored circles distributed in a generally lateral configuration, with each circle containing information, and one circle centered in the middle of the display with the title "Life". The content in the graphic was of three types: facts about homosexuality, evidence supporting these facts, and information unrelated to homosexuality (facts and evidence about everyday life). When the infographic contained a high amount of information, it displayed the facts and the evidence about homosexuality; when it contained a low amount of information, only the facts about homosexuality were displayed; and when it contained no information the only information displayed was unrelated to homosexuality. Facts were 13- to 17-word statements, sampled widely from credible and well-respected sources on the Internet, to convey the general message that homosexuality is pervasive, partially innate, and widely spread in everyday life. Evidence was comprised of 25- to 30-word statements providing additional information from the same sources supporting the facts. Information unrelated to homosexuality consisted of facts about everyday life, and the associated evidence
supporting the unrelated facts, the unrelated information was structured and vetted in the same way as described above.

Since the infographic was created by the researchers specifically for this study, it was essential to make certain that the graphic content among all three conditions was equivalent in persuasiveness, and interestingness, but not in relatedness to homosexuality. Thus, prior to the main study, a pool of 40 facts and 40 evidence statements were generated, half of which were intended to be related, and half unrelated to homosexuality. Thirty-five undergraduate volunteers (male $n = 5$, $M_{age} = 23.6$ years, ranging from 19 to 50 years) were directed to rate each of the 40 statements (facts and evidence) on a 7-point Likert-scale labelled 1 = “not at all” and 7 = “very”. From the pool of statements, a least-squares method was used to find a set of eight homosexuality-related and eight homosexuality-unrelated statements with equivalent persuasive and interest ratings, but inequivalent ratings on homosexuality. Paired t-tests revealed that the two groups of eight statements met these conditions (see Table 1 for the means, standard deviations, and t-values; see Appendix 1 for the chosen pairs of statements).

In order to maximize the external validity of the infographic’s effect, a context image was designed in which the infographic was embedded. The context image (1500 x 1000 pixel) taken from the Internet and modified for the purpose of the study showed the infographic as a billboard in a neutral environment on a street (see Appendix 2). The authors made certain that one was not able to determine where the picture was
taken. The context image was automatically displayed for five seconds before presenting the infographic (see Appendix 3 for the three infographics).

Table 1. Means, standard deviations and t-test values for the norming ratings of the facts.

<table>
<thead>
<tr>
<th>Statement</th>
<th>$M$</th>
<th>$SD$</th>
<th>$t$-test value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fact 1 homo persuasiveness</td>
<td>3.77</td>
<td>2.10</td>
<td>$t(34) = .50, p = .63$</td>
</tr>
<tr>
<td>Fact 1 hetero persuasiveness</td>
<td>3.57</td>
<td>2.21</td>
<td></td>
</tr>
<tr>
<td>Fact 1 homo interestingness</td>
<td>5.66</td>
<td>1.24</td>
<td>$t (34) = .59, p = .56$</td>
</tr>
<tr>
<td>Fact 1 hetero interestingness</td>
<td>5.51</td>
<td>1.69</td>
<td></td>
</tr>
<tr>
<td>Fact 2 homo persuasiveness</td>
<td>3.54</td>
<td>1.83</td>
<td>$t (34) = -.46, p = .65$</td>
</tr>
<tr>
<td>Fact 2 hetero persuasiveness</td>
<td>3.71</td>
<td>2.01</td>
<td></td>
</tr>
<tr>
<td>Fact 2 homo interestingness</td>
<td>5.23</td>
<td>1.70</td>
<td>$t (34) = 1.19, p = .24$</td>
</tr>
<tr>
<td>Fact 2 hetero interestingness</td>
<td>4.83</td>
<td>1.87</td>
<td></td>
</tr>
<tr>
<td>Fact 3 homo persuasiveness</td>
<td>3.80</td>
<td>2.17</td>
<td>$t (34) = .27, p = .79$</td>
</tr>
<tr>
<td>Fact 3 hetero persuasiveness</td>
<td>3.69</td>
<td>2.19</td>
<td></td>
</tr>
<tr>
<td>Fact 3 homo interestingness</td>
<td>5.54</td>
<td>1.22</td>
<td>$t (34) = .35, p = .73$</td>
</tr>
<tr>
<td>Fact 3 hetero interestingness</td>
<td>5.46</td>
<td>1.77</td>
<td></td>
</tr>
<tr>
<td>Fact 4 homo persuasiveness</td>
<td>3.29</td>
<td>2.08</td>
<td>$t (34) = .39, p = .70$</td>
</tr>
<tr>
<td>Fact 4 hetero persuasiveness</td>
<td>3.14</td>
<td>2.20</td>
<td></td>
</tr>
<tr>
<td>Fact 4 homo interestingness</td>
<td>4.91</td>
<td>1.60</td>
<td>$t (34) = .47, p = .64$</td>
</tr>
<tr>
<td>Fact 4 hetero interestingness</td>
<td>4.74</td>
<td>2.21</td>
<td></td>
</tr>
<tr>
<td>Fact 5 homo persuasiveness</td>
<td>4.37</td>
<td>2.28</td>
<td>$t (34) = .18, p = .86$</td>
</tr>
<tr>
<td>Fact 5 hetero persuasiveness</td>
<td>4.31</td>
<td>2.10</td>
<td></td>
</tr>
<tr>
<td>Fact 5 homo interestingness</td>
<td>5.77</td>
<td>1.09</td>
<td>$t (34) = .77, p = .45$</td>
</tr>
<tr>
<td>Fact 5 hetero interestingness</td>
<td>5.57</td>
<td>1.46</td>
<td></td>
</tr>
<tr>
<td>Fact 6 homo persuasiveness</td>
<td>3.77</td>
<td>2.07</td>
<td>$t (34) = 1.12, p = .27$</td>
</tr>
<tr>
<td>Fact 6 hetero persuasiveness</td>
<td>3.31</td>
<td>2.26</td>
<td></td>
</tr>
<tr>
<td>Fact 6 homo interestingness</td>
<td>5.80</td>
<td>1.47</td>
<td>$t (34) = .57, p = .57$</td>
</tr>
<tr>
<td>Fact 6 hetero interestingness</td>
<td>5.63</td>
<td>1.54</td>
<td></td>
</tr>
<tr>
<td>Fact 7 homo persuasiveness</td>
<td>4.26</td>
<td>1.93</td>
<td>$t (34) = -.97, p = .34$</td>
</tr>
<tr>
<td>Fact 7 hetero persuasiveness</td>
<td>4.63</td>
<td>2.10</td>
<td></td>
</tr>
<tr>
<td>Fact 7 homo interestingness</td>
<td>5.66</td>
<td>1.32</td>
<td>$t (34) = .74, p = .47$</td>
</tr>
<tr>
<td>Fact 7 hetero interestingness</td>
<td>5.43</td>
<td>1.56</td>
<td></td>
</tr>
<tr>
<td>Fact 8 homo persuasiveness</td>
<td>4.20</td>
<td>2.10</td>
<td>$t (34) = .91, p = .37$</td>
</tr>
<tr>
<td>Fact 8 hetero persuasiveness</td>
<td>3.83</td>
<td>1.96</td>
<td></td>
</tr>
<tr>
<td>Fact 8 homo interestingness</td>
<td>5.23</td>
<td>1.82</td>
<td>$t (34) = .66, p = .52$</td>
</tr>
<tr>
<td>Fact 8 hetero interestingness</td>
<td>4.97</td>
<td>1.82</td>
<td></td>
</tr>
</tbody>
</table>

**Need for Cognition Scale**

NFC was assessed using the reduced Need for Cognition Scale (NCS) by Cacioppo, Petty and Kao (1984). The NCS is a 18-item forced-choice test designed to assess individual differences in intrinsic motivation to engage in effortful cognitive endeavors (Cacioppo & Petty, 1982; Cacioppo, Petty, & Kao, 1984) with items such as “The notion of thinking abstractly is appealing to me” and “Thinking is not my idea of fun” (reverse-coded). All items were displayed on one page and rated on a 9-point Likert-scale anchored at -4 = “very strong disagreement” and 4 = “very strong agreement” with all possible choices labelled. The NCS reports an internal consistency
reliability of Cronbach’s $\alpha = .90$ (Cacioppo et al., 1984), while recent studies (Carnaghi, Cadinu, Castelli, Kiesner, & Bragantini, 2007; See, Petty, & Evans, 2009) reported a Cronbach’s $\alpha = .97$ and $\alpha = .81$, respectively. The present investigation yielded a Cronbach’s $\alpha = .90$ using the participant sample. For criterion validity, the NCS reports positive correlations with cognitive style ($r = .19$) and American College Testing Program Exam scores related to intelligence (ACT, $r = .39$), as well as a negative correlation with dogmatism ($r = -.27$; Cacioppo & Petty, 1982).

Explicit Attitude Toward Homosexuals: The Scenario Scale

In order to measure explicit attitudes toward homosexuals, we carefully designed a Scenario scale including 30 everyday life scenarios regarding homosexuality. The Scenario scale contained 15 scenarios describing interactions with lesbians and 15 scenarios describing interactions with gay men which differed just in terms of gender words (e.g., “waiter” and “waitress”). Thus, the purpose of the Scenario scale was to determine (a) the emotional component and (b) the behavioral component of respondents’ explicit attitude toward lesbians and gay men, respectively. To assess the emotional component, participants rated on a 9-point Likert-scale how comfortable they would feel in a described situation with -4 = “very uncomfortable” and 4 = “very comfortable”; to estimate the behavioral component, a second rating on a 9-point Likert-scale labelled -4 = “very unlikely” to 4 = “very likely” determined how likely it was that participants showed a scenario-specific behavior. The scenarios, as well as the questions for the
behavioral component, are displayed in Table 2. The scenarios were randomly presented to avoid order effects. Reliability values of the Scenario scale are contained in Table 3.

Table 2. The scenarios and the items measuring the behavioral component of the explicit attitude toward gay men.

<table>
<thead>
<tr>
<th>Scenario (“Imagine the following situation…”)</th>
<th>Item to measure the behavioral component</th>
</tr>
</thead>
<tbody>
<tr>
<td>You are in a restaurant. You can tell that the waiter who is serving your table is gay.</td>
<td>How likely is it that his sexuality affects how much you tip?</td>
</tr>
<tr>
<td>You are sitting in the chair of your hairdresser and he tells you that he finally came out and announced to his boss, friends, and family that he is gay.</td>
<td>How likely is it that you keep going to your hairdresser?</td>
</tr>
<tr>
<td>You are about to buy a product at a local farmer’s market, then you read a sign saying that 40% of its price goes to an organization that supports gay men.</td>
<td>How likely is it that you will buy the product?</td>
</tr>
<tr>
<td>You are looking for a job as a nanny. You are invited for an interview. When you arrive, you realize that the parents are both men. They offer you the job.</td>
<td>How likely is it that you take the job?</td>
</tr>
<tr>
<td>A friend of yours asks you to go with him to a gay pride parade.</td>
<td>How likely is it that you will accompany him to the parade?</td>
</tr>
<tr>
<td>You are dancing with some friends in a club. Two men enter the club and start dancing with each other nearby.</td>
<td>How likely is it that you dance further away from them?</td>
</tr>
<tr>
<td>You are part of a sports team. One of your team members recently came out as homosexual. After practice, you and your team members are dressing in the locker room.</td>
<td>How likely is it that you change in front of the team member who came out?</td>
</tr>
<tr>
<td>You are waiting for a train. On the track you observe a gay couple kissing each other and saying goodbye. When you enter the train and look for your seat, you notice that your seat is next to the gay man who you saw saying goodbye.</td>
<td>How likely is it that you change your seat?</td>
</tr>
<tr>
<td>You are invited to a Bachelor party of a gay friend. You do not know what is planned and what is going to happen at the party.</td>
<td>How likely is it that you go to the Bachelor party?</td>
</tr>
<tr>
<td>You are zapping through different channels. You end up watching a TV series you do not know. After a while the main characters (two men) start kissing each other, you realize that the actors play a gay couple.</td>
<td>How likely is it that you switch the channel?</td>
</tr>
<tr>
<td>Your child goes to elementary school. The teacher informs you that there will be an optional week in which the children learn about gay men and their lifestyle.</td>
<td>How likely is it that you opt out your child for participation during this week?</td>
</tr>
</tbody>
</table>
Your friend has a son and you are babysitting the little boy. He was really nice this afternoon and as a reward you want to buy him a toy, so the two of you go into a toy store and you ask him which toy he would like to have. The little boy requests a doll. How likely is it that you buy a doll for your friend's son?

You are at the birthday party of a friend. Some other guests play a game in which you have to drink out of one cup. Some of the couples playing the game are gay men. How likely is it that you join the game which includes sharing the cup?

You are looking for a nanny for your child. You have interviewed several people, and the man you finally pick is willing to take the job. Then you learn the man has recently come out as gay. How likely is it that you hire the person as the nanny for your child?

Your child has a friend who is gay. Recently, their friendship seems to be getting stronger. How likely is it that you will intervene in this friendship?

Note: male version of the scenarios (interactions with gay men); for the explicit attitude toward lesbians we change the words implicating a gender into the female version.

Table 3. Cronbach’s α for the Scenario scale.

<table>
<thead>
<tr>
<th>Measure of Scenario scale</th>
<th>Cronbach’s α</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotional component attitude toward lesbians</td>
<td>.95</td>
</tr>
<tr>
<td>Behavioral component attitude toward lesbians</td>
<td>.87</td>
</tr>
<tr>
<td>Emotional component attitude toward gay men</td>
<td>.95</td>
</tr>
<tr>
<td>Behavioral component attitude toward gay men</td>
<td>.88</td>
</tr>
</tbody>
</table>

IAT in General

The implicit association test (IAT) is a sorting task used to estimate implicit attitudes, or more precisely to indirectly measure the association strength between paired concepts (Greenwald, Nosek, & Banaji, 2003). Items (images or words) appear in the middle of the screen and are sorted into four categories, of which most of the time two represent a concept discrimination (e.g., homosexual vs. heterosexual) and two represent
an attribute discrimination (e.g., good vs. bad). The items should be typical exemplars for the concepts and the attributes (Nosek, Greenwald, & Banaji, 2007). There are just two response options (e.g., key A and key L), each of which is assigned to two of the four concepts (e.g., homosexual and good for key A and heterosexual and bad for key L). A right-hand key press categorizes the item as one concept (e.g., homosexual) and one attribute (e.g., good), whereas a left-hand key press represents an association between the other two categories (e.g., heterosexual and bad). For the second sorting task, the key assignments for the category pairs are switched (e.g., heterosexual and good now share a response key as well as homosexual and bad). The reaction time, also referred to as response latency or performance speed, is measured and compared between the two different sorting tasks. The IAT measure, or IAT effect, is interpreted in terms of association strength by assuming that participants respond faster (and make less mistakes) when the concept and attribute that share a response key are strongly associated than when their association is weaker (Greenwald, Nosek, & Banaji, 2003). The advantage of the IAT is that participants classify and process stimuli without overtly considering and reporting their preferences. Furthermore, it can be applied in many different areas because it provides access to a broad variety of socially significant associations and implicit attitudes (Greenwald, Nosek, & Banaji, 2003).
Lesbian- and Gay Men-IAT

We constructed a lesbian- and a gay men-IAT in order to estimate participants’ attitudes towards homosexuals implicitly by measuring and comparing the reaction time for associations between the concepts homosexual and heterosexual and the attributes good and bad. Each concept and attribute (homosexual, heterosexual, good, bad) was represented by six items. The items for the attribute categories (good and bad) were words, whereas the concept categories (homosexual and heterosexual) were represented by images.

The word stimuli were taken from a normed word list (Phelps, LaBar, & Spencer, 1997) which is commonly used in the IAT technique (Olson & Marshuetz, 2005); the same number of nouns and adjectives were used for the two attribute categories. The positive words were beautiful, glorious, joyful, pleasure, smile, and wonderful. As negative words, we used agony, awful, horrible, hurt, nasty, and terrible.

For the concept images, a pool of photographs was preselected by the researchers from the Internet. In order to make certain that the images were typical exemplars for the concepts (homosexual, heterosexual) and the IAT was a valid measure estimating the implicit attitude toward homosexuals, the images were normed. Prior to the main study, for the lesbian-IAT (for the gay men-IAT), 20 images of lesbian couples (20 images of gay men) and 20 images of heterosexual couples were rated by 36 undergraduate volunteers (male n = 5, M_age = 24.72 years, ranging from 20 to 51 years) on a 7-point semantic differential scale as either homosexual or heterosexual, positive or
negative, good or bad, gay or straight, dislikable or likable, uncomfortable or comfortable, and attractive or unattractive. The images were presented in random order. From the pool of images, a least-squares method was used to find a set of six lesbian (gay men) images and six heterosexual images with equivalent valence (positive/negative and good/bad), and equivalent ratings of likability, comfort and attractiveness, but inequivalent ratings on homosexuality (homosexual/heterosexual and gay/straight).

Paired t-tests (α = .05) revealed that the two groups of six pairs each for the lesbian- and the gay men-IAT met these conditions. Some of the heterosexual images were the same in the lesbian- and in the gay men-IAT; therefore the order of the two IAT was counterbalanced to avoid familiarity effects due to previous exposure to a particular stimulus.

The whole IAT procedure consisted of seven blocks – three single blocks and four combined blocks. Each word and image was displayed twice in each block, so that there were 24 items for the single blocks and 48 items for combined blocks. During the first block (single block), all six homosexual images and six heterosexual images were presented twice (24 trials). During the 24 trials of the second block (single), each of the six positive and six negative words was presented twice. The third and fourth block (1st sorting task) were identical – all 24 stimuli (12 concept images and 12 attribute words – combined block) were presented twice, resulting in a total of 48 trials. The fifth block was similar to the first block and block six and seven (2nd sorting task) resembled the third and fourth block, except with regard to the response assignments for
homosexual and heterosexual; for the first sorting task, homosexual – good and heterosexual – bad shared a response key; for the second sorting task, the pairs switched so that homosexual – bad and heterosexual – good shared a response key. The procedure of the seven blocks can be seen in Table 4.

All blocks were separated by a self-terminated pause during which written instructions, the labels for the next block, and their allocation to the response keys were presented on the screen. The order in which the different stimuli were presented was randomized for each block and each participant separately.

After an incorrect response to a trial (word or image) a red X appeared for 500ms in the center of the screen before the next stimulus was presented. Since reversed response mapping is known to influence performance, we used the training block and the feedback on each trial to minimize this order effect (Nosek et al., 2007).

The difference in average latency between the two sorting tasks (block three and six or four and seven, respectively) provides the basis for the IAT measure. For example, faster responses for the homosexual – good / heterosexual – bad task than for the heterosexual – good / homosexual – bad task indicate a stronger association of homosexuals than heterosexuals with positive valence. Thus, the response time difference between block three and six and four and seven, respectively, was taken as a measure of implicit preference for heterosexual over homosexual couples.
Table 4. Process of the lesbian- and gay men-IAT with the sequence of trial blocks.

<table>
<thead>
<tr>
<th>Block</th>
<th>No. of trials</th>
<th>Function</th>
<th>Items assigned to left-key response</th>
<th>Items assigned to right-key response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>24</td>
<td>Practice</td>
<td>Homosexual images</td>
<td>Heterosexual images</td>
</tr>
<tr>
<td>2</td>
<td>24</td>
<td>Practice</td>
<td>Good words</td>
<td>Bad words</td>
</tr>
<tr>
<td>3</td>
<td>48</td>
<td>1st Sorting Task</td>
<td>Homosexual images + Good words</td>
<td>Heterosexual images + Bad words</td>
</tr>
<tr>
<td>4</td>
<td>48</td>
<td>1st Sorting Task</td>
<td>Homosexual images + Good words</td>
<td>Heterosexual images + Bad words</td>
</tr>
<tr>
<td>5</td>
<td>24</td>
<td>Practice</td>
<td>Heterosexual images</td>
<td>Homosexual images</td>
</tr>
<tr>
<td>6</td>
<td>48</td>
<td>2nd Sorting Task</td>
<td>Heterosexual images + Good words</td>
<td>Homosexual images + Bad words</td>
</tr>
<tr>
<td>7</td>
<td>48</td>
<td>2nd Sorting Task</td>
<td>Heterosexual images + Good words</td>
<td>Homosexual images + Bad words</td>
</tr>
</tbody>
</table>

Note: A trial is defined as the time from the onset of a single stimulus to a categorization of it. Trials in which an error is made did not require the participant to correct the error before proceeding; after the red X the next stimulus appeared automatically. Homosexual images = images of homosexual couples (lesbian couples for the lesbian-IAT and gay men couples for the gay men-IAT); Heterosexual images = images of heterosexual couples.

Sentence Verification Technique in General

The Sentence Verification Technique (SVT) is a method measuring reading comprehension introduced by Royer, Hastings, and Hook (1979). To test the reading comprehension of a text passage, the SVT test consists of 16 test sentences with four different types of test sentences each used four times: (1) an original item is an exact repetition of the sentence as it appears in the passage; (2) a paraphrase item conveys the same meaning as a sentence in the passage but is developed by changing as many words as possible; (3) a meaning change item has the same syntax as a sentence in the text passage, however one or two words are changed such as the meaning of the sentence.
changes completely; (4) a distractor item has a similar syntactic structure as a passage sentences but the meaning of a distractor item is unrelated to any sentence in the passage.

Students read the text passage and afterwards, without re-examining the passage, respond to the test sentences by rating each item as “yes” meaning this sentence is or means the same as a passage sentence (correct answer for original and paraphrase items) or “no” meaning this sentence has a different meaning from a passage sentence (correct answer for meaning change and distractor items). The rationale behind the technique is that, after reading and understanding a text, the meaning is stored in memory, but not necessarily the exact wording. Thus, the SVT test examines whether the reader can store the meaning of the text in memory, or not (Rasool & Royer, 1986).

The test sentences are arranged randomly in the SVT test with the restriction that test sentences assessing the first half of the passage appear first in the test. The purpose of this restriction is to prevent that the first test sentence has just been read, and thus allowing the participant to respond to the test sentence using the contents of short-term memory. The decision to use an equal number of each of the item types was made to ensure that the test contains an equal number of Yes- (original and paraphrase) and No-items (meaning change and distractors) so that participants do not response in a biased way favoring one response over the other. The SVT test can be used in a wide range of areas, e.g. to measure learning from reading outcomes and to test if prior attitudes serve as a filtering system that affects the information people select from a text (Royer, 2001).
Sentence Verification Technique for Comprehension of Infographics Content

Due to the fact that it is a measure that can be developed for specific texts, the SVT test fit our purpose to measure learning from the information on the infographic well. For the facts related to homosexuality, as well as for the evidence related to homosexuality, we constructed two 16-sentence SVT tests each consisting of four original items, four paraphrase items, four meaning change items, and four distractor items using test development teams recommended by Royer (2001; see Appendix 4). The test sentences were presented on separate pages one at a time. The order of the items in each SVT test was fixed, but randomly arranged prior to the experiment. The items and their order for both SVT tests are displayed in Table 5.

Table 5. Test sentences used for the Sentence Verification Technique to measure learning of the statements related to homosexuality on the infographic.

<table>
<thead>
<tr>
<th>#</th>
<th>Item type</th>
<th>Test item in the SVT test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Distractor</td>
<td>All over the U.S., the number of divorced homosexual couples has grown.</td>
</tr>
<tr>
<td>2</td>
<td>Distractor</td>
<td>U.S. citizens who live alternative lifestyles are more likely to adopt children.</td>
</tr>
<tr>
<td>3</td>
<td>Meaning Change</td>
<td>Approximately 9 million U.S. citizens are not heterosexuals and live a single lifestyle.</td>
</tr>
<tr>
<td>4</td>
<td>Paraphrase</td>
<td>As of last year, 72% of U.S. states have passed laws legalizing marriage for gay and lesbian couples.</td>
</tr>
<tr>
<td>5</td>
<td>Paraphrase</td>
<td>Heterosexual men and lesbian women appear to have analogous brain structures.</td>
</tr>
<tr>
<td>6</td>
<td>Distractor</td>
<td>Love at first sight is more common among homosexuals than heterosexuals.</td>
</tr>
<tr>
<td>7</td>
<td>Paraphrase</td>
<td>11% of U.S. families are comprised of a man and a woman who are married and a pair of children.</td>
</tr>
<tr>
<td>8</td>
<td>Distractor</td>
<td>In the U.S., there are as many divorced couples with children as married homosexual couples.</td>
</tr>
<tr>
<td>9</td>
<td>Original</td>
<td>The brain structure of homosexual women is similar to the brain structure of heterosexual men.</td>
</tr>
<tr>
<td>10</td>
<td>Paraphrase</td>
<td>The quantity of same-sex couples, married or living together has risen in number.</td>
</tr>
<tr>
<td>11</td>
<td>Meaning Change</td>
<td>In one second, people cannot detect whether a man is gay or straight.</td>
</tr>
<tr>
<td>12</td>
<td>Original</td>
<td>The surge of hormones in the womb can influence adult human sexual orientation.</td>
</tr>
<tr>
<td>13</td>
<td>Original</td>
<td>The existence of homosexual behavior among different animal species may</td>
</tr>
<tr>
<td>No.</td>
<td>Type</td>
<td>Text</td>
</tr>
<tr>
<td>-----</td>
<td>------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>14</td>
<td>Meaning Change</td>
<td>The existence of homosexual behavior among different animal species may confer certain evolutionary disadvantages.</td>
</tr>
<tr>
<td>15</td>
<td>Meaning Change</td>
<td>The temperature in the womb can influence adult human sexual orientation.</td>
</tr>
<tr>
<td>16</td>
<td>Original</td>
<td>In 2014, 36 of the 50 states in the U.S. have legalized same-sex marriage.</td>
</tr>
<tr>
<td>17</td>
<td>Meaning change</td>
<td>Studies have shown that, even at 50ms, heterosexual participants were able to judge significantly better than homosexual participants if a man is gay or not by seeing the man’s face.</td>
</tr>
<tr>
<td>18</td>
<td>Meaning change</td>
<td>Florida became the 36th state to legalize same-sex marriage in 2014. The minority of U.S. citizens now live in states that have legalized same-sex marriage.</td>
</tr>
<tr>
<td>19</td>
<td>Paraphrase</td>
<td>Sexual preference is affected by the amount of prenatal androgens people are exposed to in the womb. According to a study, the surge of prenatal androgens is higher for lesbians than for heterosexual women.</td>
</tr>
<tr>
<td>20</td>
<td>Paraphrase</td>
<td>Since last year, it is legal for homosexual couples to get married in Florida. A minority of Americans now live in one of the 14 states that have still deemed gay marriage illegal.</td>
</tr>
<tr>
<td>21</td>
<td>Distractor</td>
<td>fMRI studies have shown that sexual preferences are not influenced by the environment; instead only genetic components affect if a person is gay or straight.</td>
</tr>
<tr>
<td>22</td>
<td>Paraphrase</td>
<td>Brain scans showed that a gay man’s brain reacts similar to the brain of a straight woman when looking at a picture of a male face.</td>
</tr>
<tr>
<td>23</td>
<td>Original</td>
<td>A study showed that prenatal androgens affect the homosexuality in both sexes, e.g. homosexual women are exposed to more prenatal androgens than are heterosexual women.</td>
</tr>
<tr>
<td>24</td>
<td>Distractor</td>
<td>There is an increasing trend of U.S. citizens to not call a same-sex couple with a child “normal”.</td>
</tr>
<tr>
<td>25</td>
<td>Original</td>
<td>Only 11% of all families live in what is considered a standard lifestyle; this shows that homosexual households are as “normal” as every other family unit.</td>
</tr>
<tr>
<td>26</td>
<td>Meaning change</td>
<td>An fMRI study showed that homosexual men have a reaction in the same brain area as heterosexual women when viewing a picture of a baby.</td>
</tr>
<tr>
<td>27</td>
<td>Meaning change</td>
<td>3.5% of Americans are not identified as LGBT people which stands for lesbian, gay, bisexual, and transsexual – this is roughly the population of New Jersey.</td>
</tr>
<tr>
<td>28</td>
<td>Distractor</td>
<td>In 2011, 347,000 same-sex couples reported liking to adopt a child, 128,000 of them were gay men. In 2013, 35,000 same-sex couples adopted a child and helped to increase the adoption rate.</td>
</tr>
<tr>
<td>29</td>
<td>Original</td>
<td>A study has shown that same-sex pairings can increase fitness by providing superior care for offspring. It decreases the likelihood of divorce, strengthens social bonds, and reduces competition.</td>
</tr>
<tr>
<td>30</td>
<td>Paraphrase</td>
<td>Four years ago, the amount of homosexual couples living together was estimated about 605,000, of which 168,000 were married. In 2013, these numbers raised up to 726,000 homosexual households with about a third of them having a spouse.</td>
</tr>
<tr>
<td>31</td>
<td>Distractor</td>
<td>A study has shown that all animal species have the same likelihood to show homosexual behavior. Same-sex pairings have neither evolutionary roots nor natural advantages.</td>
</tr>
<tr>
<td>32</td>
<td>Original</td>
<td>3.5% of Americans are identified as LGBT people which stands for lesbian, gay, bisexual, and transsexual – this is roughly the population of New Jersey.</td>
</tr>
</tbody>
</table>
The SVT test reports an internal consistency reliability of Cronbach’s $\alpha = .50$ to .60 for three passages (48 total test sentences; Royer, 2001). The present investigation with two passages (facts and evidence related to homosexuality) yielded a Cronbach’s $\alpha = .91$ using the participant sample. For criterion validity, the SVT test reports positive correlations with memory capacity ($r = .67$); furthermore, the SVT test is sensitive to, (a) differences in text readability, (b) differences in reading skills, (c) variation in background knowledge necessary to interpret the text, (d) variation in the formal characteristics of text and to test instructions (Royer, 2001). Moreover, the validity research has established that the SVT test, (a) predicts learning performance in college courses, (b) measures passage comprehension rather than sentence comprehension, and (c) correlates well with other tests measuring attributes related to comprehension ability (convergent validity), but has a low correlation with scores with which it should not be correlated (divergent validity; Royer, Greene, & Sinatra, 1987).

**Involvement**

To measure perceived personal involvement, participants were directed to rate on a 7-point Likert-scale from 1 = “not at all” to 7 = “very” to what degree they felt personally involved with the issue they read about in the infographic (ranged from 1 to 7, $M = 4.79$, $SD = 1.70$).
Procedure

Participants were tested in groups in a computer lab of the university; the session lasted between 50-70 minutes; there was no follow-up session. Each computer was pre-assigned to one of the three infographic content conditions (randomly assigned by Qualtrics). On arrival, participants had to sign an informed consent before further participation. Then, participants completed the NFC-Scale in which they were instructed to choose the answer that best described their feelings to each of the 18 NFC-items which were presented on one page. After all participants in a session completed this task, they got further instructions for the infographic presentation. Participants were given a brief context (verbal and written instructions; see Appendix 5) about what they would see, emphasizing that the next pages would be presented automatically. Then, the context image in which the infographic was embedded was displayed for five seconds automatically, followed by the infographic which was presented for 208 seconds. Next, participants answered the involvement-item and filled out the SVT tests for facts and evidence regarding homosexuality, respectively; the SVT-items were presented one at a time with the instruction to look at the sentence and decide whether or not the sentence had the same meaning as a sentence on the infographic. To ensure that every participant had the same cognitive load, the students completed both SVT tests regardless of the condition to which they were assigned.

Then, participants completed the measurements of the dependent variable: Scenario scales for lesbians and gay men as well as the lesbian- and gay men-IAT; those
measures were counterbalanced to avoid order effects. For the scenarios, participants were directed to respond spontaneously and to not spend too much time on each scenario. For the two IAT tests, participants were instructed to use the A and L key on the keyboard in order to categorize the items (images or words). Furthermore, the participants were told to reply as fast as possible and to make few mistakes; the order of the lesbian-IAT and the gay men-IAT was counterbalanced.

Next, participants completed the demographic questionnaire. Then, they were debriefed and told not to talk about the experiment to other students who were yet to participate; finally, they were thanked for their participation and excused.

Data Source

NFC Score

After recoding the reversed items of the NFC-scale, an NFC-score was computed by averaging the responses for each participant on the 9-point Likert-scale; the score ranged from -1.56 to 3.83 (potential range -4 to 4) and had a mean of 1.05 and a standard deviation of 1.09; high numbers indicated a high level of NFC. In order to use the variable as a dichotomous factor, we eliminated the participants with scores a quarter standard deviation below or above average and split the remaining participants into two groups, high (> $M + \frac{1}{4} SD; n = 61$) and low (< $M - \frac{1}{4} SD; n = 63$) NFC, instead of performing a median split.
Scenario Scale

After recoding the comfortable items and several behavioral items into the same scale direction, four scores were calculated by averaging the 15 scores from the scenarios (for lesbians and gay men respectively) and for each scoring dimension (emotional and behavioral component). This yielded four scores: one comfortable score (emotional component) for the attitude toward lesbians, one behavioral score for the attitude toward lesbians, one comfortable score (emotional component) for the attitude toward gay men, and one behavioral score for the attitude toward gay men. The ranges, means, and standard deviations for the four scores can be seen in Table 6.

When a participant scored high on the comfortable score, the score indicated that the respondent had a more negative (emotional) attitude toward homosexuals; a high score on the behavioral score indicated that the participant had a more negative (behavioral) attitude toward homosexuals. Low numbers indicated a more positive attitude toward lesbians and gay men, respectively.

Table 6. Ranges, means, and standard deviation for the Scenario scale.

<table>
<thead>
<tr>
<th>Name</th>
<th>Range</th>
<th>$M$</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comfortable score attitude toward lesbians</td>
<td>-4 to 1.80</td>
<td>-2.99</td>
<td>1.35</td>
</tr>
<tr>
<td>Behavioral score attitude toward lesbians</td>
<td>-4 to 2.07</td>
<td>-2.65</td>
<td>1.30</td>
</tr>
<tr>
<td>Comfortable score attitude toward gay men</td>
<td>-4 to 2.67</td>
<td>-2.81</td>
<td>1.50</td>
</tr>
<tr>
<td>Behavioral score attitude toward gay men</td>
<td>-4 to 2.00</td>
<td>-2.51</td>
<td>1.38</td>
</tr>
</tbody>
</table>
Note: The potential range for all four scores is from -4 to 4. Comfortable items for all scenarios were recoded to ensure that high ratings go along with a negative attitude toward lesbians and gay men, respectively.

IAT Scores

Instead of using the conventional algorithm originally proposed by Greenwald, McGhee, and Schwartz (1998) we computed the IAT effect $D$ (or IAT score) for the lesbian- as well as for the gay men-IAT based on the improved algorithm recommended by Greenwald, Nosek and Banaji (2003). The improved algorithm truncated the sample by 28%. Thus, the sample size in the present investigation was $n = 118$ for analyses including the IAT. Table 7 summarizes the method for calculating the IAT score with the improved scoring algorithm (Lane, Banaji, Nosek, & Greenwald, 2007). Since block six and seven measured the reaction time for the association homosexual – bad and heterosexual – good, high numbers in the IAT score indicated a more negative attitude toward lesbians and gay men, respectively.

Table 7. The steps of the improved scoring algorithm for computing the IAT effect

(adapted from Lane, Banaji, Nosek, & Greenwald, 2007, Table 3.3).

<table>
<thead>
<tr>
<th>No.</th>
<th>Step and its calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Delete trails greater than 10,000 msec</td>
</tr>
<tr>
<td>2</td>
<td>Delete participants for whom more than 10% of trails have latency less than 300 msec</td>
</tr>
<tr>
<td>3</td>
<td>Compute mean latency of correct responses for each combined block (three, four, six, seven)</td>
</tr>
<tr>
<td>4</td>
<td>Replace error latency with an error penalty computed as block mean + 600 msec</td>
</tr>
<tr>
<td>3</td>
<td>Compute the “inclusive” standard deviation for all trails in blocks three and six and likewise for all trails in blocks four and seven</td>
</tr>
<tr>
<td>4</td>
<td>Compute the mean latency for responses for each block three, four, six, seven</td>
</tr>
<tr>
<td>5</td>
<td>Compute the two mean differences ($M_{Block\ 6} - M_{Block\ 3}$) and ($M_{Block\ 7} - M_{Block\ 4}$)</td>
</tr>
<tr>
<td>6</td>
<td>Divide each difference score by its associative “inclusive” standard deviation</td>
</tr>
<tr>
<td>7</td>
<td>$D =$ the equal-weight average of the two resulting ratios</td>
</tr>
</tbody>
</table>
Learning Scores (SVT)

Learning scores for SVT I (learning of facts related to homosexuality) and SVT II (learning of evidence related to homosexuality) were computed by counting the number of correct answers. Participants who processed the infographic with high information got one point for each correct answer in SVT I and SVT II (“yes” as correct response for original and paraphrase items; “no” as correct response for meaning change and distractor items), participants who processed the infographic with low information (just facts about homosexuality) were not able to answer the items in SVT II because they did not process all the information on which they were tested in the SVT test; therefore each “no” (meaning the sentence had a different meaning from a passage sentence) was counted as correct response in the SVT II and was given one point. For participants in the control group, no learning scores were computed because participants had not read any of the information about homosexuality.

With this procedure, two learning scores were computed for participants in the experimental conditions. The learning score for facts (SVT I) ranged from 8 to 16 with a potential range from 0 to 16, whereas the learning score for evidence (SVT II) ranged from 4 to 16 with the same potential range. The means and standard deviations, separated for each learning score, are summarized in Table 8. High numbers in the learning scores indicated that participants learned more from the information on the infographic.
Table 8. Means and standard deviations separately for learning of facts (SVT I) and learning of evidence (SVT II).

<table>
<thead>
<tr>
<th>Learning scores</th>
<th>$M$</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>SVT I (facts related to homosexuality)</td>
<td>13.95</td>
<td>1.68</td>
</tr>
<tr>
<td>SVT II (evidence related to homosexuality)</td>
<td>11.86</td>
<td>2.75</td>
</tr>
</tbody>
</table>

$n = 111$
CHAPTER IV

RESULTS

Influences of Attitudes Toward Homosexuality

We were interested in determining whether attitudes toward lesbians and gay men are different. If they were, it would make sense to evaluate the effects of infographic content and NFC separately for both homosexual groups. Thus, we calculated paired t-tests for each homosexual group on both the implicit and explicit attitude measures. Results revealed significant differences between the attitude toward lesbians and gay men, for implicit attitudes, \( t (117) = 4.76, \ p < .001 \), as well as for the behavioral component of explicit attitudes, \( t (163) = 2.89, \ p = .004 \), and for the emotional component of explicit attitudes, \( t (163) = 4.37, \ p < .001 \). The implicit attitude toward gay men \( (M = .09, \ SD = .33) \) was found significantly more negative than the implicit attitude toward lesbians \( (M = -.07, \ SD = .34) \); the same results were yielded for explicit attitudes (behavioral component: gay men \( M = -2.51, \ SD = 1.38 \); lesbians \( M = -2.65, \ SD = 1.30 \); emotional component: gay men \( M = -2.81, \ SD = 1.50 \); lesbians \( M = -2.99, \ SD = 1.35 \)).

Based on the findings above, we wanted to determine whether implicit and explicit attitudes could be influenced by the information contained in an infographic, moderated by participants’ NFC. We were also interested in the degree to which learning from the infographic, and participants’ perceived personal involvement with homosexuality, were related to both implicit and explicit attitudes toward lesbians and
gay men. Thus, first we calculated the correlations between the measures. See Table 9 for the correlation matrix with the implicit attitude measures and Table 10 with the explicit attitude measures. Then, we tested the hypothesis in a two factor (Infographic Content and NFC) crossed design.

**Table 9. Correlation matrix including NFC, perceived personal involvement, the two learning scores and the two implicit attitude measures.**

<table>
<thead>
<tr>
<th>NFC</th>
<th>Involvement</th>
<th>SVT I</th>
<th>SVT II</th>
<th>Lesbian-IAT</th>
<th>Gay men-IAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFC</td>
<td>1</td>
<td>.096</td>
<td>.330**</td>
<td>.254**</td>
<td>-.097</td>
</tr>
<tr>
<td>Involvement</td>
<td>1</td>
<td>.053</td>
<td>.054</td>
<td>-.205*</td>
<td>-.136</td>
</tr>
<tr>
<td>SVT I</td>
<td>1</td>
<td>.579**</td>
<td>-.065</td>
<td>.063</td>
<td></td>
</tr>
<tr>
<td>SVT II</td>
<td>1</td>
<td>.011</td>
<td>.083</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lesbian-IAT</td>
<td></td>
<td>1</td>
<td>.421**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gay men-IAT</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

*Note:* **p = .010; * p = .050; n = 118. SVT I = learning score for facts related to homosexuality, SVT II = learning score for evidence related to homosexuality.

**Implicit Attitudes: IAT Scores**

IAT scores were significantly related to *perceived personal involvement* for lesbians \( (r = -.205, p = .050) \) but not gay men; and, infographic learning showed no significant shared variation with either of the two implicit attitude measures or personal involvement. Thus, to test the first hypothesis, involvement was entered as a covariate into two 3 Infographic Content (high vs. low vs. none) x 2 NFC (high vs. low) factorial Analysis of Covariance (ANCOVA) – one with the IAT score for lesbians and one with the IAT score for gay men.
Table 10. Correlation matrix including NFC, perceived personal involvement, the two learning scores and the four explicit attitude measures.

<table>
<thead>
<tr>
<th></th>
<th>NFC</th>
<th>Involvement</th>
<th>SVT I</th>
<th>SVT II</th>
<th>Explicit lesbians behavioral</th>
<th>Explicit gay men behavioral</th>
<th>Explicit lesbians emotional</th>
<th>Explicit gay men emotional</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFC</td>
<td>1</td>
<td>.108</td>
<td>.217**</td>
<td>.177*</td>
<td>-.203*</td>
<td>-.182*</td>
<td>-.226**</td>
<td>-.202**</td>
</tr>
<tr>
<td>Involvement</td>
<td>1</td>
<td>.067</td>
<td>.070</td>
<td>-.190*</td>
<td>-.240**</td>
<td>-.174*</td>
<td>-.220**</td>
<td></td>
</tr>
<tr>
<td>SVT I</td>
<td>1</td>
<td>.600**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SVT II</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explicit lesbians behavioral</td>
<td></td>
<td></td>
<td>1</td>
<td>.893**</td>
<td>.874**</td>
<td>.820**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explicit gay men behavioral</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explicit lesbians emotional</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explicit gay men emotional</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

Note: ** p = .010; * p = .050; n = 164. SVT I = learning score for facts related to homosexuality, SVT II = learning score for evidence related to homosexuality.

For the implicit attitude toward lesbians, results revealed that perceived personal involvement was a significant covariate in the analysis, $F(1, 80) = 4.44, MS_{error} = .12, p = .038$, partial $\eta^2 = .05$. Neither the main effect for Infographic Content, $F(2, 80) = .22, MS_{error} = .12, p = .801$, nor the main effect for NFC, $F(1, 80) = .23, MS_{error} = .12, p = .632$, reached a reliable level of statistical significance. However, a marginal significant influence for the interaction between Infographic Content and NFC was found, $F(2, 80) = 2.97, MS_{error} = .23, p = .057$, partial $\eta^2 = .07$. Specifically, the simple effects test, $F(1, 32) = 5.92, MS_{error} = .13, p = .021$ partial $\eta^2 = .16$, revealed that implicit attitudes toward lesbians were significantly less negative for participants high in NFC.
who processed the infographic with a high amount of information about homosexuals, $M = -.27; \ SD = .35$ relative to participants low in NFC who processed the same infographic, $M = .03; \ SD = .37$ (see Figure 3).

![Figure 3. Diagram to the interaction between NFC and Infographic Content with Involvement as covariate.](image)

As for the implicit attitude toward gay men, no significant effect was found when accounting for personal involvement, neither for the main effect of Infographic Content, $F (2, 80) = .78, MS_{error} = .10, p = .462$, nor for the main effect of NFC, $F (1, 80) = .31, MS_{error} = .10, p = .579$, nor the interaction of both, $F (2, 80) = .48, MS_{error} = .10, p = .618$. 

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Examining Factors of Implicit Attitudes Further

To further explore the variables responsible for influencing the implicit attitudes toward homosexuals within each factorial condition, stepwise multiple regression analyses were used to predict implicit attitudes toward lesbians and gay men, independently, from three predictor variables: perceived personal involvement and the two learning scores (SVT I and SVT II).

For the implicit attitude toward lesbians, the multiple regression model was significant only for the low NFC group, with the high amount of information infographic, $F (1, 16) = 4.54, MS_{Error} = .11, p = .049, R = .470$, accounting for 22.1% of the variance in implicit attitudes toward lesbians. The predictor significantly operating in the model was perceived personal involvement, $t (1) = -2.13, \beta = -.470, p = .049$. Thus, participants’ attitude toward lesbians is reliably predicted as less negative when their involvement in homosexuality is high – but only under conditions when they were low in NFC and processed an infographic high in homosexuality-related information.

For the implicit attitude toward gay men, the multiple regression model was also found significant for the low NFC group, with the high amount of information infographics, $F (1, 16) = 8.72, MS_{Error} = .08, p = .009, R = .594$, accounting for 35.3% of the variance in the IAT score for gay men. Again, perceived personal involvement, $t (1) = -2.95, \beta = -.594, p = .009$, was the only significant predictor in this model. Specifically, the more participants were personally involved in homosexuality, the less negative their
implicit attitude toward gay men – but only when they were low in NFC and processed the infographic with a high amount of information.

**Explicit Attitudes: Scenario Scales**

To test the hypotheses for the explicit attitudes toward homosexuals, we entered the measures from the Scenario scales. Again, the learning scores showed no significant shared variation with either of the four explicit attitude measures or personal involvement (see Table 10 above). However, personal involvement was significantly correlated to every explicit attitude measure (behavioral component of the explicit attitude toward lesbians $r = -.203$, $p = .050$ and toward gay men $r = -.182$, $p = .050$; emotional component of the explicit attitude toward lesbians $r = -.226$, $p = .010$ and toward gay men $r = -.202$, $p = .010$); therefore personal involvement was entered as a covariate into the same design: 3 Infographic Content (high vs. low vs. none) x 2 NFC (high vs. low) factorial Analysis of Covariance (ANCOVA). This time, the design was tested with four dependent measures – the behavioral component of the explicit attitude toward lesbians and toward gay men as well as the emotional component for lesbians and for gay men.

For the behavioral component of the explicit attitude toward lesbians, results revealed that *personal involvement* was a significant covariate in the analysis, $F (1, 117) = 4.53$, $MS_{error} = 1.65$, $p = .035$, partial $\eta^2 = .04$. Neither the main effect for Infographic Content, $F (2, 117) = .06$, $MS_{error} = 1.65$, $p = .945$, nor the interaction between
Infographic Content and NFC, $F(2, 117) = 1.96, MS_{error} = 1.65, p = .146$, reached a reliable level of statistical significance. However, a significant influence for the main effect of NFC was found, $F(1, 117) = 4.17, MS_{error} = 1.65, p = .043$, partial $\eta^2 = .03$.

Specifically, the behavioral component of explicit attitudes toward lesbians was significantly less negative for participants high in NFC, $M = -2.88; SD = 1.11$, relative to participants low in NFC, $M = -2.34; SD = 1.47$ (see Figure 4).

For the behavioral component of the explicit attitude toward gay men, results revealed a similar pattern. Again, personal involvement was a significant covariate in the analysis, $F(1, 117) = 4.34, MS_{error} = 1.74, p = .039$, partial $\eta^2 = .04$. Moreover, the main effect for NFC was found significant, $F(1, 117) = 4.31, MS_{error} = 1.74, p = .040$, partial $\eta^2 = .04$. However, nor the main effect for Infographic Content, $F(2, 117) = .02, MS_{error} = 1.74, p = .979$, nor the interaction between Infographic Content and NFC, $F(2, 117) = 1.54, MS_{error} = 1.74, p = .219$, reached a reliable level of statistical significance. Specifically, the behavioral component of explicit attitudes toward gay men was significantly less negative for participants high in NFC, $M = -2.78; SD = 1.14$, relative to participants low in NFC, $M = -2.23; SD = 1.49$ (see Figure 4).
Figure 4. Diagram for the behavioral component of the explicit attitude toward lesbians and gay men.

Since the four scores measuring the explicit attitude toward homosexuals were highly correlated, we expected similar results for the emotional component toward lesbians and gay men.

For the emotional component of the explicit attitude toward lesbians, personal involvement was found to be a significant covariate in the analysis, $F (1, 117) = 3.63, MS_{error} = 1.82, p = .059$, partial $\eta^2 = .03$. Again, results revealed a significant main effect for NFC, $F (1, 117) = 5.56, MS_{error} = 1.82, p = .020$, partial $\eta^2 = .05$, but neither the
main effect for Infographic Content, $F(2, 117) = .24, MS_{error} = 1.82, p = .791$, nor the interaction of Infographic Content and NFC, $F(2, 117) = .51, MS_{error} = 1.82, p = .599$, reached a reliable level of statistical significance. The results of the analysis indicate that participants high in NFC had a significantly less negative emotional component of the explicit attitude toward lesbians, $M = -3.32; SD = 1.00$, than participants with a low level of NFC, $M = -2.68; SD = 1.62$, when accounting for involvement (see Figure 5).

As expected, similar results were found for the emotional component of the explicit attitude toward gay men. *Perceived personal involvement* was a significant covariate in the analysis, $F(1, 117) = 4.37, MS_{error} = 2.01, p = .039$, partial $\eta^2 = .04$. No significant effect was found neither for the main effect of Infographic Content, $F(2, 117) = .20, MS_{error} = 2.01, p = .816$, nor for the interaction of Infographic Content and NFC, $F(2, 117) = .66, MS_{error} = 2.01, p = .520$, when accounting for involvement. However, results revealed that, again, the main effect for NFC reached a reliable level of statistical significance, $F(1, 117) = 5.93, MS_{error} = 2.01, p = .016$, partial $\eta^2 = .05$, indicating that participants high in NFC had a less negative emotional component of the explicit attitude toward gay men, $M = -3.20; SD = 1.04$, than participants low in NFC, $M = -2.49; SD = 1.72$ (see Figure 5).
To further explore the variables responsible for influencing the explicit attitudes toward homosexuals within each factorial condition, we ran four stepwise multiple regression analyses to predict the behavioral component as well as the emotional component of the explicit attitudes toward lesbians and gay men, independently, from
three predictor variables: *perceived personal involvement* and the two learning scores (SVT I and SVT II).

For the behavioral component of the explicit attitude toward lesbians, the multiple regression model was significant only for the high NFC group, with the high amount of information infographic, $F (1, 19) = 5.36, MS_{Error} = 1.62, p = .032, R = .470$, accounting for 22.0% of the variance in the behavioral component of explicit attitudes toward lesbians. The predictor significantly operating in the model was *perceived personal involvement*, $t (1) = -2.32, \beta = -.470, p = .032$. Thus, participants’ behavioral component of the explicit attitude toward lesbians is reliably predicted as less negative when their involvement in homosexuality is high – but only under conditions when they had a high level of NFC and processed an infographic high in homosexuality-related information.

For the behavioral component of the explicit attitude toward gay men, the multiple regression model was also found significant only for the high NFC group, with the high amount of information graphics, $F (1, 19) = 4.40, MS_{Error} = 1.83, p = .050, R = .434$, accounting for 18.8% of the variance in the behavioral component of the Scenario score for gay men. Again, *perceived personal involvement*, $t (1) = -2.10, \beta = -.434, p = .050$, was the only significant predictor in this model. Specifically, the more participants were personally involved in homosexuality, the less negative their behavioral component of the explicit attitude toward gay men – but only when they were high in NFC and processed the infographic with a high amount of information.
For the emotional component of the explicit attitude toward lesbians, the multiple regression analysis revealed similar results. Only for the high NFC group, with the high amount of information graphic, the model was significant, $F (1, 19) = 11.73$, $MSE_{error} = .85$, $p = .003$, $R = .618$, accounting for 38.2% of the variance in the emotional component of explicit attitudes toward lesbians. Again, the predictor significantly operating in the model was perceived personal involvement, $t (1) = -3.43$, $β = -.618$, $p = .003$. Specifically, participants’ emotional component of the explicit attitude toward lesbians is reliably predicted as less negative when their involvement in homosexuality is high – but only under conditions when they had a high level of NFC and processed an infographic high in homosexuality-related information.

For the emotional component of the explicit attitude toward gay men, the multiple regression model was also found significant only for the high NFC group, with the high amount of information graphics, $F (1, 19) = 13.53$, $MSE_{error} = .86$, $p = .002$, $R = .645$, accounting for 41.6% of the variance in the emotional component of the Scenario score for gay men. Again, the only significant predictor in this model was perceived personal involvement, $t (1) = -3.68$, $β = -.645$, $p = .002$. Specifically, the more participants were personally involved in homosexuality, the less negative their emotional component of the explicit attitude toward gay men – but only when they had a high level of NFC and processed the infographic with a high amount of information.

To sum up, the results of the multiple regressions revealed perceived personal involvement is the only predictor of explicit attitudes toward homosexuals – but
only under the condition that participants were high in NFC and processed the infographic with a high amount of information.

Learning Scores

Finally, we were interested in determining whether participants learned differentially based on their assignment to Infographic Content conditions, moderated by their level of NFC. Since there were two learning scores, we ran a 3 Infographic Content (high vs. low vs. none) x 2 NFC (high vs. low) x 2 learning scores (SVT I vs. SVT II) Analysis of Variance (ANOVA), with learning scores manipulated as a within-subject variable. The analysis revealed a significant main effect for the learning scores, $F(1, 63) = 38.69$, $MS_{\text{error}} = 4.29; p > .001$, partial $\eta^2 = .38$, as well as an interaction effect for Infographic Content and NFC, $F(1, 63) = 5.89$, $MS_{\text{error}} = 6.09$, $p = .018$, partial $\eta^2 = .09$ (see Figure 6). All other main effects and interactions failed to reach an acceptable level of statistical significance. Specifically, participants learned significantly more facts ($M = 14.00$, $SD = 1.74$) than evidence ($M = 11.70$, $SD = 2.84$) from the infographics. In addition, when participants high in NFC processed the infographic with a high amount of information, they learned significantly more of its content ($M = 14.88$, $SD = 1.69$) than participants low in NFC ($M = 12.95$, $SD = 2.06$). However, there was no difference in learning from the low information infographic between participants high ($M = 14.33$, $SD = 0.72$) and low ($M = 13.87$, $SD = 1.41$) in NFC.
Figure 6. Differences in learning scores by factorial conditions.

Note: No learning score was computed for the infographic with unrelated information. * = estimated marginal means.
CHAPTER V

DISCUSSION

Results and Hypotheses

The goal of the present investigation was to determine whether information on an infographic can influence implicit and explicit attitudes, moderated by people’s NFC. Furthermore, we were interested in the degree to which learning from the infographic, and people’s perceived personal involvement with homosexuality, were related to both implicit and explicit attitudes toward lesbians and gay men.

The present investigation showed that infographics can influence people’s attitude toward homosexuals under certain circumstances. We found that an infographic with a high amount of information influences implicit attitudes toward lesbians in a positive way. This effect is moderated by people’s NFC. Specifically, people high in NFC who processed the high information infographic had a less negative implicit attitude toward lesbians. The attitudes toward gay men were more negative than toward lesbians.

Based on research that revealed that strong attitudes are difficult to change (Petty, Cacioppo, & Schumann, 1983), we assumed that the strong negative attitudes toward gay men are less easy to shift. Therefore, the high information infographic influenced people’s implicit attitude toward lesbians but not the implicit attitudes toward gay men.

Results of the present investigation revealed that implicit and explicit attitudes toward gay men are more negative than the attitudes toward lesbians. This
confirms hypothesis 1 and is in line with previous research (Herek & Capitano, 1999; Kite, 1984; Kite & Whitley, 1996). Since implicit and explicit attitudes complement each other but they are not the same, we interpreted the data for implicit and explicit attitudes separately.

Based on the literature, we expected to find no difference in the attitudes of people high and low in NFC, when processing the infographic with a high amount of information. This hypothesis was not supported by the data. The results of the present investigation showed significant differences between people high and low in NFC. Further, we hypothesized that people low in NFC would be more persuaded by a low information infographic than people high in NFC. This hypothesis was also rejected because people high in NFC showed a less negative attitude toward homosexuals regardless of the infographic they processed. Results revealed that when processing the high information infographic, people high in NFC showed a less negative *implicit attitude toward lesbians* relative to people low in NFC. NFC did not influence the persuasiveness of the other two infographics.

The difference between the people high and low in NFC when processing the high information infographic may have been due to two operations:

1. Since people high in NFC enjoy thinking (Haugtvedt & Petty, 1992), we believe that they processed the detailed information more deeply than people low in NFC. Therefore, processing the high information infographic led to an increased knowledge about homosexuals for people high in NFC. Gaining knowledge about the attitude object
can reduce negative attitude (Pettigrew & Tropp, 2008). The new knowledge about homosexuals might have been retrieved from memory when completing the attitude measures (Costley & Brucks, 1992). Thus, deeper processing and learning about homosexuals, finally resulted in a less negative attitude toward homosexuals.

(2) Since people low in NFC prefer simple arguments and emotional cues in a persuasive message (Haugtvedt & Petty, 1992), we assume that people low in NFC did not process all the information from the high information infographic. Thus, people low in NFC were not persuaded by the high information infographic.

For implicit attitudes toward gay men, we did not find any influence of NFC on the persuasiveness of the infographics. Since the attitudes toward gay men were more negative than the attitudes toward lesbians, this finding can be explained by research in attitude strength; specifically, it is difficult to influence strong attitudes (Petty, Cacioppo, & Schumann, 1983). Further, people might not be aware of their implicit attitudes (Greenwald & Banaji, 1995); therefore, the information is not as accessible as explicit attitudes; this could be another explanation why the infographics did not influence the implicit attitudes toward gay men.

As for the explicit attitudes toward lesbians and gay men, NFC had an influence on the persuasiveness of the infographic. Specifically, people high in NFC had less negative explicit attitudes than participants low in NFC regardless of which infographic they processed. We assume the following explanations for the difference in explicit attitudes between people high and low in NFC regardless of the processed
infographic: Again, we believe that people with a high level of NFC might have processed the information more deeply, so that the information is easily accessible from memory and can be used for decisions that lead to a reduced negative attitude. Furthermore, people high in NFC generally think deeply (Petty, Briñol, Loersch, & McCaslin, 2009). Thus, we believe that people high in NFC might have thought about homosexuality before, leading them to possess better established schema about homosexuals from which to retrieve from memory than people low in NFC when processing the same information. This prior knowledge would be expected to lead to a more positive attitude for people high in NFC relative to people low in NFC regardless of whether they processed the low or high information infographic. As an alternative, it is possible that the low information infographic might have been too detailed and contained too few emotional cues to persuade people low in NFC. Thus, people low in NFC would not have paid close attention to the information when processing the low information infographic; this would result in less knowledge construction and less reduction of their negative attitudes. People high in NFC, by comparison, would elaborate on the new information and therefore reduce negative attitudes toward homosexuals – this would explain why the low information infographic was more influencing for high NFC people.

The present investigation also examined whether NFC and learning from an infographic influence implicit and explicit attitudes. We hypothesized that people high in NFC would learn more information about homosexuality from the infographic than
people low in NFC. This hypothesis was confirmed when participants processed the infographic with a high amount of information. However, there was no difference in learning between people high and low in NFC when they processed the low information infographic.

These findings support the assumption that people high in NFC processed the information deeply, constructed knowledge which they could retrieve from memory and which could be used for further decisions (Costley & Brucks, 1992). Based on Contact Theory (Allport, 1954), indirect contact, (e.g., constructing knowledge about an attitude object) reduces negative attitudes. Furthermore, the data revealed that participants learned significantly more facts than evidence from the infographics. This may have been due to the infographic with a high amount of information containing too many details, such that participants were not able to process all the information (facts and evidence) in the short exposure time. This assumption needs to be addressed in subsequent studies.

In our fourth research question, we suspected that perceived personal involvement would influence the persuasiveness of the infographic. Specifically, we assumed that people with a high level of involvement in homosexuality would have a less negative attitude toward homosexuals than people who were less involved.

This hypothesis was confirmed for the implicit attitudes toward lesbians and gay men – under the condition when people were low in NFC and processed the infographic with a high amount of information. For the explicit attitudes toward lesbians
and gay men, the hypothesis was confirmed for people high in NFC who processed the high information infographic. However, there was no difference in learning from the infographic with a reduced amount of information between high and low involved people. We believe that people who were highly involved processed the information on the infographic deeply and carefully because the information had significant consequences for their own lives (Apsler & Sears, 1968). Even though less involved people need less information in order to be persuaded, their attitudes are less strong and therefore easier to influence (Petty, Cacioppo, & Goldman, 1981).

In general, one can state that perceived personal involvement influences the attitude toward lesbians and gay men when people process an infographic with a high amount of information. We assume that involvement has a greater impact on attitude change than NFC; this would explain why implicit attitudes of people low in NFC are influenced by involvement in the same way as explicit attitudes of people high in NFC: people high in NFC as well as people high in involvement prefer a high amount of information; people low in NFC prefer less information. However, it might be possible that people low in NFC but high in involvement, process the information deeply because the attitude object is more relevant to them, relative to people who are less involved; thus people high in involvement are persuaded when processing the high information infographic, even though they are low in NFC. Subsequent investigations should focus on the role of involvement on attitude change and how NFC and involvement affect each other. Further studies might then be able to explain the inconsistent findings for implicit
and explicit attitudes regarding NFC and involvement by determining whether involvement outperforms the influence of NFC on attitude change by information on an infographic.

To sum up, the present investigation revealed that: (1) NFC influences attitudes toward homosexuals. People high in NFC have a less negative attitude toward homosexuals than people low in NFC, because, we assume, they process the information on the infographic more deeply. This was found for explicit but not for implicit attitudes. (2) An infographic with a high amount of information influences implicit attitudes toward lesbians in a positive way; NFC moderates this relationship. Specifically, people high in NFC process the high amount of information on the infographic more deeply, which leads to a less negative implicit attitude toward lesbians relative to people low in NFC. (3) The infographic with a low amount of information and the unrelated-information infographic do not impact attitudes toward homosexuals. (4) The more participants are personally involved in homosexuality, the less negative their implicit and explicit attitude toward gay men and lesbians – this is the case under certain conditions which differ for implicit (low NFC) and explicit attitudes (high NFC). Perceived personal involvement is the only predictor influencing implicit and explicit attitudes toward homosexuals when processing an infographic with a high amount of information. Involvement might have a greater impact on attitude change than NFC; this assumption needs subsequent investigation.
Practical Implications

According to the results of this investigation, we did not find an infographic that persuades people high and low in NFC. However, the findings revealed practical implications. Billboards displaying infographics with a high amount of information about homosexuality can reduce negative attitudes toward homosexuals. Specifically, a high information infographic on a billboard will influence people high in NFC; it will reduce their implicit negative attitudes toward lesbians and the explicit attitudes toward homosexuals. Due to its strength, implicit attitudes toward gay men can be influenced only if people are highly involved in homosexuality – an infographic on a billboard is not the most successful way to change implicit attitudes toward gay men.

Even though the infographic will not influence the attitudes of everyone, the findings of the present investigation are one step to reducing discrimination of sexual minorities. Pro-social campaigns should choose their target group and the appropriate infographic based on the results of this investigation. The most effective target group is the group of people high in NFC, whereas the most successful type of infographic is the one with a high amount of information. Since people learn more facts than evidence, a campaign should focus on this piece of information on the infographic. In short, social campaigns that aim to reduce negative attitudes toward homosexuals should create billboards with a high amount of information that persuades people high in NFC.
Limitations

Despite the fact that we normed the material and constructed the infographics and the instruments carefully, the present investigation yields several limitations and suggestions for subsequent studies.

First, the participant sample was comprised only of college students from one university. Thus, the generalizability of the results is restricted to this group. The study should be replicated using a wider and more varied sample in order to guarantee the validity of the findings. Second, due to a small number of male participants in the sample, the cell size for males was too small ($n = 5$) to examine further research questions about gender differences. A replication with a larger number of males should be accomplished.

Another limitation of the study is the fact that involvement was measured with a single item. The results revealed that involvement has a significant impact on attitude change; thus, perceived personal involvement needs to be addressed in further studies. However, this can be realized only if involvement is validated with a well-established instrument, or grounded in actual behavior. In addition, the Scenario scale measuring the explicit attitudes toward homosexuals requires further validation, as well. It is unclear to what extent people respond to the scenarios in a socially desirable way; thus, studies including a social desirability scale would help to establish whether the Scenario scale measured effectively the behavioral and emotional component of attitudes toward homosexuals.
Next, there could have been an order effect on trials of the IAT. Even though we implemented the training block and feedback on each trial to minimize the potential of an order effect (Nosek et al., 2007), a software capable of counterbalancing the categories (homosexual/good or heterosexual/good) which are assigned to a right- and left-hand response, respectively, might be effective in mitigating this potential.

Finally, even though the SVT is established as a method to measure text comprehension, it was designed to access text comprehension rather than sentence comprehension (Royer, 2001). In the present investigation, the information on the infographic was divided into sentences, which were related to each other and conveyed an overall message. However, the facts were not organized in a text and stood alone for themselves. Therefore, an instrument other than the SVT, measuring how deeply people process the facts and evidence, should be implemented in a replication. This instrument can be valuable to determine whether the SVT is an appropriate measurement for the comprehension of the information on the infographic.

The SVT was presented in all three conditions to ensure that the time period between processing the infographic and measuring the attitudes was of the same length for all participants. However, the two SVT tests contained eight original statements related to homosexuality from the infographic. The control condition processed an infographic with information unrelated to homosexuality, but was also exposed to the SVT tests – participants in the control group also processed eight statements related to homosexuality. These SVT sentences could have influenced the attitudes of participants
in the control group and therefore pose a potential confound of the design. A replication should avoid this problem by implementing a distraction task (e.g., SVT about the homosexuality-unrelated information) for the control group instead of presenting the SVT sentences related to homosexuality in all three conditions.

One final potential limitation is noteworthy: the short exposure time of the infographic. In the present investigation, participants processed the infographic for 208 seconds at the beginning. However, the entire procedure of the study took about an hour. Thus, we cannot guarantee that the information from the infographic was still active in memory when participants completed the attitude measurements. It might be possible that we measured participants’ attitudes without the impact of the information. Furthermore, we did not include a manipulation check; thus, we cannot guarantee that participants were able to process the information in the given amount of time. A longer or repeated exposure time should be used in subsequent studies, in order to validate the effects of this investigation.

Conclusion

The findings of the present investigation suggest that infographics can influence people’s negative attitudes toward homosexuals under certain conditions. An infographic with a high amount of information seems to reach a lot of people at the same time. Further, especially the attitudes of people high in NFC toward homosexuals can be influenced by an infographic. Therefore, pro-social campaigns that aim to reduce
negative attitudes toward homosexuals should create billboards with a high amount of
information that persuades people high in NFC; this combination of target group and
Infographic Content promises the most success in reducing discrimination.

Despite the fact that involvement was operationalized by one item, perceived personal involvement might play a role in attitude change; thus the relationship between involvement, implicit and explicit attitudes as well as NFC requires further investigation.

Even though the results revealed that we failed to integrate the preferences of people high and low in NFC in one infographic, it is still the goal for improved studies in the future to design an infographic persuading people high and low in NFC in the same way in order to reduce negative attitudes toward homosexuals. In short, infographics appear to be influential in reducing the discrimination of homosexuals.
REFERENCES


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*Research on Social Work Practice, 16*(2), 176-190.


Appendix 1. Chosen pairs of statements displayed on the infographics.

<table>
<thead>
<tr>
<th>Condition 1 (high information)</th>
<th>Control Group (none information)</th>
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<tbody>
<tr>
<td><strong>The surge of hormones in the womb can influence adult human sexual orientation.</strong> A study showed that prenatal androgens affect the homosexuality in both sexes. E.g., homosexual women are exposed to more prenatal androgen than are heterosexual women.</td>
<td>Just like unique fingerprints, every human being also possesses a unique tongue print. The tongue is a very strong muscle and presents geometric shape information and physiological texture information, which are both potentially useful in identity verification applications.</td>
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<tr>
<td><strong>The existence of homosexual behavior among different animal species may confer certain evolutionary advantages.</strong> A study has shown that same-sex pairings can increase fitness by providing superior care for offspring. It decreases the likelihood of divorce, strengthens social bonds, and reduces competition.</td>
<td>In the U.S., there are huge differences in the number of homeless people per state. In 2013, the national rate of homelessness was 19 homeless persons per 10,000 people, but it ranged from 106 in Washington, DC to 8 in Mississippi.</td>
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<td><strong>Approximately 9 million U.S. citizens are not heterosexual and live a LGBT lifestyle instead.</strong> 3.5% of Americans are identified as LGBT people which stands for lesbian, gay, bisexual, and transgender – this is roughly the population of New Jersey.</td>
<td>Military GPS is very precise and can pinpoint a location within a few centimeters. The Global Positioning System (GPS) consists of about 30 satellites originally developed by the U.S. government for military navigation and is now freely accessible for anyone with a GPS device.</td>
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<tr>
<td><strong>In a first impression, people can detect whether a man is gay or straight.</strong> Studies have shown that, even at 50ms, participants were able to judge significantly better than chance if a man is gay or not by seeing the man’s face.</td>
<td>Two-digit Interstate numbers are designed to let drivers know the general direction of the highway. The procedure for naming the highways is systematic. If the interstate has an odd number, it runs north-south, while interstates with even numbers run east-west.</td>
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<td><strong>In 2014, 36 of the 50 states in the U.S. have legalized same-sex marriage.</strong> Florida became the 36th state to legalize same-sex marriage in 2014. The majority of U.S. citizens now live in states that have legalized same-sex marriage.</td>
<td>Almost one third of all homeless people are under the age of 25 years. In 2013, the U.S. department of Housing and Urban Development stated that 23% of homeless people are children under 18 years and 10% between 18 and 24.</td>
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<td><strong>The brain structure of homosexual women is similar to the brain structure of heterosexual men.</strong> An fMRI study showed that homosexual men have a reaction in the same brain area as heterosexual women when viewing a picture of a male face.</td>
<td>Sea otters often hold hands while sleeping, resting, or eating to avoid drifting away. Otters float in groups and hold hands or wrap themselves up in sea plants in order to stay in their group while they eat or sleep.</td>
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<td><strong>The number of same-sex households as well as the number of married homosexual couples has increased.</strong> In 2011, 605,000 same-sex couple households were estimated, 168,000 of them were married. In 2013, 726,000 homosexual households were counted, of which 251,000 reported being married.</td>
<td>Almost one in three automobile accident deaths is caused by a drunk driver. In 2012, the total number of people killed by drunk driving was 10,322 people. Binge drinkers are 14 times more likely to drive under the influence.</td>
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<td><strong>One in eleven family units in the U.S. consists of a heterosexual married couple with two children.</strong> Only 11% of all families live in what is considered a</td>
<td>In 1405, gender inequality was already documented as an issue in a book by Christine de Pizan. The Italian French advocate for gender</td>
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</table>
standard lifestyle; this shows that homosexual households are as “normal” as every other family unit. equality wrote about the oppression of women due to irrational prejudice. She pointed out numerous advances in society because of women.

*Note:* Condition 2 (low information) contained only the bold facts from condition 1 (high information).
APPENDIX 2

The context displayed the infographic depending on which condition participants were in. Specifically, people in the condition 1 saw the high information infographic in the context, participants in condition 2 the low amount of information infographic, and the infographic with no information related to homosexuality was presented in the context to participants in the control group. Therefore, the change from the context image to the infographic can be seen as a zoom.
APPENDIX 3
Appendix 3. The three Infographics.

High Amount of Information Infographic (Condition 1).
Low Amount of Information Infographic (Condition 2).
Infographic with No Information Related to Homosexuality (Control Group).
APPENDIX 4
Appendix 4. Team procedure to develop the SVT test.

<table>
<thead>
<tr>
<th>Steps involved in team approach to SVT test development</th>
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<tbody>
<tr>
<td><strong>Step 1: Team formation</strong></td>
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<tr>
<td>Form a team consisting of a team leader and four to six team members. Have each team member bring materials to the workshop that could be used to construct an SVT test.</td>
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<tr>
<td><strong>Step 2: Passage selection and editing</strong></td>
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<tr>
<td>Select passages that are self-contained and coherent. Edit them to have these properties if necessary. Also, edit the passages so they are the appropriate length (most often 12 sentences).</td>
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<tr>
<td><strong>Step 3: Explain the SVT test sentence types</strong></td>
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<td>Introduce the four SVT item types and explain the rules for developing each item type.</td>
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<tr>
<td><strong>Step 4: Develop test sentences</strong></td>
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<tr>
<td>Each team member copies the individual sentences from the edited passage and creates paraphrase and meaning-change versions of each sentence. Each team member then reads his or her paraphrase version of the first passage sentence, and it is copied onto an overhead transparency underneath the original sentence. After all of the team’s paraphrase sentences have been copied, the team members critique each of the sentences and then select one sentence or a combination that they believe best paraphrases the original sentence. This process is repeated for the meaning-change sentences and for each sentence in the original passage. Test sentence construction is completed by constructing distractor sentences to accompany each original sentence.</td>
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<tr>
<td><strong>Step 5: Test creation</strong></td>
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<tr>
<td>Create a test consisting of a randomly chosen original, paraphrase, or meaning-change sentence to represent each original sentence in a passage. A test based on a 12-sentence passage will consist of 4 original sentences, 4 paraphrase sentences, and 4 meaning-change sentences. Four distractor sentences are then added to those 12 to construct a 16-sentence test. Randomly order the test sentences with the restriction that test sentences representing sentences 1 to 6 in the original passage appear in the last half of the test. Continue this test development process until a test based on at least two passages has been created.</td>
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<tr>
<td><strong>Step 6: Independent creation of test sentences</strong></td>
</tr>
<tr>
<td>Select two new test segments and have each team member independently complete the process of creating test sentences for the passages. Return to a group setting and have each team member display his or her passage and test sentences on an overhead transparency. The group critiques both the passage editing and the development of the test sentences. Continue this process until the group as a whole has agreed upon a final version of all of the passages and test sentences.</td>
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<tr>
<td><strong>Step 7: Create test instructions and format test</strong></td>
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<tr>
<td>The group or a single member of the group can then create test instructions that are appropriate for the age of the examinees. These instructions should emphasize that examinees are not to return to a passage once they turn the page to expose the test sentences. The test is then formatted for reproduction. The instructions should be on separate pages from the passages and tests. Each passage should be separated from its test sentences. Responses can be marked on the actual test or on an answer sheet. Students completing an SVT listening test will be presented with only an answer sheet.</td>
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</table>
Appendix 5. Instructions for the infographic.

Before processing the context and the infographic, participants got the following written and verbal instructions:

“In a moment you are going to see two pictures. They are going to be timed, so it is important that you do not click anywhere. The next pages will be automatically presented. You will see the first picture for 5 seconds, and then it will zoom in and stay at the second picture for three and a half minutes. Please remember: do not click anywhere.

Here is the scenario about what you will see: It is a typical Saturday afternoon; you are waiting for your friends to spend the day on the water in the sun. While you are waiting you notice that there are billboards – as they are pretty much everywhere where you go. This time the billboard titled “LIFE” captures your attention. You walk up on it to read it. Your friends will arrive in three minutes, enough time to consider it. What do you think?”