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Affective Responses to Gay Men Using Facial Electromyography: Is There a Psychophysiological “Look” of Anti-Gay Bias

Melanie A. Morrison, PhD, Krista M. Trinder, MA, and Todd G. Morrison, PhD

Department of Psychology, University of Saskatchewan, Saskatoon, Canada

ABSTRACT

Despite a wealth of attitudinal studies that elucidate the psychological correlates of anti-gay bias, studies that provide evidence of the physiological correlates of anti-gay bias remain relatively scarce. The present study addresses the under-representation of physiological research in the area of homonegativity by examining psychophysiological markers, namely the affective manifestations of anti-gay prejudice, and their correspondence with anti-gay behavior. Facial electromyography (EMG) was the technique used to acquire the psychophysiological markers via recordings from two facial muscle sites. Whether heterosexual men’s implicit affective reactions to gay male couples best predicted their overt and covert discriminatory behavior toward a presumed gay male confederate was determined. The strength of the implicit affective reactions to predict anti-gay discrimination was then tested against the strength of participants’ implicit cognitive reactions acquired via the Implicit Association Test (IAT). Results indicated that the affective reactions recorded via facial EMG emerged as the strongest predictor of discrimination toward gay men compared to the cognitive reactions recorded using the IAT. Findings support the contention that emotional reactions to gay men using implicit techniques such as facial EMG are potentially valuable pathways toward understanding the nature and sequelae of anti-gay behavior.

Many Westernized countries (e.g., Canada, the United States, the United Kingdom) have antidiscrimination policies that have been designed to protect gay and lesbian persons from inequitable treatment and discrimination. For instance, the United States’ Supreme Court made a landmark decision on June 27, 2015, that the marriages of gay and lesbian couples across all 50 states, the territory of Guam, and the District of Columbia could be performed without repercussions and be legally recognized (GLAAD, 2017). Further, Canadian law stipulates that lesbian women and gay men cannot be prohibited from adopting a child due to their sexual orientation...
Despite antidiscrimination policies being in effect in many Westernized countries, gay men and lesbian women continue to experience violence, discrimination, and prejudice at alarming rates (Bostwick, Boyd, Hughes, West, & McCabe, 2014; Calabrese, Meyer, Overstreet, Haile, & Hansen, 2014; Garung et al., 2018; Herek, 2009; Herek & McLemore, 2013; Huebner, Rebchook, & Kegeles, 2004). A recent survey conducted in the United States found that 50% of gay men had experienced discrimination in the previous 12 months, as had 54% of lesbian women within that same timeframe (Bostwick et al., 2014). Similar prevalence rates have been documented elsewhere in the United States and span several decades (e.g., Mays & Cochran, 2001; Meyer, 2003). In a relatively recent Canadian study investigating the association between sexual minority persons’ experiences of enacted stigma and their psychological health, data provided by 348 lesbian women and gay men revealed that 80% had been verbally insulted; 29% had been verbally threatened; 16% had their property damaged; 14% had been physically assaulted; 12% were spat on; and 8% had been sexually assaulted in their lifetime due to their sexual orientation. These experiences, many of them violent, were associated with depression and psychological distress as well as compromised self-esteem and life optimism (Morrison, 2012). Despite Canada’s province-based assurances that sexual minority youth will be protected (e.g., through Safe and Caring School Acts), research shows that violence, discrimination, and prejudice against adolescents who are gay or lesbian also are widespread (Taylor & Peter, 2012). Indeed, a recent mixed-methods study examining the association between Canadian sexual minority youth’s experiences of enacted stigma and wellness found that, for those identifying as lesbian, gay, bisexual, or questioning, discrimination was significantly related to diminished feelings of comfort and personal safety while at school, as well as decrements in academic performance, school attendance, and participation in extracurricular and sports-based activities (Morrison, Jewell, McCutcheon, & Cochrane, 2014).

Homonegativity is a term that accounts for the violence, discrimination, and prejudice that impacts the lives of gay and lesbian persons and, formally defined, is a multidimensional construct composed of negative cognitions, affective reactions, and behaviors directed toward individuals who are, or are presumed to be, members of a minority group based on sexual orientation (Hudson & Ricketts, 1980; Jewell & Morrison, 2010; Morrison & Morrison, 2003). The vast majority of research on homonegativity thus far has been attitudinal in nature and is typified by investigations into heterosexuals’ anti-gay/anti-lesbian cognitions (i.e., belief-based objections to, or appraisals of, gay men and lesbian women). This body of research is currently complemented by a much smaller volume of studies on the behavioral component of homonegativity (i.e., the various forms of anti-gay/anti-lesbian discrimination that have been perpetrated, and how these experiences affect the lives of
gay and lesbian individuals; Roderick, McCammon, Long, & Allred, 2008; Van De Ven, Bornholt, & Bailey, 1996). Comparatively, research on the affective component, which is posited to be best understood when using implicit or physiological means, is even less frequently undertaken (Mahaffey, Bryan, & Hutchison, 2005; Mahaffey, Bryan, Ito, & Hutchison, 2011; Stewart et al., 2013). To address this gap, the current study focuses on the affective component of homonegativity and establishes, for the first time, how implicit anti-gay bias manifests itself psycho-physiologically via recordings of two prominent, affect-laden facial muscle sites using facial electromyography (EMG).

**Cognitive component of homonegativity**

Theoretical accounts and empirical evidence have suggested that the cognitive component of homonegativity may consist of two distinct forms: one that is old-fashioned in nature and one that is modern. Homonegativity, in its old-fashioned form, is grounded in traditional objections and religious/moral disapproval of homosexuality (Morrison & Morrison, 2003). It also is evident when blatant stereotypes about gay men and lesbian women are endorsed, and when attitudes toward human rights for sexual minorities, such as the right to housing and employment, are opposed. There are a number of self-report measures designed to assess old-fashioned homonegativity in an explicit sense, with the most widely used being the Attitudes Toward Lesbians and Gay Men Scale (ATLG; Herek, 1994). Sample items for the gay men version of the ATG are “Male homosexuality is a perversion” and “Homosexual behavior between two men is just plain wrong”; sample items for the lesbian women version of the ATL are “Female homosexuality is a sin” and “Lesbians are sick.”

In contrast to old-fashioned homonegativity, the cognitive component of modern homonegativity refers to negative beliefs about gay men and lesbian women that are based on contemporary abstract objections and/or concerns about these individuals. Specifically, these beliefs manifest in appraisals that: (1) discrimination against gay men and lesbian women is a thing of the past; (2) gay men and lesbian women are making unnecessary demands for changes in the status quo (e.g., the right to marry; pressing for antidiscrimination legislation); and (3) gay men and lesbian women place too much emphasis on their sexual orientation, which, in turn, prevents them from assimilating into mainstream society (Morrison & Morrison, 2011). To measure modern homonegativity toward gay men and lesbian women in an explicit sense using a self-report instrument, Morrison and Morrison (2003) developed parallel gay and lesbian versions of the Modern Homonegativity Scale (MHS, 2003). Sample items for the MHS-G and MHS-L are “In today’s tough economic times, tax dollars should not be used to support gay men’s
[lesbian women’s] organizations,” and “Gay men [Lesbian women] should stop shoving their lifestyle down other people’s throats.” As items on the Modern Homonegativity Scale reflect beliefs about gay men and lesbian women rather than the emotions evoked by such individuals, the MHS is viewed as cognitive in nature.

One of the most glaring critiques of explicit self-report measures such as the ATL/ATG and MHS-G/MHS-L is that they are subject to self-presentation biases (Von Hippel, Brener, & Von Hippel, 2008). When engaged in self-report, study participants consciously or deliberately select their response options. In the event that participants actively comply with social norms, their subsequent responses to questionnaire items may become influenced by the desire to respond in socially or culturally appropriate ways. Self-presentation bias is a key concern whenever explicit questionnaire methods are used, and it is arguably pronounced when homonegativity is the topic of investigation. To address the limitations associated with self-report instruments, researchers have incorporated implicit techniques in their investigations of intergroup biases (e.g., Brochu & Morrison, 2007), and, importantly, studies assessing homonegativity implicitly from a cognitive perspective have steadily grown (e.g., Burke et al., 2015; Sabin, Riskind, & Nosek, 2015; Steffens, 2005; Steffens & Buchner, 2003).

The most common technique designed to assess cognition implicitly is the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998; Nosek, Greenwald, & Banaji, 2005). The premise of the IAT is that people will categorize together strongly associated concepts more quickly than concepts that are weakly associated (Greenwald et al., 1998). In a typical IAT scenario, participants are presented with a target category (e.g., White, Black, male, female) that is paired with an attribute category (e.g., good, bad, positive, negative) and then practice categorizing target or attribute stimuli by pressing a designated key. Trials consist of congruent (Black + negative; White + positive) and incongruent (Black + positive; White + negative) pairings, where reaction times are recorded to measure strength of associations, which reflect the difference between overall speeds for blocks of congruent and incongruent trials (Greenwald et al., 1998). Individuals with faster reaction times for congruent trials (i.e., White + positive; Black + negative) compared to incongruent trials (White + negative; Black + positive) would be seen as preferring Whites, relative to Blacks. Techniques such as the IAT that elicit reaction time data have proven critical to the study of intergroup relations; yet it could be argued that they advance understanding in terms of the cognitive features of social bias. In order to examine homonegativity as a multidimensional construct, we propose broadening the measurement techniques in an effort to cover not only the cognitive dimension but the affective and behavioral as well.
Affective component of homonegativity

The affective component of social bias refers to the emotions evoked by members of a target group. In relation to homonegativity, for example, a feeling of disgust at seeing a gay couple holding hands would constitute a negative affective response. Affective responses are believed to change depending on context and personal feelings (Anvik et al., 2008); yet when compared to cognitive responses, they consistently emerge as stronger predictors of phenomena such as prejudice and discrimination (e.g., Smith & De Houwer, 2015; Stangor, Sullivan, & Ford, 1991; Stewart et al., 2013; Tropp & Pettigrew, 2005). Mahaffey et al. (2005) maintained that a majority of the research within the area of homonegativity has focused on the cognitive element, with minimal attention paid to the role that affect plays in understanding anti-gay/-lesbian bias. Further, since affect is posited to be the least “tangible” component of homonegativity to detect (Mahaffey et al., 2005), using implicit techniques to measure affective responses is vital (e.g., Graves, Cassisi, & Penn, 2005). Moreover, from a theoretical vantage, the affective dimension has been viewed as the potential gateway to understanding anti-gay behaviors that range from a limited number of smiles directed at a gay target to the homicide of gay men (Mahaffey et al., 2011). Influential research (e.g., Parrott, 2009; Parrott & Zeichner, 2005; Vincent, Parrott, & Peterson, 2011, 2016) on the emotional precursors to violence against gay men further highlights the importance of including the affective dimension in research on homonegativity.

A technique that affords researchers the opportunity to measure affective responses implicitly is facial electromyography (EMG). Facial EMG is an unobtrusive continuous measure that remains the only psychophysiological technique that can discern positive from negative affect (Heller, Greischar, Honor, Anderle, & Davidson, 2011; Larsen, Norris, & Cacioppo, 2003). With regard to the latter characteristic, both negative and positive affect are measured via involuntary muscle movements occurring below the skin’s surface: electrodes are commonly placed on the corrugator supercilium muscle site, located above the eyebrow, and on the zygomaticus major muscle site, located on the cheek. Greater brow activity provides an indication of negative affect in the form of imperceptible frowns, while greater cheek activity depicts positive affect in the form of imperceptible smiles. These two locations have been found to be longstanding psychometrically sound indicants of implicit affective reactions (Cacioppo, Petty, Losch, & Kim, 1986; Heller et al., 2011; Mauersberger, Blaison, Kafetsios, Kessler, & Hess, 2015; Tassinary, Cacioppo, & Geen, 1989).

Facial EMG has been used extensively to understand implicit affective reactions in marketing (e.g., preferences for food packaging; Liao, Corsi, Chrysochou, & Lockshin, 2015), business, and technology (e.g., preferences
for certain types of media communication; Wells & Dennis, 2016). Given its utility in these industries, there has been a relatively recent surge of interest in facial EMG as a technique that can be used to detect interpersonal bias—specifically, the uncontrollable affective responses people evidence in relation to other human targets. Facial EMG has been used to detect bias toward unattractive infants (Schein & Langlois, 2015), persons with schizophrenia (Graves et al., 2005), and children who are phobic (Leutgeb & Schienle, 2012), as well as other human emotions such as schadenfreude (e.g., Cikara & Fiske, 2012) and those associated with mimicry (e.g., Mauersberger et al., 2015). Given the discriminatory treatment of gay men and lesbian women along with the desire of the vast majority of individuals to appear non-prejudiced, using a technique such as facial EMG in the context of homonegativity research may prove particularly valuable. Interestingly, despite the empirical evidence in favor of using facial EMG in this context, the physiological manifestations of homonegativity have received scant empirical attention. Based on a comprehensive review of the literature, only one study to date has examined implicit affective bias using facial EMG. In their study, Stewart et al. (2013) assessed the relationship between explicit attitudes using an old-fashioned measure of homonegativity (the ATLG; Herek, 1984), implicit affective responses, as measured by the corrugator (frowning) muscle site, and collective action, as indicated by the number of flyers taken by participants to distribute in support of a presumed gay-straight organization at a later point in time. Of particular interest was whether affective reactions (via facial EMG) or cognitive attitudes (via self-report) best predicted antidiscrimination tendencies. Results indicated that less corrugator activity predicted greater collective action on behalf of the organization, as evidenced by the number of flyers taken by participants at the end of the experiment, and participants’ physiological affective reactions better predicted antidiscrimination than did their explicit self-reported cognitive attitudes toward gay men.

Given that, to date, only one published study exists that uses facial EMG to address sexual orientation bias (indicated in this case by collective action or antidiscrimination), we build on Stewart et al.’s (2013) work by testing the utility of facial EMG as a means of detecting interpersonal bias toward gay men. We also address extant limitations associated with this pioneering work, and those affiliated with facial EMG studies more generally. Specifically, unlike Stewart et al. (2013), we include recordings from both the corrugator superciliii, which is active when frowning, and the zygomaticus major, which is active when smiling. Drawing on recordings from both muscle sites enables us not only to detect negative affective responses but also to account for the presence of positive affective responses to gay men should they appear.
Further, Stewart and colleagues (2013) used an implicit affective measure (facial EMG) and a cognitive self-report measure (the ATLG) to determine which linked most strongly with LGBT discrimination. Importantly, their approach did not allow for comparisons to be made using directly comparable measures, a limitation that the authors cite as a key omission in their study. We address this issue by incorporating measures of affect and cognition that are directly comparable so that comparisons can be made between cognition and affect at both implicit and explicit levels.

Research on interpersonal bias that occurs implicitly has accorded limited empirical attention to testing the conceptual distinctiveness of various implicit techniques and their association with behavior. Indeed, across all facial EMG studies to date, only one race-based study addressing interpersonal bias in the form of anti-Black reactions has compared the efficacy of an implicit cognitive reaction-based measure (i.e., the commonly used IAT; Greenwald et al., 1998) against an implicit affective reaction-based measure (i.e., facial EMG). Vanman, Saltz, Nathan, and Warren (2004) found that affective reactions, as measured by facial EMG, better predicted low-scoring Whites’ race-based bias toward African Americans than did cognitive responses captured via the IAT. Given this large gap in the literature, we test the relative effectiveness of a physiological indicator of implicit affect against an indicator of implicit cognition and assess their association to discriminatory behavior that is both overt and covert in nature. To our knowledge, our study will be the first to offer such comparisons as they pertain to sexual orientation and will build on the work of Vanman et al. (2004).

To date, at the behavioral level, studies using facial EMG to assess interpersonal bias have incorporated only one form of discrimination; that is, researchers have examined either overt or covert discrimination in isolation. For instance, Vanman et al. (2004) assessed White participants’ “deliberate, discriminatory behavior” toward Blacks (i.e., overt discrimination), which was indicated by a “yes” or “no” response when asked whether they would grant a teaching fellowship to a hypothetical Black or White candidate. In contrast, Stewart et al. (2013) measured behavior of a “discreet nature,” as indicated by the number of flyers participants took with them to distribute at a later time on behalf of an LGBT organization. In this case, the behavior assessed was classified as covert and reflected the relative absence of discrimination (i.e., antidiscrimination). Therefore, how overt and covert behavioral indicants relate to implicit affect using facial EMG and implicit cognition using a traditional measure such as the IAT remains unknown. We address this gap in the present study and, in so doing, provide much-needed empirical evidence of these interrelationships in general, and as they pertain to sexual orientation–related bias in particular.

Finally, the present study also was designed to account for a final omission in the facial EMG literature. On the basis of a comprehensive review, it
appears that the facial EMG literature does not yet contain empirical evidence of the interrelationships among cognition, affect, and behavior, where the behavioral outcomes are derived from real-life interactions between majority and minority group members. Indeed, we are unaware of any published research using facial EMG that has incorporated actual members of the minority group into the investigation; instead, the dependent measures used are more abstract in nature. Participants have been asked to make decisions about hypothetical applicants using vignette methodology (e.g., Vanman, Paul, Ito, & Miller, 1997), assign attributes based on yearbook pictures of African American and European Americans (e.g., Vanman et al., 2004), and make known their intended future collective action by virtue of the number of flyers they picked up as they exited the experimental setting (Stewart et al., 2013). The present facial EMG study is, to our knowledge, the first to assess discrimination using real-life human interaction with members of the oppressed group—in this case, a presumed “gay” male.

**Present study**

The present study addresses several longstanding gaps in the existing facial EMG literature and complements the one published study that has used facial EMG to explore sexual orientation-related bias. Specifically, direct comparisons between implicit affect using facial EMG and implicit cognition using the traditional IAT are made, and their association with discriminatory behavior that is determined via real-life interaction with a gay man is examined. To our knowledge, this is the first study of this kind to be conducted not only in the area of sexual orientation bias, but in the facial EMG literature overall. We further expand the extant research by incorporating into our facial EMG assessment two key facial muscle sites, which elucidate both negative and positive affective reactions to our gay target. Finally, we assess homonegative cognition explicitly using the psychometrically sound Modern Homonegativity Scale (Morrison & Morrison, 2003) and homonegative affect explicitly using a feeling thermometer. We use the Modern Homonegativity Scale rather than the old-fashioned Attitudes Toward Lesbians and Gay Men Scale (Herek, 1984) as our measure of explicit cognition because it has been found to resonate more strongly with university students (Rye & Meaney, 2010), thus strengthening our ability to detect cognitive homonegative bias within our university sample. We incorporated a feeling thermometer to assess affective reactions to gay men because they have been found to be reliable and valid (Herek & Norton, 2013)

**Hypotheses**

Hypotheses were generated in accordance with gaps in the literature, previous research on implicitly measured cognitive and affective-based
responses, and theorizing in the area of modern prejudice (e.g., Morrison & Morrison, 2003, 2011). In relation to the latter, the core argument is that, given the socially inappropriate nature of overt prejudice and discrimination, individuals are more likely to express covert, relative to overt, biased attitudes or behaviors toward members of a minority group. Therefore, it was hypothesized that: (1) participants would evidence greater covert discrimination toward the gay male versus heterosexual male interviewer; and (2) implicitly measured bias captured via facial EMG and the IAT (rather than the explicit cognitive Modern Homonegativity Scale scores and the affect-related feeling thermometer) would be significantly associated with participants’ covert discriminatory behavior evidenced during face-to-face interviews.

Method

Participants for Phase I

Participants involved in Phase I of the research were 171 male undergraduates from a mid-sized university in western Canada. All of the male participants were between the ages of 18 and 52 (M = 22.87; SD = 5.09) and were recruited from an online bulletin board. Participants were asked to identify their sexual orientation using a 7-point response option, where possible responses were “exclusively heterosexual,” “primarily heterosexual,” “more heterosexual than homosexual,” “bisexual,” “more homosexual than heterosexual,” “primarily homosexual,” and “exclusively homosexual.” The majority of participants identified as “exclusively” or “primarily” heterosexual (87.5%). Further, a considerable proportion (79%) of respondents reported their ethnicity to be “Caucasian.” Participants were asked to complete an online questionnaire designed to measure their self-reported homonegative attitudes toward gay men. At the end of the questionnaire, participants were asked to provide their contact information if they wished to be contacted about participating in future studies on related topics. Below are the measures that were used in Phase I and reflect the explicit cognitive and affective measures used in the analyses associated with Phase II and III of the study.

Measures: Phase I

The Modern Homonegativity Scale–Gay (MHS; Morrison & Morrison, 2003). The MHS-G was designed to measure modern negative attitudes toward gay men, and it serves as the explicit measure of cognition in the present study. The MHS scale consists of 12 items (e.g., “Gay men should stop shoving their lifestyle down other people’s throats”) and uses a Likert-type scale ranging
from 1 (strongly disagree) to 5 (strongly agree). Higher scores indicate greater modern prejudice toward gay men, and the MHS-G has been found to have good scale score reliability, with alpha values greater than .80, and has demonstrated construct, discriminant, and predictive validity (Morrison, Kenny, & Harrington, 2005; Morrison & Morrison, 2003; Morrison, Morrison, & Franklin, 2009; Rye & Meaney, 2010). The alpha coefficient in the present study was .90 (95% CI: .88–.92).

**Feeling thermometer**

A feeling thermometer with 101 points ranging from 0 to 100 was used to measure explicit affect toward gay men. The feeling thermometer was similar to those used by Herek and Capitanio (1999), with higher scores indicating greater levels of warmth and positivity, and lower scores reflecting feelings that are more cold and negative. A rating of 50 signified a neutral evaluation. Feeling thermometers toward various targets, including gay men, have been found to be reliable and valid (e.g., Haddock, Zanna, & Esses, 1993). In the current study, the feeling thermometer had a $M$ of 62.17 ($SD = 30.02$).

**Participants for Phases II and III**

Fifty-five men were contacted and invited to participate in two additional studies (which constituted Phases II and III of the current investigation). These individuals were chosen because they scored in the top or bottom tertile on the Modern Homonegativity Scale\(^2\) in Phase I (MHS; Morrison & Morrison, 2003). They also self-identified as “exclusively” or “primarily” heterosexual and were between the ages of 18 and 45 ($M = 23, SD = 5.16$). Phase II included an interview about campus services (the overt and covert behavioral components), and Phase III included involvement in two computer-related tasks (the IAT and facial EMG components, which were administered in counterbalanced order). Participants were informed that these two studies were being paired together as neither took much time to complete.\(^3\)

**Measures and procedure for Phases II and III**

**Behavioral component (Phase II)**

Using a modified procedure by Dovidio and colleagues (1997), participants’ overt and covert discriminatory behavior toward men perceived to be gay was assessed. Participants were informed that this session was part of an interview requirement for an upper-year psychology class; they would be interviewed by one or more students; and the interview would be video-recorded for later evaluation. Prior to the interview, participants were asked to sign a consent form explaining that they would complete an interview about campus services; participation was strictly voluntary; all data would
remain confidential; and withdrawal from the study at any time without penalty was acceptable.

Each participant met individually with two male researchers for the interview. The sexual orientation of the “gay” interviewer was indicated through his identification near the beginning of the interview with the Gay, Lesbian, Bisexual, and Transgender Pride Center on campus. Two interviewers recruited from the campus Pride Centre served as gay interviewers, whereas three upper-year psychology students served as heterosexual interviewers. As well, one upper-year psychology student served as both a gay and heterosexual interviewer. During the interview, participants were asked to respond to a total of six predetermined questions regarding campus issues (e.g., food services and transportation to campus), with each interviewer asking three questions. After the first interviewer completed his questions, he excused himself to retrieve the second interviewer. The order in which the “gay” and “straight” interviewers appeared in the room containing the participant was counterbalanced. In total, each interview took approximately 15 minutes.

Interviews were video-recorded by a discreet camera located near the ceiling, and three trained judges, unaware of participants’ explicitly and implicitly measured attitudes, coded participants’ covert behavior using Dasgupta and Rivera’s (2006) coding scheme. Using an 11-point scale, where 0 = none and 11 = very much, the following six covert behaviors were coded: (1) eye contact, (2) number of smiles, (3) body posture (leaning toward vs. away from interviewer), (4) overall comfort, (5) overall friendliness, and (6) overall interest in the interaction. The behaviors could range from 6 to 66, and lower scores indicated greater covert discrimination. Across the three judges, scale score reliability ranged from .80 to .87 (95% CI, .71–.92) for covert behaviors toward the gay interviewer and from .74 to .80 (95% CI, .61–.87) for the heterosexual interviewer. Pearson’s correlation coefficients also revealed that there were strong associations amongst the judges’ ratings of the six covert behaviors (i.e., total scores from one judge correlated with the total scores from the other two judges; rs ranged from .72 to .86, ps < .001). Therefore, the ratings for all three judges were collapsed into a single measure of behaviors directed toward the gay interviewer and a single measure of behavior directed toward the heterosexual interviewer. Finally, scores for the gay interviewer were subtracted from scores for the heterosexual interviewer, with higher scores corresponding to more discriminatory behavior directed toward the gay man.

Overt discrimination was measured by having participants evaluate each interviewer after the interview was completed. Participants were asked to rate the interviewers on 10 items (e.g., their professional manner, friendliness, sincerity) using a scale ranging from 0 (not at all) to 10 (very much), where higher scores reflected a more positive evaluation (possible range from 0 to 100). As well, participants were asked to indicate, based on their ratings, to
what degree they would recommend that each interviewer conduct interviews in the future and to what extent they would consider hiring each interviewer. Participants were informed that the interviewers would be allowed to see the ratings they received, thus heightening the overt nature of their reviews. After participants completed the evaluation, they were greeted by a third experimenter and escorted to another room in the same department for the second study.

Total scores for overt discrimination were obtained by separately summing the score for the evaluation of each interviewer. Cronbach’s alpha revealed that this measure possessed satisfactory scale score reliability: $\alpha = .77$ (95% CI, .66–.85) for ratings of the first interviewer and $\alpha = .82$ (95% CI, .73–.88) for ratings of the second interviewer. Cronbach’s alpha coefficient was .81 (95% CI, .73–.88) for ratings of gay interviewers and .78 (95% CI, .68–.86) for ratings of heterosexual interviewers. Total scores from the evaluation of the gay interviewer were subtracted from the total evaluation scores of the heterosexual interviewer, with higher scores reflecting greater levels of overt discrimination.

### Facial EMG component (Phase III)

After the behavioral component, participants were escorted to a separate room to complete the facial EMG and IAT, the order of which was counterbalanced. Participants were required to sign a second consent form pertaining to the facial EMG and IAT, which outlined the purpose of the study, participants’ rights, and confidentiality of the data. Facial EMG was used to implicitly measure participants’ affective responses to pictures of gay and heterosexual couples, as well as to neutral images. Electrodes were placed on the zygomaticus major (cheek) and corrugator supercilium (brow) muscle regions according to Tassinary et al.’s (1989) specifications. As well, dummy electrodes were placed on the back of the neck according to Vanman and colleagues’ (1997) recommendations to divert participants’ attention from the face as the area of interest. Following Vanman et al.’s (1997) instructions, participants were informed that the electrodes measured neural impulses that emanated from the head. Facial EMG data were recorded using Biopac MP150 hardware and AcqKnowledge software.

Forty-five black-and-white pictures of gay and heterosexual couples as well as neutral images (e.g., nature scenes) were presented in random order using Superlab software. There were 15 pictures from each category. All pictures for the couples had been pilot-tested for attractiveness of targets, sex of targets, and perceived sexual orientation. In addition to implicitly measuring participants’ affect while viewing these pictures, participants provided explicit ratings of each picture on a scale ranging from 0 (extremely negative) to 9 (extremely positive) to determine how much they liked or disliked each image. Thus it was intended that participants would indicate how they felt
while viewing the image and that higher ratings would indicate greater levels of positivity toward the image. These ratings constituted a measure of explicit affect toward gay men. Ratings were performed on a Biopac transducer, a device that has a sliding lever that participants move to reflect the rating they wish to assign to each image. Ratings assigned through the transducer were viewed on the computer monitor along with the facial EMG data by the experimenter in an adjoining room. Following data acquisition, a series of steps were performed to integrate the data.

Facial EMG cheek and brow bias scores were computed for each participant by subtracting the mean EMG amplitude during the gay trials from the mean amplitude during the heterosexual trials. Higher scores for the cheek EMG bias reflect more positive affect when viewing images of heterosexual couples, while higher scores for brow EMG bias reflect more negative affect for heterosexual images compared to gay images.

IAT component (Phase III)
Participants viewed 12 of the pictures used in the facial EMG condition (six gay and six heterosexual images). In addition to the gay and heterosexual images, participants also viewed 12 words: six positive (gift, excellent, free, wholesome, beneficial, wonderful) and six negative (failure, accident, unsafe, harmful, unhealthy, stupid). These words were chosen from existing IAT tasks as well as words that Crites, Fabrigar, and Petty (1994) described as cognitive in nature. This IAT script was designed using Superlab software. All images and words appeared in black and white. The stimuli were: (1) presented with 250-ms inter-image intervals in order to clear the screen between trials; and (2) randomly selected from a larger set of images without replacement.

Participants were presented with seven consecutive blocks of IAT trials. For the initial target-concept discrimination trial (Block 1), participants viewed the 12 images of gay and heterosexual couples and categorized the images as “gay” or “straight” by pressing the appropriate keys. Following this first trial, participants completed the attribute discrimination task (Block 2) in which they categorized the words as “positive” or “negative.” Then participants completed the first pairing task, which included 24 practice trials (Block 3) followed by 48 experimental trials (Block 4). Block 5 consisted of 24 practice trials where the position of the target-concept targets was reversed from the previous trials. Finally, participants completed the reversed pairing task, which consisted of 24 practice trials (Block 6) and 48 experimental trials (Block 7). The reversed combination task included an additional practice block to control for order effects that are typically observed between the two combined tasks (Greenwald, Nosek, & Banaji, 2003).

Two versions of the IAT were created, one with the incongruent combined task presented first, and one with the congruent combined task presented first. To address order effects, half the participants completed the incongruent block
first, and half completed the congruent block first. In the incongruent critical block, participants were instructed to press the “d” key for positive words as well as images of gay couples and the “k” key for negative words and images of heterosexual couples. In the congruent critical block, participants pressed the “d” key for negative words and images of gay couples and the “k” key for positive words and images of heterosexual couples. For all trials, participants were instructed to respond as quickly as possible. When participants incorrectly classified a stimulus (e.g., classifying a gay couple as heterosexual), a red “X” was presented on the screen along with a message indicating that they needed to press the correct response key to continue. IAT data were analyzed following Greenwald et al.’s (2003) recommendations. Figure 1 indicates the study design and measures used to assess the key constructs of interest.

After completing the implicit measures, subjects participated in a post-experimental inquiry conducted by a separate researcher to investigate whether they were aware of the true purpose of the study and, importantly, whether they attended to the interviewer’s sexual orientation. Regarding the latter, participants were asked to identify each interviewer’s race, approximate age, and their sexual orientation. All participants accurately indicated that the “gay” interviewer’s sexual orientation was indeed “gay.” After that, they were fully debriefed. Participants also signed video release forms, indicating that they gave consent for their interviews to be watched and coded for research purposes.

**Results**

Paired-samples $t$ tests revealed that participants provided more positive ratings for images of heterosexual couples ($M = 6.73$, $SD = 1.30$) than gay
couples \((M = 5.02, SD = 2.31)\), \(t(52) = -5.35, p < .001, d = .91\). Significantly more positive ratings were given to neutral images \((M = 7.10, SD = 1.23)\) than gay images, \(t(52) = -6.27, p < .001, d = 1.12\), and neutral images were given more positive ratings than heterosexual images, \(t(54) = -2.97, p = .004, d = 0.29\). In accordance with Hypothesis 1, where it was predicted that participants would evidence greater covert discrimination toward the gay male interviewer versus the heterosexual male interviewer, participants did indeed display greater covert discrimination toward interviewers perceived as gay \((M = 32.99, SD = 4.90)\) than those perceived as heterosexual \((M = 34.88, SD = 4.29)\), \(t(53) = -4.20, p < .001, d = .41\). A similar finding did not emerge for the assessment of overt discrimination; that is, there were no significant differences in the extent of overt discriminatory behavior directed toward the gay interviewer \((M = 77.83, SD = 8.89)\) versus the heterosexual interviewer \((M = 79.05, SD = 7.62)\), \(t(52) = -1.54, p = .13, d = 0.15\). Thus it appears that a difference was detected when the discrimination was covert in nature rather than overt, and Hypothesis 1 was supported.

The correlations between the explicit and implicit measures can be found in Table 1.

The IAT was significantly associated with scores on all explicit cognitive and affective measures. Specifically, greater IAT bias was related to greater modern homonegativity (explicit-cognitive), colder feelings toward gay men as evidenced by the feeling thermometer (explicit-affect), and less comfort viewing pictures of gay male couples (explicit-affect). Facial EMG, in the form of cheek and brow bias, was not significantly associated with scores on the MHS (explicit-cognitive), feeling thermometer (explicit-affect), or ratings of images of gay couples (explicit-affect).

The second hypothesis, which stated that implicitly measured bias captured via the IAT and facial EMG (rather than the explicit cognitive Modern Homonegativity Scale scores and the affect-related feeling thermometer) would be significantly associated with participants’ covert discriminatory behavior, was next tested. The IAT did not correlate significantly with overt or covert anti-gay behavior. Thus those with greater implicitly measured cognitive bias toward heterosexual individuals were not more likely to display covert or overt discrimination toward gay men. Importantly, however, a significant association was observed between facial EMG in the form of cheek bias and covert anti-gay discrimination. Participants were indeed more likely to engage in covert discriminatory behavior when they displayed greater implicit positive affect toward heterosexual individuals as evidenced by the facial EMG cheek recordings. Taken together, the second hypothesis wherein implicit measures were posited to link with covert behavior evidenced during face-to-face interviews was supported for the facial EMG recordings as far as the zygomaticus (cheek) muscle site but not the IAT.
Table 1. Correlations for all measures (N = 54).

<table>
<thead>
<tr>
<th>Variable</th>
<th>MHS</th>
<th>FT</th>
<th>GayRating</th>
<th>IAT</th>
<th>Brow</th>
<th>Cheek</th>
<th>Covert</th>
<th>Overt</th>
<th>BrowKiss</th>
</tr>
</thead>
<tbody>
<tr>
<td>MHS</td>
<td>32.75 (12.58)</td>
<td>−76**</td>
<td>−.63**</td>
<td>.42**</td>
<td>−.10</td>
<td>.14</td>
<td>.27*</td>
<td>−.02</td>
<td>−.05</td>
</tr>
<tr>
<td>FT</td>
<td>62.17 (30.02)</td>
<td>.66**</td>
<td>−.35**</td>
<td>.11</td>
<td>.15</td>
<td>−.09</td>
<td>−.02</td>
<td>−.10</td>
<td></td>
</tr>
<tr>
<td>GayRating</td>
<td>5.02 (2.3)</td>
<td>−.29*</td>
<td>.13</td>
<td>.06</td>
<td>−.15</td>
<td>−.16</td>
<td>−.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IAT</td>
<td>−62 (.38)</td>
<td>−.07</td>
<td>−.03</td>
<td>0.03</td>
<td>.07</td>
<td>.06</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brow</td>
<td>−</td>
<td>−.27*</td>
<td>−.04</td>
<td>.18</td>
<td>.24*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cheek</td>
<td>−</td>
<td>.33**</td>
<td>−.03</td>
<td>−.19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Covert</td>
<td>1.89 (3.30)</td>
<td></td>
<td>1.3</td>
<td>−.26*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overt</td>
<td>1.22 (5.74)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.33**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BrowKiss</td>
<td></td>
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</tbody>
</table>

Note: MHS = scores on the Modern Homonegativity Scale (explicit-cognitive); FT (feeling thermometer-explicit affect); GayRating = rating given to images of gay couples (explicit-affect); IAT = IAT score (implicit-cognitive); Brow = brow activity measured by facial EMG (implicit-negative affect); Cheek = cheek activity measured by facial EMG (implicit-positive affect); Covert = covert behavior (indicated via participants’ non-verbal behavior toward interviewers during interview session); Overt = overt behavior (indicated via explicit evaluations of interviewers); BrowKiss = brow activity recorded by facial EMG for images of couples kissing (implicit-negative affect). Means and standard deviations, where appropriate, appear on the diagonal. *p < .05, **p < .01 (1-tailed significance).
Overall brow activity did not significantly correlate with either overt or covert behavior. Based on unpublished findings from Morrison and Trinder (2018) that revealed the presence of elevated brow activity in response to sexually explicit gay male stimuli, we explored whether the nonsignificant relationship observed between brow activity and covert behavior was a function of the innocuous nature of some of the stimuli presented (e.g., gay couples leaning into one another, embracing, or holding hands). Specifically, we focused on a subset of pictures consisting of target couples that engaged in more “provocative” behavior (i.e., kissing). To ease interpretability, this exploratory variable was calculated by subtracting scores for heterosexual kissing images from scores for gay kissing images, with higher scores reflecting more negative affect when viewing images of gay couples kissing. Results indicated that participants who displayed greater brow activity toward images of gay couples kissing were more likely to engage in overt discrimination by rating the heterosexual interviewer more favorably than the gay interviewer. Surprisingly, those who displayed elevated brow activity when exposed to images of gay couples kissing were less likely to engage in covert discrimination.

Discussion

The overt and covert discrimination documented in the present study occurred during face-to-face interviews with both gay and heterosexual males. Participants were unaware at the time of data collection that their facial expressions and body posture would serve as indicators of the degree to which they discriminated against the interviewers. As predicted, significantly greater covert discrimination in the form of more standoffish body postures, fewer smiles, less eye contact, and diminished overall comfort, friendliness, and interest in the interaction with the gay versus heterosexual interviewer emerged. This finding also supports theorizing in the area of modern prejudice. That is, given the socially inappropriate nature of overt forms of discrimination in certain contexts (e.g., university settings), the type of discrimination directed toward minority groups is likely to be more subtle than blatant (e.g., Rye & Meaney, 2010; Steffens, 2005).

The present study also showed that facial EMG can be used to implicitly measure bias based on sexual orientation. Being the first to apply this technique to the domain of homonegativity using two muscle sites, we demonstrated that facial EMG was significantly associated with discrimination. Specifically, cheek activity signifying greater positivity toward heterosexual versus gay couples was related to discrimination toward our gay versus heterosexual male interviewers. Moreover, the finding that only activity measured at the zygomaticus major (cheek site) versus that measured at the corrugator supercilium (brow site) was associated with discrimination
may point to the potential role played by heteronormativity (i.e., the notion that promotes heterosexuality as the normal and preferred sexual orientation) in the study. Certainly, our findings are consistent with Vanman et al.’s (2004) study assessing racial bias using facial EMG and overt discrimination. As such, activity emanating from the cheek rather than the brow may provide social psychologists with greater insight as to how implicit bias might be expressed, particularly contemporary bias that reflects ingroup favoritism rather than outgroup derogation. In their investigations of covert bias toward gay men and lesbian women, respectively, Aberson, Swan, and Emerson (1999) and Swim, Ferguson, and Hyers (1999) found that biases were a direct result of positivity toward the ingroup (i.e., heterosexuals) rather than negativity toward the outgroup. To better gauge the utility of the corrugator supercilium vis-à-vis homonegativity, we created a variable containing the more explicit pictures of gay couples. The correlative patterns suggest that participants who evidenced greater distaste for the sexualized images of gay male couples (i.e., images where the targets were kissing) may have been more comfortable expressing overt forms of discrimination, as shown by their favorable ratings accorded to both the heterosexual interviewers and heterosexual couples. One implication of this finding is that, in order to activate the brow during facial EMG trials when investigating sexual orientation bias, researchers are cautioned to use imagery that is explicit (i.e., sexualized) in nature. The use of innocuous stimuli featuring gay men smiling at each other or embracing one another may be perceived as rather mundane in today’s social climate and may not crystallize the point of difference between heterosexuals and gay or lesbian couples—that is, their sexual behavior and the target to which this behavior is directed. For instance, as noted earlier, Morrison and Trinder (2018) found significant brow activity when showing a film clip of gay men who graduate to the point where they are about to undress each other in preparation for intercourse. A parallel clip featuring a heterosexual couple did not elicit the same degree of brow activity. Further research is needed to demarcate the types of stimuli that are most effective in studies examining homonegativity implicitly.

To date, there is only one study (Vanman et al., 2004) that has tested the correspondence between facial EMG and the IAT, as well as their relationship to discrimination. In the present study, facial EMG and IAT bias did not correlate significantly with one another, and, unlike facial EMG, the IAT did not relate to discrimination. These findings parallel those reported by Vanman et al. (2004) and suggest the existence of similar patterns between facial EMG, the IAT, and discrimination across two dimensions: race and sexual orientation. Interestingly, whereas facial EMG possessed no significant associations with the explicit measures used in the current study, significant correlations between the IAT and our explicit measures emerged—namely, the MHS (explicit-cognitive), feeling thermometer (explicit-affect), and ratings of gay couples (explicit-affect).
The disadvantage to relying solely on explicit measures is the fact that participants can control their responses. When completing the IAT, for example, participants may have been aware, to some degree, of what this technique was measuring. Moreover, participants may be able to control the explicit cognitive and affective aspects of prejudice more easily than the implicit affective component (Vanman et al., 2004). Given that individuals higher in homonegativity report an aversive “gut” reaction to gay men (Jewell & Morrison, 2010; Jewell & Morrison, 2012; Mahaffey et al., 2011), the affective component may be the more difficult to control in comparison to the cognitive component. With that said, it is critical to reflect on the potential value of the MHS, the scale that constituted our explicit-cognitive assessment. Unlike the relationship between scores on the IAT and covert discrimination \(r = .03\), scores on the MHS correlated significantly with covert discrimination toward gay men \(r = .27\). Despite not being as strong in magnitude as the association between the facial cheek EMG assessment and covert discrimination toward gay men \(r = .33\), the linkage between the explicit-cognitive MHS and covert discrimination far surpassed the (limited) relationship between the implicit-cognitive IAT and covert behavior. The broader implication of these findings is that, for those who may not have access to facial EMG equipment and/or the necessary lab space, the MHS could be considered useful when attempting to capture and reveal covert discriminatory behavior toward men who are gay.

Homonegativity remains a critical social issue, one that impedes the lives of sexual minority men and women. In order to be in a position to confront homonegativity, it is incumbent on researchers to address its multifaceted nature. Jewell, Morrison, and Gazzola (2012) underscored the need to design studies that provide insight into how the separate components of homonegativity align or diverge. Additional research is clearly needed that seeks to uncover the role that negative and positive affective reactions to sexual minority persons plays and their interrelationship to behavior that is discriminatory (Mahaffey et al., 2005, 2011). As well, and in accordance with the recommendations offered by Stewart et al. (2013), future research using facial EMG would undoubtedly benefit from incorporating a broader range of negative affective reactions such as contempt and disgust and ensuring that explicit measures of these affective states also are included.

Based on the findings of the present study, it appears that affect captured implicitly, and the use of physiological techniques such as facial EMG to do so, produces a more holistic understanding of the antecedents and consequences of homonegativity. A multifaceted understanding of homonegativity may, in turn, be used to benefit sexual minority women and men as well-informed strategies for cognitive, affective, and behavioral change begin to take shape and be implemented. It is only by taking a comprehensive approach to the assessment of homonegativity, as was done in the present study, that these necessary pieces begin to fit together.
Notes

1. Previous research (e.g., Morrison & Morrison, 2003; Steffens, 2005) has found that heterosexual men possess greater degrees of explicit and implicit homonegativity compared to women. As well, heterosexual men are more inclined to direct their homonegativity toward gay targets compared to lesbian targets. Thus, heterosexual men comprised the sample in the current study.

2. Given the detailed nature of the experimental procedures, we felt it prudent to begin testing participants that were most likely to harbor negative cognitions and affect toward sexual minorities. Further, selecting participants with higher or lower scores maximizes the likelihood of demonstrating that behavior is influenced by an attitudinal variable (Cox, 1957).

3. A post-experimental inquiry revealed that 38 participants believed the two studies were related, but not until after they began the second study. Of these participants, 15 reported that they did not realize the connection until they were specifically asked. As well, at the time of debriefing, 16 participants indicated that they did not see a common element between the two studies. Thus, participants entered the interview and the IAT and facial EMG phases believing they were participating in separate studies.

4. A 15-item post-experimental inquiry revealed that all the participants correctly believed that each interviewer was the intended sexual orientation. No participants reported being aware of the true purpose of the interview, suggesting that the manner in which sexual orientation was depicted did not arouse suspicion.

5. Each interviewer worked from a strict set of questions. The questions may be obtained from the first author.

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