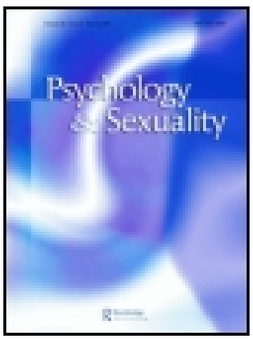

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ARTICLE

What do two men kissing and a bucket of maggots have in common? Heterosexual men's indistinguishable salivary α-amylase responses to photos of two men kissing and disgusting images

Breanna Maureen O'Handley [a], Karen L. Blair [a] and Rhea Ashley Hoskin [b]

[a]Psychology Department, St. Francis Xavier University, Antigonish, NS, Canada; [b]Sociology Department, Queen's University

ABSTRACT

The current study sought to examine how Utah men's physiological reactions to viewing same-sex public displays of affection (PDA), measured through salivary alpha-amylase (sAA), differ as a function of sexual prejudice, as assessed using the Attitudes Towards Lesbians and Gay Men Scale (ATLG) and the Modern Homonegativity Scale. In examining physiological responses to same-sex PDA, the present study hoped to assist in explaining current levels of anti-gay hate crimes despite growing positive public opinion for the LGBTQ community. Participants in the current study viewed six different slide shows depicting same-sex PDA, mixed-sex PDA, everyday items, and disgusting images, while providing saliva samples in the lab. A series of paired-samples *t*-tests was performed and found that sAA responses to images of same-sex kissing ($t_{(98)} = 3.124$, $p = .002$) and universally disgusting images ($t_{(98)} = 2.128$, $p = .036$) were significantly greater than sAA responses to the slide show depicting everyday items. This result held across the full sample, regardless of individual levels of prejudice. The results of the current study suggest that all individuals, not just highly sexually prejudiced individuals, may experience a physiological response indicative of stress when witnessing a male same-sex couple kissing. The possibility of a socialised disgust response to same-sex PDA is discussed.

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Sexual prejudice; salivary alpha-amylase; same-sex PDA; hate crimes; psychophysiology

In 1998, two men offered Matthew Shepard a ride home, with the intention of robbing him. However, these men proceeded to pistol whip, torture, and tie Shepard to a fence, where they left him bloodied and on the verge of death. Matthew died 6 days later, never having regained consciousness. In trial, the lawyer for one of Shepard's killers attempted to argue that the assailant experienced temporary insanity as a result of Shepard's alleged unwanted sexual advances and, due to 'gay panic', the assailant was provoked to commit such a heinous crime. While the defence was rejected by the judge in this case, the 'gay panic' defence has been a common argument used in extremely violent anti-gay hate crime trials (Lee, 2008; Suffredini, 2001). These men often describe experiencing instant, uncontrollable, aggressive behaviour upon experiencing sexual advances from gay men or viewing affectionate behaviour between two men. Recent research has found that the 'gay panic' defence is accepted by some conservative jurors (Salerno et al., 2015), but is there any evidence of the argument of a 'gay panic' state? The 'gay panic' argument suggests that a temporary state of insanity underlies an unconscious physiological reaction that provokes extreme violence in the face of gay male sexuality. In an attempt to determine if the

CONTACT Karen L. Blair Karen@klbresearch.com

proposed reaction of a 'gay panic' exists, the present study sought to uncover if an underlying physiological response is present when heterosexual men view images of male same-sex couples kissing or holding hands, and whether such responses are influenced by self-report levels of sexual prejudice.

Sexual prejudice refers to negative attitudes towards a person because of his or her sexual orientation (Herek, 2004). In the present day, it can sometimes be easy to forget that discrimination and violence towards individuals belonging to the lesbian, gay, bisexual, transgender and queer (LGBTQ) community is still an issue of concern. The LGBTQ community has gained massive ground in civil rights within the last two decades. In the 1990s, a federal court ruling lifted the ban on lesbians and gays in the Canadian military and an Ontario ruling allowed same-sex couples to adopt. In 2005, Canada became the fourth country in the world to allow same-sex marriage. Within the same time frame there has been a dramatic shift in public opinion towards the LGBTQ community, with public attitudes growing increasingly more positive. Support for marriage equality has consistently increased each year. Gallup polls in 2005 indicated that only 37% of Americans believed same-sex marriage should be recognised as valid by the law with the same rights as traditional marriage (Gallup, 2005), however this number increased to 60% by 2015 (Gallup, 2015). More recently, a GenForward poll from July 2016 found that most young people (between the ages of 18 and 30), across race and ethnicity, favour rights and protection for LGB people (GenForward, 2016). Such shifts in public opinion are not limited to law and policy. Attitudes towards lesbians and gays have grown warmer over the past decade, as measured by research using 'feeling thermometers', a scale on which participants indicate their feelings in numbers using temperatures as an analogy (Herek, 2015). Although lagging a decade behind Canada, same-sex marriage became legal nationwide in the United States of America after a Supreme Court ruling in June 2015.

Despite the favourable social and political shifts of recent years, anti-gay hate crimes are still a prevalent problem in Canada and the United States. The Uniform Crime Reporting Program reported that in 2014 there were almost 5500 hate crimes reported in the US, with 18.6% of these incidents involving a victim who was targeted due to their sexual orientation (Federal Bureau of Investigation, 2015). In Canada, 16% of the hate crimes committed in 2013 were motivated by sexual orientation and 2/3 of these crimes involved violent offences (Allen, 2015). Hate crime statistics indicate that hate crimes motivated by hatred of sexual orientation are much more likely than other hate crimes to involve physical violence. Given growing positive public opinion, as well as support and advancement of LGBTQ rights and protections, it is surprising that the number of anti-gay hate crimes remains so prevalent.

An increase in same-sex public displays of affection (PDA) may be the missing link in the relationship between decreasing sexual prejudice and increasing violence against LGBTQ people. In a society where lesbian and gay people perceive growing public support for their sexual orientation, they are likely to feel more comfortable being open about their sexuality in public. PDA often includes holding hands, affectionate touching, or kissing, but generally these actions are not overtly sexual. While PDAs by mixed-sex couples may go unnoticed, same-sex PDAs may result in negative responses from those high in sexual prejudice. Thus, same-sex PDA may trigger either a disgust or anger response, which can have affective, cognitive, and physiological components.

Sexual prejudice and disgust

Some research has argued that disgust is an important emotional component of sexual prejudice. Heterosexual college students who displayed implicit, but not explicit, sexual prejudice rated male same-sex kissing photos as disgusting (Kiebel, McFadden, & Herbstrith, 2016). In fact, in a study conducted by Kiebel et al. (2016), participants gave indistinguishable ratings to photos of male same-sex couples kissing and photos of universally disgusting images. Other research has found that individuals who report high levels of disgust sensitivity, meaning they have a dispositional proneness to experiencing disgust, are more likely than those low in disgust sensitivity to display

an implicit prejudice towards gays and lesbians (Inbar, Pizarro, Knobe, & Bloom, 2009). It appears that disgust plays a role in implicit sexual prejudice and is one way in which individuals describe their sexual prejudiced attitudes; therefore it is possible that disgust plays a role in explicit sexually prejudiced attitudes and behaviours.

As noted, anti-gay hate crimes disproportionately involve physical violence and this may reflect a physical disgust response. This theory is supported by the idea of a behavioural immune system (BIS). The BIS is made up of psychological processes that ascertain infection risk from perceptual cues; it is separate from, and complementary to, the physical immune system (Schaller, 2011). Given the metabolic costs and limitations of the physical immune system, the BIS works through proactive mechanisms to prevent contact with pathogens in the first place. The BIS responds to superficial cues that indicate infection risk through activation of aversive emotions, cognitions, and behavioural impulses (Schaller, 2011). Through disgust, the BIS may work to produce aversive responses to out-group members, as they may be seen as carrying pathogens foreign to the local population and as engaging in non-normative behaviours thought to be more likely to contract such pathogens. While Scaller (2011) mainly examines discriminatory behaviours activated by the BIS in terms of ethnic out-groups, heterosexuals may perceive LGB people to be an unfamiliar out-group whose members engage in non-normative behaviours that may put them at risk to carry foreign pathogens. Such a view may result in some heterosexuals engaging in discriminatory and aversive behaviours, perhaps even acting in an aggressive manner (Schaller, 2011).

Kelly (2011) suggests that disgust may work to regulate humans' social norms; the emotion may work to motivate compliance with these norms and punishment of those who do not conform to social norms. Individuals are socially conditioned to think that certain behaviours, which fall outside of social norms, are disgusting, thereby removing any motivation to engage in such activities. At the same time, individuals who fail to comply with social norms are seen *as* disgusting and are therefore avoided. This ostracism then works as a form of punishment. The function of disgust in regulating social norms may work to foster different kinds of prejudice and discrimination when individuals see members of out-groups as non-compliers with social norms who should therefore be ostracised.

For some out-groups, the BIS and the social function of disgust can be even more detrimental, as some out-groups that elicit disgust are seen as less human than others. A functional magnetic resonance imaging study found that individuals looking at images of certain out-group individuals, perceived as disgusting, displayed little to no medial prefrontal cortex (mPFC) activity (Harris & Fiske, 2006). The mPFC is a region in the brain that is implicated in social cognition and is activated whenever an individual thinks about a person, but not an object. The finding that the mPFC region was not activated, but that regions implicated in the experience of disgust were activated when individuals were exposed to photos of certain 'lowest of low' out-group members, suggests that out-group members perceived as disgusting were completely dehumanised. If those who see lesbians and gays, and therefore same-sex PDA, as disgusting also fail to cognise the out-group as human, this may explain the occurrence of violent anti-gay hate crimes (Tapias, Glaser, Keltner, Vasquez, & Wickens, 2007).

Psychophysiology of prejudice

Despite substantial gains in LGBTQ rights and increases in positive public attitudes towards the LGBTQ community (Gallup, 2015; GenForward, 2016; Herek, 2015), anti-gay hate crimes remain a prevalent issue (Allen, 2015; Federal Bureau of Investigation, 2015). The missing link between decreasing sexual prejudice and increasing positive attitudes towards LGB people may be PDA, with which LGB individuals may now feel more comfortable. Accompanying this increase in same-sex PDAs is an increase in same-sex couple representation in film and television. For individuals remaining persistently sexually prejudiced, it may feel as though they are being bombarded with same-sex PDA that they may perceive as disgusting (Kiebel et al., 2016). Since viewing out-groups

as disgusting has been linked to dehumanising cognitions (Harris & Fiske, 2006) and aversive behaviours (Schaller, 2011), it is possible that viewing behaviour perceived as disgusting, such as same-sex PDAs, may encourage aggression.

Disgust and prejudice have been shown to be capable of eliciting responses from one of the body's major stress systems: the sympathetic nervous system. Salivary alpha-amylase (sAA; Bosch et al., 1996; Chatterton, Vogelsong, Lu, Ellman, & Hudgens, 1996; Nater et al., 2005; Skosnik, Chatterton, Swisher, & Park, 2000; Thoma, Kirschbaum, Wolf, & Rohleder, 2012) is considered a biomarker of the sympathetic nervous system. sAA activity is especially responsive to inductions of disgust in which the individual has no control or ability to stop the disgusting situation (Dawson, Schell, & Filion 2007) or they are only allowed passive coping (Bosch, de Geus, Veerman, Hoogstraten, & Amerongen, 2003). Therefore, if sexual prejudice has a physiological component, it would likely function through disgust and could potentially be measured through sAA. Such physiological responses would likely be most pronounced in situations in which exposure to same-sex PDA, as the stressor, is felt to be uncontrollable and inescapable. Such a case is common now in daily life, as same-sex PDA is felt to be more acceptable and is more present in mainstream media. A similar situation can be created experimentally by showing slide shows depicting same-sex PDA to individuals who are homophobic with the instruction to not look away, as was done in the current study.

Alpha amylase

sAA is a digestive enzyme that works to break down insoluble starch into soluble maltose and dextrin, but its concentration in saliva is thought to indicate sympathetic nervous system activity (Bosch et al., 2011). sAA comprises 40–50% of the total salivary gland produced protein and most of the enzyme is synthesised in the parotid salivary gland (Nater & Rohleder, 2009). The literature is inconsistent on whether sAA can be considered a reliable biomarker of sympathetic nervous system activity, as both parasympathetic and sympathetic branches of the autonomic nervous system innervate acinar cells that produce sAA. Some work indicates that sympathetic nerve stimulation results in a greater secretion of sAA (Anderson et al., 1984), while others suggest that sAA activity is influenced more so by the parasympathetic nerve stimulation (Morse et al., 1983). However, Morse et al.'s (1983) was methodologically flawed, as there was no control group or random allocation to treatment groups. In addition, the relaxation condition in Morse et al. (1983) always followed the stress induction condition, meaning that the sAA response the researchers found may have been a leftover stress response (Nater & Rholeder, 2009). More recent studies have indicated that sAA levels respond to physical (Chatterton et al., 1996; Walsh et al., 1999) and psychological stress (Bosch et al., 1996; Skosnik et al., 2000). There is evidence that sAA responses depend on the nature of stressors as well as the passive or active coping capabilities of those enduring the stressor (Bosch et al., 2003). sAA responses to passive watching of a gruesome, disgust-inducing video suggest that not being able to look away or do anything about a disgust-inducing stressor is enough to elicit an sAA response. More recently, the sAA response has been found to be a significant predictor of norepinephrine responses (Thoma et al., 2012), which is the main neurotransmitter implicated in sympathetic nervous system activity. It has been shown that sAA activity increases in response to a psychosocial stress paradigm but does not correlate with cortisol responses, suggesting that alpha-amylase indicates the reaction of a separate stress system, rather than the hypothalamic–pituitary–adrenal axis (Nater et al., 2005). Given the past research, it seems likely that the separate stress system sAA is implicated in the sympathetic nervous system.

Current study

The current study sought to investigate the way in which sAA responses may differ as a function of attitudes towards same-sex PDA when viewing photos of male same-sex couples kissing or holding

hands as opposed to mixed-sex couples doing the same. Since research regarding physiological responses underlying prejudice, especially sexual prejudice, has been unclear, the present study was exploratory in nature. However, it was hypothesised that individuals reporting high levels of sexual prejudice would exhibit greater sAA responses while viewing same-sex PDAs than those who report low levels of sexual prejudice. If individuals who are higher in sexual prejudice display unique physiological responses to images of same-sex couples kissing, this could potentially help to explain why their prejudice persists in the face of growing social norms that disapprove of overt anti-gay prejudice as a result of a general societal trend towards accepting same-sex couples. Conversely, if those high in prejudice do not differ in their physiological responses, then their heightened prejudice must be explained through more cognitive or attitudinal factors, and not some form of underlying physiological sensitivity, as suggested by the 'gay panic' defense.

Method

Participants and procedure

The participants for the present study were recruited using Facebook advertisements, postcard mailings, and flyers distributed in areas such as parking lots and local establishments. The recruitment information for this study was intentionally broad in order to prevent participants from guessing that the actual research topic was associated with sexual identity or same-sex couples. The University of Utah Institutional Review Board approved all procedures and materials for the study.

Participants were invited to complete an online survey about 'attitudes and opinions' in which they were asked about various types of prejudices, such as Islamophobia, racism, sexism, homophobia, and transphobia. A total of 465 participants completed the online survey, of whom 438 met the criteria (heterosexually identified men between the ages of 18 and 45) to be invited to the research lab for the in-lab portion of the study. The age range was capped at 45 so as to avoid potential generational effects, given the generally lower levels of acceptance of same-sex sexuality as age increases (McDermott & Blair, 2012). Participants were coded as being low, moderate, or high in their sexual prejudice levels by the lead investigator. Sexual prejudice was measured using an implicit association test (IAT; Greenwald, McGhee, & Schwartz, 1998) designed for the current study showing images of same-sex and mixed-sex PDA, and was completed online using Inquisit 4 Web (Millisecond, 2016). The IAT was used to measure the extent to which same-sex or mixed-sex PDAs were automatically associated with positive or negative evaluations. The cut-off values for the IAT *d* scores to determine sexual prejudice levels were less than .35 for low, .35–.64 for moderate, and greater than or equal to .65 for high. This information was then blinded to the research assistants, who were instructed to randomly invite equal numbers of participants from each group until a total of 140 participants had been run through the in-lab procedure. Although 140 men were run through the in-lab procedure, the sample size for the current analysis is 120 due to some participants not providing sufficient saliva samples for analysis, and a few participants later being identified as identifying above 2 on the Kinsey Scale.

Of the 120 participants, the mean age was 26.87 (SD = 5.4), all were male, as per the study criteria, and the majority identified as exclusively heterosexual (74.2%) as per the Kinsey Scale. The Kinsey Scale (Kinsey, Pomeroy, & Martin, 1948) is a single item measure used to assess the sexual attraction and behaviour of individuals towards members of the same and opposite sex on a 7-point scale (0 = 'exclusively heterosexual', 6 = 'exclusively homosexual'). Participants indicating a Kinsey Scale sore of 3 (bisexual) or higher (homosexual) were excluded from the current analysis in order to focus specifically on male heterosexual responses to male same-sex PDA. Participants with a Kinsey score above 2 were excluded as scores 0–2 indicate that individuals are predominantly heterosexual or only incidentally homosexual, indicating they would not be likely to be sexually

Table 1. Sample demographics.

Demographic $N = 120$	*n* (%)
Age M (SD)	26.87 (5.4)
Ethnicity n (%)	
White	104 (86.7%)
Hispanic	5 (4.2%)
Asian/Pacific Islander	5 (4.2%)
Other	6 (5%)
Religion *n* (%)	
Mormon/LDS	75 (62.5%)
Atheist	12 (10%)
Spiritual but not religious	12 (10%)
Other	21 (17.5%)
Religiosity *n* (%)	
Not at all religious	30 (25%)
Not very religious	13 (10.8%)
Somewhat religious	28 (23.3%)
Very religious	49 (40.8%)
Attendance of religious services *n* (%)	
Never–rarely	38 (31.9%)
Every so often	20 (16.7%)
Weekly	61 (50.8%)
State *n* (%)	
Utah	78 (65%)
Other	42 (35%)
Level of Education *n* (%)	
High school diploma	55 (45.8%)
Undergraduate degree	44 (36.7%)
Graduate degree	21 (17.4%)
Kinsey Responses *n* (%)	
0: Exclusively heterosexual	89 (74.2%)
1: Only incidentally homosexual	20 (16.7%)
2: More than incidentally homosexual	8 (6.7%)

aroused by same-sex PDAs. Complete demographic information for the sample can be found in Table 1.

Participants who completed the in-lab portion of the study were required to be in the lab for approximately 2–3 hours. The participants were placed in a room on their own and watched an automated series of slide shows (described below) displayed on a computer screen (21" iMac). At various pre-determined times throughout the slide show, the slide show instructed participants to provide saliva samples by drooling saliva into test tubes. Throughout the slide shows, participants were seated in front of the computer monitor and instructed to remain sitting still and to not touch their face or fidget. The slide shows were randomly presented to participants in one of six possible orders (A, B, C, D, E, F; B, C, D, E, F, A, etc.). In between each set of images, participants completed questionnaires using an iPad Mini about their responses to the set of images they had just viewed.

Measures

Demographic measures

During the initial online survey, participants provided their basic demographic information, including age, educational achievement, religion, and ethnicity (Table 1).

Self-report measure of prejudice towards gay men

As part of the online survey completed prior to being invited into the lab, participants completed two validated measures of prejudice towards gay men, the Modern Homonegativity Scale (MHS; Morrison & Morrison, 2003; Morrison, Morrison & Franklin, 2009) and the Attitudes Towards Lesbians and Gay Men Scale (ATLG; Herek, 1994). The MHS-G is a 10-item scale which assesses

modern forms of prejudice towards gay men by asking participants to indicate their agreement with each item (e.g. 'gay men should stop shoving their lifestyles down other people's throats') using a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The ATLG assesses the construct of 'old-fashioned' negative attitudes towards gay men. The scale consists of 10-items (e.g. 'male homosexuality is a perversion') which are rated on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The two measures were found to be highly correlated ($r = .76$, $p < .001$) and were thus combined into a single measure of prejudice towards gay men. The overall scale had high reliability, as indicated by a Cronbach's alpha of 0.96, which was higher than each of the individual scales alone (MHS = .94; ATLG = .94).[1]

Photo slide shows

During the in-lab component, participants watched a series of six slide shows on a computer while providing saliva samples at preset intervals. Participants provided a sample immediately before each slide show and immediately following each slide show. Participants were instructed to sit still, not touch their face and to look at each photo for the entire time that it was on the screen, 'even though some images may be boring or difficult to look at.' The slide shows were presented in a random order and each one was 5 minutes long and consisted of 30 different images that fell into one of six categories: mixed-sex PDA (MSP), disgust, same-sex PDA (SSP), things, mixed-sex kissing (MSK) or same-sex kissing (SSK) (see Figure 1 for sample images). The MSP and SSP slide shows were made up of images depicting heterosexual or male same-sex (respectively) couples displaying some sort of affection that did not involve kissing. The disgust slide show consisted of images that the majority of people would find disgusting or disturbing, such as maggots, rotting food, and open wounds. The 'things' (neutral) slide show was comprised of images displaying everyday items, such as paperclips, rocks, and staplers. The MSK and SSK slide shows contained images of heterosexual or male same-sex (respectively) couples engaged in kissing PDA. Figure 1 displays a representative image from each category. All photos were converted to a black and white greyscale

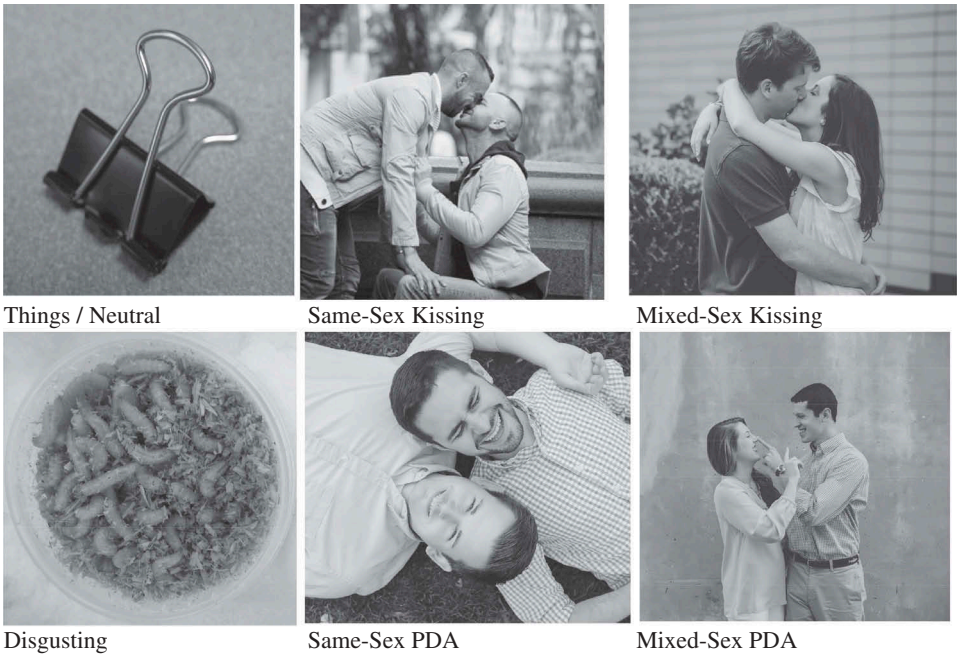

Figure 1. Sample images from each slideshow type viewed by participants. All images were shown in black and white. Please see notes section for image copyright details.[2]

and all couples presented were relatively young, white, and of an average body size, so as to reduce additional mitigating factors (e.g. prejudice towards interracial couples).

Saliva samples

Saliva samples were collected throughout the in-lab slide show portion of the study. The 'passive drooling' method of saliva collection was used. Other methods of collection include having participants chew on a cotton roll in order to produce enough saliva, however, such methods have been found to introduce measurement errors, especially in the measurement of sAA. The process of chewing can cause more sAA to be released simply due to its role in digestion (Bosch et al., 2011). Participants were instructed to passively allow saliva to collect in their mouth and then drool into a vial. Samples were provided immediately before and after each slide show and were assessed for sAA. All samples were frozen after collection until they were analysed by the laboratory of Clemens Kirschbaum at the Technical University of Dresden, which used a time-resolved immunoassay with flurometric end point detection. The lab returned an analysis indicating the amount of sAA in each sample, measured in units per millilitre (U/ml).

Measures not in current analysis

The full study included multiple measures of attitudes, including modern racism, Islamophobia, Social dominance orientation and ambivalent sexism. Additionally, participants' heart rate and electrodermal activity was also measured during the in-lab portion of the study, but technical issues with these two measurements resulted in a reduced sample size of useable data and the data have not yet been prepared for analysis. Finally, participants were recorded throughout the in-lab visit, allowing for future analysis of facial expressions and body language.

Results

In order to assess how participants' measures of sAA differed by slide show content as a function of sexual prejudice, a series of independent samples *t*-tests were run, comparing mean sAA response to each slide show between high and low prejudice groups. In order to dichotomise the MHS and ATLG scale scores, a median split was performed, where scores of 2.74 or greater were determined to indicate a high level of sexual prejudice and scores less than 2.74 were determined to indicate a low level of sexual prejudice. Table 2 presents the descriptive statitiscs for the combined MHS-ATLG scale and the sAA response to each slideshow, represented as a percentage of each participant's baseline sAA value.

The independent samples *t*-tests produced no significant group differences as a function of a participant's level of prejudice. The next step was to assess whether, across the full sample, differences in sAA responses could be detected between each of the slide shows. Visual inspection of the means (see Figure 2) indicated that sAA responses to images of male same-sex couples kissing and the disgust images were higher than the means for the other four slide shows. In order to assess whether these differences were statistically significant, paired-samples *t*-tests were run to compare sAA in response to the same-sex kissing slide show to all other slide shows, including

Table 2. Descriptive statistics of MHS–ATLG scale, and sAA data.

	M (SD)	sAA (% of baseline)
MHS–ATLG	2.66 (.97)	M(SD)
Same-sex kissing	–	150.16 (11.6)
Disgust	–	148.3 (11.93)
Mixed-sex kissing	–	134.85 (9.57)
Same-sex PDA	–	137.39 (10.1)
Mixed-sex PDA	–	131.39 (8.74)
Neutral	–	133.71 (10.93)

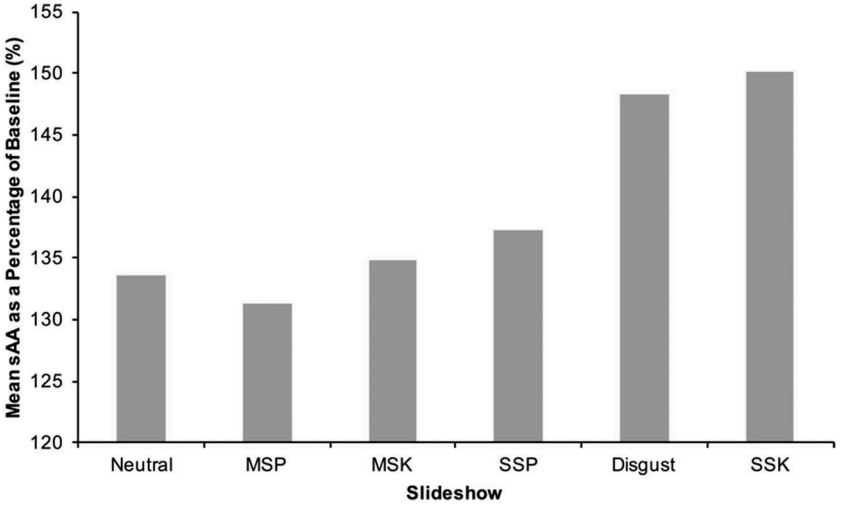

Figure 2. Mean sAA immediately after each slide show as a percentage of mean sAA immediately after the baseline slide show.

Table 3. Results of paired samples *t*-tests of sAA measured after each slide show as a percentage of each participant's own sAA baseline.

Slide show pairs	Mean difference	Standard deviation	95% confidence interval of the difference	*t*	df	Two-tailed significance (*p*)	Cohen's *d*
Neutral – same-sex kissing	−16.09	51.26	−26.32 /-5.87	−3.12	98	**.002**	.14
Neutral – mixed-sex kissing	−2.53	66.82	−16.00 /10.93	−.37	96	.709	–
Neutral – same-sex PDA	−1.88	75.83	−17.01 /13.24	−.25	98	.805	–
Neutral – mixed-sex PDA	2.70	75.54	−12.29 /17.69	.35	99	.721	–
Neutral – disgust	−13.66	63.89	−26.40 /-0.92	−2.13	98	**.036**	.12
Disgust – same-sex kissing	−2.27	67.08	−15.65 /11.12	−.34	98	.737	–
Disgust – mixed-sex kissing	12.45	71.28	−1.92 /26.82	1.72	96	.089	–
Same-sex kissing – mixed sex kissing	13.88	72.15	−0.52 /28.27	1.91	98	.059	.15
Same-sex kissing – Same-sex PDA	12.66	82.54	−3.72 /29.03	1.53	99	.128	–
Same-sex kissing – Mixed-sex PDA	18.77	79.62	−3.05 /34.49	2.37	100	**.02**	.18

disgust. The results, reported in Table 3, indicate that sAA in response to the same-sex kissing slide show (M = 150.57, SD = 117.7) was greater than the sAA response to the neutral slide show images (M = 134.48, SD = 109.59; $t(98) = 3.124$, $p = .002$, $d = 0.14$), the mixed-sex PDA images (M = 131.38, SD = 87.81; $t(100) = 2.369$, $p = .02$, $d = 0.18$), and the mixed-sex kissing images, although this final comparison was only trending on statistical significance, (M = 134.85, SD = 95.21; $t(98) = 1.913$, $p = .059$, $d = 0.15$). There were no statistically significant differences when comparing sAA response to same-sex kissing images to either the images of same-sex couples holding hands (SSP) or the disgusting images.

A paired samples *t*-test showed that participants' sAA levels after the disgust slide show (M = 148.1, SD = 118.83) were significantly greater than participants' sAA levels after the neutral slide show (M = 134.44, SD = 109.62), $t(98) = 2.128$, $p = .036$, $d = 0.12$), but that they did not differ significantly from any of the other slide shows. Furthermore, sAA levels after the same-sex kissing slide show (M = 150.57, SD = 117.7) did not significantly differ from sAA levels after the disgust slide show (M = 148.1, SD = 118.83), indicating that these slide shows induced similar physiological reactions, as indicated through sAA. Table 3 displays the results of the paired samples *t*-tests and

Figure 2 shows means of sAA as a percentage of each participant's sAA baseline, for each slide show.

Discussion

The current study sought to determine if participants' physiological reactions to a series of different types of images differed as a function of their sexual prejudice. Specifically, we compared sAA concentration levels after viewing photos of male same-sex couples kissing or engaged in other forms of PDAs, mixed-sex couples kissing or engaged in other forms of PDAs, a series of 'neutral' images and a series of disgusting images.

Salivary alpha-amylase

Participants in the current study did not display significantly different responses to images of male same-sex couples (kissing or engaged in PDAs) as a function of their pre-existing levels of sexual prejudice. However, contrary to what was expected, we did find that *all* participants exhibited a stronger sAA response to the images of male same-sex couples kissing, regardless of their level of sexual prejudice. More in line with our expectations, participants also showed heightened sAA responses to the disgusting images, compared with the neutral images. Consequently, it appears that within the current sample, individuals experienced a heightened sAA response after viewing either a series of photos depicting two men kissing *or* a series of photos depicting disgusting images, including rotting flesh, maggots, and spoiled food. In other words, participants, regardless of sexual prejudice levels, displayed sAA responses consistent with feelings of disgust, or at least sympathetic nervous system stress.

In addition to being a potential indicator of disgust, sAA is also associated with feeling trapped in a situation one cannot escape. The finding that a physiological response often associated with desire to escape an unpleasant or disgusting stimulus was elicited by witnessing images of male same-sex couples kissing in all participants, not just those who exhibited sexual prejudice, contradicted our original hypothesis. Consequently, the notion that highly prejudiced individuals may be experiencing some form of heightened physiological reaction when they encounter a same-sex couple that leads them to respond violently, or to 'lose control,' seems unlikely given the pattern of responses within the current sample. Clearly, most who experience a heightened sAA response to images of male same-sex couples kissing do not engage in violence towards gay men. Our finding suggests that many people experience a physiological response potentially indicative of disgust or stress when witnessing male same-sex couples kissing, even those who may claim that 'gay is okay.'

Although it is not possible to definitively state that the heightened sAA levels reported in the current study are indicative of participants' experiencing disgust, much of the relevant literature supports that the underlying emotion of sexual prejudice is disgust (Guth, Lopez, Clements, & Rojas, 2001; Haidt & Hersh, 2001; Inbar et al., 2009; Tapais et al., 2007). While it has been suggested that sexual prejudice, disgust, and consequential physiological reactions are an evolutionary function to aid in the avoidance of contagions (McGinn, 2011; Schaller, 2011), it seems more likely that the perception of male same-sex couples kissing as disgusting has been socialised, or influenced by and internalised from social groups (Kandel, 1978). Research has shown that implicit prejudices of parents are often passed down to children, indicating that implicit prejudice, independently of explicit prejudice, may be the product of socialisation (Sinclair, Dunn, & Lowery, 2005). Kelly (2011) proposed that the emotion of disgust regulates the social norms of humans and research suggests that social norms dictate the acceptable targets for prejudice (Crandall, Eshleman, & O'Brien, 2002). Therefore, it seems logical to propose that a physiological reaction to images of male same-sex couples kissing is the result of social norms that cast gay men as appropriate targets for such attitudes. Consistent with this premise, past research has found that

mere exposure to derogatory language regarding a certain stigmatised group is enough to elicit negative evaluations of those belonging to the group, regardless of pre-existing attitudes (Goodman, Schell, Alexander & Eidelman, 2008). In some cases, the simple induction of disgust through noxious scent is enough to elicit feelings of disgust towards gay men (Inbar, Pizarro, & Bloom, 2012). Therefore, it seems possible that negative attitudes towards gay men, such as feelings of disgust towards male same-sex couples kissing, do not have the prerequisite of high levels of sexual prejudice. Rather, the responses found in the current study may simply be indicative of the extensive reach of social norms in shaping our physiological responses to objects and behaviours socially marked as disgusting.

Herek (2009) suggests that within Western society a sexual stigma exists that is attached to any non-heterosexual behaviour, relationship, social group, and identity. Sexual stigma can be thought of as a shared knowledge that homosexuality is devalued in comparison with heterosexuality and is suggested to create social norms and expectations for individuals, regardless of their sexual orientation or personal attitudes (Herek, 2009). Furthermore, it seems that by such a mechanism, the idea that same-sex sexuality and behaviours are deviant or shameful is integrated into various levels of society so that even young children have been exposed to such beliefs (Dermer, Smith, & Barto, 2010). It is possible that sexual stigma and related orientations, which are ingrained at a young age, are so pervasive that even those who exhibit low sexual prejudice still experience feelings consistent with sexual stigma when viewing homosexual behaviour, such as disgust. The results of the current study echo those of Kiebel et al.'s (2016) study, in which all of the participants reported little to no sexual prejudice, but still rated images of male same-sex couples kissing as disgusting and not significantly different than universally disgusting images. In the current study, even participants low in sexual prejudice demonstrated a similar physiological reaction to images of male same-sex couples kissing as they did to disgusting images. This inability of physiological responses to distinguish between male same-sex couples kissing and disgusting images may be the result of having been socialised to perceive same-sex sexual or romantic behaviour as disgusting. Even though participants in the current study varied in terms of their levels of sexual prejudice, the fact that those who were lower in self-reported sexual prejudice still demonstrated heightened sAA responses to the images of male same-sex couples kissing may provide additional evidence that sexual prejudice is the result of socialisation of implicit attitudes that associate same-sex sexuality with emotions related to disgust or taboo behaviours. In other words, although social norms have helped to reduce explicit and cognitive prejudices towards LGBTQ individuals, these changes may not yet be reflected in our physiological responses to the targets of prejudice.

Strengths and limitations

The sample for the current study was made up of men living in the Utah area, many of whom were Mormon (62.5%), a religion that is common in Utah and that has promoted sexually prejudiced beliefs (Grigoriou, 2014). In one way, the over-representation of Mormon men in the sample strengthened the study. Past research investigating physiological responses to same-sex PDA has been dependent on rather liberal and accepting samples, such as university undergraduates (Kiebel et al., 2016). It is more likely that a sample of Mormon men with more sexually prejudiced beliefs would display a physiological response to same-sex PDA, if there is one, than a sample of mostly accepting university undergraduates. To assess the extent to which the current sample may have been unique in expressing higher than average levels of sexual prejudice, the means of the MHS and ATLG in the current sample were compared to those reported elsewhere in the literature. The mean score in the current sample on the combined MHS–ATLG was 2.66 (SD = .97), compared with a mean score of 2.98 (SD = .98) on the MHS and a mean score of 2.6 (SD = 1.12) on the ATLG for American men in a study conducted by McDermott and Blair (2012) comparing men and women's levels of sexual prejudice in Canada, the United States, the United Kingdom and Ireland. However, although the current sample did not differ significantly from past samples in the literature

concerning levels of prejudice, a mostly Mormon sample may still limit the generalizability of the results.

The current study is limited in that, as a result of missing data, the sample size was greatly reduced. Due to expenses of collecting and analysing saliva, which had to be analysed by an outside laboratory, the intended sample size of the current study was small even before missing data considerations. The reduced sample size resulted in a lack of statistical power to assess group differences using more sophisticated statistical analyses (e.g. ANOVA). While our analyses revealed some effects of slide show type, these results must be interpreted with care, especially given the small effect sizes (d = .14–.18).

It is also possible that the extreme length of the in-lab portion of the present study (2–3 h) may have created other feelings over the duration that would be difficult to disentangle from the concepts of interest. Participants could have simply felt frustrated or bored after being in the lab for an extended amount of time.

Implications and future directions

The current study suggests that most people may experience a physiological response thought to be indicative of sympathetic nervous system activity when seeing two men kiss and that such a response may not be limited to those who experience high levels of sexual prejudice. This finding makes it unlikely that an extreme physiological response to witnessing two men kiss is an underlying motivation for violent hate crimes, as clearly the vast majority of individuals who may also be experiencing similar physiological responses do not respond violently. In other words, the physiological response is not unique to those higher in prejudice, indicating that those responding violently are not simply responding in a flurry of 'fight or flight' physiological responses. However, the present study finding that all participants experienced a physiological response to two men kissing indicates that, perhaps, the general public is still socialised to perceive same-sex PDAs as disgusting. Therefore, the current study demonstrates the need for further research investigating the socialisation of implicit beliefs and perceptions regarding same-sex PDAs and the effect that this can have on individuals in same-sex relationships. Social support for one's romantic relationships has a strong association with relationship quality as well as individuals' health (Blair & Holmberg, 2008; Holmberg & Blair, 2016), and implicit beliefs may have an impact on social interactions (Dovidio, Kawakami, & Gaertner, 2002). Therefore, those who are low in sexual prejudice, but who may implicitly perceive same-sex PDAs to be disgusting, may communicate disapproval or lack of support in subtle ways, such as keeping a greater physical distance (Dotsch & Wigiboldus, 2008), or displaying unconscious facial responses when a same-sex couple shares affection, both of which could have a negative impact on those in same-sex relationships.

Further research with a larger sample of participants would be necessary to make any certain conclusions about whether viewing same-sex PDAs can elicit stronger sAA responses. A larger sample size may result in finding that physiological measures do differ among slide shows as a function of sexual prejudice. The current study had a sample comprised of mostly Mormon men living in Utah, future research would benefit from collecting data from a sample more representative of the general population. In addition, the sample in the present study also had measures of heart rate variability recorded, and future research could analyse these data to examine if these demonstrate similar trends to the sAA data of the current analysis. If the cardiac data fit well with the sAA data , then perhaps the two could be combined to form an overall measure of sympathetic nervous system activity.

Facial expression analyses using the recorded videos of participants in the current study could also be a valuable future direction. Facial expression analysis can be conducted using computer systems that seek to automatically analyse and recognise facial feature changes and facial movements from visual information so as to determine the emotion individuals are experiencing. The use of facial expression recognition technology is capable of , and accurate in, recognising facial expressions of disgust (Sarode & Bhatia, 2010; Tian, Kanade, & Cohn, 2011), and would aid in

determining if disgust is in fact the emotion that participants viewing male same-sex couples kissing or holding hands were experiencing, rather than anger or arousal.

Conclusion

The current study found that sAA responses of all participants, regardless of their level of sexual prejudice, were significantly greater while viewing images of two men kissing and universally disgusting images than images of everyday items and mixed-sex PDA. These results indicate that a physiological disgust response to same-sex PDA cannot explain the stable incidence of anti-gay hate crimes at the present time and that a 'gay panic' defence of violence towards gay men is not sufficient. This is a particularly relevant conclusion given that many jurisdictions today are still allowing the so-called 'gay panic' or 'homosexual advance' defence to be used by perpetrators who violently attack gay men and then claim that they temporarily lost control due to the victim having made an advance. The current study suggests that there is nothing unique concerning the physiological responses of highly sexually prejudiced individuals to same-sex PDA. Furthermore, it appears that the vast majority of individuals, experiencing the same physiological response, are able to respond to two men kissing without violence. Since the sAA response to two men kissing does not appear to differ as a function of sexual prejudice, it is likely that such physiological responses are the result of socialisation, however, future research with larger samples and examining multiple facets of physiological activity are warranted in order to understand this issue more clearly.

The gay panic defence, as it was used by the two men who murdered Matthew Shepherd in 1998, and as it has been used by countless other defendants on trial for violently attacking or killing gay men, rests upon the assumption that being exposed to an LGBTQ individual is sufficient to cause a 'reasonable' person to respond with a violent fit of panic. As of this writing, the only jurisdiction in the United States that has banned the gay panic defence is the state of California (Ferguson, 2014), and the defence strategy has been successful in other jurisdictions around the world, as recently as 2009 (Koubaridis, 2009). One notable recent case included the murder of Larry King, a 15-year-old gay teenager who was murdered by his 14-year-old classmate. The defence argued that the accused was reacting to King having asked him to be his Valentine. The defence resulted in a hung jury and the assailant eventually took a plea in exchange for a lesser charge (Chawkin, 2009). To date, no convincing empirical evidence has been offered to support the underlying assumptions of the gay panic defence. The current study has attempted to add to the chorus of those calling for the global banning of the gay panic defence strategy, and to set clear, as one writer put it, that an 'LGBT persons' mere existence is never provocation for physical violence' (Kreis, 2017).

Notes

1. Readers may wonder whether using the MHS-G and ATLG separately would result in detectable group differences in alpha amylase based on either modern or old-fashioned homonegativity, however, analyses revealed that the measures operated in a similar fashion within the current data set, regardless of whether the scales were treated as separate scales, or combined into a single factor.
2. The information below is for copyright and attribution purposes. Things: Thomas Quine - https://www.flickr.com/photos/quinet/51111202/in/photolist-rbdzeT-5vXzC-4xwEK2-rbdzjn-spoogD-d9zFey-x36Qe-SewqjY-74UcNX-qvWqSY-fm5UXf-m2GGEf-qA1Dvg-9EV6te-92qSFr-rhFbUi-6PVNSy-awmaXT-3RYmvb-pi5B3G-8GrHd4-aDou27-aSKe8V-q9ai3K-8GrGDD-e1s7sj-6esJvw-oemgK-8tsDTo-9iXtYD-6jeSsz-CY9Bd-8rnGQ7-5B3JhQ-ETYbH-7GdmWm-5cW5v-4ZzfsC-bsi5Nk-gcamEN-8tpCxR-oJX2on-9qxqt9-ynPAp-8ALFAX-7QJYNF-nwcyx-4AbpWg-7G9pti-brupAe
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Same-Sex Kissing: - Joe TickNow

Same-Sex PDA – Casey Hendrickson "Justin & Nathan"
Mixed-Sex PDA – Casey Hendrickson "Hillman Wedding"
Mixed-Sex Kissing – Casey Hendrickson – "Laura & Sturgeon"

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Dedication

This research is dedicated to Joseph 'Joey' Kellogg: 1986–2014. Joey was one of the crowdfunding donors for this study and a passionate advocate for LGBTQ civil rights.

Find the truth that we are all human, we are all different, and yet the same.
Found by Joey Kellogg, October 14, 1928

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Notes on contributors

Breanna M. O'Handley, BSc., (Hon), is the research coordinator for the KLB Research Lab at St. Francis Xavier University in Nova Scotia, Canada. The present work is based on her honours thesis conducted at St. Francis Xavier University. Her current research is examining shared memories of LGBTQ coming out stories between parents and their LGBTQ adult children.

Karen L. Blair, PhD., is an Assistant Professor of Psychology at St. Francis Xavier University in Nova Scotia, Canada, and director of KLB Research. Dr. Blair studies the role that social support for relationships plays in the development, maintenance and dissolution of relationships, LGBTQ Psychology, and the connections between relationships, social prejudices and health. Dr. Blair's work has received funding from the Canadian Institutes of Health Research, the Social Science and Humanities Research Council, the American Institute of Bisexuality, the Gay and Lesbian Medical Association 's Lesbian Health Fund, Patreon, and Experiment.com. http://www.drkarenblair.com.

Rhea Ashley Hoskin, MA, PhD., Candidate, is a SSHRC-CGS doctoral candidate at Queen's University in the Department of Sociology. Rhea's research applies an intersectional lens to the topics of femme theory, femme identity, gender identity, social determinants of health and feminist theory. http://www.ashleyhoskin.ca.

ORCID

Breanna Maureen O'Handley http://orcid.org/0000-0001-9166-3384
Karen L. Blair http://orcid.org/0000-0002-8602-098X
Rhea Ashley Hoskin http://orcid.org/0000-0001-9065-980X

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