THE PERCEIVED NEED TO BE HOT: AN INVESTIGATION OF THE RELATIONSHIP BETWEEN BELIEF IN SEXUAL STEREOTYPES AND ERECTILE DYSFUNCTION IN GAY MEN USING THERMAL IMAGING

by

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Abstract

The Perceived Need to be Hot: An Investigation of the Relationship between Belief in Sexual Stereotypes and Erectile Dysfunction in Gay Men using Thermal Imaging

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Erectile dysfunction (ED) has been associated with considerable mental health and interpersonal problems, an increase in risky sex, and is particularly prevalent among gay and bisexual men. Psychological treatment protocols for sexual dysfunctions often aim at challenging beliefs and cognitions about the importance of a "perfect sexual performance," known as sexual stereotypes. However, to date, little empirical evidence exists for the relationship between ED and belief in sexual stereotypes (BSS). To address this gap, 70 gay men were recruited; 30 with ED and 40 healthy controls. Participants completed a battery of questionnaires, including a measure of BSS, followed by having their genital temperature measured using a thermal imaging camera, while viewing a sexually explicit film. The study had four main objectives: (1) to evaluate between group differences in subjective sexual arousal and physiological arousal; (2) to examine within group differences in the effects of BSS on physiological and self-reported sexual arousal; (3) to evaluate the relationship between BSS, negative automatic thoughts during sex, and ED; and (4) to evaluate the relationship between ED and risky sex among gay men. Results revealed significant between-group differences in physiological arousal, but not in subjective sexual arousal. While between-group differences were found in BSS, no within-group differences were found in the relation of BSS on physiological and self-reported sexual arousal. No significant

relationships were found between BSS, negative automatic thoughts, and ED. Participants with ED were found to be significantly more likely to use erectile enhancing drugs, but no significant differences in condom removal were found between groups; however, substantially more individuals with ED (23.3%) reported removing condoms prior to the completion of sexual activity, as compared to healthy controls (5%). Findings of this study contribute to improving psychological treatments for gay men with ED, as well as better understanding pathways leading to risky sex in gay men.

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The Perceived Need to be Hot: An Investigation of the Relationship between Belief in Sexual Stereotypes and Erectile Dysfunction in Gay Men using Thermal Imaging

Sexuality and sexual functioning are essential components of general health and psychological well-being (Ducharme, 2004). Erectile dysfunction (ED) is the most commonly reported sexual dysfunction among men presenting for treatment at sexuality and men's health clinics in the United States (Ducharme, 2004). The Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5) diagnostic criteria for ED state that ED is characterized by marked difficulty in obtaining an erection during sexual activity, and/or marked difficulty in maintaining an erection until the completion of sexual activity, and/or marked decrease in erectile rigidity (American Psychiatric Association, 2013). These symptoms must occur on 75-100% of occasions of sexual activity, have a duration of over 6 months, and cause clinically significant distress. As such, these DSM-5 outlines the diagnostic criteria for ED. Nonetheless, many individuals experience erectile difficulties that are subthreshold to the DSM-5 diagnostic criteria. For the purpose of this paper, ED will refer to individuals who meet diagnostic criteria, while erectile difficulties will refer to individuals who experience difficulties with erections, but do not meet DSM-5 diagnostic criteria for ED.

ED has been associated with both physical and mental health problems. Physical health problems, including cardiovascular disease (Gandaglia et al., 2014), dyslipidemia (Miner & Billups, 2008), diabetes (Bacon, Giovannucci, Glasser, Mittleman, & Rimm, 2002), and HIV infection (e.g., Asboe et al., 2007; Cove & Petrak, 2004; Ende, Lo Re, DiNubile, & Mounzer, 2006; Bancroft et al., 2005) have been associated with significantly higher rates of ED. Mental health concerns include an increase in depression, and fear and avoidance behaviours among men with erectile difficulties (Bancroft, Carnes, Janssen, Goodrich, & Long, 2005). In addition,

men with erectile difficulties experience interpersonal problems within their romantic relationships, including having communication deficits (Cameron, Rosen, & Swindle, 2005), as well as having unsatisfactory and non-loving relationships (McCabe et al., 2010).

While ED is reported to be highly prevalent among men, exact prevalence rates are variable across studies. Rosen and colleagues (2004) surveyed 27,900 men in North America, South America, and Europe using several self-report items to assess for the presence and the severity of ED (Rosen et al., 2004). Men in the United States were found to report the highest prevalence of ED (22%), while men in Spain reported the lowest prevalence (10%). Additionally, consistent with other literature, the prevalence of ED was found to increase with age (Rosen et al., 2004; McCabe, 2008; Shindel, Horberg, Smith, & Breyer, 2011; Lewis et al., 2010), and medical conditions, including cardiovascular problems such as heart disease and high blood pressure. Overall, reviews of prevalence studies have found that the prevalence estimates of ED range from 5% to 20% in the general population (Kubin, Wagner, & Fugl-Meyer, 2003).

Gay men and ED

Sexual orientation appears to influence both the types of sexual dysfunction experienced and prevalence rates of sexual dysfunction. In general, gay and bisexual men report statistically significantly higher rates of sexual dysfunction compared to heterosexual men (Bancroft et al., 2005; Rosser, Metz, Bockting, & Buroker, 1997). Specifically, gay men report significantly more erectile difficulties relative to heterosexual men. While 4.5% of gay men report experiencing difficulty attaining or maintaining an erection ‘most of the time’, this statistic drops to 3.6% among heterosexual men (Bancroft et al., 2005). Additionally, when asked about sexual difficulties, gay men more frequently report experiencing erectile difficulties, while heterosexual men more frequently report experiencing difficulties with premature ejaculation (Bancroft et al.,

2005). This is consistent with the findings of Breyer and colleagues (2010), who found that 24% of gay male medical students experienced ED, as compared to only 12% of heterosexual male medical students.

An Australian study revealed that gay men most frequently reported experiencing ED and hypoactive sexual desire, relative to other sexual dysfunctions (Mao et al., 2009). A recent investigation of sexual dysfunction within a Portuguese sample found that gay men most frequently endorse experiencing anodyspareunia, followed by ED, sexual desire, and ejaculation difficulties (Peixoto & Nobre, 2015). Nonetheless, when distress related to sexual dysfunction was examined, gay men with ED reported extremely high levels of distress, relative to other sexual dysfunctions. As such, developing effective treatment protocols for reducing symptoms of ED in gay men is of particular importance.

Although several treatment protocols aimed at reducing symptoms of psychogenic ED have been published, no treatment manual has been published that specifically aims to reduce ED among gay men. As the existing treatment protocols are heteronormative in nature, they cannot be directly used when treating gay men. Sandfort and De Keizer (2001) highlighted the numerous differences in sexuality of heterosexual and gay men. For example, gay men engage in more non-coital sex (e.g., oral sex) relative to straight men. In addition, the reversibility of sex roles (i.e., insertive and receptive) among gay men is highlighted, which is not present in heterosexual couples. Sandfort and De Keizer (2001) also highlight the lack of heteronormative sexual scripts among gay men, which may create difficulties and complications with communication around sexual expectations. Although treatment protocols may address communication within relationships, this communication differs when focusing on potentially

changing sexual roles. As such, treatment protocols of ED for gay men need to incorporate these potential issues around sexuality that may not be present in heterosexual couples.

Physiology of Erections

Changes in the neurotransmitter activity and blood flow through specific muscle groups and veins allow for changes in penile rigidity to occur throughout the various phases of penile erections. During the flaccid state, continuous partial contractions of the smooth muscle cells in the walls of the arteries, arterioles, and corporal trabeculae are present (Auffenberg, Helfand, McVary, 2016). As a result, the penis receives a low blood flow, as indicated by a blood partial pressure of oxygen (PO_2) is about 35mmHg range (Dean & Lue, 2005). While this PO_2 allows for sufficient blood flow to the penis in order to provide basic physiological and nutritional needs, it is not sufficient for a penile erection.

Penile tumescence occurs with the presence of sexual stimulation or other sexual cues (e.g., thoughts, memories, images). First, proerectile neural pathways are activated allowing for neurotransmitters to be released into the penis (Christ & Lue, 2004). These neurotransmitters cause the smooth musculature of the penis to relax, resulting in increased blood flow to the penis due to dilation of arteries and arterioles. Second, the relaxation of the corporal trabeculae allows for the corporal sinusoids to expand and become fully engorged with blood. This expansion results in the venuocclusive mechanism, that is, the subtunicle venules become compressed and largely prevents outflow of blood from the penis. As a result of the decreased outflow of blood, the intracavernosal pressure is increased to an approximate PO_2 of 100 mmHG and the penis is in the fully erect position. Third, the rigid-erection phase occurs during heightened sexual activity (Auffenberg et al., 2016). During this phase, the bulbocavernosus reflex is activated, which causes the ischiocavernosus muscles to contract, and subsequently compresses the base of the

corpora cavernosa, temporarily causing all inflow and outflow of blood to cease and an increase in intracavernosal PO_2 up to several hundred mmHG.

Detumescense occurs either following ejaculation or the cessation of the proerectile neural stimulus. The combination of vasoconstriction of the penile arteries and partial contraction of the smooth muscle cells cause the arterial blood inflow to reduce. As a result, the sinusoids drain and the trabeculae recontract, resulting in an outflow of blood that allows the penis to return to a flaccid state (Auffenberg et al., 2016).

Measurements of Sexual Arousal

Physiological assessment of sexual arousal.

Penile plethysmograph. Several apparatuses have been used in research to assess for the physiological erectile function of men. Perhaps the most commonly used tool, the penile plethysmograph, measures blood flow to the penis, a variable that provides an indication of specifically sexual, rather than general, arousal (Fernandez, 2002). Two types of penile plethysmographs currently exist; the penile strain gauge, assessing for changes in penile circumference, and the volumetric gauge, assessing for overall changes in penile volume. The use of the penile strain gauge has been criticized in the literature as research suggests that during the initial stages of an erection, penile circumference actually decreases as penile length increases (Earls & Marshall, 1982). As such, with the use of the penile strain gauge, it would appear that sexual interest is initially decreasing, even though an individual has an erection, thus introducing error into measurement. The use of the volumetric gauge involves a tube being placed over the penis, which assesses for overall air displacement (Fernandez, 2002). As such, regardless of whether a change in the length of the penis or the circumference of the penis occurs, the volumetric gauge will be able to detect an overall increase in penile volume,

indicating an increase in sexual arousal. Kuban and colleagues (1999) directly compared the sensitivity of the penile strain gauge and the volumetric gauge, and found that when sexual response was high, both measures were equally sensitive. However, among lower-intensity sexual responses, the volumetric gauge provided a more accurate measure of sexual arousal. This represents an important issue when conducting research on ED in the laboratory, as this type of research typically assessed for lower levels of sexual arousal.

Regardless of the type of penile plethysmograph used, it is important to consider the intrusive nature of this device. Both types of plethysmograph require direct contact of the apparatus with the penis in order to gain an accurate assessment of physiological arousal. This may result in an overall change in the assessment experience of the participant. That is, some participants may become more aroused by having an apparatus in direct contact with their penis, while others will consider this experience to be anxiety inducing and may as a result experience a diminished sexual response. Finally, it may be more difficult to recruit participants to participate in a study in which they are informed that their penis will be inserted into a device.

Ultrasound. Ultrasound represents the gold standard of physiological ED assessment. Typically used by urologist, it allows for the real-time visualization of the venuocclusive mechanism, which prevents outflow of blood from the penis during an erection (Parada & Germe, 2015). In order to assess diameter and flow rate changes that occur in each phase of an erection, ultrasound is coupled with pharmacostimulation by vasoactive agents (e.g., intravernosal injections of Prostaglandin-E1, papaverine, phentolamine; Albaugh & Ferrans, 2009; Junuzovic et al., 2013;). Three main measurements assess for ED during the ultrasound: the peak systolic velocity, end diastolic velocity, and resistance index. The peak systolic velocity serves as an indicator of the greatest flow systolic velocity detectible within the two cavernous

arteries of the penis. The end diastolic velocity provides an indication of venogenic impotence, or leakage of blood from the penis during an erection. The resistive index represents the ratio of peak systolic velocity to end dialostic velocity, and values under 0.75 suggest the presence of a venous leak.

Ultrasound has been found to have strong psychometric properties. In addition, the technique itself is non-invasive. However, the vasoactive agents used during ultrasound are often administered via intravernosal injections. While patients self-report low levels of pain associated with the actual intravernosal injection, many patients may have negative reactions to the thought of having a needle inserted into their penis (Albaugh & Ferrans, 2009). In addition, approximately 50% of patients report pain following the injection as a result of the drug (Albaugh & Ferrans, 2009). Finally, both running and interpreting the results of ultrasound requires skilled personnel, including urologists, nurses, andrologists, and radiologists (Parada & Germe, 2015). Therefore, using ultrasound within the context of a laboratory research study is not feasible.

Themography. A less invasive measurement of physiological arousal is thermal imaging, or thermography. Thermography detects changes in temperature that coincide with either an increase or a decrease in blood flow to a given area (Parade & Germe, 2015). In the case of physiological arousal, thermography detects changes in temperature in the genitals that occur while viewing sexually explicit stimuli (e.g., Kukkonen et al., 2007; 2010). Thermography can be used continuously across extended periods of time, and has an accuracy of approximately + or - 0.03˚C (Parada & Germe, 2015).

Thermal imaging has been found to accurately detect an increase in physiological arousal among men aged 18 to 30, with these individuals seeing a mean temperature increase from

baseline to peak temperature of 1.75˚C (Kukkonen et al., 2007). These findings were replicated in an investigation of sexually functional adults aged 30 to 45, with this age group demonstrating a mean genital temperature change score of .74˚C (Kukkonen et al., 2010). Within this sample, adult men showed significantly more genital temperature change as compared to women. This difference in genital temperature change across age groups is consistent with previous research indicating that sexual function declines with age (McCarthy & Fucito, 2005). Nonetheless, a genital temperature change score of .74˚C did represent a significant increase of sexual arousal. Thermography has also been validated as a tool for assessing both the presence of ED, as well as the difference between subtypes of ED. Sarin and colleagues (2014) found in a sample of men between the ages of 18 and 50 that thermal imaging could reliably differentiate between men with and without ED. Most recently, Hafez and colleagues (2017) demonstrated that thermography can reliably differentiate between men with organic ED and men with psychogenic ED. Due to men with organic ED having medical issues that directly effect blood flow and neural responses of the penis, individuals with organic ED display significantly lower genital temperature change scores, as compared to men with psychogenic ED.

Thermal imaging represents an attractive alternative to penile plethysmography as a result of the relative reduction in obtrusiveness. No direct contact between the genitals and the thermal imaging camera is required, which may result in reduced apparatus interference, and an increased willingness for participants to engage in this type of research. Nonetheless, any objective measure of physiological sexual functioning may create a sense of self-consciousness and performance anxiety. However, the combination of no direct physical contact with further techniques to reduce the salience of the presence of the thermal imaging camera (e.g., the use of DVD goggles in order to allow participants to focus on the sexually explicit material without

attending to the camera) results in the thermal imaging camera being an ideal tool for the assessment of physiological arousal.

Subjective assessment. When considering male erectile function in general, numerous validated self-report questionnaires exist to reliably assess subjective reports of erectile function (e.g., International Index of Erectile Function [Rosen, Riley, Wagner, Osterloh, Kirkpatrick, & Mishra, 1997]; Golombok Rust Inventory of Sexual Satisfaction [Rust & Golombok, 1986]; Brief Sexual Function Questionnaire for Men [Reynolds et al., 1988]). However, special consideration need to be taken when examining self-reported erectile function among gay men. The majority of questionnaires assessing for ED contain questions pertaining to heterosexual penile-vaginal intercourse, and consider this to be the only measure of sexual activity. For example, questions such as "How often were you able to penetrate your partner" are included, however, these questions do not take into account the varying sex roles taken by gay men. For example, gay men who self-identify as being a "top" prefer the insertive anal sex role, while men who self-identify as being a "bottom" prefer the receptive anal sex role (Moskowitz & Hart, 2011). In a survey of self-identified anal sex roles among gay men in New York, 26.2% identified as tops and 22.6% identified as bottoms (Wegesin & Meyer-Bahlburg, 2000). Among HIV-positive men, 18% identified as tops and 23% as bottoms (Hart et al., 2003). Additionally, some gay men identify as "versatile", and enjoy both insertive and receptive anal sex ((Moskowitz & Hart, 2011). While these heteronormative questionnaires may be applicable for the individual who is acting as the insertive anal sex partner, they disregard the individual in the receptive anal sex role. As these questions do not accurately assess for the sexual experiences of gay men, questionnaires specific to this population are needed.

To date, only one self-report measurement tool of sexual function has been adapted to and validated for use with men who have sex with men (MSM). The International Index of Erectile Function – Men who Have Sex With Men (IIEF-MSM; Coyne et al., 2010) includes items pertaining to the experience of both men identifying as tops and men identifying as bottoms. For example, questions such as "When you attempted active anal intercourse, how often were you able to penetrate (enter) your partner?" pertain to the individual acting as the top, while questions such as "During passive anal intercourse, how often were you able to maintain your erection after you had been penetrated by your partner?" are specific to men taking on the bottom anal sex role. However, there are several problems with the IIEF-MSM, which may result in an inflated prevalence of ED.

First, lower scores on the IIEF-MSM reflect poorer sexual functioning. However, the IIEF-MSM requires that individuals who report not having engaged in any sexual activity during the past three months receive a score of "0" on each scale item. Therefore, individuals who have not engaged in sexual activity appear to have severe sexual dysfunction. There are numerous reasons why an individual would report not having engaged in sexual activity. While some of these reasons may be indicative of avoidance of sexual activity due to feared sexual dysfunction, other possibilities for reporting no sexual activity may be a lack of access to sex, lack of a committed sexual partner, relationship problems, abstinence from sex for a variety of personal reasons, or simply a non-pathological lack of interest in sex. Therefore, it is inaccurate to assume that individuals who do not have sex experience more severe sexual dysfunction.

Second, there is an unequal distribution of questions that pertain to gay men who identify as tops as compared to those who identify as bottoms. While two items are included to assess for ED during insertive anal sex, only one item assessed for ED during receptive anal sex. As a

result, men who exclusively prefer the receptive anal sex role will have to answer the questions pertaining to insertive anal sex with a response of "no sexual activity", giving them a score of "0" on these two items. Similarly, men that exclusively prefer the insertive anal sex role will be given a score of "0" on the question pertaining to receptive anal sex. Therefore, regardless of actual sexual function, men who exclusively prefer the receptive anal sex role will appear to have more severe dysfunction, as compared to men who prefer the insertive anal sex role. Finally, men who are behaviourally "versatile", or who actively take on both the insertive and receptive anal sex roles, will appear to have the strongest sexual function as an artefact of being able to answer each of the questions. Although researchers could theoretically control for these issues statistically, the imbalance of questions pertaining to the various anal sex roles result in an inability to directly compare men of each sex role, and therefore would limit the types of analyses that could be conducted. Further, if men of differing sex roles were not separated into varying analytical groups, the scores indicating severity of ED would be flawed due to the aforementioned issues with the IIEF-MSM. Another issue with the IIEF-MSM is the lack of clinical cut-off scores. While the IIEF-MSM does have options to classifying ED as being mild, moderate, or severe, there is no validated clinical cut-off score for assessing ED. Therefore, although the IIEF-MSM represents the only validated measure of sexual dysfunction among MSM, the current issues with this measure result in the scores of this questionnaire needing to be interpreted with caution.

In addition to validated self-report instruments, another self-reported assessment of ED consists of asking one or two questions related to an individual's perception of their current erectile function. For example, some studies measure ED using a single item question (i.e., "In the past three months, have you experienced any difficulty in obtaining or maintaining a full

erection during sexual activity?"; Bancroft et al., 2005). Similarly, other self-reported measures of ED consist of asking a dichotomous "yes" or "no" question, and then rating the severity of their difficulties as "mild", "moderate", or "severe" (Rosen et al., 2004). While this method of assessment has the benefit of being pragmatically and quickly administered, the lack of reliability and validity data are problematic. As such, having measures of both self-reported sexual arousal and physiological arousal is of importance.

Psychophysiological assessment of sexual arousal. In addition to physiological and subjective assessments of sexual arousal, it is important to consider psychophysiological assessments. This is due to the fact that sexual arousal represents a complex interplay between cognitive, emotional, and physiological factors (e.g., Barlow et al., 1986; Wiegel et al., 2007). As such, when considering only physiological arousal, and ignoring how the cognitive and affect components are involved in sexual arousal, research is not examining sexual arousal, but rather, sexual physiology. In addition, if physiological responses are ignored, and only subjective assessments of sexual arousal are used, research is missing an understanding of the actual physiological response. Therefore, in order to assess for sexual arousal, both subjective and physiological assessments of sexual responses are necessary.

Concordance between self-reported and physiological sexual arousal

Despite the relative ease of utility of self-report measures, there has been some evidence to support that men's self-reported description of erectile difficulties varies from the physiological assessment. Although significant research attention has been focused on the concordance between female self-reported sexual arousal and physiological sexual arousal (see Chivers, 2005 for review), this subject has received considerably less attention among men. A recent meta-analysis revealed that men were found to have significant and positive correlations

between self-reported and physiological sexual arousal (Chivers, Seto, Lalumiere, Laan, & Grimbos, 2010). When examining the few studies that have compared self-reported and physiological arousal among both sexually function and sexually dysfunctional men, Chivers and colleagues (2010) found no effect of sexual functioning on concordance rates. However, despite not finding an effect when examining absolute correlations, the authors note that variability in concordance rates exist across the studies investigated.

A limited body of research indicates that important differences exist between these concordance rates among men with ED and healthy controls. Indeed, in a recent investigation by Sarin and colleagues (2014), there were high positive correlations between self-reported and physiological sexual arousal among men with healthy erectile functioning. However, among men with ED, this relationship was negative in valence and not significant. Similarly, research has indicated that men with sexual dysfunction reported significantly less self-reported sexual arousal relative to healthy controls following the depiction of sexually explicit material, despite achieving corresponding increases in physiological arousal, as measured by penile plethysmography, with some men achieving similar levels of physiological arousal as healthy controls did (Abrahamson, Barlow, Sakheim, Beck, & Anasthasiou, 1985; Beck, Barlow, & Sakheim, 1983; Cranston-Cuebas, Barlow, Mitchell, & Anasthasiou, 1993). Sakheim, Abrahamson, and Beck (1987) compared men with healthy sexual function to men with organic and psychogenic ED, and found that the correlations between self-reported erectile response and physiological arousal were significantly lower for the ED groups, as compared to the healthy controls. Rowland and Heiman (1991) found that even following treatment for ED, men with ED had significantly lower correlations between self-reported and physiological arousal, as

compared to controls. This suggests that among men with ED, there is a disconnect between self-reported and physiological sexual arousal.

In addition, when considering qualitative, rather than psychophysiological research, the concordance rates of men with healthy sexual function come into question. Qualitative research suggests that men have difficulty disentangling the concepts of physiological sexual arousal and subjective sexual arousal, and that men do not consider an erection to be an adequate measure of subjective sexual arousal (Janssen, McBride, Yarber, Hill, & Butler, 2008). For example, men in this study noted that nocturnal erections and spontaneous erections (e.g., from a bumpy bus ride) were often not accompanied by subjective sexual arousal, while at other times, sexual arousal was not accompanied by an erection (e.g., from attending a strip club). Therefore, even among men with healthy sexual function, the relationship between physiological and subjective arousal is not always clear.

The sexual function of men therefore appears to be an important construct when considering concordance rates between self-reported and physiological sexual arousal. Therefore, a direct comparison of the concordance rates of men with healthy sexual function and men with ED is an important step in understanding the complex relationship between self-reported and physiological sexual arousal. Chivers and colleagues (2010) highlighted two important considerations when examining concordance rates among men. First, the inclusion of older men may skew the results, as age is significantly associated with concordance. Second, the use of contiguous assessment time points of self-reported sexual arousal was associated with significantly lower concordance rates among men. The authors hypothesized that contiguous assessment serves as a cognitive distraction that reduces physiological sexual response, but does not reduce self-reported sexual arousal. This may explain previous research findings of similar

levels of physiological sexual arousal among sexually dysfunctional and functional men, in that sexually functional men experience a decrease in physiological sexual arousal when a cognitive distraction is present. Therefore, age and the assessment time-points of self-reported sexual arousal should be considered when assessing for concordance rates among men.

Theories of ED

Organic ED. The physiology of healthy erectile function has been described above. However, neurologic, vasculogenic, and endocrinologic factors can cause difficulty or inability to attain or maintain an erection, leading to organic ED (Shamloul & Ghanem, 2013). First, neurologic disorders (e.g., Parkinson's disease, Alzheimer's, multiple sclerosis, epilepsy) result in both a decrease in sexual desire, as well as a potential inability to activate proerectile neural pathways (Lue, 2001). Second, vascular diseases (e.g., hypercholesterolemia, blunt trauma, diabetes) can cause impaired arterial flow, impaired cavernosal smooth muscle relaxation, cavernosal fibrosis, and dysfunction of the venuocclusive mechanism (Siroky & Azadzoi, 2003). By impairing these vascular pathways, vasculogenic diseases can prevent men from being able to attain or maintain an erection. Finally, as hormonal changes contribute to the physiology of erections, endocrinologic disorders can impact this pathway and can therefore be an indirect causal factor of ED.

In addition, lifestyle factors, including smoking, can impact erectile function (Verze, Margreiter, Esposito, Montorsi, & Mulhall, 2015). These conditions and lifestyle factors influence blood circulation directly, and therefore account for difficulty in obtaining or maintain erections in these individuals. The prevalence of ED is also significantly higher for HIV-positive than HIV-negative men (e.g., Asboe et al., 2007; Cove & Petrak, 2004; Ende, Lo Re, DiNubile, & Mounzer, 2006; Bancroft et al., 2005), suggesting an association between HIV and ED.

Although the findings are mixed in nature, the association between HIV and ED has been hypothesized to be due to CB4 count, having a history of opportunistic infections, use of HAART for treatment, and serum testosterone levels (Cove & Petrak, 2004; Lallemand, Salhi, Linard, Giami, & Rozenbaum, 2002; Ende et al., 2006).

Psychogenic ED. In addition to medical conditions that directly impact blood circulation, psychological factors can also influence erectile function. Masters and Johnson (1970) were the first researchers to empirically evaluate possible mechanisms interfering with the ability to attain or maintain an erection. They focused on the role of social anxiety in preventing the attainment of a sufficiently rigid erection, highlighting performance anxiety and fears of sexual inadequacy as interfering mechanisms. Kaplan (1974) elaborated further on these findings, noting that partner demands for performance and an excessive need to please partners further interferes in sexual arousal. That is, the presence of these psychological variables of sexual anxieties act as a negative feedback loop, resulting in the inhibition of adequately sufficient blood flow to the penis for an erection to occur (Kaplan, 1981). In an experimental investigation of the effects of self-efficacy on ED, sexually functional men who received negative feedback on their erectile function during a prior physiological assessment of arousal experienced significant decreases in their physiological arousal during a subsequent measurement (Bach, Brown, & Barlow, 1999). As such, cognitive factors such as inducing the belief of problematic sexual arousal in otherwise sexually functional males can result in ED.

Nonetheless, some research suggests that the presence of anxiety has no effect on erectile function, and may actually increase erectile function (e.g., Barlow, Sakheim, & Beck, 1983; Beck & Barlow, 1984). For example, increases in sexual arousal have been found in response to threats of knives and other weapons in the event of an absence of a sexual response (Sarrel &

Masters, 1982), as well as during imaginary exposures to threats including being chased by the police, being threatened with punishment, and accidents (Ramsey, 1943). Similarly, in an investigation of sexually functional men, participants experienced an increase in physiological arousal after having been told they would receive an electric shock if their erection was not adequately rigid (Barlow et al., 1983).

An important distinction appears to exist between sexually functional men and men with ED. Although functional men tend to experience an increase in physiological arousal after having been told they would receive an electric shock if their erection was not adequately rigid, dysfunctional men experienced a decrease in sexual arousal (Barlow et al., 1983). This indicates that sexually dysfunctional men experience difficulty attaining or maintaining an erection in response to demand characteristics. Similarly, in addition to functional and dysfunctional men experiencing differing responses to affective demand cues, there appear to be two significant differences in their responses to cognitive distractions.

First, when examining the effects of neutral cognitive distractions, men with ED appear to experience significantly more physiological sexual arousal relative to functional men. Abrahamson and colleagues (1985) conducted an experimental investigation in which sexually functional men and men with ED were instructed to view erotic stimuli while listening to an unrelated informative audiotape, after half were told that they would be tested on the content of the audiotape at a later time, while the other half had no cognitive distraction present. While functional men saw decreases in sexual arousal in the cognitive demand condition, men with ED saw no changes in sexual arousal across groups.

Second, when examining the effects of clinically relevant cognitive distractions, men with ED experienced significantly less sexual arousal. (e.g., Beck et al., 1983; Abrahamson et al.,

1985; Heiman & Rowland, 1983). In two experimental investigations in which erotic material was either viewed or listened to, functional and dysfunctional men attended to material in which the partner was either highly aroused or not aroused (Beck et al., 1983; Abrahamson et al., 1985). In both studies, the functional men experienced comparable increases in sexual arousal across conditions. However, the men with ED experienced only increases in sexual arousal in response to the no arousal condition, showing significantly less sexual arousal in response to the high arousal condition. Abrahamson and colleagues (1985) found that men with ED focus more on performance related concerns when responding to a sexually aroused partner, while sexually functional men continue to focus their attention on erotic cues. Therefore, men with ED appear to be significantly affected by cognitive distraction cues specific to perceived sexual performance, and therefore likely attend to cognitive demand cues rather than erotic cues. Given the effects of cognitive distraction on the sexual arousal of men with ED, it is important to identify the particular cognitions that may be interfering in their ability to attain or maintain erections.

Recently, researchers have built upon the early theories of psychogenic ED, incorporating research from the past two decades. Two main theories of male sexual arousal have emerged. First, Bancroft and Janssen (2000) created the first model to highlight the presence of both excitatory and inhibitory mechanisms in sexual arousal; the Dual Control Model. This state-trait model describes how a sexual response occurs or does not occur according to a balance of excitatory and inhibitory systems in the brain. The Dual Control Model suggests that individual differences exist in the levels of intensity of each of these systems. While individuals with high levels of inhibition and/or low levels of excitation may experience ED, individuals with low

levels of inhibition and/or high levels of excitation are at an increased risk of engaging in risky sexual behaviour (Bancroft, Graham, Janssen, & Sanders, 2009).

The inhibitory system has been hypothesized to serve four main functions, which translate across species; (1) to avoid sexual situations perceived to be threatening; (2) to reduce sexual response during non-sexual threats in order to be able to attend to the threat, rather than being distracted by sexual activity; (3) preventing excessive sexual behaviour by inhibiting further sexual activity (e.g., ejaculation); and (4) to inhibit sexual/reproductive activity during chronic stress to prevent population overcrowding (Bancroft & Janssen, 2000). In men with ED, the inhibitory system is activated upon presentation of sexual stimuli, as these stimuli have been deemed a perceived threat. This may be due to increased stress or anxiety associated with these stimuli, and therefore a decrease genital response is elicited as the result of the activation of the inhibitory system (Bancroft, 1999). Although not explicitly stated, the inhibitory system may also be activated in the presence of negative automatic thoughts, serving as a potential perceived threat. Therefore, the role of maladaptive cognitions in activating the inhibitory system should be considered.

Most recently, Wiegel and colleagues (2007) expanded upon Barlow's (1986) previously proposed model, which emphasized cognitive distraction and affective associations and responses to sexual stimuli. The updated model builds upon Barlow's (1986) model, by highlighting the importance of considering research on cognitive schemata, affect, self-focused attention, and worry in conceptualizing psychogenic ED.

First, research on cognitive schemata has focused on the differences in cognitions of individuals with and without sexual dysfunction. For example, Wiegel and colleagues (2007) highlighted research showing that individuals with ED have been found to have cognitions

including a perceived lack of control over sexual arousal (Mitchell, Marten, Williams, & Barlow, 1990), sexual failure expectancies (Bach, Brown, & Barlow, 1999; Cranston-Cuebas et al., 1993), maladaptive sexual causal attributions (Weisberg et al., 2001; Scepkowski et al., 2003), and cognitive bias (Barlow, 2000). As such, considering the presence and role of these cognitions in individuals with ED has important treatment implications.

Second, while Barlow's (1986) model highlighted the role of negative affect in reducing sexual responses, subsequent research studies have revealed that both positive and negative affect have a central role in sexual function. For example, several research studies have found an association between subjective sexual arousal and both positive and negative affect (e.g., Koukounas & McCabe, 2001; Mitchell, DiBartolo, Brown, & Barlow, 1998; Rowland, Cooper, & Heiman, 1995; Rowland, Cooper, & Slob, 1996). Following a positive or negative mood induction, sexually functional male participants in the positive mood induction group showed a significant increase in both self-reported and physiological arousal, while participants in the negative mood induction showed a significant decrease in both self-reported and physiological arousal (Mitchell et al., 1998). Therefore, Wiegel and colleagues (2007) highlighted the importance of considering the state-affective valence when approaching a sexual situation among individuals with ED.

Third, while Barlow's (1986) model focused on how shifting attentional focus towards non-erotic cues during sexual experiences could result in ED, Wiegel and colleagues (2007) noted that rather than focusing on non-erotic cues, individuals with ED actually increase their self-focused attention. Wiegel and colleagues (2007) described that the most important consequence of the switch to self-focused emotion among individuals with ED is the impact that this level of focus has on affect. That is, individuals focusing their attention on internal cues and

performance-related cues during sexual activity are likely to experience negative affect, which then decreases both subjective and physiological sexual function.

Finally, Wiegel and colleagues (2007) highlighted the role of worry as a maintaining factor of sexual dysfunction. He describes that worry can create further shifts in attentional focus, further negative affect, and more negative intrusive thoughts during sex, which result in maintaining sexual dysfunction over time. As such, Wiegel and colleagues' (2007) recent model of sexual dysfunction highlights the importance of considering cognitive, affective, and attentional factors in the onset and maintenance of sexual dysfunction.

Taken together, psychogenic ED can be conceptualized as being caused by a variety cognitive, affective, and neurological factors. The relative contribution of each of these factors remains largely unknown, however, their importance has been highlighted across theories and research studies. Cognitive processes have consistently been implicated in contributing to psychogenic ED. As such, identifying specific cognitive targets for reducing ED is imperative to improving treatment protocols aimed at reducing ED.

Belief in Sexual Stereotypes

Current popular treatment protocols for treating psychogenic ED (e.g., McCarthy, 1992; Rosen et al., 1994; Wincze & Barlow, 2004) focus on challenging beliefs and cognitions about the importance of a "perfect sexual performance," known as sexual stereotypes. Further, guidelines for adapting treatment protocols for use in gay and bisexual men highlight the importance of targeting belief in sexual stereotypes (BSS) in gay and bisexual men (Hart & Schwartz, 2011). BSS are characterized by a set of beliefs about sexuality. They can be beliefs or ideas about sexuality and sexual expression that not only guide sexual behavior, but are also used to interpret sexual events (Nobre & Pinto Gouveia, 2000). BSS include maladaptive beliefs such

as “men must always get an erection immediately” and “men must maintain an erection at 100% rigidity throughout sex” (Nobre & Pinto Gouveia, 2000).

Experiencing BSS represents a cognitive distraction during sex that may prevent men from experiencing sufficiently rigid erections. Similar to the studies previously discussed by Beck (1983) and Abrahamson (1985), the presence of BSS and automatic thoughts stemming from BSS during sex may represent an implicit cognitive demand cue. That is, while there is no explicit instruction to achieve and maintain an erection, the pressure men with high BSS place on themselves to perform and attain and maintain a sufficiently rigid erection in order for sex to be a “success” mimics this effect. The existing treatment protocols emphasize the need to identify BSS among all clients presenting for ED treatment, and incorporate psychoeducation and cognitive restructuring to address and diminish these beliefs.

Indeed, community samples have found that men who experience more negative automatic thoughts related to sexual performance have higher rates of psychological distress and sexual difficulties (Nelson & Purdon, 2011). In addition, relative to women, men experience significantly more performance related concerns during sexual activity (Nelson & Purdon, 2011). Lacefield and Negy (2012) found that not only do gay men experience significantly more negative automatic thoughts during sex related to sexual performance, STI-related fears, and body image relative to heterosexual men, but they also experience more anxiety regarding these negative automatic thoughts during sex. These performance related fears included not being able to satisfy their partner and not being able to give their partner an orgasm, and are consistent with a strong underlying BSS. In addition, among both sexually functional men and men with ED, gay men experience significantly more performance related concerns, including fear of not maintaining an erection and fears of not pleasing their partner, relative to heterosexual men

(Bancroft et al., 2005). However, the presence of BSS does not only result in psychological distress, but also in higher rates of ED among men who have high BSS.

BSS and ED

The need to target BSS has been supported by preliminary investigations of the relationship between BSS and ED. Men with ED were significantly more likely to experience BSS, as compared to sexually functional men (Nobre et al., 2005). Specifically, men with ED endorsed higher beliefs in myths related to the themes of sexual conservatism, female sexual power, the need to be macho, women's sexual satisfaction, and restrictive attitudes towards sex. While Nobre and colleagues (2005) demonstrated the relationship between these constructs in a Portuguese sample, these results have been replicated across other cultural samples as well. For example, the relationship between men with ED and belief in these themes were further demonstrated in a Turkish sample (Apay et al., 2015). In addition, Nelson and Purdon (2011) found that men with performance related fears are more likely to report experience sexual difficulties, including ED.

Furthermore, this construct has been examined within gay and bisexual men. Consistent with the heterosexual literature, dysfunctional sexual beliefs differentiated sexually functional gay men from sexually dysfunctional gay men (Peixoto & Nobre, 2014). Both gay and heterosexual men with ED reported significantly more fears of failing as a sexual partner and being unable to achieve an erection, relative to individuals without ED (Peixoto & Nobre, 2016). This is consistent with reports from the treatment literature, which indicate that gay men with ED frequently exhibit BSS such as "A good top is always erect during sexual encounters" (Hart & Schwartz, 2011). Moreover, gay men with ED were found to have more thoughts related to being a "sexual failure" relative to straight men (Shires & Miller, 1998), suggesting that gay men

perceive the ability to achieve or maintain an erection as an indicator of sexual competence. As such, the current literature provides support for the relationship between BSS and ED in both heterosexual men and gay and bisexual men.

BSS and Treatment of ED

While numerous cognitive treatment protocols exist to target psychogenic ED, to date, only three studies have been conducted examining the efficacy of cognitive strategies in reducing symptoms of ED. With the introduction of pharmaceutical interventions for ED, a path was paved to compare the efficacy of CBT to pharmaceuticals in reducing symptoms of ED. Despite the limited nature of the literature, this body of research does provide preliminary support for targeting BSS in men with ED. The first study consisted of six heterosexual men with ED who, prior to participation, reported using Sildenafil and were finding it to be effective (Bach, Barlow, & Wincze, 2004). All of the men were provided with six weeks of CBT for ED, using the Wincze & Barlow (1997) manual. While each of the men reported that Sildenafil continued to be effective in reducing their symptoms of ED, 50% of men reported benefits of CBT over and above the benefits of Sildenafil alone, and reported in a follow-up assessment that while their use of Sildenafil had decreased, the benefits of CBT persisted. The second study compared Sildenafil to combined Sildenafil and a 90-minute didactic psychoeducational intervention about normative sexual functioning in heterosexual men (Phelps, Jain, & Monga, 2004). Although not explicitly stated, this psychoeducational intervention likely addressed BSS by providing information regarding normative sexual functioning. While both groups improved on their symptoms of ED, the group that received psychoeducation reported higher confidence in their ability to perform sexually and higher overall satisfaction at a 12-week follow-up. The final study compared the use of sildenafil to a four-week CBT treatment protocol, including psychoeducation and

challenging maladaptive beliefs in heterosexual men (Banner & Anderson, 2007). While both groups made significant improvement in their symptoms of ED after four weeks of treatment, 48% of men in the CBT group no longer met criteria for ED, compared to only 29% of men treated with Sildenafil alone. Taken together, these findings suggest that a cognitive intervention may be beneficial in reducing symptoms of ED and improving overall sexual satisfaction and confidence, over and above pharmaceutical interventions in heterosexual men.

The existing literature on the efficacy of psychological treatments of ED in gay and bisexual men does not provide information regarding the importance of targeting BSS. Only two studies have examined the effectiveness of psychological treatments for ED in gay men, both of which contained a behavioral intervention and consisted of field trials. The first evaluated ten gay couples in which one partner had ED who presented at their clinic for psychological treatment (McWhirter and Allison, 1978). The authors reported a Masters and Johnson approach to treating ED, which consists mainly of a behavioural component; sensate focus exercises. In this field trial, ED was said to be reversed in seven of the ten couples. Unfortunately, the authors included only participants who they continued to treat over a prolonged period of time (e.g., up to 18 weeks), and therefore, information on attrition and reasons for discontinuation are not provided. The second study examined 40 men who participated in ten 2-hour weekly sessions (Reece, 1982). The major component of these sessions was a behavioural intervention in which participants engaged in sexual activity and sensate focus exercises with a sexual surrogate. At a 6-month follow-up 52% of men reported progress in reducing symptoms of ED.

While these results appear to show support for the use of behavioural interventions in reducing symptoms of ED in gay and bisexual men, several major limitations are present. First, in both studies, the measurement of ED was problematic. Rather than use an empirically

supported measure of ED, Reece's (1982) findings related to ED were based on one question in which the participant was to rate the degree of improvement on a 5-point Likert Type scale. McWhirter and Allison (1978) did not report how they determined that symptoms in ED had improved in their clients. These non-empirically supported approaches are likely flawed not only in their validity and reliability, but may also be met by reporting biases. For example, a social desirability bias may have been minimized by including a multi-item, validated measure of ED, rather than a single item question about progress in the Reece (1982) study. As the method of assessment remains unclear in the McWhirter & Allison (1978) study, it is difficult to determine if any reporting biases were present. Although few validated measures of assessment of ED existed during the time of publication of these studies, it remains unclear whether the method of measurement provided an accurate reflection of improvement in symptoms.

Second, attrition rates in these behavioural interventions appear to be significantly higher than in the CBT interventions described for use with heterosexual populations. While Reece (1982) reported an attrition rate of a 23%, Banner and Anderson (2007) reported an attrition rate of only 7%. The high attrition rate of the Reece study (1982) was largely the result of participants being unwilling to engage in sexual activity with a sexual surrogate, and that participants did not believe the study would work. While McWhirter and Allison (1978) did not report their attrition rate, the long-term commitment to their type of therapy (e.g., up to 18 sessions), may present a deterrent for many clients who do not have adequate finances to cover this type of therapy. The CBT protocols used in research studies examining the efficacy of psychological treatment for heterosexual men, on the other hand, consisted of a range of one 90 minute session to 6 hour-long sessions. As such, the CBT protocols may be more accessible for many clients.

Finally, behavioural interventions for sexual dysfunctions are limited by the need to include a partner in treatment. While some of the techniques involved in sensate focus exercises can be adapted for use in single men, the majority of the exercises require the participation of a willing and trusted partner. As such, single men are faced with the challenge of either finding a willing partner to engage in sensate focus exercises with, or completing only very few sensate focus exercises solo, of which the empirical support for is limited. In addition, while early ED treatment research did at times use sexual surrogacy as a component of therapy, the ethics and legal implications of using surrogates currently results in very limited to no use of surrogacy (Freckelton, 2013).

As such, the limitations of behavioural interventions for clients are present both in the methodology of previous research, and in the actual logistics of providing behavioural interventions to many gay male clients. Therefore, developing an alternative treatment strategy to reduce symptoms of ED in gay and bisexual men is imperative. Given the benefits of cognitive behavioural therapy over and above Sildenafil and the limitations of behavioural interventions, identifying cognitive targets for intervention would be of benefit. Of note, both studies examining the use of behavioural interventions for gay men with ED mentioned the importance of providing psychoeducation about anatomy and normative physiology to gay couples to reduce symptoms of ED and anxiety, but neither reported using these techniques (McWhirter & Allison, 1978; Reece, 1982). As gay men with ED report higher BSS as compared to sexually functional men, this construct warrants further examination. However, as previously stated, only one study has examined BSS in gay men, and the results were correlational in nature, and used self-report measurements of ED. Therefore, examining this relationship using physiological measurements of ED would be an important next step in the research literature.

Sexual Behaviour and ED

Research has also found that among gay men, ED represents a risk factor for engaging in unprotected anal sex (Rosen et al., 2004). Understanding the pathways leading from ED to unprotected anal sex is particularly important among MSM, given that risky sex, defined as unprotected anal intercourse, among MSM remains one of the leading means of infection in Canada with 51% of incident HIV cases being among MSM (PHAC 2013). Men with ED are more likely to make a deliberate choice to not use condoms with casual sex partners, as a result of difficulty attaining and maintaining an erection while wearing a condom (Graham et al., 2006; Lammers, Davidovich, Prins, & Stolteet, 2008). In addition, men with ED are more likely to report that they will remove a condom prior to completion of sex, due to an insufficient rigidity of their erection (Sanders et al., 2012). It is therefore unsurprising that men with ED report higher rates of sexually transmitted infections, compared to men without ED (Jena, Goldman, Kamdar, Lakdawalla, & Lu, 2010).

HIV prevention efforts have led to the use of pre-exposure prophylaxis (PrEP), sold under the name Truvada. Individuals taking PrEP take antiretroviral medications typically used to treat HIV infection as a preventative method against HIV infection. PrEP reduces the risk of contracting HIV through unprotected anal sex and vaginal sex by more than 90%, among individuals who are considered to be at high risk for contracting HIV (Anderson et al., 2012). Specifically, the Centres for Disease Control and Prevention (2017) indicates that individuals in a serodiscordant relationship with an HIV positive partner would benefit from taking PrEP in order to prevent HIV infection, in addition to individuals who engage in condomless sex and injection drug users. As the risk of HIV infection decreases substantially when taking PrEP, many individuals taking PrEP forego condom use during sex. A predictive study showed that

approximately 35% of gay and bisexual men reported they would decrease condom use if they had access to PrEP (Golub, Kowalczyk, Weinberger, & Parsons, 2011). Indeed, a recent study found significant reductions in condom use in a sample of Australian gay and bisexual men (Luxi et al., 2017). However, several problems are present with this behaviour.

PrEP protects only against HIV infection, but not other sexually transmitted infections. With the recently confirmed that antibiotic and macrolide resistant strains of syphilis have emerged in numerous developed countries, including the United States and Canada (Stamm, 2009; Martin et al., 2009). In addition, gonorrhoea has recently been found to be resistant to antimicrobials and other previously recommended for first-line treatment (Unemo & Nicholas, 2012). Furthermore, viral infections such as herpes, remain incurable (Tong, Jackson, Kerstetter, & Worswick, 2014). As sexually transmitted diseases are becoming increasingly difficult to treat, they are posing a new threat to individuals exposed to them. Indeed, a recent study found a significant increase in the rate of sexually transmitted infections among Australian men using PrEP over a one year period (Luxi et al., 2017). Therefore, condomless anal sex remains a risky activity even in cases where men are currently using PrEP. In addition to the increased risk of other sexually transmitted infections, access to PrEP remains limited. Very few Canadian individuals currently have access to this medication, and even fewer are currently regular users of PrEP. As such, understanding the pathways leading to unprotected anal sex among MSM with ED is of importance.

BSS may represent one such pathway through which ED predicts risky sex. For example, BSS includes the beliefs that men always need to be able to attain an erection in order to be considered an adequate sexual partner. In addition, a major component of BSS is related to the ability to please a sexual partner, and the interference that ED has on this ability. Men with ED

hold the belief that in order to be able to satisfy their partner sexually, they must be able to penetrate them with an erect penis (Peixoto & Nobre, 2014). These beliefs may therefore explain Yarber and colleague's (2007) findings of men removing condoms as a result of insufficient erectile rigidity.

Current Study

The current study will evaluate the relationship between BSS and ED, by measuring physiological responses to sexual stimuli in a laboratory environment in addition to self-report measures of sexual arousal and BSS in a sample of gay men with and without ED. Given that the current literature on this topic is correlational in nature and driven by self-report data, employing a physiological approach will provide unique insight in evaluating this relationship. This method of assessment is particularly important given the varying concordance rates among sexually functional men and men with ED. In addition, this study will evaluate the relation between ED and risky sex among gay men, a topic that merits further research given that risky sex among gay men remains one of the leading means of HIV infection (PHAC, 2013). Therefore, this study will not only provide insight into potential reasons for the increased prevalence of ED among gay men, but will also serve to answer important questions related to reducing risky sex among gay men. As such, findings of this study will aid in improving treatments for gay and bisexual men, a vulnerable population that has previously been relatively ignored within this body of literature.

Aim 1. The first aim of the study was to evaluate between group differences in self-reported sexual arousal and physiological arousal.

Hypothesis 1. It was hypothesized that men with ED would experience significantly lower physiological arousal, relative to healthy controls. In addition, based on the findings that sexually functional men and men with ED experience differing concordance rates between

subjective sexual arousal and physiological arousal (e.g., Sarin et al., 2014), it was hypothesized that healthy controls would experience a stronger relationship between subjective sexual arousal and physiological arousal, while men with ED would report lower subjective arousal relative to their physiological arousal.

Aim 2. The second aim of the study was to examine between group and within group differences in the relation between BSS and physiological and subjective sexual arousal.

Hypothesis 2. It was hypothesized that men with ED would have significantly higher levels of BSS and negative cognitions about sex, relative to healthy controls. In addition, it was hypothesized that within each group, men with lower physiological and subjective sexual arousal would report higher BSS, while men with higher physiological and subjective sexual arousal would report lower BSS.

Aim 3. The third aim of the study was to evaluate the relationship between BSS, negative automatic thoughts during sex, and ED.

Hypothesis 3. Consistent with Beck's theory (1995), core beliefs generate negative automatic thoughts, which then generate negative emotions and behaviours. While ED is not behaviour, it is plausible that BSS and negative automatic thoughts related to sex function as a negative feedback loop resulting in ED. It was therefore hypothesized that negative automatic thoughts, would mediate the relationship between more deeply engrained BSS and ED, as operationalized by average genital temperature during the last three minutes of the baseline film, as well as the first, middle, and last five minutes of the sexually explicit film.

Aim 4. The final aim of the study was to evaluate the relationship between ED and sexual behaviour among gay men.

Hypothesis 4. Based on the findings of men with ED being less likely to use condoms (e.g., Graham et al., 2006; Lammers et al 2008; Yarber et al., 2007), it was hypothesized that men with ED would report removing condoms during anal sex with casual partners more often, relative to healthy controls. In addition, it was hypothesized that BSS would mediate the relationship between ED and condom removal. Finally, it was hypothesized that men with ED would be more likely to have used erectile enhancing drugs during the previous six months, which has been associated with increased engagement in risky sex (Harte & Meston, 2011).

Methods

Participants

A total of 75 self-identified cisgender gay and bisexual men within the Toronto Metropolitan Area that were recruited to participate in the GQ Arousal Study. The study was conducted at the HIV Prevention Lab at Ryerson University. Recruitment efforts included posters at community organizations and venues. Additionally, online advertisements were placed on social media sites targeting gay men (e.g., Facebook.com/LGBTQ.Health) and more generic websites (e.g., toronto.craigslist.ca/d/volunteers/search/vol). Finally, advertisements were placed on dating applications (e.g., Scruff), with detailed information regarding how to contact the lab.

Of the 75 participants, 41 participants denied having any sexual difficulties, and were placed into the healthy control (HC) group and 34 participants were assessed to have ED. This assessment occurred through a telephone screen at which DSM-5 criteria for ED were queried (APA, 2013). In order to be included in the ED group, participants had to report difficulty in obtaining or maintaining an erection, or a marked decrease in erectile rigidity on at least 75% of occasions of sexual activity. At least one of these symptoms must have been reported to be present for a minimum of six months, and be associated with clinically significant distress. It is

important to note that the term HC is referring to participant's health with respect to their erectile functioning, rather than their overall health. Although some medical conditions were screened, a full medical history of individuals in the HC group was not collected, and it would therefore be inaccurate to assume that these individuals were in fact healthy, beyond their erectile functioning.

Further, eligible participants had to be between the ages of 18 and 40, as sexual functioning has been shown to start declining at around age 40 (Delamater, 2012; Moreira et al., 2008). Participants were excluded from the study if they were not within the specified age group, if they reported any chronic medical conditions associated with sexual arousal difficulties (e.g., diabetes, HIV-positive, multiple sclerosis), if they reported currently taking any medications known to effect sexual arousal (e.g., antidepressants), if they reported they did not have a flesh male penis, and if they expressed discomfort with viewing sexually explicit videos.

Procedure

Ethics approval for this study was obtained from Ryerson University. When a participant contacted the HIV Prevention Lab indicating their interest in participating in the study, they underwent a brief phone screen, during which eligibility criteria was assessed and the study procedure was described. They were provided with detailed information regarding the study procedure, including that all participants are required to view a sexually explicit film while having their genital temperature measured using a thermal imaging camera. Participants were informed that the use of thermal imaging cameras is safe and that there are no physical risks to undergoing this type of assessment. In addition, participants were informed of procedures to protect their confidentiality, including storing contact information and participant identification numbers separately, and that all materials would be destroyed in the event that they withdraw

from the study. Participants deemed ineligible following the phone screen were provided with resources for LGBTQ community organizations and sex therapists in Toronto. Eligible participants who indicated that they were interested in continuing on in the study were scheduled for a 1.5-hour appointment at the HIV Prevention Lab.

Once at their appointment, participants were provided with a consent form that further outlined the study procedure and notified them of their rights to withdraw at any time. The lead graduate student reviewed the consent form with the participant, and allowed the participant to ask any questions and voice any concerns related to study participation at that time.

Following the attainment of consent, participants were led into the testing room and the researcher provided the participant with specific instructions for the thermal imaging portion of the study. They were instructed to wait until the researcher left the room, and then remove any clothing covering their genitals. This room contained a window fully covered by opaque curtains and a sign on the door indicating no entry due to participant testing. In addition, the participant was informed that they could lock the door from the inside, and that only the researcher running the testing session had a key to the room during that time. They were instructed to sit in a specific chair with their legs spread, and to keep their hands away from their thighs or genitals in order to avoid image interference. Participants were informed that they could communicate with the researcher during the videos through the intercom in the event that they had any questions and concerns. Participants were instructed that once seated, they could put on the DVD goggles and let the researcher know through the intercom when they were ready for the videos to begin. Participants were also encouraged to experiment with using the computer mouse to monitor continuous subjective sexual arousal during the first couple of minutes of the baseline video, in order to have an understanding of how it worked for when the sexually explicit film began. Once

the researcher left the room, both sexually functional participants and participants with ED privately had their genital temperature measured remotely using a thermal imaging camera, while first viewing a 15-minute neutral baseline video to stabilize genital temperature, followed by a 15-minute sexually explicit film. Following the baseline video, the questionnaire assessing for discrete sexual arousal appeared in the DVD goggles, and participants responded to these questions via the intercom. Once this questionnaire was finished, a slide appeared reminding them to keep their legs spread, their hands to the side, and to use the computer mouse to monitor subjective sexual arousal. Following this, the sexually explicit film began.

The researcher was in a separate room monitoring the thermal imaging feed, and communicated with the participant through the intercom as needed (e.g., if the participant had any questions, or to ask the participant to move their hands in the event that they are covering the image). Participants were instructed to put their clothes back on once the videos have ended, and all participants will complete a battery of questionnaires which were loaded onto a computer. Participants were instructed to let the researcher know to enter the room, only once they are comfortable and have completed the questionnaire.

A detailed debriefing followed, providing accurate information on sexual stereotypes and sexual functioning. During this time, participants were encouraged to ask any questions they may have had related to the study and about sexual stereotypes and sexual functioning in general. All participants were provided with resources for LGBTQ community organizations and sex therapists in Toronto. Following participation, all participants were compensated $50 for their time, a compensation that has been deemed appropriate and reasonable within research assessing sexual arousal (Dawson et al., 2019).

Apparatus/Measures

Phone screen. The initial telephone screen consisted of questions that assessed for eligibility criteria. As such, items such as age of the potential participant, sexual orientation, and ability to read in English were included. The phone screen also included questions related to various chronic medical conditions and medication use known to impact sexual arousal. Participants were asked whether they have a flesh male penis, and questions related to their erectile functioning, including questions about difficulty obtaining or maintaining an erection, by querying DSM-5 criteria for ED. The telephone screen also included detailed information regarding the requirements involved in participating in the study, including watching a sexually explicit film and the use of a thermal imaging camera to assess for genital temperature change.

Demographic variables. Participants completed a demographics questionnaire assessing age, gender, sexual orientation, employment status, education level, income, and relationship status.

Thermal imaging. To assess for sexual arousal, participants had their genital temperature measured using a thermal imaging camera. Thermal imaging cameras rely on the detection of infrared emissions, which are continuously emitted from the skin (Kukkonen et al., 2007). By detecting infrared emissions, thermal imaging cameras can produce thermal images where the average temperature of less than 1 millimetre of skin can be determined with a precision of 0.07˚C. The camera was placed at a distance of 1.03 metres diagonally to the left of the participant and at a height of 95cm, tilted at an angle of approximately 30 degrees (Hafez, 2017). Regions of interest included a measure on the shaft of the penis, on the inner thigh, and on the wall as a control measure. Various measures of genital temperature were included in analyses. First, in order to assess for differences in physiological arousal throughout the videos,

genital temperature was divided into 16 bins, consisting of one bin with the average genital temperature during the last three minutes of the baseline video, and one bin during each of the 15 minutes of the sexually explicit film. In addition, in order to condense these results, genital temperature was also divided into four bins, consisting of one bin with the average genital temperature during the last three minutes of the baseline video, and one bin during the first, middle, and final five minutes of the sexually explicit film. Finally, in order to assess for change over time, a genital temperature change score was calculated for each participant, by subtracting baseline genital temperature from the maximum genital temperature reached during the sexually explicit film.

Stimulus materials. Two 15-minute video clips were shown to each participant. The first video was a neutral film clip showing images of plants, waterfalls, and other natural landscapes, which served as a 15-minute window to stabilize genital temperature and functioned as a baseline comparison. The second video was sexually explicit in nature. While several sexually explicit films have been validated for use in sex research, these are all heteronormative in nature, and have been validated only for use in heterosexual samples (Janssen, Carpenter, & Graham, 2003). To our knowledge, no sexually explicit videos have been validated for use with gay samples at this time. Nonetheless, Chivers and colleagues (2007) evaluated the effects of showing various videos (heterosexual penetrative sex, gay penetrative sex, male masturbation) to gay and heterosexual men to establish which video content would result in the highest subjective and physiological ratings of arousal. Gay men reported their subjective sexual arousal to be highest during the gay sex scenes, which was consistent with the physiological results. As such, six 15-minute sexually explicit film containing scenes of two men kissing, engaging in oral sex, anilingus, and anal sex were selected for piloting. These films were shown to ten gay men of

various ethnicities, who each rank ordered the films in terms of preference. The video with the highest overall rank was selected for the purpose of the present study.

When divided into three five-minute bins, the selected video showed a variety of sexual activity across each bin. The first bin included oral sex, the second bin included kissing, oral sex and masturbation, and analingus. Finally the third bin consisted of anal penetration and ejaculation.

DVD goggles. Participants viewed the videos through DVD goggles (e.g., Vuzix Wrap 1200 Video Eyewear). As consistent with previous literature, these goggles contained ear buds to minimize external noise distraction (Kukkonen et al., 2007; 2010; Sarin et al., 2014). The ear buds were used for the first ten participants; however, following equipment malfunction, a set of headphones (i.e., Sony MDRZX1110 Over-Ear Headphones) was used to replace the ear buds for the remaining 60 participants.

Intercom. In order for the researcher and participant to be able to easily and privately communicate with one another during the testing session, a two-way intercom was installed with one unit being in the testing room, next to the participant, and the other being accessible to the researcher in the control room.

Room temperature. In order to control for room temperature, the internal temperature of the testing room will be continuously monitored using a standard thermostat. Although the thermal imaging camera has been found to have a sensitivity of 0.07˚C when operating under temperatures from 15˚C to 40˚C (Hafez, 2017), room temperature was kept stable within participants to ensure the comfort of the participant, rather than specificity of the measurement. As such, consistent with previous studies (e.g., Kukkonen et al., 2007; 2010; Sarin et al., 2014),

room temperature was maintained and within each testing session there was a variation in temperature of less than 0.8˚C.

Continuous subjective sexual arousal. Subjective sexual arousal was measured continuously throughout the testing session. Participants rated their sexual arousal on a 10-point Likert-type scale ranging from 0 (no sexual arousal) to 10 (the most sexually aroused a participant could feel) using a standard computer mouse (Sarin et al., 2014). By clicking on the left button of the mouse, sexual arousal ratings decreased, while clicking on the right button of the mouse caused an increase in sexual arousal ratings. Each click of the mouse was accompanied by an audio prompt of the currently selected level of subjective sexual arousal, so that participants were easily able to use the device. Two measures of continuous subjective sexual arousal were included in analyses. First, in order to assess for differences in subjective sexual arousal throughout the videos, subjective sexual arousal was divided into 16 bins, consisting of one bin with the average subjective sexual arousal during the last three minutes of the baseline video, and one bin during each of the 15 minutes of the sexually explicit film. In addition, in order to assess for change over time, a subjective sexual arousal score was calculated for each participant, by subtracting baseline subjective sexual arousal from the maximum subjective sexual arousal reached during the sexually explicit film.

Discrete subjective sexual arousal. Discrete subjective sexual arousal questions were administered following the viewing of each of the videos (see Kukkonen et al., 2007; 2010 for full list). Questions assessed for levels of relaxation, enjoyment, humour, and various aspects of sexual arousal (e.g., “Did the video make you feel like masturbating”, “How would you rate your peak sexual arousal?”), as well as interference of the camera on these points, using a 10-point Likert-type scale ranging from 0 (not at all) to 10 (the most ever). In addition, a comparative

question was asked (i.e., “how sexually aroused did you feel during the film as compared with how sexually aroused you typically are with a partner?) and answered on a 10-point Likert type scale ranging from -5 (much less sexually aroused) to +5 (much more sexually aroused).

Self-reported sexual function. Sexual dysfunction was assessed using the International Index of Erectile Function adapted for MSM (IIEF-MSM; Coyne et al., 2009). The IIEF-MSM consists of 22 self-report items adapted from the original IIEF-MSM and assesses sexual functioning over the past four weeks (Rosen et al., 1997). For example, instead of asking in the original IIEF-MSM (Rosen et al., 1997) a question that assumes that all sexual acts involve penetration “When you attempted sexual intercourse, how often was it satisfactory for you?”, the IIEF-MSM asks “When you attempted sexual intercourse or other sexual activity, how often was it satisfactory for you?”. The IIEF-MSM contains five subscales: 1) erectile function (e.g., “How often were you able to get an erection during sexual activity?”); 2) intercourse satisfaction (e.g., “How much have you enjoyed sexual intercourse or other sexual activity?”); 3) orgasmic function (e.g., “When you had sexual stimulation or intercourse, how often did you ejaculate?”); 4) sexual desire (e.g., “How often have you felt sexual desire?”); and 5) overall satisfaction (e.g., “How satisfied have you been with your overall sex life?”). A low score indicated poor sexual functioning. The erectile function, orgasmic function, and sexual desire subscales had high internal consistency, ranging from $\alpha = 0.82$ to 0.89 (Coyne et al., 2009). Overall satisfaction and intercourse satisfaction had inadequate internal consistencies, $\alpha = 0.42$ and 0.55, respectively (Coyne et al., 2009).

Although the IIEF-MSM was psychometrically examined in a sample that was both MSM and HIV-positive, none of the questions directly address HIV-status. In addition, the IIEF-MSM has been used as a measure of sexual functioning in both HIV-positive (Vansintejan,

Janssen, Van de Vijver, Vandevoorde, & Devroey, 2013) and HIV-negative (Shindel et al., 2011) samples of MSM.

BSS. The SDBQ assessed for BSS. This measure consisted of 40 items answered on a five-point Likert Type scale (Nobre & Pinto-Gouveia, 2000). Five domains of BSS were assessed: (1) sexual conservatism (e.g., "Foreplay is a waste of time"); (2) macho beliefs (e.g., "A real man must be capable of maintaining an erection until the end of any sex"); (3) beliefs about partner's sexual satisfaction (e.g., "Penis erection is essential for partner's sexual satisfaction"); (4) restrictive attitudes towards sex (e.g., "It is not appropriate to have sexual fantasies during sexual intercourse"); (5) sex as an abuse of men's sexual power (e.g., "sex is a violation of the partner's body"); (6) importance of erectile performance; and (7) beliefs about partner's sexual power. When adapted for use with gay and bisexual men, questions related to man/women interaction are changed to top/bottom interactions (e.g., "Women have no other choice but to be sex-subjugated by men's power" was changed to "Bottom men have no other choice but to be sex-subjugated by top men's power; Peixoto & Nobre, 2014). This questionnaire has been found to have acceptable internal consistency among heterosexual men, $\alpha = 0.93$, and gay men $\alpha = 0.73$ (Nobre & Pinto-Gouveia, 2000; Peixoto & Nobre, 2014).

Negative automatic thoughts during sex. Two independent self-report questionnaires assessed for the content of negative automatic thoughts during sex. First, the Non-Erotic Cognitive Distraction Questionnaire (NECDQ; Lacefield & Negy, 2012) consisted of 15 questions answered on a 5-point Likert-type scale. Four domains of negative automatic thoughts were assessed: (1) Body Image Concerns (e.g., "During sexual activity, I worry that my partner will get turned off by seeing my body without clothes"); (2) Performance Concerns (e.g., "I worry about whether my actions are satisfying my partner during sexual activity"); (3)

External/Emotional Concerns (e.g., “During sexual activity, I feel guilty about having sex”); and (4) Disease Concerns (e.g., “I worry about getting a sexually transmitted disease during sexual activity”). This questionnaire was gender-neutral and was non-heteronormative in nature, and was therefore appropriate for use without adaptation in a sample of gay men. The reliability of this questionnaire has been assessed in a sample of heterosexual and gay men and women, and has found strong test-retest reliability (r = .74) at a two-week interval. In addition, each subscale was significantly correlated to measures of trait anxiety in the expected direction.

In addition, the Sexual Modes Questionnaire (SMQ; Nobre & Pinto-Gouveia, 2003) was administered. The male version of this questionnaire consists of 30 questions assessing for frequency of thoughts, emotions associated with thoughts, and the intensity of sexual response when these thoughts are present. For example, a participant would be asked to rate the frequency with which they experience the thought “I must achieve an erection” during sex on a 5-point Likert type scale (1=Never, 5=Always), the emotions generally experienced when this thought is present (options of emotions provided are: worry, sadness, disillusioned, guilt, fear, shame, anger, hurt, pleasure, satisfaction), and the intensity of their sexual response when this thoughts are present on a 5-point Likert type scale (1=Very Low, 5=Very High). Five domains of negative thoughts were assessed: (1) Failure Anticipation Thoughts (e.g., “This time I cannot disappoint my partner”); (2) Erection Concern Thoughts (e.g., “My penis is not responding”); (3) Age/Body Related Thoughts (e.g., “I’m getting old”); (4) Negative Thoughts Toward Sex (e.g., “This way of having sex is immoral”); and (5) Lack of Erotic Thoughts (e.g., “I have other important matters to deal with”). The male-version of this questionnaire was found to have strong internal consistency, with a total internal consistency of α = .88 and subscale internal consistencies of α = .69 to .83. (Nobre & Pinto-Gouveia, 2003).

Sexual behaviour. For the purpose of this study, risky sex was operationalized according to how often participants removed a condom during anal sex with a casual partner within the previous six months. In addition, participants were asked about the frequency with which they use condoms during insertive and receptive anal sex, as answered on a 5-point Likert-Type Scale (1= "None of the time", 6 = "Almost Always"). Participants were also asked about their frequency of the use of erectile enhancing drugs during the previous 6 months as answered on a 5-point Likert-Type Scale (1= "None of the time", 6 = "Almost Always"), as well as reasons for use of erectile enhancing drugs. Participants were provided with the choices of "To enable me to get an erection"; "To allow me to maintain my erection despite putting on a condom"; "To offset effects of drugs preventing me from getting an erection"; and "To have sex for longer". Finally, participants were asked about their reasons for removal of condoms, and were provided with the choices of "Partner requested I remove it"; "To intensify Pleasure"; "I was losing my erection"; "I was having difficulty getting an erection"; "I decided I felt safe enough not to use a condom with that partner"; and "Other".

State anxiety. State Anxiety was assessed using the State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA; Ree et al., 2000). The STICSA has both a trait and state version, however, only the state version was administered in the present study. The STICSA consists of two subscales; the cognitive anxiety subscale and the somatic anxiety subscale. The cognitive anxiety subscale consists of 10 items (e.g., "I think that the worst will happen"), answered on a 4-point scale ranging from 1 (not at all) to 4 (very much so). The somatic anxiety subscale consists of 11 items (e.g., "I feel trembly and shaky"), and is also answered on a 4-point scale ranging from 1 (not at all) to 4 (very much so). The STICSA has been found to have strong internal validity, with alphas ranging from $\alpha = .75$ to .88 (Ree et al., 2000).

Statistical Analyses

Power analysis. An a priori power analysis was conducted to ensure that a sample size of 70 would be sufficiently large to detect statistically significant differences. Based on the previous literature showing that healthy controls had a mean of 53.42 (SD=1.77) and ED groups had a mean of 57.68 (SD=1.77; Peixoto & Nobre, 2014), the sample size of 70 current sample size (control = 40 and ED = 25) was found to be adequate to detect a mean difference on the SDBQ of 1.3 with power of 80.68% and alpha = 0.05, and to detect a large effect size (Cohen's *D* = 1.29). A mean difference of 2.0 would be detected with power of 99.15%. As such, the sample size of 70 was found to be adequately large to detect expected differences.

Sample characteristics. In order to examine potential group differences in demographic variables, independent samples *t*-tests were conducted to examine potential differences in age. Chi-square analyses were conducted to examine potential differences sexual orientation, highest education attained, annual income, ethnicity, or anal sex roles. Fisher's Exact Tests were used to evaluate potential group differences in gender, relationship status, and circumcision status.

In addition, the mean, standard deviation, and range of each of the scales was assessed, both using the total sample and using each individual group.

Exploration of assumptions. Univariate outliers were detected by examining the box plots of each of the main variables included in analyses. Scores with a *z*-value exceeding |3.29| were identified as outliers (Field, 2013). In addition, skewness, kurtosis, and stacked histograms were examined to assess for whether the variables included in the analyses were normally distributed.

Between-group differences on study variables. In order to assess for whether between-group differences existed on state anxiety, a MANOVA was conducted. To evaluate whether

between-group differences existed on genital temperature and subjective sexual arousal change scores, two independent-samples t-tests were conducted. In order to assess whether men with ED would have significantly higher levels of BSS and negative cognitions about sex, relative to healthy controls, three MANOVAs were conducted, evaluating group differences on each of the subscale and total scores of the SDBQ, NECDQ, and SMQ, respectively.

Aim 1. To evaluate whether men with ED would experience significantly lower physiological arousal, relative to healthy controls, a 2 x15 repeated measures ANOVA was conducted. Temperature time points consisted of average genital temperature of each minute of the sexually explicit video. Covariates consisted of average room temperature and average genital temperature during the last 3 minutes of the neutral video.

In addition, this analysis was replicated with the condensed genital temperature data, by conducting a 2x3 repeated measures ANOVA was conducted, with room temperature and baseline genital temperature as covariates. Temperature time points consisted of average genital temperature during the first, middle, and last five minutes of the sexually explicit video.

To evaluate whether men with ED would experience significantly lower subjective sexual arousal, relative to healthy controls, a 2x15 repeated measures ANOVA was conducted. Time points consisted of average subjective sexual arousal during each minute of the sexually explicit video.

In order to assess for whether healthy controls would experience a stronger relationship between subjective sexual arousal and physiological arousal, while men with ED would report more discrepancies between these measures, within group correlations were computed for each participant and were then compared between groups using an independent samples t-test, comparing the *r*-value between groups.

Aim 2. In order to investigate the relationship between BSS, as well as negative automatic thoughts during sex, and genital temperature, Bivariate Pearson Correlations Correlations between the four genital temperature time points, genital temperature change scores, and each of the subscales and total scores of the SDBQ, SMQ, and the NECDQ. In order to assess whether within each group, men with lower physiological and subjective sexual arousal would report higher BSS, while men with higher physiological and subjective sexual arousal would report lower BSS, a series of hierarchical linear regression models were conducted. In order to examine within group variance, a hierarchical regression was run with each group. Outcomes consisted of genital temperature change score and subjective sexual arousal change score. Negative automatic thoughts related to sex were included as predictors, and were defined by SMQ total scores, NECDQ total scores, and SDBQ total scores.

Aim 3. To evaluate whether NECDQ total scores and SMQ total scores mediate the relationship between SBDQ total scores and sexual arousal, simple mediation models (Preacher and Hayes, 2008) were conducted, using genital temperature change score and subjective sexual arousal change score as outcomes. These were conducted both with the full sample, in order to ensure variability in outcome measure scores, as well as with the ED group, in order to test this hypothesis on the group with lower sexual arousal.

Aim 4. In order to evaluate the relation between ED and sexual behaviour, independent samples *t*-tests were conducted in order to evaluate whether there is a difference between groups on removal of condoms during sex and use of erectile enhancing drugs. In addition, reasons for removal of condoms and use of erectile enhancing drugs were assessed in each group. Finally, a simple meditational model (Preacher & Hayes, 2008), was conducted to assess whether BSS would mediate the relationship between more ED and condom removal.

Results

Sample Characteristics

In total, 104 individuals completed the telephone screen. Of the 27 individuals were found to be ineligible for the study, ten were excluded due to being outside of the specified age range, nine reported having a chronic illness known to be associated with ED, four individuals reported having ED that did not meet the severity requirements, one individual reported being uncomfortable with the procedure, one was on medications known to be associated with ED, one individual reported being straight, and one individual reported having no issues with ED, but experienced another sexual dysfunction.

Of the 77 participants who were found to be eligible based on the telephone screen, 41 participants denied having any sexual difficulties, and 36 participants were assessed to have ED (see Figure 1). Following data cleaning, seven participants were removed. One participant was removed from the control group as they dropped out during the thermography portion of the study, reporting being uncomfortable and not wishing to proceed. Six participants were removed from the ED group; three did not show up to their appointment, and three individuals cancelled their appointments following scheduling, noting that they were no longer comfortable with the procedure. As such, the final sample consisted of 70 cisgender gay men; 40 healthy controls and 30 men in the ED group.

Demographic variables were examined to identify the sample characteristics of the two groups (see Table 1). An independent samples *t*-test revealed no significant differences in age between men with ED (M = 29.88, SD = 6.58) and healthy controls (M = 29.50, SD = 6.12), $t(64) = -.24$, $p = .81$ (see Table 1). Men with ED did not differ from healthy controls on gender, sexual orientation, highest education attained, annual income, ethnicity, anal sex roles, or circumcision

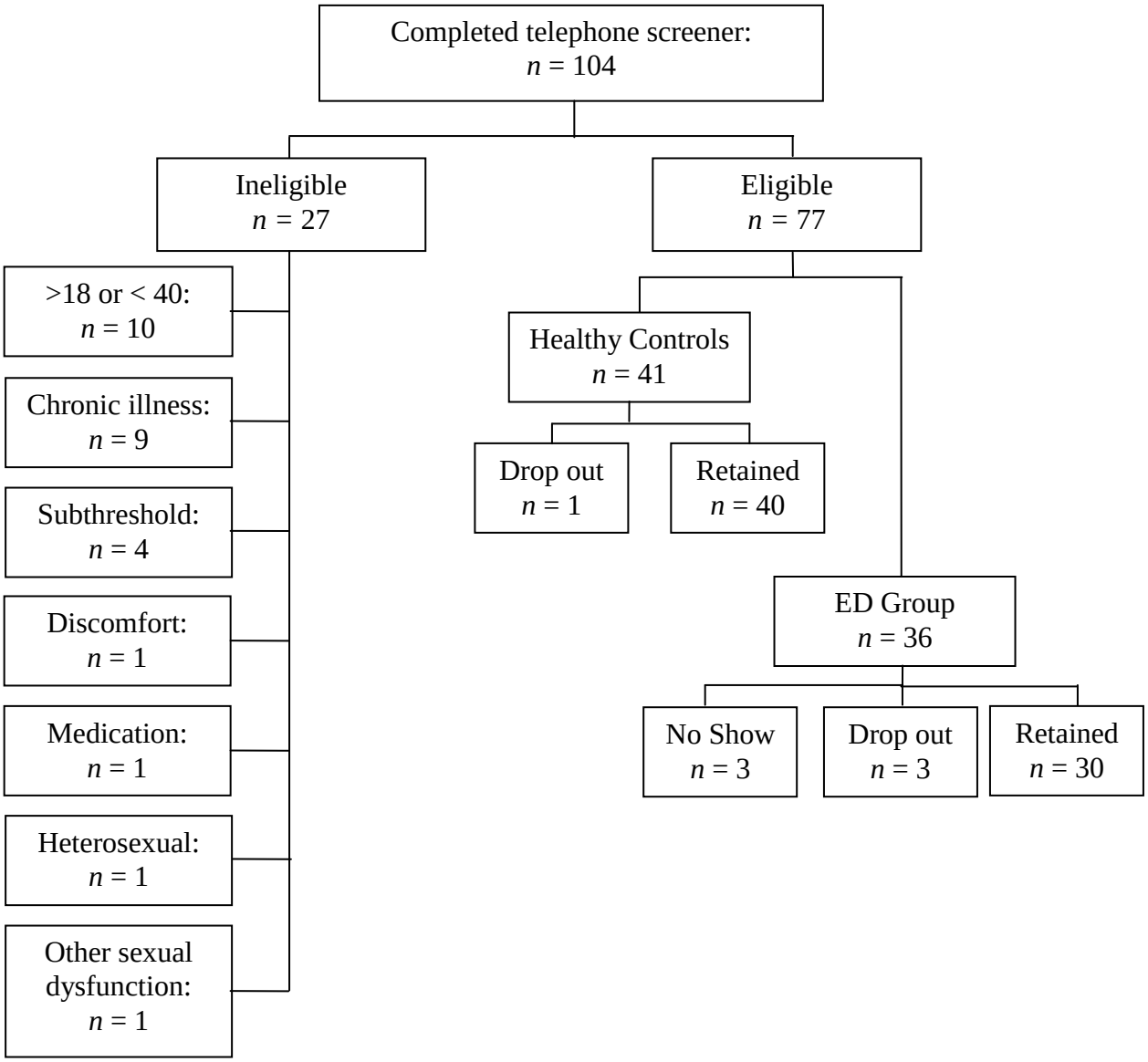

Figure 1. Flowchart depicting the individuals who were retained and removed from analyses.

Table 1
Sociodemographic Characteristics and Comparisons of Groups

	ED (n = 30)	Control (n = 40)	Total (N = 70)	
Variable	n (%)	n (%)	N (%)	Test Statistic
Gender				p = .18; FET
Male	24 (92.3)	40 (100)	64 (97)	
Non-Binary	2 (7.7)	0 (0)	2 (3)	
Sexual Orientation				χ^2 (2) = 2.02
Gay	24 (92.3)	33 (82.5)	57 (86.4)	
Bisexual	1 (3.8)	2 (5)	3 (4.5)	
Queer	1 (3.8)	5 (12.5)	6 (9.1)	
Two-Spirited	0 (0)	0 (0)	0 (0)	
Pansexual	0 (0)	0 (0)	0 (0)	
Undefined	0 (0)	0 (0)	0 (0)	
Highest Education				χ^2 (4) = 1.93
Did not attend high school	0 (0)	0 (00)	0 (0)	
Some high school	0 (0)	0 (0)	0 (0)	
Completed high school	3 (11.5)	4 (10)	7 (10.6)	
Some secondary education	8 (30.8)	7 (17.5)	15 (22.7)	
Completed secondary education	10 (38.5)	16 (40)	26 (39.4)	
Some graduate or professional school	1 (3.8)	3 (7.5)	4 (6.1)	
Completed graduate or professional school	4 (15.4)	10 (25)	14 (21.2)	
Annual Income				χ^2 (4) = 2.49
Under $20,000	15 (57.7)	16 (40)	31 (47)	
$20,000 - $39,999	5 (19.2)	14 (35)	19 (28.8)	
$40,000 - $59,999	3 (11.5)	4 (10)	7 (10.6)	
$60,000 - $79,000	2 (7.7)	2 (5)	4 (6.1)	
Over $80,000	1 (3.8)	4 (10)	5 (7.6)	
Ethnicity				χ^2 (6) = 11.51
White	13 (43.33)	19 (47.5)	32 (45.7)	
Black	0 (0.0)	4 (10.0)	4 (5.7)	
Latin American	4 (13.3)	5 (12.5)	9 (12.9)	
South Asian	1 (3.3)	5 (12.5)	6 (8.6)	
East/South East Asian	1 (3.3)	3 (7.5)	4 (5.7)	
Middle Eastern	8 (26.7)	2 (5.0)	10 (14.3)	
Two or more ethnicities	3 (10.0)	2 (5.0)	5 (7.1)	
Relationship Status				p < 01; FET
Single	21 (80.8)	18 (45)	40 (60.6)	
Partnered	9 (19.2)	22 (55)	26 (39.4)	
Anal Sex Role				χ^2 (5) = 3.83

Top	3 (10)	6 (15)	9 (12.9)	
Top/Versatile	9 (30)	8 (20)	17 (24.3)	
Versatile	3 (10)	9 (22.5)	12 (17.1)	
Bottom/Versatile	6 (20)	8 (20)	14 (20)	
Bottom	7 (23.3)	9 (22.5)	16 (22.9)	
Other: No anal sex	2 (6.7)	0 (0)	2 (2.9)	
Circumcision Status				p = .81; FET
Intact Foreskin	14 (46.7)	21 (52.5)	35 (50.0)	
Circumcised Foreskin	16 (53.3)	19 (47.5)	35 (50.0)	

Note. FET = Fisher's Exact Test.

status. A significant difference was found between groups when examining relationship status, with men with ED being less likely to report being in a relationship as compared to healthy controls (p = .02; FET).

Although the study aimed to collect a sample that consisted of gay cisgender men, results showed that two individuals identified as gender non-binary, six individuals identified as queer, and three individuals identified as bisexual. These individuals were retained in the final sample. The decision to maintain the gender non-binary participants was made following a review of the qualifying description of their gender, wherein both individuals indicated that they were "questioning non-binary," indicating that they do not currently identify as non-binary. In addition, decision to retain the queer and bisexual participants was based on findings suggesting that bisexual individuals show comparable physiological response to sexually explicit videos depicting two men engaging in sexual activities as gay individuals do, and have stronger physiological responses to sexually explicit videos depicting men engaging in sexual activity than women engaging in sexual activity. Therefore, given that the same physiological measure is used in the current study, these individuals were retained (Rieger, Chivers, & Bailey, 2005).

In addition, the mean, standard deviation, and range of each of the scales was assessed, both using the total sample and using each individual group (see Table 2).

Exploration of Assumptions

Univariate outliers were detected by examining the box plots of each of the main variables included in analyses (i.e., NECDQ, SMQ, SDBQ, IIEF-MSM, STICSA, genital temperature change scores, and subjective sexual arousal change scores). Scores with a *z*-value exceeding |3.29| were identified as outliers (Field, 2013). One score was identified as being an outlier in the NECDQ variable, and one score in the STICSA variable. These scores were

Table 2
Descriptive Statistics

Factor	Possible Range	ED		Control		Total
		Mean(SD)	Range	Mean(SD)	Range	Cronbach's Alpha (interpretation[1])
IIEF-MSM						
Erectile Function	7-42	24.78(6.39)	25	35.35(4.98)	21	.83(good)
Satisfaction	2-12	8.5(1.6)	6	10.50(1.13)	4	.69(questionable)
Ejaculatory Concerns	2-12	8.17(2.05)	8	10.10(1.71)	5	.37(unacceptable)
Desire	3-18	9.78(2)	9	12.42(2.04)	8	.71(acceptable)
Total	13-78	51.20(9.67)	36	68.38(6.33)	27	.62(questionable)
SDBQ						
Macho	6-30	16.76(4.21)	15	15.25(4.13)	17	.64(questionable)
Beliefs about Partner's Satisfaction	5-25	13.33(4.58)	17	12.95(4.62)	16	.79(acceptable)
Restrictive Attitudes Towards Sex	4-20	7.77(2.67)	11	7.43(2.02)	8	.39(unacceptable)
Abuse of Top Man's Power	3-15	5.60(2.08)	10	5.40(2.07)	8	.61(questionable)
Sexual Conservatism	10-50	14.33(4.62)	17	15.62(4.57)	20	.79(acceptable)
Partner's Sexual Power	8-40	20.47(5.75)	23	19.87(5.09)	21	.72(acceptable)
Sexual Performance	7-35	17.83(5.51)	23	15.23(4.24)	17	.75(acceptable)
Total	47-235	96.07(24.27)	96	92.62(22.66)	87	.90(excellent)
NECDQ						
Body Image	5-25	13.48(6.06)	20	9.35(3.61)	15	.94(excellent)
Physical Performance	4-20	11.93(3.79)	14	9.90(2.68)	11	.77(acceptable)
External/ Emotional	4-20	6.33(284)	10	6.85(2.58)	11	.76(acceptable)
Disease	2-10	5.00(2.19)	8	5.45(2.42)	8	.92(excellent)
Total	15-75	36.73(10.56)	44	31.55(7.59)	34	.87(good)
SMQ						
Failure Anticipation	7-35	16.43(5.08)	21	12.55(3.68)	15	.81(good)
Erection Concerns	7-35	21.75(5.52)	24	16.03(5.24)	20	.83(good)
Age and Body	4-20	9.04(2.90)	13	6.80(2.68)	10	.64(questionable)
Negative Thoughts Towards Sex	5-25	8.81(2.75)	10	8.33(2.60)	11	.57(poor)
Lack of Erotic thoughts	4-20	11.89(2.36)	11	9.95(2.53)	13	.65(questionable)
Total	27-135	67.93(14.14)	59	53.87(12.03)	46	.77 (acceptable)

STICSA						
Cognitive	10-40	21.93(8.68)	28	15.20(5.02)	23	.91(excellent)
Somatic	11-44	18.17(5.20)	29	17.00(4.23)	16	.83(good)
Total	21-84	40.22(13.16)	27	31.97(7.40)	32	.65(questionable)
Discrete Ratings of Sexually Explicit Film						.32(unacceptable)
Relaxation	0-10	6.17(2.04)	9	5.20(2.12)	10	
Enjoyment	0-10	6.27(2.20)	9	5.93(2.49)	10	
Anxiety	0-10	2.67(2.23)	7	2.81(2.42)	10	
Humour	0-10	4.14(2.25)	9	3.21(2.41)	9	
Distraction	0-10	3.00(2.30)	7	3.34(2.16)	9	
Sexual Arousal	0-10	5.93(2.30)	9	6.33(2.18)	10	

Note. The interpretations of the Cronbach's alpha levels is based on the recommendations of George & Mallery (2003).

identified in the same participant. Although these outliers were considered possible candidates for deletion, they were ultimately not removed. This decision was based on the concept of prevention of unnecessary data reduction, as well as on the non-parametric nature of bootstrapping (Hayes, 2009). There were no outliers for SMQ, SDBQ, IIEF-MSM scores, genital temperature change scores, or subjective sexual arousal change scores.

Skewness, kurtosis, and stacked histograms were examined to assess for whether the variables included in the analyses were normally distributed. Table 3 shows the skewness and kurtosis of each variable in the model. Based on examination of *z*-scores and visual surveying of histograms, IIEF-MSM total scores, NECDQ total scores, STICSA total scores, and Subjective Sexual Arousal change scores were not normally distributed. IIEF-MSM Total scores and Subjective Sexual Arousal change scores tended to cluster around the higher end, while NECDQ Total scores and STICSA total scores tended to cluster around the lower end. However, as bootstrapping does not require variables to be normally distributed, no transformations were made (Hayes, 2009).

Manipulation Checks

In order to determine whether each group experienced a similar research environment, groups were compared on average room temperature. Analyses revealed statistically significant differences between groups on room temperature, with room temperature among healthy controls being significantly higher (*M* = 24.72°C, *SD* = 50, range = 23.86°C - 26.22°C) than among the ED group (*M* = 23.84°C, *SD* = 1.02, range = 22.25°C - 25.92°C). Therefore, room temperature was included as a covariate in analyses. Given this difference, group differences in baseline genital temperature were also examined, in order to determine whether room temperature may have impacted participant's baseline genital temperature. Statistically significant differences

Table 3

Skewness and Kurtosis of Study Variables

	Skewness			Kurtosis		
Variable	Statistic	*SE*	*z*	Statistic	*SE*	*z*
SDBQ Total Scores	.31	.26	1.19	-.43	.58	-.074
IIEF Total Scores	-.57	.29	-1.97*	-.54	.57	-.95
NECDQ Total Scores	.79	.29	2.72**	-.1.1	.57	-1.93
SMQ Total Scores	.58	.30	1.93	.50	.59	0.85
STICSA Total Scores	1.37	.30	4.60***	1.95	.58	3.36***
Genital Temperature Change Score	.06	.29	0.21	-.85	.57	-1.49
Subjective Sexual Arousal Change Score	-1.24	.29	-4.27***	.94	.57	1.65

Note. SE = standard error. * $p < .05$; ** $p < .01$; *** $p < .001$

ED group (M = 23.84°C, SD = 1.02, range = 22.25°C - 25.92°C). Therefore, room temperature was included as a covariate in analyses. Given this difference, group differences in baseline genital temperature were also examined, in order to determine whether room temperature may have impacted participant's baseline genital temperature. Statistically significant differences were revealed between groups on baseline genital temperature, $t(68) = -3.40$ $p < .01$, which was also included as a covariate for subsequent analyses. There were no statistically significant differences between groups on the self-reported discrete ratings of sexual arousal during the neutral video, $t(67) = .74$, $p > .05$, and therefore, baseline subjective sexual arousal was not included as a covariate.

Between-Group Differences on Study Variables

Group differences in self-reported sexual concerns. The two groups of participants were compared on the five domains of the IIEF-MSM as well as the total. A MANOVA was used to examine whether differences occurred between the participant groups on the six domains. Men in the healthy control group had higher scores on erectile functioning than men in the ED group, F (1, 67) = 58.72, $p < .01$, $\eta p^2 = .47$, power = 1.00, higher scores on sexual satisfaction, F (1, 67) = 36.76, $p < .01$, $\eta p^2 = .35$, power = 1.00, higher scores on ejaculatory function, F (1, 67) = 19.40, $p < .01$, $\eta p^2 = .23$, power = 0.99, higher scores on sexual desire, F (1, 67) = 26.19, $p < .01$, $\eta p^2 = .28$ power = 1.00, and higher total IIEF-MSM scores, F (1, 67) = 5007.45, $p < .01$, $\eta p^2 = .54$, power = 1.00. In addition, in order to examine whether significant differences existed between groups on ability to maintain erections in non-intercourse sexual activity, an independent samples t-test was conducted on IIEF-MSM item 10 (i.e., "During non-intercourse sexual activity (e.g., masturbation, oral sex), how often were you able to maintain your erection until the completion of sexual activity?"). T-tests revealed significant differences between

groups; $t(52.70) = 4.18$, $p < .01$, with healthy controls reporting significantly more ability to maintain erections ($M = 5.55$, $SD = 1.31$) as compared to men with ED ($M = 4.20$, $SD = 1.47$).

Group differences in cognitions related to sex. Group differences were evaluated on subscale and total scores of the SMQ, the NECDQ, and the SDBQ.

SMQ. A MANOVA was used to examine whether differences occurred between the participant groups on the five domains of the SMQ, as well as the total score. Results showed that men in the healthy control group showed lower scores on Failure Anticipation Thoughts, $F(1, 64) = 11.38$, $p < .01$, $\eta p^2 = .15$, power = .91, Erection Concern Thoughts, $F(1, 64) = 18.43$, $p < .01$, $\eta p^2 = .23$, power = .99, Age/Body Related Thoughts, $F(1, 64) = 9.44$, $p < .01$, $\eta p^2 = .13$, power = .86, Lack of Erotic Thoughts, $F(1, 64) = 10.54$, $p < .01$, $\eta p^2 = .14$, power = .89, and total SMQ scores, $F(1, 64) = 18.73$, $p < .01$, $\eta p^2 = .23$, power = .99, indicating that men with ED show more concerns in these areas as compared to healthy controls. No differences were found between groups on Negative Thoughts Toward Sex ($p > .05$).

NECDQ. A MANOVA was used to examine whether differences occurred between the participant groups on the four domains of the NECDQ, as well as the total score. Results revealed that men in the healthy control group showed higher scores on body image as compared to the ED group, $F(1, 69) = 12.53$, $p < .01$, $\eta p2 = .16$, power = .94, and on performance concerns, $F(1, 69) = 6.93$, $p = .01$, $\eta p2 = .09$, power = .74, indicating that men in the healthy control group have lower levels of body image concerns and performance concerns. In addition, results revealed significant differences between the groups on total scores $F(1, 69) = 5.72$, $p = .02$, $\eta p2 = .09$, power = .65, indicating that overall, men with ED experience more non-erotic cognitive distraction during sex as compared to healthy controls. No significant differences were found between groups on disease concerns or on emotional/external concerns ($ps > .05$).

SDBQ. The two groups of participants were compared on the seven domains of the SDBQ as well as the total. A MANOVA was used to examine whether differences occurred between the participant groups on the eight domains. Results revealed no statistically significant differences between the groups on any of the domains (all *p*s > .05).

Group differences in state anxiety. A MANOVA was used to examine whether differences occurred between the participant groups on the two domains of the STICSA, as well as the total score. Results revealed significant differences between scores on the Cognitive domain, F (1, 65) = 17.17, $p < .01$, $\eta p^2 = .21$, power = .98, and lower total STICSA scores, F (1, 64) = 10.54, $p < .01$, $\eta p^2 = .14$, power = .89, indicating that healthy controls had lower overall and cognitive anxiety as compared to men with ED. No group differences were found on the Somatic Symptom subscale, $p > .05$.

Group differences in post-erotic video ratings. The two groups of participants were compared on the seven items pertaining to discrete post-erotic video ratings (i.e., relaxation, enjoyment, humour, anxiety, distraction, sexual arousal). A MANOVA was used to examine whether differences occurred between the participant groups on the seven domains. Results revealed no statistically significant differences between the groups on any of the domains (all *p*s > .05).

Group differences in change scores. In order to assess for genital temperature change over time, a change score was created in which the difference between the maximum temperature during the sexually explicit film, and the average genital temperature during the last three minutes of baseline was calculated. An independent samples t-test showed significant differences between groups, $t(68) = 5.82$, $p < .01$. Analyses revealed that men in the healthy control group had significantly higher genital temperature change scores (M =3.13°C, SD =

1.28), as compared to men in the ED group (M = 1.36°C SD = 1.24). The same approach was taken to calculating subjective sexual arousal change scores. An independent samples t-test revealed no significant differences between groups in subjective sexual arousal scores *(*p = .09).

Aim 1: Between Group Differences in Sexual Arousal

Temperature change over time. To investigate the relationship between group (ED and healthy controls) and genital temperature over time, a 2 X 15 repeated measures ANOVA was conducted, with room temperature and baseline genital temperature as covariates. Temperature time points consisted of average genital temperature of each minute of the sexually explicit video, see Figure 2.

The assumption of sphericity was violated; and the Greenhouse-Geisser estimate was greater than the suggested estimate of 0.75 (Barcikowski & Robey, 1984; Girden, 1992; Huynh & Feldt, 1976), a Huynh-Feldt correction was applied to all within group effects. The assumption of homogeneity of variance was met; therefore, no corrections were applied to between group effects. Results revealed a significant main effect of temperature $F(2.80, 184.94) = 3.03$, $p < .05$, $\eta p2 = .04$, observed power = .66, a significant main effect of group $F(1,66) = 19.26$, $p < .01$, $\eta p2 = .23$, observed power = .99 and non-significant temperature x group interaction ($p = .33$). The significant main effect of group reveals that participants in the healthy control group (M = 33.71°C, SD = 1.64) had significantly higher overall average genital temperatures than those in the ED group (M = 32.51°C, SD = 1.95).

Group differences in genital temperature using three time-points. To investigate the relationship between group (ED and healthy controls) and genital temperature over time using the three time-points, a 2 x 3 repeated measures ANOVA was conducted, with room temperature and baseline genital temperature as covariates. Temperature time points consisted of average

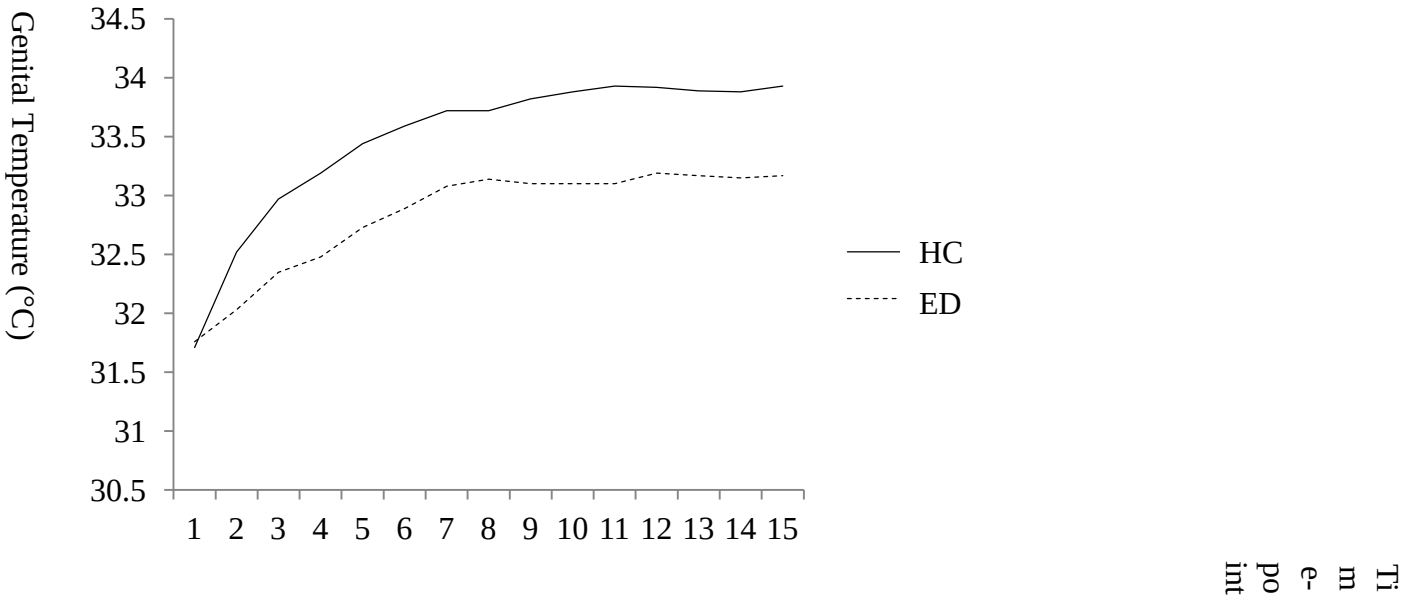

Figure 2. Graph depicting genital temperature over time, using 15 bins. For time-points 1 through 15, each number corresponds to the average genital temperature during that minute of the sexually explicit film. HC = healthy controls, ED = erectile dysfunction.

genital temperature during the first, middle, and last five minutes of the sexually explicit video, see Figure 3.

The assumption of sphericity was violated; and therefore a Greenhouse-Geisser correction was applied to all within group effects. The assumption of homogeneity of variance was met; therefore, no corrections were applied to between group effects. Results revealed a significant main effect of group $F(1,66) = 22.22$, $p < .01$, $\eta p2 = .25$, observed power = 1.0, as well as a non-significant main effect of temperature ($p = .20$) and a non-significant temperature x group interaction ($p = .33$).

Continuous subjective sexual arousal change over time. To investigate the relationship between group (ED and healthy controls) and continuous subjective sexual arousal over time, see Figure 4, a 2 x 15 repeated measures ANOVA was conducted. The assumption of sphericity was violated; and the Greenhouse-Geisser estimate was greater than the suggested estimate of 0.75 (Barcikowski & Robey, 1984; Girden, 1992; Huynh & Feldt, 1976), a Huynh-Feldt correction was applied to all within group effects. The assumption of homogeneity of variance was met; therefore, no corrections were applied to between group effects. Results revealed a significant main effect of subjective sexual arousal $F(5.46, 332.95) = 64.32$, $p < .01$, $\eta p^2 = .51$, observed power = 1.00, a non-significant main effect of group ($p = .17$), and non-significant subjective sexual arousal x group interaction ($p = .45$).

Relationship between genital and subjective sexual arousal. In order to assess whether differences existed between the correlation coefficients of men with ED and healthy controls, within subject correlations were computed for each participant and were then compared between groups. Among healthy controls, three individuals had negative within subject correlation coefficients, and six individuals were found to have non-significant correlation coefficients.

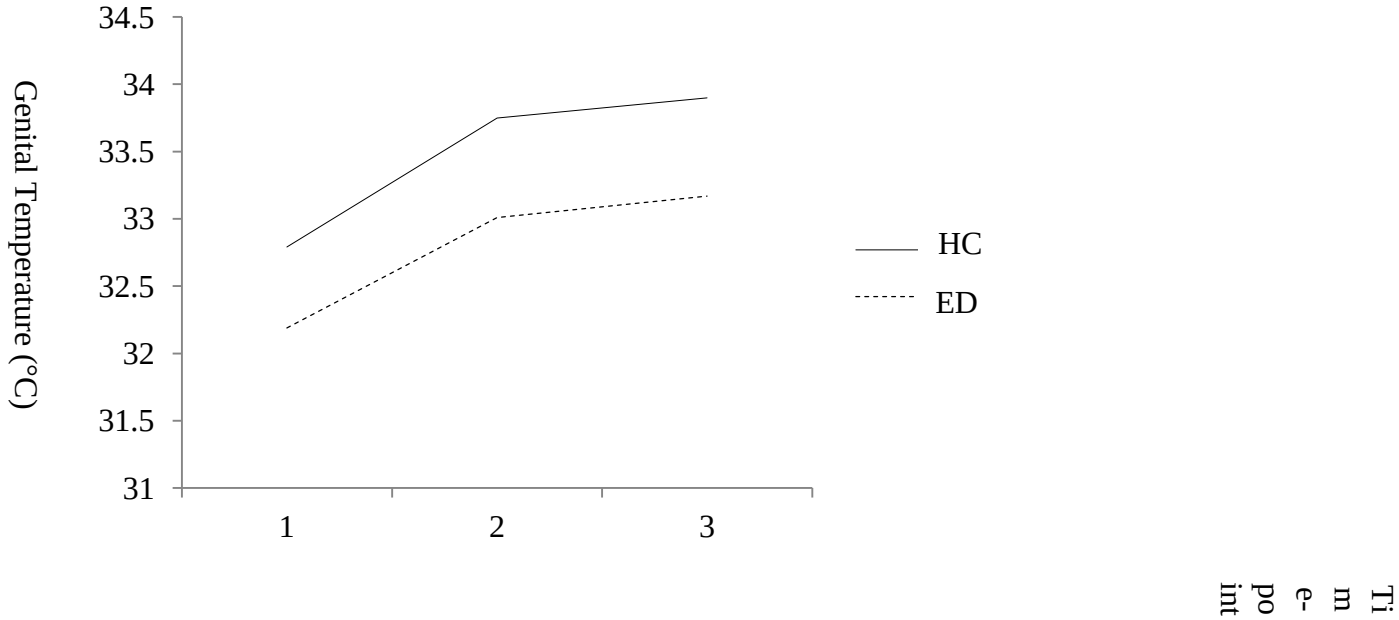

Figure 3. Graph depicting genital temperature over time, using 3 bins. For time-points 1 through 3, each time-point corresponds to the average genital temperature during the first, middle, and last five minutes of the sexually explicit film. HC = healthy controls, ED = erectile dysfunction.

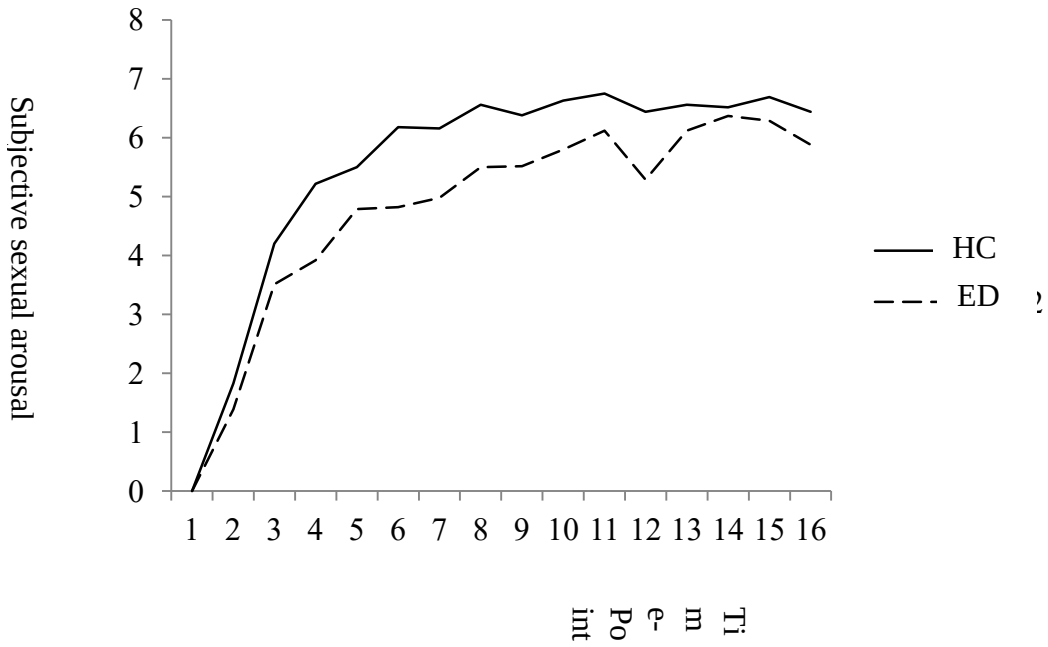

Figure 4. Graph depicting subjective sexual arousal over time, using 16 bins. For time-points 1 through 16, each number corresponds to the average subjective sexual arousal during that minute of the sexually explicit film. HC = healthy controls, ED = erectile dysfunction.

Among the ED group, four individuals had negative within subject correlation coefficients, and seven individuals were found to have non-significant correlation coefficients. An independent sample t-test was conducted to examined if there are differences in mean correlations between healthy controls (M = .57; SD = .41, range = -.82 - .95) and men with ED (M = .47; SD = .48, range = -.64 - .94). Analyses revealed no significant group differences, $t(61) = .87$, $p > .05$, $g = .22$.

Aim 2: Negative Thoughts Related to Sex and Sexual Arousal

Correlations between cognitions related to sex and sexual arousal.

Relationship between SMQ scores and genital temperature. In order to investigate the relationship between SMQ scores and genital temperature, bivariate Pearson correlations were conducted between the six SMQ subscales and five genital temperature scores. The five genital temperature scores were during the last three minutes of the baseline video, and the average genital temperature during the first, middle, and last five minutes of the sexually explicit video, as well as the genital temperature change score. When examining the full sample, results revealed a negative correlation between Failure Anticipation Thoughts and the genital temperature during the last five minutes of the sexually explicit video, $r = -.25$, $p < .05$, as well as the genital temperature change score, $r = -.33$, $p < .01$. In addition, significant negative correlations were revealed between Erection Concern Thoughts and genital temperature during the middle five minutes of the sexually explicit video, $r = -.30$, $p < .01$, last five minutes of the sexually explicit video, $r = -.34$, $p < .05$, as well as the genital temperature change score, $r = -.35$, $p < .01$. A significant negative correlation was found between Age/Body Related Thoughts and the genital temperature during the middle five minutes of the sexually explicit video, $r = -.25$, $p < .05$, last five minutes of the sexually explicit video, $r = -.25$, $p < .05$, as well as the genital

temperature change score, $r = -.28$, $p < .05$. Significant negative correlations were revealed between Lack of Erotic Thoughts and genital temperature during the first five minutes of the sexually explicit video, $r = -.25$, $p < .05$, and the last five minutes of the sexually explicit video, $r = -.25$, $p < .05$, as well as the genital temperature change score, $r = -.27$, $p < .05$. Significant negative correlations were revealed between Negative Thoughts Toward Sex and genital temperature during the first five minutes of the sexually explicit video, $r = -.28$, $p < .05$, and last five minutes of the sexually explicit video, $r = -.25$, $p < .05$. Finally, a significant negative correlation was found between total SMQ scores and the genital temperature during the first five minutes of the sexually explicit video, $r = -.28$, $p < .05$, middle five minutes of the sexually explicit video, $r = -.35$, $p < .01$, last five minutes of the sexually explicit video, $r = -.38$, $p < .01$, as well as the genital temperature change score, $r = -.37$, $p < .01$.

Among healthy controls, Erection Concern Thoughts were significantly negatively correlated with middle five minutes of the sexually explicit video, $r = -.34$, $p < .05$, as well as during the last five minutes of the sexually explicit video, $r = -.39$, $p < .01$. Negative Thoughts Toward Sex was significantly negatively correlated with last five minutes of the sexually explicit video, $r = -.33$, $p < .05$. Finally, SMQ total scores were significantly negatively correlated with middle five minutes of the sexually explicit video, $r = -.34$, $p < .05$, as well as during the last five minutes of the sexually explicit video, $r = -.43$, $p < .01$. No other significant correlations were found between SMQ subscales and genital temperature.

Among men with ED, no significant correlations were found between SMQ subscales and genital temperature.

Relationship between NECDQ scores and genital temperature. In order to investigate the relationship between NECDQ scores and genital temperature, bivariate Pearson correlations

were conducted between the five NECDQ subscales and five genital temperature scores; during the last three minutes of the baseline video, and the average genital temperature during the first, middle, last five minutes of the sexually explicit video, and genital temperature change scores. When examining the full sample, results revealed a positive correlation between Body Image and baseline genital temperature, $r = .37$, $p < .01$, and a negative correlation between Body Image and genital temperature change scores, $r = -.42$, $p < .01$. In addition, results revealed a significant negative correlation between External/Emotional Concerns and genital temperature change scores, $r = -.24$, $p < .05$. Finally, a significant positive correlation was found between NECDQ total scores and baseline genital temperature, $r = .29$, $p < .05$, and a significant negative correlation was found between NECDQ total scores and genital temperature change scores, $r = -.37$, $p < .01$. No other significant correlations were revealed.

Among healthy controls, results revealed a negative correlation between Body Image and genital temperature change scores, $r = -.36$, $p < .05$. No other significant correlations were found between NECDQ subscales and genital temperature.

Among men with ED, no significant correlations were found between NECDQ subscales and genital temperature.

Relationship between SDBQ scores and genital temperature. In order to investigate the relationship between SDBQ scores and genital temperature, bivariate Pearson correlations were conducted between the six SDBQ subscales and five genital temperature scores; during the last three minutes of the baseline video, and the average genital temperature during the first, middle, and last five minutes of the sexually explicit video, and genital temperature change scores. When examining the full sample, results revealed a positive correlation between sex as an abuse of men's sexual power and baseline genital temperature, $r = .25$, $p < .05$, as well as a positive

correlation between importance of sexual performance and baseline genital temperature, $r = .24$, $p < .05$. Partner's Sexual Power was found to be significantly negatively correlated with genital temperature change scores, $r = -.28$, $p < .05$. Finally, Sexual Performance was found to be significantly negatively correlated with genital temperature change scores, $r = -.29$, $p < .05$. No other significant correlations were revealed.

Among healthy controls, Restrictive Attitudes Towards Sex was found to be significantly negatively correlated with genital temperature change scores, $r = -.40$, $p < .01$, middle five minutes of the sexually explicit video, $r = -.34$, $p < .05$, and last five minutes of the sexually explicit video, $r = -.41$, $p < .01$. Abuse of Top Man's Power was found to be significantly negatively correlated with genital temperature change scores, $r = -.34$, $p < .05$. Sexual Conservatism was found to be significantly negatively correlated with genital temperature change scores, $r = -.35$, $p < .05$. Partner's Sexual Power was found to be significantly negatively correlated with genital temperature change scores, $r = -.51$, $p < .01$. SDBQ Total Scores were found to be significantly negatively correlated with genital temperature change scores, $r = -.38$, $p < .05$. No significant correlations were found between Macho Beliefs, Beliefs about Partner's Satisfaction, Sexual Performance and genital temperature.

Among men in the ED group, no significant correlations were found between any of the SDBQ subscales and genital temperature.

Within-group differences of impact of negative automatic thoughts related to sex on sexual arousal. A series of hierarchical regression analyses were conducted to test whether negative automatic thoughts related to sex predict genital temperature change and subjective sexual arousal change. In order to examine within group variance, a hierarchical regression was run with each group. The genital temperature change score was chosen as our outcome measure

as it provides an indication of overall genital temperature change from baseline to peak during the sexually explicit film. The time at which participants reach their peak sexual arousal varies across each participant, as there are differential preferences for any given scene or moment in the sexually explicit film. It therefore represents an indication of peak sexual arousal. Subjective sexual arousal change scores were chosen as the second outcome measure for the same reasons; they provide an indication of overall subjective sexual arousal during the sexually explicit film. Negative automatic thoughts related to sex were defined by SMQ total scores, NECDQ total scores, and SDBQ total scores.

Healthy control group. In the hierarchical regression model examining genital temperature change scores in the healthy control group, two sets of predictor variables were used. First, in order to control for the effects of negative automatic thoughts related to sex on genital temperature change scores, SMQ total scores, NECDQ total scores, and SDBQ total scores were entered in Block 1. Second, in order to determine the contribution of subjective sexual arousal on genital temperature change scores, over and above negative thoughts related to sex, subjective sexual arousal change score was entered in Block 2.

In the hierarchical regression model examining subjective sexual arousal change scores in the healthy control group, two sets of predictor variables were used. First, in order to control for the effects of negative automatic thoughts related to sex on subjective sexual arousal change scores, SMQ total scores, NECDQ total scores, and SDBQ total scores were entered in Block 1. Second, in order to determine the contribution of genital temperature on subjective sexual arousal change scores, over and above negative thoughts related to sex, genital temperature change score was entered in Block 2.

Assumptions. Diagnostic tests were first conducted to determine whether hierarchical regressions were a viable procedure. As with all hierarchical regressions, assumptions of independence of observations, linearity, homoscedasticity, normally distributed errors, absence of multicollinearity, and lack of unusual points (i.e., outliers, high leverage point, highly influential points) were verified.

There were a total of 38 participants from the healthy control group that had completed all required measures used in the hierarchical regression analyses. Given that each value of the outcome variables came from a separate case, independence of observations was assumed. There was also independence of residuals, as assessed by a Durbin-Watson statistic of 2.07. Assumptions of linearity (i.e., predictor variables are collectively and independently linearly related to all outcome variables), homoscedasticity (i.e., equal residuals for all values of the outcome variables), and normally distributed errors (i.e., normal distribution of the residuals) were explored graphically, with no violations found. Variance inflation factor (VIF) values less than ten (VIF = 1.10-1.27) indicated a lack of multicollinearity. Bivariate correlations between genital temperature change scores, average room temperature, and predictor variables were also explored. Finally, the absence of unusual points was verified (i.e., scores were less than three standard deviations from the mean, leverage values were below the maximum leverage values for three predictors (i.e., 0.21), and Cook's Distance values were below 1.

Genital temperature change results. A hierarchical multiple regression was run to determine whether, among healthy controls, the addition of negative automatic thoughts related to sex improved the prediction of genital temperature change scores, over and above age, subjective sexual arousal.

The model of subjective sexual arousal change scores to predict genital temperature change scores was not statistically significant, $F(3, 29) = 1.43$, $p = .25$, nor was the addition of negative automatic thoughts related to sex to the prediction of genital temperature change scores (Block 2), $F(4, 28) = 1.08$, $p = .39$.

Subjective sexual arousal change results. A hierarchical multiple regression was run to determine whether, among healthy controls, the addition of negative automatic thoughts related to sex predicted subjective sexual arousal scores. The model of genital temperature change scores to predict subjective sexual arousal change scores was not statistically significant, $F(3, 29) = 1.24$, $p = .31$, nor was the addition of negative automatic thoughts related to sex to the prediction of subjective sexual arousal change scores (Block 2), $F(4, 28) = 0.94$, $p = .45$.

ED group. The same data analyses were conducted to examine the predictive value of negative automatic thoughts related to sex on sexual arousal in the ED group.

Assumptions**.** There were a total of 26 participants from the ED group that had completed all required measures used in the hierarchical regression analyses. Given that each value of the outcome variables came from a separate case, independence of observations was assumed. There was also independence of residuals, as assessed by a Durbin-Watson statistic of 2.24.

Assumptions of linearity (i.e., predictor variables are collectively and independently linearly related to all outcome variables), homoscedasticity (i.e., equal residuals for all values of the outcome variables), and normally distributed errors (i.e., normal distribution of the residuals) were explored graphically, with no violations found. Variance inflation factor (VIF) values less than ten (VIF = 1.05-1.37) indicated a lack of multicollinearity. Bivariate correlations between genital temperature change scores, average room temperature, and predictor variables were also explored. Finally, the absence of unusual points was verified (i.e., scores were less than three

standard deviations from the mean, leverage values were below the maximum leverage values for three predictors (i.e., 0.21), and Cook's Distance values were below 1.

Genital temperature change results. A hierarchical multiple regression was run to determine whether, among men with ED, the addition of negative automatic thoughts related to sex improved the prediction of genital temperature change scores, over and above age, subjective sexual arousal.

The model of subjective sexual arousal change scores to predict genital temperature change scores was not statistically significant, $F(3, 18) = 1.44$, $p = .27$, nor was the addition of negative automatic thoughts related to sex to the prediction of genital temperature change scores (Block 2), $F(4, 17) = 1.29$, $p = .31$.

Subjective sexual arousal change results. A hierarchical multiple regression was run to determine whether, among men with ED, the addition of negative automatic thoughts related to sex predicted subjective sexual arousal scores. The model of genital temperature change scores to predict subjective sexual arousal change scores was not statistically significant, $F(3, 18) = 1.59$, $p = .23$, nor was the addition of negative automatic thoughts related to sex to the prediction of genital temperature change scores (Block 2), $F(4, 17) = 1.41$, $p = .27$.

Aim 3: Mediators of Relationship Between BSS and Sexual Arousal

Full sample. In order to test the hypothesis that negative automatic thoughts and self-reported sexual dysfunction will mediate the relationship between more deeply engrained BSS and ED, two mediational analyses were conducted using ordinary least squares path analysis in PROCESS, using the entire sample in order to ensure variability in outcome measure scores. Negative automatic thoughts were operationally defined as SMQ total scores and NECDQ total scores, self-reported sexual dysfunction was operationally defined by IIEF-MSM total scores,

and BSS was operationally defined as SDBQ total scores. Outcomes consisted of ED, as operationally defined by the genital temperature change score and subjective sexual arousal, as operationally defined by subjective sexual arousal change score.

Genital temperature. As illustrated in Figure 5, SDBQ total scores predicted NECDQ total scores (a^1 = 0.15, $t(59) = 3.81$, $p < .01$), as well as SMQ total scores (a^2 = .29, $t(59) = 4.38$, $p < .01$). SDBQ total scores did not predict IIEF-MSM total scores (a^3 = -.05, $p = .24$). IIEF-MSM total scores (b^3 = .12, $p < .01$) predicted genital temperature change scores; however, neither NECDQ total scores (b^1 = -.03, $p = .18$), nor SMQ total scores (b^2 = -.20, $p = .17$) predicted genital temperature change scores. Since a bias-corrected confidence interval for the indirect effect (c = -.01) based on 10,000 bootstrap samples crossed zero (-.03 to .03), it is not possible to reject the null hypothesis. As such, SBDQ total scores did not indirectly influence genital temperature change scores through its effect on SMQ total scores, NECDQ total scores, and IIEF-MSM total scores. Additionally, SDBQ total scores did not influence genital temperature change scores independent of its effects on SMQ total scores, NECDQ total scores, and IIEF-MSM total scores (c' = .002, $p = .78$).

Subjective sexual arousal. As illustrated in Figure 6, SDBQ total scores predicted NECDQ total scores (a^1 = 0.12, $t(52) = 2.90$, $p < .01$), as well as SMQ total scores (a^2 = .30, $t(52) = 4.24$, $p < .01$). SDBQ total scores did not predict IIEF-MSM total scores (a^3 = -.05, $p = .31$). Neither NECDQ total scores (b^1 = .06, $p = .13$), SMQ total scores (b^2 = .01, $p = .64$), nor IIEF-MSM total scores (b^3 = .06, $p = .09$), predicted subjective sexual arousal change scores. Since a bias-corrected confidence interval for the indirect effect (c = .01) based on 10,000 bootstrap samples crossed zero (-.02 to .03), it is not possible to reject the null hypothesis. As such, SBDQ total scores did not indirectly influence subjective sexual arousal change scores

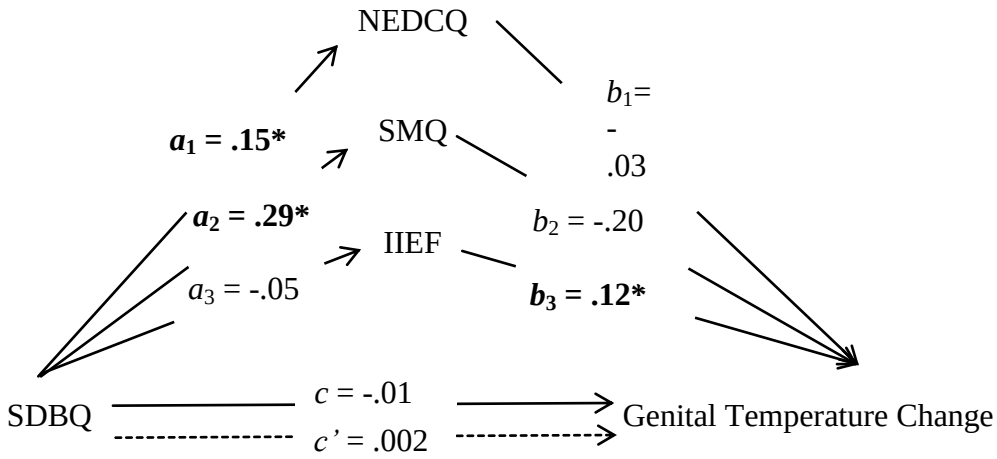

Figure 5. Results of the mediation model depicting direct and indirect effects of BSS on ED, using the full sample, with negative automatic thoughts related to sex and self-reported erectile function as mediators. SDBQ = Sexually Dysfunctional Beliefs Questionnaire (Nobre & Pinto-Gouveia, 2000); NECDQ = Non-Erotic Cognitive Distraction Questionnaire (Lacefield & Negy, 2012); SMQ = Sexual Modes Questionnaire (Nobre & Pinto-Gouveia, 2003); IIEF-MSM = International Index of Erectile Function (Coyne et al., 2009); * $p < .05$

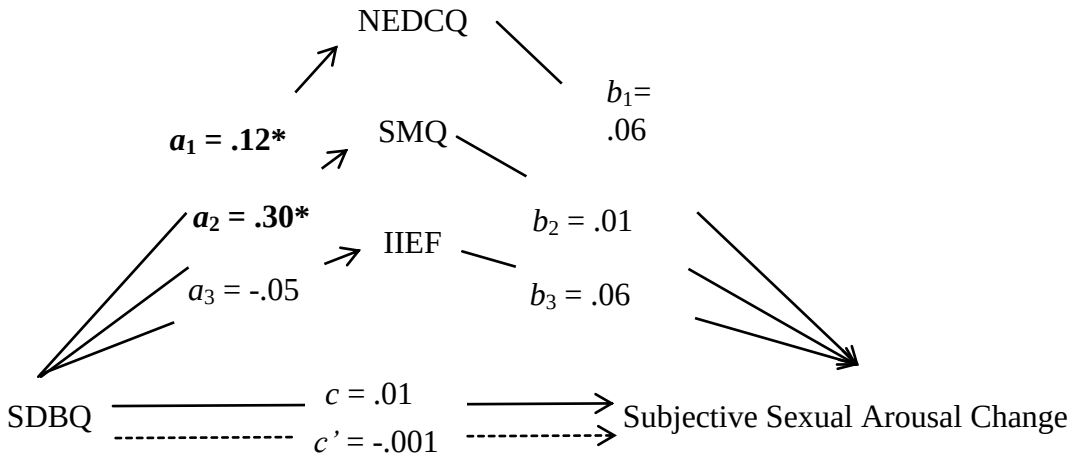

Figure 6. Results of the mediation model depicting direct and indirect effects of BSS on subjective sexual arousal using the full sample, with negative automatic thoughts related to sex and self-reported erectile function as mediators. SDBQ = Sexually Dysfunctional Beliefs Questionnaire (Nobre & Pinto-Gouveia, 2000); NECDQ = Non-Erotic Cognitive Distraction Questionnaire (Lacefield & Negy, 2012); SMQ = Sexual Modes Questionnaire (Nobre & Pinto-Gouveia, 2003); IIEF-MSM = International Index of Erectile Function (Coyne et al., 2009); * $p < .05$

through its effect on SMQ total scores, NECDQ total scores, and IIEF-MSM total scores. Additionally, SDBQ total scores did not influence subjective sexual arousal change scores independent of its effects on SMQ total scores, NECDQ total scores, and IIEF-MSM total scores (c' = -.001, p = .93).

ED Group. This analysis was replicated using only the ED group in order to test this hypothesis on the group with lower sexual arousal.

Genital temperature. As illustrated in Figure 7, SDBQ total scores predicted SMQ total scores (a^2 = .22, t(24) = 2.29, p < .05). SDBQ total scores did not predict NECDQ total scores (a^1 = 0.15, p < .01) or IIEF-MSM total scores (a^3 = .11, p = .09). IIEF-MSM total scores (b^3 = .09, t(24) = 2.44, p < .05) predicted genital temperature change scores, however, neither NECDQ total scores (b^1 = -.03, p = .32), nor SMQ total scores (b^2 = -.05, p = .52) predicted genital temperature change scores. Since a bias-corrected confidence interval for the indirect effect (c = .001) based on 10,000 bootstrap samples crossed zero (-.02 to .02), it is not possible to reject the null hypothesis. As such, SBDQ total scores did not indirectly influence genital temperature change scores through its effect on SMQ total scores, NECDQ total scores, and IIEF-MSM total scores. Additionally, SDBQ total scores did not influence genital temperature change scores independent of its effects on SMQ total scores, NECDQ total scores, and IIEF-MSM total scores (c' = .01, p = .29).

Subjective sexual arousal. As illustrated in Figure 8, SDBQ total scores did not predict NECDQ total scores (a^1 = 0.08, p = .26), SMQ total scores (a^2 = .23, p = .07), or IIEF-MSM total scores (a^3 = -.06, p = .31). Neither NECDQ total scores (b^1 = .08, p = .25), SMQ total scores (b^2 = .04, p = .36), nor IIEF-MSM total scores (b^3 = -.01, p = .85), predicted subjective sexual arousal change scores. Since a bias-corrected confidence interval for the indirect effect (c

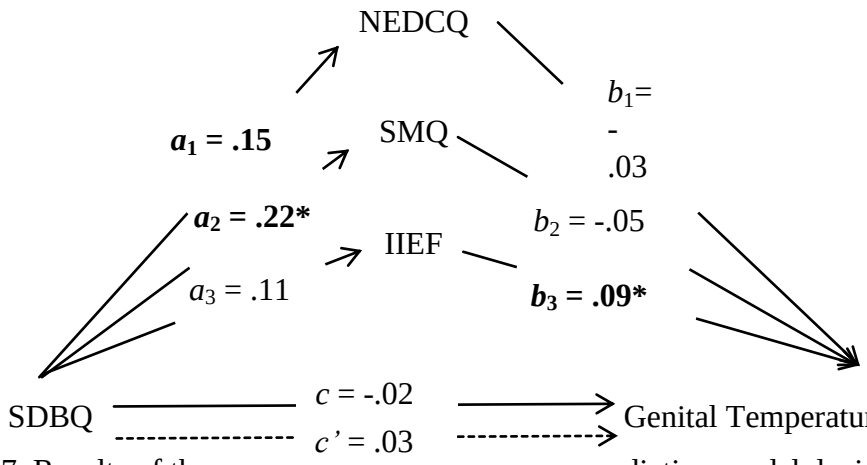

Figure 7. Results of the mediation model depicting direct and indirect effects of BSS on ED using the ED group, with negative automatic thoughts related to sex and self-reported erectile function as mediators. SDBQ = Sexually Dysfunctional Beliefs Questionnaire (Nobre & Pinto-Gouveia, 2000); NECDQ = Non-Erotic Cognitive Distraction Questionnaire (Lacefield & Negy, 2012); SMQ = Sexual Modes Questionnaire (Nobre & Pinto-Gouveia, 2003); IIEF-MSM = International Index of Erectile Function (Coyne et al., 2009); ED = erectile dysfunction; * $p < .05$

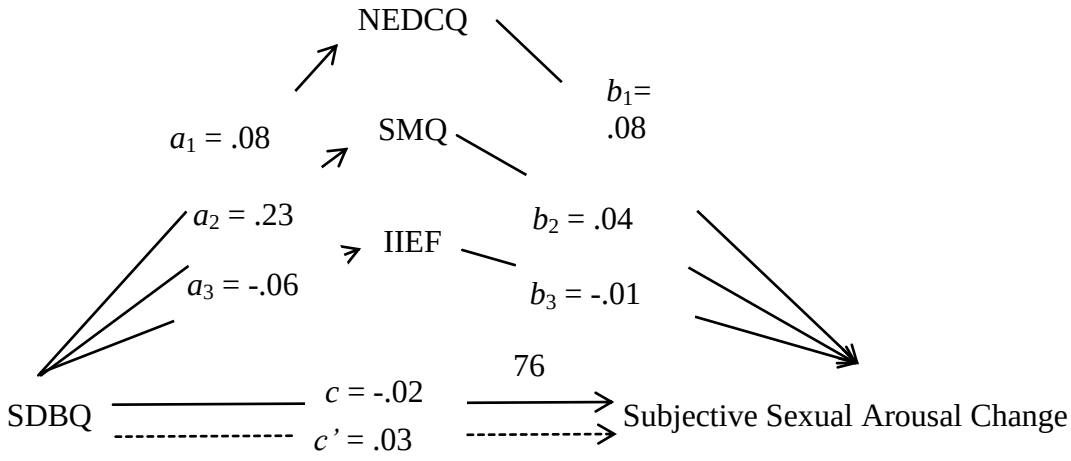

Figure 8. Results of the mediation model depicting direct and indirect effects of BSS on subjective sexual arousal using the ED group, with negative automatic thoughts related to sex and self-reported erectile function as mediators. SDBQ = Sexually Dysfunctional Beliefs Questionnaire (Nobre & Pinto-Gouveia, 2000); NECDQ = Non-Erotic Cognitive Distraction Questionnaire (Lacefield & Negy, 2012); SMQ = Sexual Modes Questionnaire (Nobre & Pinto-Gouveia, 2003); IIEF-MSM = International Index of Erectile Function (Coyne et al., 2009); ED = erectile dysfunction

= -.02) based on 10,000 bootstrap samples crossed zero (-.06 to .02), it is not possible to reject the null hypothesis. As such, SBDQ total scores did not indirectly influence subjective sexual arousal change scores through its effect on SMQ total scores, NECDQ total scores, and IIEF-MSM total scores. Additionally, SDBQ total scores did not influence subjective sexual arousal change scores independent of its effects on SMQ total scores, NECDQ total scores, and IIEF-MSM total scores (*c*' = -.03, *p* = .13).

Aim 4: Sexual Behaviour

Table 4 shows the frequency with which individuals in each group reported using and removing condoms during sex, as well as the frequency of reported use of erectile enhancing drugs.

Removal of condoms during sex. An independent samples t-test revealed no significant group differences in reported use of condoms during receptive anal sex, $t(68) = 0.02$ $p = .98$. In addition, no significant group differences in reported use of condoms during insertive anal sex, $t(68) = 0.20$ $p = .84$. Additionally, no significant group differences in reported removal of condom prior to completion of anal sex, $t(48.58) = -1.63$, $p = .11$, $g = .42$.

Reasons for removal of condoms. Among healthy controls the most common reason for removal of condoms during sex was loss of erection (10%), followed by feeling safe with a partner (7.5%), to ejaculate on a different body part (7.5%) to intensify pleasure (5%), difficulty attaining an erection (2.5%), partner requesting removal (2.5%), and moving on to a different sexual activity (2.5%). Among men with ED, the most common reason for removal of condoms during sex was loss of erection (20%), followed by difficulty attaining an erection (10%), and feeling safe with a partner (3.3%).

Table 4.

Frequency of risky sexual behaviour and use of erectile enhancing drugs.

Variable	ED *n*(%)	Controls *n*(%)
Removal of condoms		
- None of the time	16(53.3)	24(60.0)
- Almost never/never	2(6.7)	7(17.5)
- Much less than half of the time	4(13.3)	4(10.0)
- Half of the time	0(0.0)	1(2.5)
- Much more than half of the time	1(3.3)	2(5.0)
- Almost always/always	7(23.3)	2(5.0)
Use of condoms during receptive anal sex		
- None of the time	9(30.0)	12(30.0)
- Almost never/never	5(16.7)	3(7.5)
- Much less than half of the time	1(3.3)	5(12.5)
- Half of the time	1(3.3)	2(5.0)
- Much more than half of the time	3(10.0)	6(15.0)
- Almost always/always	11(36.7)	12(30.0)
Use of condoms during insertive anal sex		
- None of the time	8(26.7)	10(25.0)
- Almost never/never	5(16.7)	4(10.0)
- Much less than half of the time	1(3.3)	4(10.0)
- Half of the time	3(10.0)	4(10.0)
- Much more than half of the time	3(10.0)	6(15.0)
- Almost always/always	10(33.3)	12(30.0)
Use of erectile enhancing drugs		
- None of the time	18(60.0)	38(95.0)
- Almost never/never	1(3.3)	1(2.5)
- Much less than half of the time	4(13.3)	1(2.5)
- Half of the time	1(3.3)	0(0.0)
- Much more than half of the time	5(16.7)	0(0.0)
- Almost always/always	1(3.3)	0(0.0)

Use of erectile enhancing drugs. Among healthy controls, 5% reported having used any erectile enhancing drugs over the past six months, as compared to 40% of men with ED. An independent samples t-test revealed significant group differences in reported use of erectile enhancing drugs during the past six months, $t(30.82) = -3.64$ $p = .01$, $g = .99$. Men with ED were significantly more likely to report having used erectile enhancing drugs ($M = 2.23$, $SD = 1.72$) as compared to healthy controls ($M = 1.08$, $SD = .35$). Among healthy controls, one individual indicated that he used erectile enhancing drugs to offset the effects of drugs preventing them from having an erection, and one individual indicated that he used erectile enhancing drugs to have sex for longer. Among men with ED, seven individuals (23.3%) indicated that they used erectile enhancing drugs to allow them to maintain an erection despite using a condom, two individuals (6.7%), indicated that they used them to enable them to get an erection, two individuals (6.7%), indicated that they used them to have sex for longer, and one individual (3.3%) indicated that he used erectile enhancing drugs to offset the effects of drugs preventing them from having an erection.

Relationship between condom removal and sexual arousal. In order to test the hypothesis that BSS would mediate the relationship between more ED and condom removal, a mediational analysis was conducted using ordinary least squares path analysis in PROCESS, using the entire sample in order to ensure variability in outcome measure scores. ED was operationally defined by the genital temperature change score. BSS was operationally defined as SDBQ total scores. The outcome of condom removal was assessed by the frequency with which individuals reported removing condoms prior to the completion of sexual activity.

As illustrated in Figure 9, genital temperature change did not predict SDBQ total scores ($a = 0.24$, $p = .93$). In addition, SDBQ total scores did not predict removal of condoms ($b = .01$,

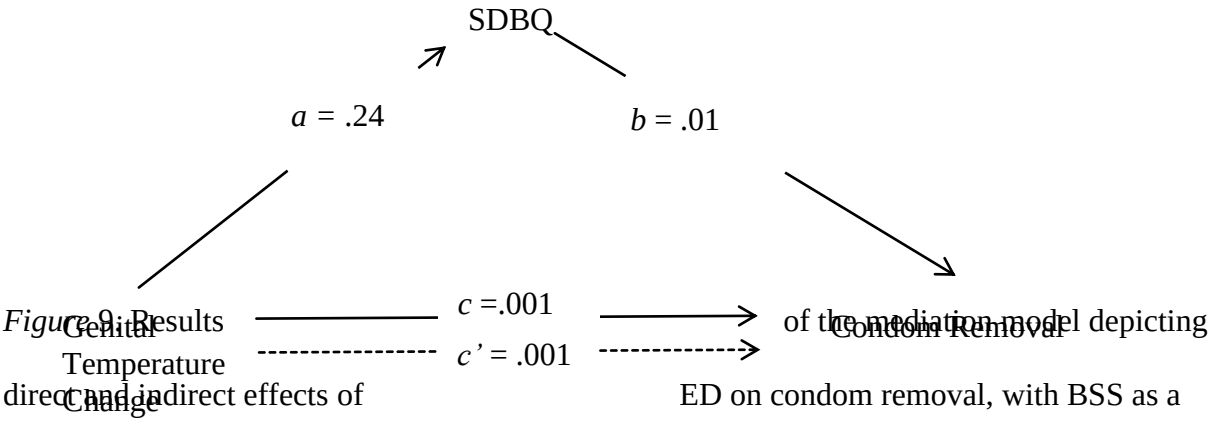

Figure 9. Results of the mediation model depicting direct and indirect effects of ED on condom removal, with BSS as a mediator. SDBQ = Sexually Dysfunctional Beliefs Questionnaire (Nobre & Pinto-Gouveia, 2000); ED = erectile dysfunction

p = .68). Since a bias-corrected confidence interval for the indirect effect (*c* = .001) based on 10,000 bootstrap samples crossed zero (-.06 to .07), it is not possible to reject the null hypothesis. As such, genital temperature change scores did not indirectly influence removal of condoms through its effect on SBDQ total scores. Additionally, genital temperature change scores did not influence removal of condoms independent of its effects on SDBQ total scores (*c*' = .001, *p* = .97).

Discussion

The study examined the relationship between ED and negative automatic thoughts related to sex among gay men. The study had four primary aims and accompanying hypotheses, which were partially supported by the results. Although there were overall differences between men with ED and healthy controls on a number of questionnaires, as well as genital temperature, the proposed mediation models were non-significant. Through further exploration of the results, the lack of significant findings of the mediation models may be the result of a measurement bias with the main measure of BSS. Nonetheless, interesting results were found with respect to group differences, as well as condom usage.

Summary of Results By Aim

Aim 1: Group differences in subjective sexual arousal and physiological arousal. It was hypothesized that men with ED would experience significantly less physiological arousal, relative to healthy controls. In addition, it was hypothesized that healthy controls would experience a stronger relationship between subjective sexual arousal and physiological arousal, while men with ED would report lower subjective arousal relative to their physiological arousal.

Covariates. Despite efforts taken to control for average room temperature within each participant, results showed that, when examining between-group differences, the average room

temperature was significantly higher during the testing sessions of the healthy control group, as compared to the ED group. Nonetheless, when examining within-subject room temperature change scores, a maximum room temperature change score of 0.8˚C was found. This small change in room temperature likely would not have impacted each participant's ability to experience sexual arousal. However, given the significant group differences, average room temperature was included as a covariate in analyses in order to control for any variability in genital temperature accounted for by room temperature.

In addition, results showed significant differences between groups on baseline genital temperature. This finding is inconsistent with previous literature (e.g., Sarin et al., 2014), which found no significant group differences between baseline genital temperature between groups of healthy controls and male participants with various sexual dysfunctions. Although circumcision status might impact genital temperature (Payne, Thaler, Kukkonen, Carrier, & Binik, 2007), there were no differences between the men with ED and healthy controls on this variable. As such, it is likely that the differences in baseline genital temperature are the result of room temperature differences between groups.

Through further exploration of the differences in room temperature between groups, it was shown that the healthy control group had significantly higher average room temperature during the baseline condition, as compared to the ED group, $t(42.19) = 4.60$ $p < .01$. Furthermore, among the healthy control group, average room temperature decreased from the neutral video (M = 24.74°C, SD = .58) to the sexually explicit video (M = 24.70°C, SD = .47), while average room temperature increased from the neutral video (M = 23.77 °C, SD = 1.04) to the sexually explicit video (M = 23.89 °C, SD = 1.01) in the ED group. Therefore, the

significantly higher baseline genital temperature among the healthy controls may be the result of differences in room temperature during the baseline video.

Group differences in self-reported sexual concerns. Consistent with the hypothesis, men in the ED group had significantly higher scores on all five domains of the IIEF; erectile functioning, sexual satisfaction, ejaculatory function, sexual desire, and total IIEF-MSM scores, as compared to the healthy control group. In addition, as compared to men in the healthy control group, men with ED experienced significantly more difficulty maintaining erections during non-intercourse sex, including masturbation. Given that men were sorted into groups based on their self-reported erectile difficulties on the telephone screener, these results are not surprising. These results are consistent with previous research studies using both physiological and self-report measures of sexual arousal, where in men with ED report significantly more sexual concerns, as compared to healthy controls (Sarin et al., 2014).

Nonetheless, it is important to consider that, although the IIEF-MSM is the only self-report measurement tool of sexual function has been adapted to and validated for use with MSM, there are several issues with the scale. First, lower scores on the IIEF-MSM reflect poorer sexual functioning. However, the IIEF-MSM requires that individuals who report not having engaged in any sexual activity during the past three months receive a score of "0" on each scale item. Therefore, individuals who have not engaged in sexual activity appear to have severe sexual dysfunction. When examining the frequency with which participants in each group endorsed the "no sexual activity" items on the ED scale, among healthy controls, 20% denied having engaged in any insertive anal intercourse, and 17.5% denied having engaged in any receptive anal intercourse. Among men with ED, 23.3% denied having engaged in any insertive anal intercourse, and 26.67% denied having engaged in any receptive anal intercourse.

The IIEF-MSM does not have an item pertaining to frequency of attempted sexual intercourse, exclusively, however, when examining the frequency of attempted sexual intercourse or other sexual activity, no participants in either group endorsed not having engaged in any attempts. It is therefore difficult to interpret whether the scores of some individuals are being inflated, due to their versatile anal sex role, while others scores are appearing reduced, due to them exclusively identifying with and engaging in activities associated with one anal sex role. This issue becomes further complicated by the unequal distribution of questions that pertain to gay men who identify as tops as compared to those who identify as bottoms, wherein two items are included to assess for ED during insertive anal sex, as compared to only one item assessing for ED during receptive anal sex. This results in men who identify exclusively as bottoms appearing to have poorer sexual function, as compared to men who identify as tops.

When examining the number of participants in the healthy control group who identified with each anal sex role, 42.5% identified as "bottom" or "bottom/versatile," as compared to 35% who identified as "top" or "top/versatile." Among the ED group, 43.3% identified as "bottom" or "bottom/versatile," as compared to 40% who identified as "top" or "top/versatile." As such, although significant differences exist between groups on the IIEF-MSM, this scale would benefit from addressing these issues in order to be able to more accurately interpret the findings.

Temperature change over time. The primary hypothesis of Aim 1 was that men with ED would experience significantly less physiological arousal, relative to healthy controls. This was evaluated by conducting a 2x15 repeated measures ANOVA, with room temperature and baseline genital temperature as covariates, and temperature time points consisted of average genital temperature of each minute of the sexually explicit video. Consistent with the hypothesis and with findings from previous studies using thermal imaging to assess for sexual arousal (e.g.,

Sarin et al., 2014; Kukkonen et al., 2010), results revealed a main effect of genital temperature. These findings add to the existing research literature validating the use of thermal imaging as a physiological tool to measure sexual arousal. In addition, while thermal imaging has previously been validated for the assessment of ED, it is important to consider how it relates to other, more commonly used physiological measures of ED, such as penile plethysmography. Huberman and Chivers (2015) directly compared the recorded sexual arousal responses obtained by thermography and plethysmography, and found that, for men, genital temperature changes were significantly correlated with changes in penile circumference, as assessed by plethysmography. In addition, men's peak thermography and plethysmography responses were significantly correlated. These findings further corroborate the use of thermography for the physiological assessment of sexual arousal.

In support of the main hypothesis of Aim 1, a main effect of group was found, wherein individuals in the healthy control group had significantly higher overall average genital temperatures than those in the ED group. These findings are consistent with the results found by Sarin and colleagues (2014), who found that, in a sample of men between the ages of 18 and 50, thermal imaging could reliably differentiate between men with and without ED. As such, these findings further contribute to the research literature that validates thermography as a tool for assessing the presence of ED.

Sarin and colleagues (2014) found a mean temperature increase from baseline to peak temperature of 0.56˚C among the ED group, and 1.66˚C among the healthy control group, and therefore, a between group difference of 1.1˚C was found. The current study consisted of younger age group (*M* age in current study = 29.64, *SD* = 6.58; *M* age in Sarin et al (2014) study = 32.72, *SD* = 10.17), and found a mean genital temperature change score of 1.36˚C among men

with ED, showing an overall between group difference of 1.77˚C. The slightly higher between group difference in the current study is likely the result of the younger age group, as including individuals between age 40 and 50 may have resulted in lower levels of genital arousal change overall in the Sarin and colleagues (2014) study, as erectile function has been shown to start declining past the age of 40 (Delamater, 2012; Moreira et al., 2008). In addition, the Sarin et al (2014) study was conducted in the same laboratory as the Kukkonen et al (2007) study, and therefore, some of the difference in temperature may be accounted for by a measurement error as a result of different laboratory set-ups, as well as differences in room temperature. It is also possible that the region of interest used to assess for genital temperature was located on a slightly different spot on the penis in the current study, as compared to the previously mentioned studies. For example, the current study may have used a region of interest closer to a major artery than the previously mentioned studies did, which may have resulted in increased genital temperature, and may therefore account for differences in genital temperature.

Group differences in genital temperature using three time-points. When condensing the genital temperature to consist of only three time-points (i.e., average genital temperature during the first, middle, and last five minutes of the sexually explicit video), a 2x3 repeated measures ANOVA revealed a significant main effect of group. As such, even when using condensed data points, the main hypothesis of Aim 1 was supported, as individuals in the healthy control group had significantly higher overall average genital temperatures than those in the ED group.

It was observed that a decrease in subjective sexual arousal occurred at the 11-12 minute mark of the sexually explicit film. Upon further examination of what may have led to this dip, it was observed that this particular moment in the film was the only minute in which penetration

was not visible to the viewer. Therefore, it appears that participants show less subjective sexual arousal when viewing content of sexually explicit films that does not show any penetrative sex.

Of note, when condensing the genital temperature data to consist of three time-points, no main effect of genital temperature was found. This represents a difference in the findings when examining genital temperature change over time as evaluated by 15 time-points, compared to three time-points. This suggests that, when condensing the data to consist of average genital temperature across the first, middle, and last five minutes of the sexually explicit film, the variability in within-subject genital temperature is no longer significant. Therefore, the subtle differences that can be detected when examining change across each minute of the sexually explicit film are lost when condensing the data to consist of three time-points.

Group differences in change scores. When examining group differences in genital temperature change scores, results revealed that men in the healthy control group experienced significantly higher genital temperature change scores, as compared to men in the ED group. This suggests that when comparing the average genital temperature during the last three minutes of baseline to the peak sexual arousal experienced during the sexually explicit film, men in the healthy control group displayed significantly higher changes in genital temperature. As genital temperature is a measure of blood flow to the penis, and serves as a primary indicator of genital sexual arousal, these findings show that men in the healthy control group experience significantly higher levels of genital sexual arousal, as compared to men with ED. As participants were sorted into groups based on their self-reported erectile difficulties on the telephone screener, this finding confirms that the participants in this study were able to accurately describe their ability to attain an erection, and were correctly classified into the corresponding group. Although men have been found to have a tendency to underestimate the

intensity of their sexual response (Nobre et al., 2003), these findings suggest that these underestimations are likely consistent across men with ED and healthy controls, and therefore, this underestimation of sexual response did not impact whether individuals were correctly classified into their corresponding group.

No significant differences were found between groups when examining subjective sexual arousal change scores. This is consistent with Sarin and colleagues' (2014) findings that men with ED did not differ from healthy controls on subjective sexual arousal. In fact, when comparing men with ED, men with hypoactive sexual desire disorder, men with combined ED and hypoactive sexual desire disorder, and healthy controls, men with ED and healthy controls were found to have significantly higher levels of subjective sexual arousal.

Continuous subjective sexual arousal change over time. The relationship between group (ED and healthy controls) and continuous subjective sexual arousal over time was investigated using a 2x15 repeated measures ANOVA. Consistent with the hypothesis, results revealed a significant main effect of subjective sexual arousal, suggesting that the sexually explicit film did result in an overall increase in subjective sexual arousal. This is consistent with previous literature (e.g., Kukkonen et al., 2007, 2010; Sarin et al., 2014, Chivers et al., 2010) showing participant level of continuous subjective sexual arousal increases during the viewing of a sexually explicit film in a research laboratory. However, a non-significant main effect of group was found, suggesting that no group differences existed on continuous subjective sexual arousal ratings. This is consistent with Sarin and colleagues (2014), which found no significant group differences in continuous subjective sexual arousal when evaluating differences between men with ED and healthy controls.

Relationship between genital and subjective sexual arousal. A secondary hypothesis of Aim 1 was that healthy controls would experience a stronger relationship between subjective sexual arousal and physiological arousal, while men with ED would report lower subjective arousal relative to their physiological arousal. In order to assess for whether differences existed between the correlation coefficients of men with ED and healthy controls, within subject correlations were computed for each participant and were then compared between groups. However, no between-group differences were found. This is consistent with the results of a meta-analysis conducted by Chivers and colleagues (2010) investigating concordance rates of genital and subjective sexual arousal across research studies, who found no effect of sexual functioning on concordance rates. Nonetheless, Chivers and colleagues (2010) highlighted that variability in concordance rates were observed across the studies investigated.

While no significant group differences were found in the current sample, an investigation of the frequencies of large effect sizes was conducted. Among healthy controls, 76% of individuals had a large and positive correlation coefficient (i.e., $r > .50$), as compared to only 57% of individuals with ED. These relatively lower correlation coefficients among men with ED are consistent with previous research literature that have found differences in concordance rates among men with ED and healthy controls. Sarin and colleagues (2014), found high positive correlations between subjective and physiological sexual arousal among men with healthy erectile functioning, while among men with ED, this relationship was negative in valence and not significant. Similarly, more dated research has shown that despite achieving corresponding increases in physiological arousal, as measured by penile plethysmography, men with sexual dysfunction reported significantly less subjective sexual arousal relative to healthy controls

(Abrahamson, Barlow, Sakheim, Beck, & Anasthasiou, 1985, 1987; Beck, Barlow, & Sakheim, 1983; Cranston-Cuebas, Barlow, Mitchell, & Anasthasiou, 1993).

The meta-analysis conducted by Chivers and colleagues (2010) highlighted two important considerations when examining concordance rates among men. First, they noted that the inclusion of older men may skew the results, as age is significantly positively associated with concordance rates. As such, the current study included individuals between the ages of 18 and 40. The cut-off age of 40 was selected for the current study as erectile function has been shown to decline at this age (Delamater, 2012; Moreira et al., 2008); however, it may also have reduced the possibility of skewed results when comparing concordance rates.

The second important consideration highlighted by Chivers and colleagues (2010) was that the use of continuous time points to assess for subjective sexual arousal was associated with significantly lower concordance rates among men. The authors hypothesized that continuous assessment serves as a cognitive distraction that reduces physiological sexual response, but does not reduce subjective sexual arousal. The present study used a continuous measure of subjective sexual arousal, in addition to discrete ratings of subjective sexual arousal. No significant group differences were found on neither the continuous nor the discrete ratings of subjective sexual arousal. In addition, participants were asked to rate how distracted they became while watching the films. During the neutral film, participants in the ED group reported that they were significantly more distracted during the neutral film (M = 4.35, SD = 2.02), as compared to healthy controls (M = 3.10, SD = 1.94), $t(67) = -2.58$, $p < .01$. However, given that the majority of the changes in continuous sexual arousal changes occurred during the sexually explicit film, it is likely that the distraction ratings during the sexually explicit film are more important to consider. No significant group differences were found in levels of distraction during the sexually

explicit film, and average distraction ratings were found to be low, with the healthy controls group reporting an average of 3.34/10, with 10 being the most distracted, and the ED group reporting an average of 3.00/10. Based on these low ratings of distraction, it is unlikely that the continuous measure of subjective sexual arousal distracted considerably from ability to attain sexual arousal, either physiological or subjective.

Taken together, although no significant group differences were found in the overall concordance rates between men with ED and healthy controls, and the effect size was small, the present study did find that substantially more healthy controls had large correlation coefficients, as compared to men with ED. It is possible that, with a larger sample size, the current study would have had greater power to detect significant group differences on concordance rates.

Sample characteristics. Although no specific hypotheses were proposed with respect to sample characteristics, some demographic differences were found. When comparing participants in the ED group to participants in the healthy control group, no significant differences were found between groups on age, gender, sexual orientation, highest education attained, annual income, ethnicity, anal sex roles, or circumcision status. However, men in the healthy control group were significantly more likely to report being in a relationship, as compared to men in the ED group. While no specific research has been conducted examining the relationship between sexual dysfunction and relationship status among gay men, research has shown that men with ED experience lower levels of relationship satisfaction (Li, Gao, & Wang, 2016; Bellamy, Gott, & Hinchliff, 2013), increased levels of conflict, and lack of communication in their relationships (Mathias, O'Leary, Henning, Pasta, Fromm, & Rosen, 1997). In the current sample, men with ED were found to not only have higher levels of ED, but also of other self-reported sexual concerns, including sexual satisfaction, ejaculatory function, and sexual desire. While

information regarding past relationships was not assessed for the present study, it is possible that significantly fewer men with ED in this sample reported currently being in a relationship as their previous relationships have been marked by relationship dissatisfaction, and have ended as a result, given the findings of associations between ED and relationship dissatisfaction (Fugl-Meyer, Lodnert, Branholm, & Fugl-Meyer, 1997, Rosen et al., 2016). In addition, given the higher levels of anxiety among the ED group, it is possible that this group experiences more anxiety in general, including anxiety related to pursuing intimate relationships, which may lead to avoidance. Future research should explore specific psychosocial variables that may contribute to the lower reported levels of being in a relationship among men with ED.

Aim 2: Negative Thoughts Related to Sex and Sexual Arousal. It was hypothesized that men with ED would have significantly higher levels of BSS and negative cognitions about sex, relative to healthy controls. In addition, it was hypothesized that within each group, men with lower physiological and subjective sexual arousal would report higher BSS, while men with higher physiological and subjective sexual arousal would report lower BSS.

This hypothesis was partially evaluated through examining between-group differences on questionnaires assessing for BSS and negative cognitions about sex. In order to further evaluate this hypothesis, correlations were conducted between cognitions related to sex and sexual arousal, using the last three minutes of the baseline video, and the average genital temperature during the first, middle, and last five minutes of the sexually explicit video, as well as the genital temperature change score as measures of sexual arousal.

Group differences in cognitions related to sex.

SMQ. As compared to healthy controls, men with ED had significantly more concerns related to Failure Anticipation Thoughts, Erection Concern Thoughts, Age/Body Related

Thoughts, Lack of Erotic Thoughts, and total SMQ scores. These findings are consistent with the hypothesis, as well as with research indicating that men with ED have cognitions including a perceived lack of control over sexual arousal (Mitchell, Marten, Williams, & Barlow, 1990) and sexual failure expectancies (Bach, Brown, & Barlow, 1999; Cranston-Cuebas et al., 1993) during sex.

In addition, the types of thoughts included in this subscale are self-focused in nature (e.g., "I'm not satisfying him," "my penis is not working," "I must achieve an erection"). Wiegel and colleagues (2007) highlighted that when individuals shift their attention to focus on internal cues and performance-related cues during sexual activity, they are more likely to experience negative affect, which then decreases both subjective and physiological sexual function. Interestingly, no group differences were found on Negative Thoughts Towards Sex. This subscale primarily examines thoughts related to morality during sex, which are primarily externalizing in nature (e.g., "this way of having sex is immoral). Therefore, in comparison to the other SMQ subscales, the Negative Thoughts Towards Sex subscale does not assess for self-focused attention. Based on Wiegel and colleagues (2007) theory of self-focus having a negative impact on sexual arousal, the external focus of this SMQ subscale may therefore explain the lack of differences between groups.

NECDQ. Consistent with the hypothesis, as compared to healthy controls, men with ED had significantly more concerns related to body image, performance concerns, and total NECDQ scores, while no significant differences were found between groups on disease concerns or external/emotional concerns. These findings are similar to the pattern of findings of differences between groups on the SMQ scale. Again, the body image and performance concerns subscales have items that are self-focused in nature (e.g., "during sexual activity I think about how

unattractive my body looks", while the disease and external/emotional concerns subscales have items that are less self- focused (e.g., I worry about getting an STI during sexual activity"). This suggests that self-focused thoughts during sex are more common among men with ED, while externalizing or other non-erotic cognitive distractions do not contribute to sexual dysfunction.

SDBQ. Surprisingly, results found no significant differences between groups on any of the subscales of the SDBQ, which does not support the hypothesis. While SDBQ subscales such as restrictive attitudes towards sex (e.g., "It is not appropriate to have sexual fantasies during sexual intercourse"), sex as an abuse of men's sexual power (e.g., "sex is a violation of the partner's body"), and sexual conservatism (e.g., "sexual intercourse before marriage is a sin") contain beliefs about sex that do not pertain to sexual performance, the remaining subscales focus primarily on the importance of being able to attain and maintain an erection, and could therefore be considered to have a self-focused attentional nature. However, a key difference between the items on the SMQ and NECDQ and items on the SDBQ, is the reference point from which participants are instructed to answer the items. While items on the SMQ and NECDQ ask individuals to rate how frequently they have these thoughts or concerns during sex, items on the SDBQ ask individuals to rate how much they agree with each statement related to sexuality in general. As such, the SDBQ does not measure negative automatic thoughts during sex, but rather, beliefs about sexuality more broadly.

In addition, the SMQ and NECDQ questionnaires items have questions using first-person pronouns, while the SDBQ questionnaire items do not include any pronouns, but consist instead of broad sexuality-related statements. This is an important discrepancy, as even though subscales of the SDBQ may contain items that allude to self-focused attention during sex, they do not directly measure whether individuals are endorsing that these thoughts are present during sex.

Instead, they assess whether people have these beliefs in general. As such, the findings of between-group differences on the SMQ and NECDQ subscales are likely explained by being able to capture the self-focused attention that is experienced by men with ED during sex, while the lack of between-group differences on the SDBQ may be explained by the broad and generalized nature of these items.

A second important limitation of the SDBQ is that this questionnaire was initially designed for use with a heterosexual population. Prior to the adaptation of the SDBQ to be used with gay men, no self-report measure of BSS in gay men existed. In order for the questionnaire to be adapted for use with gay men, the word "woman" was substituted for "bottom man," while the word "man" was substituted for "top man". For example, on the original heterosexual version of the questionnaire, an item was "Woman have no choice but to be subjugated by a man's power" while in the adapted version for gay men, the item became "Bottom men have no choice but to be subjugated by a top man's power." Although the effort to adapt a questionnaire designed for a heterosexual population to be used with a gay male population is notable, the approach of equating, men who primarily identify with the receptive anal sex role as having heteronormative female stereotypes and stigmas is overly simplistic. The very limited body of research literature examining gender and anal sex roles found that when self-identified tops and bottoms were compared on the Freund Gender Identity Scale, although bottom men do have slightly higher scores on femininity, they fall within the standardized norms for "non-transsexual homosexuals" (Wegesin & Meyer-Bahlburg, 2000). Therefore, based on this limited body of research, it is inaccurate to make the assumption that "bottom men" can be represented by female norms.

In addition, it is important to acknowledge that this questionnaire classifies gay men as being either "top men" or "bottom men". In the current study's sample, only 35.8% of participants identified as either "top" or "bottom". The vast majority identified as either "top/versatile" (24.3%) or "bottom/versatile" (20%), while 17.1% of participants identified as versatile. As such, the approach taken to adapting the questionnaire, that is, to equate "bottom men's" experience with that of heterosexual women, and "top men's" experience with that of heterosexual men is problematic, as not only is it inaccurate, but it also fails to capture the experiences of the vast majority of men, who do not exclusively identify as "top" or "bottom" (Wei & Raymond, 2011).

Despite these issues with the adapted version of the SDBQ, this remains the only measure of BSS for use with gay men. Therefore, the creation of this adapted scale marked an important addition to the literature examining BSS among gay men. While certain issues with the adaptation are highlighted, this scale does provide the opportunity to further develop a scale which improves upon this adapted version, by addressing the highlighted issues.

Relationship between SMQ scores and genital temperature. When examining the full sample, results revealed a small and negative correlation between Failure Anticipation Thoughts and the genital temperature during the last five minutes of the sexually explicit video, as well as the genital temperature change score. In addition, significant small and negative correlations were revealed between Erection Concern Thoughts and genital temperature during the middle five minutes of the sexually explicit video and last five minutes of the sexually explicit video, as well as the genital temperature change score. A small and significant negative correlation was found between Age/Body Related Thoughts and the genital temperature during the middle five minutes of the sexually explicit video, last five minutes of the sexually explicit video, as well as

the genital temperature change score. Significant and small, negative correlations were revealed between Lack of Erotic Thoughts and genital temperature during the first five minutes of the sexually explicit video, and the last five minutes of the sexually explicit video, as well as the genital temperature change score. Significant and small negative correlations were revealed between Negative Thoughts Toward Sex and genital temperature during the first five minutes of the sexually explicit video, and last five minutes of the sexually explicit video. Finally, a small and significant negative correlation was found between total SMQ scores and the genital temperature during the first five minutes of the sexually explicit video, middle five minutes of the sexually explicit video, last five minutes of the sexually explicit video, as well as the genital temperature change score.

Taken together, these findings suggest that the higher the levels of negative automatic thoughts related to sex that occur during sex, regardless of the theme of the negative automatic thoughts, are associated with lower levels of physiological arousal. This is consistent with the research literature examining community samples, whereby men who experience more negative automatic thoughts related to sexual performance have higher rates of psychological distress and sexual difficulties (Nelson & Purdon, 2011). In addition, these negative automatic thoughts during sex seem to be particularly prevalent among gay men. Lacefield and Negy (2012) found that not only do gay men experience significantly more negative automatic thoughts during sex related to sexual performance, STI-related fears, and body image relative to heterosexual men, but they also experience more anxiety regarding these negative automatic thoughts during sex. These performance related fears included not being able to satisfy their partner and not being able to give their partner an orgasm. In addition, Bancroft and colleagues (2005) found that among both sexually functional men and men with ED, gay men experience significantly more

performance related concerns, including fear of not maintaining an erection and fears of not pleasing their partner, relative to heterosexual men (Bancroft et al., 2005).

Among healthy controls, Erection Concern Thoughts were significantly negatively correlated with middle five minutes of the sexually explicit video, as well as during the last five minutes of the sexually explicit video. Negative Thoughts Toward Sex was significantly negatively correlated with last five minutes of the sexually explicit video. Finally, SMQ total scores were significantly negatively correlated with middle five minutes of the sexually explicit video, as well as during the last five minutes of the sexually explicit video. Overall, these findings are consistent with the research literature discussed in the previous paragraph.

Interestingly, among healthy controls, concerns related to Failure Anticipation thoughts, Lack of Erotic Thoughts, and Age/Body Related thoughts were not significantly associated with physiological sexual arousal, and effects were weak in nature. This is not consistent with findings of previous literature, which highlights the significant body image concerns and performance related concerns experienced by gay men. Therefore, the healthy controls in the current study may represent a subset of the community who are more confident in their sexual experiences. This may be the result of a selection bias, in which the individuals who choose to participate in a sex research study and who have healthy sexual function may represent a subset of the population who experience significantly fewer negative automatic thoughts related to sex, as compared to the general population.

Relationship between NECDQ scores and genital temperature. When examining the full sample, results revealed a small and positive correlation between Body Image and baseline genital temperature, and a moderate and negative correlation between Body Image and genital temperature change scores. In addition, results revealed a significant and small negative

correlation between External/Emotional Concerns and genital temperature change scores. Finally, a significant and small positive correlation was found between NECDQ total scores and baseline genital temperature, and a significant and small negative correlation was found between NECDQ total scores and genital temperature change scores. This suggests that, having higher levels of body image concerns is associated with having higher physiological arousal at baseline, while higher levels of body image concerns are associated with lower genital temperature change scores, suggesting lower overall sexual arousal. The finding that individuals with more body image concerns experience more physiological sexual arousal during the baseline condition is surprising, given that it is inconsistent with the current research literature that suggests there should be no correlation between baseline genital temperature and body image (i.e., Sarin et al., 2014). As such, this finding might be a spurious correlation. However, the finding that the genital temperature change scores are higher among individuals with less body image concerns are consistent with research showing that individuals with lower sexual functioning have significantly more body image issues (Sarin et al., 2014; Pascoal, Narciso, & Pereira, 2012; Sanchez & Kiefer, 2007; Yamamiya, Cash, & Thompson, 2006).

Among healthy controls, results revealed a small and negative correlation between Body Image and genital temperature change scores. This suggests that individuals with fewer body image concerns experience greater physiological sexual arousal. Given that during a thermal imaging testing session, the participant is informed that the researcher is able to see a live feed of the thermal image, which is focused on the participant's lower stomach, genitals, and thighs, participants who have more body image related concerns are likely to experience more cognitive distractions related to body image during this situation, and as a result, have more cognitive distractions as they have more concerns about their body image to begin with. Based on the

literature that suggests that cognitive distractions are associated with poorer sexual function (e.g., Wiegel et al., 2007), this increase in self-focus on body image and, as a result, increase in overall cognitive distractions, likely explains the significant correlation.

Relationship between SDBQ scores and genital temperature. When examining the full sample, results revealed a small and positive correlation between sex as an abuse of top men's sexual power and baseline genital temperature, as well as a small and positive correlation between importance of sexual performance and baseline genital temperature. These findings suggest that the more physiological arousal participants experienced at baseline, the more strongly they believed in sex as an abuse of top men's power, and the importance of a perfect sexual performance. This suggests that individuals who hold these beliefs more strongly experience better physiological arousal at baseline, but given the lack of significant correlations between these subscales and sexual arousal during the sexually explicit film, these findings are not maintained in during the viewing of films intended to induce sexual arousal.

Partner's Sexual Power was found to be significantly negatively correlated with genital temperature change scores, as was Sexual Performance Beliefs. This suggests that when considering a sample of both sexually functional and dysfunctional men, erectile function is impacted by the degree to which individuals believe in Partner's Sexual Power and Performance Beliefs. The relationship between concern about sexual performance and sexual function has been well-documented in previous literature (e.g., Bancroft et al., 2005). However, although the relationship between sexual function and Partner's sexual power has been found in heterosexual samples (e.g., Nobre et al., 2005), these results were not replicated when examining a Portuguese sample of gay men (Peixoto & Nobre, 2016).

Among healthy controls, Restrictive Attitudes Towards Sex was significantly moderately negatively correlated with genital temperature change scores, middle five minutes of the sexually explicit video, and last five minutes of the sexually explicit video. Abuse of Top Man's Power was found to be significantly negatively correlated with genital temperature change scores. Sexual Conservatism was found to be significantly negatively correlated with genital temperature change scores. Partner's Sexual Power was found to be significantly negatively correlated with genital temperature change scores. SDBQ Total Scores were found to be significantly negatively correlated with genital temperature change scores. Group variability in physiological sexual response is to be expected, suggesting that although individuals in the healthy control group do not experience erectile dysfunction, some individuals will still experience a stronger physiological sexual response, as measured by genital temperature, than others. As such, this within-group variability likely explains the presence of significant relationship between these subscales and physiological arousal, among the healthy control group.

Relationship between BSS and genital temperature in ED group. Although significant group differences were found between levels of negative automatic thoughts during sex as well as BSS, none of the subscales assessing for these constructs were associated with physiological sexual arousal, when examining the ED group. This suggests that even though differences between groups in overall levels of negative automatic thoughts related to sex exist, these are not associated with the physiological sexual arousal levels assessed in the laboratory setting among individuals with ED.

These results were surprising, as initial hypotheses had predicted within each group, men with lower physiological and subjective sexual arousal would report higher BSS, while men with higher physiological and subjective sexual arousal would report lower BSS. Given that men with

ED have lower physiological sexual arousal, we expected the ED group to show significant and negative correlations between BSS and physiological arousal. Nonetheless, this hypothesis was not supported. There are several reasons why this hypothesis may not have been supported.

First, the measures of negative automatic thoughts related to sex and BSS were completed following the viewing of the neutral and sexually explicit films. As such, in order to complete these questionnaires, participants were required to rely on retroactive memory, to assess for whether these thoughts were present, and to what degree these thoughts were present. In completing these questionnaires in a laboratory setting, outside of the situation in which the individual is being asked to assess for these thoughts, the possibility for the existence of several participant biases is introduced. For example, participants may engage in positive impression management, and report that the degree to which they have these thoughts is lower than the actual frequency and intensity. On the opposite end, participants may also be engaging in negative impression management, by exaggerating the degree to which these beliefs are present.

Second, it is important to consider the setting in which the measurement of physiological arousal took place. Rather than assessing for ability to attain or maintain an erection during a partnered sexual experience, this artificial laboratory environment assessed for participants' ability to attain or maintain an erection without a partner present, and without any genital stimulation. As such, this represents a drastically different environment, as compared to the environment in which we are asking participants to assess for the presence of negative automatic thoughts. Therefore, while negative automatic thoughts related to sex may impede an individual's ability to attain or maintain an erection during a partnered sexual experience, it is possible that these thoughts may be less prominent, or of a different quality, during a laboratory investigation of sexual arousal. For example, the research literature has demonstrated that some

of the common themes of worries experienced by men with ED are related to not being able to satisfy their partner and not being able to give their partner an orgasm (Lacefield & Negy, 2012). These demand-related concerns would not be present throughout a laboratory setting, as there is no pressure to be able to provide pleasure to a partner.

Nonetheless, it is important to consider that the laboratory environment may present demand cues of a differing quality. For example, given the nature of the study, participants may feel pressured to receive an erectile response of some kind. While, to our knowledge, no research has examined the presence of inherent demand cues in thermography studies of sexual arousal in general, a body of research literature examining the impact of introducing an explicit demand cue during sex research does exist (e.g., Van Lankveld, Van den Hout, & Schouten, 2003; Heiman & Rowland, 1983, Lange, Wincze, Zwicj, Feldman, & Hughes, 1981). However, given the explicit nature of the demand cues introduced in these studies (e.g., being instructed to become sexually aroused, being informed that there is an expectation that each participant will achieve a strong erectile response), these demand cues are likely substantially different from the demand cues in the current study, in which participants were informed that there were no expectations related to whether participants did or did not achieve an erection. As such, given the lack of research regarding inherent demand cues in sex research, it is not possible to make conclusive statements about the quality of the perceived performance demands that may exist. It is therefore important to consider that the laboratory setting not only presents an artificial environment in which the physiological response being measured is qualitatively different from physiological responses during sexual experiences, but also in which the presence of demand characteristics are variable and may not be representative of the quality of demand cues present in partnered sexual experiences, which may explain the lack of findings.

In addition, the lack of findings may be the result of a selection bias that is inherent in all sex research. Participating in laboratory based sex research, particularly in studies using physiological assessments of sexual function, requires a certain level of openness. A recent study conducted by Bouchard and colleagues (2019) found that the personality trait of openness was associated with willingness to participate in sex research involving the removal of clothing. In addition, erotophilia, or having positive affective and evaluative responses to sexual cues, was found to be associated with men's willingness to engage in unclothed sex research (Bouchard et al., 2019).

This study by Bouchard and colleagues (2019) provided a welcome update to the existing body of research on selection bias in sex research, as the majority of the existing literature was published several decades ago. Nonetheless, this body of literature found several differences have been found between individuals who agree to participate and individuals who decline to participate in sex research involving physiological measurement. Individuals who agreed to participate in sex research were found to have significantly less sexual guilt and sexual fear, as compared to individuals who declined to participate (Farkas, Sines, and Evans, 1978). In an investigation of correlates of college student's willingness to participate in sex research, individuals willing to participate were found to show significantly lower levels of traditional sexual beliefs, as compared to individuals who were unwilling to participate (Wiederman, 1999).

As such, the increased openness, in addition to the lower levels of sexual guilt, sexual fear, and traditional sexual beliefs may explain the lack of significant findings between BSS and genital temperature. That is, the ED group included in the sample may represent a subset of gay men with ED who experience less concerns about stereotypical beliefs about sexuality. Given that the current measure of BSS includes scales such as sexual morality, these findings regarding

lower levels of sexual guilt and fewer traditional sexual beliefs among volunteers may translate into the current sample not being highly concerned about broad sexual beliefs, such as morality.

Finally, as with all correlational research, it is possible that the lack of significant correlations between these constructs is due to a third variable being the cause of the differences in negative automatic thoughts related to sex found between groups. By focusing only on negative automatic thoughts related to sex and BSS, it is possible that the current study is evaluating only one component of psychogenic ED, while other components, and the interaction between the presence of these thoughts and other components, may be a better explanation of what causes psychogenic ED. Wiegel and colleagues (2007) highlighted the importance of considering cognitive, affective, and attentional factors in the onset and maintenance of sexual dysfunction. While affective and attentional factors were assessed at a basic level, by assessing for self-reported level of distraction and anxiety, a more comprehensive investigation of these components and their role in predicting physiological arousal, both in the laboratory and in partnered sexual experiences, is needed.

Within-group differences of impact of negative automatic thoughts related to sex on sexual arousal. In order to investigate whether negative automatic thoughts related to sex predicted genital temperature change and subjective sexual arousal change a hierarchical regression was run with each group. The genital temperature change score was chosen as our outcome measure as it provides an indication of overall genital temperature change from baseline to peak during the sexually explicit film. It therefore represents an indication of peak sexual arousal. Subjective sexual arousal change scores were chosen as the second outcome measure for the same reasons; they provide an indication of overall subjective sexual arousal during the sexually explicit film.

In both groups, the hierarchical regression models were found to be non-significant, suggesting that negative automatic thoughts related to sex did not predict genital temperature change or subjective sexual arousal change. This hypothesis was initially proposed based on the research literature that suggests that, as compared to healthy controls, individuals with ED have been found to have more cognitions including sexual failure expectancies (Bach, Brown, & Barlow, 1999; Cranston-Cuebas et al., 1993), maladaptive sexual causal attributions (Weisberg et al., 2001; Scepkowski et al., 2003), and cognitive bias (Barlow, 2000), and that these cognitions explain the sexual dysfunction experienced. Therefore, the present study sought to confirm these findings, and to further validate them by including a physiological measure of sexual arousal.

However, as previously discussed, it is also important to consider how the construct of physiological sexual arousal was assessed. As mentioned, assessing for ability to attain or maintain an erection without any genital stimulation in a laboratory environment is qualitatively different from assessing an individual's ability to attain or maintain an erection during a partnered sexual experience. In addition, the lack of or different quality of the demand characteristics present in a laboratory investigation of sexual arousal likely resulted in the quality of concerns about sexual performance being different than they would have been in a partnered sexual experience. Therefore, future research should create a simulation-type study in which demand characteristics are present, as well as genital stimulation being present, in order to be able to better assess for the predictive nature of these cognitions.

Aim 3: Mediators of the relationship between BSS and sexual arousal. In order to test the hypothesis that negative automatic thoughts and self-reported sexual dysfunction would mediate the relationship between more deeply engrained BSS and ED, four mediational analyses

were conducted. Separate mediation analyses were conducted to investigate the full sample, in order to ensure variability in outcome measure scores, as well as the ED group, in order to test this hypothesis on the group with lower sexual arousal. Outcomes consisted of genital temperature change scores and subjective sexual arousal change scores. None of the four mediational analyses were statistically significant, suggesting that negative automatic thoughts related to sex do not mediate the relationship between BSS and ED. These results were not surprising, given the lack of relationship found between BSS and ED in the full sample and in the ED group. However, there are cases in which, despite a non-significant relationship between the predictor and the outcome variable, the model produced does represent a significant mediation model. These instances occur primarily when a significant relationship between the predictor and outcome variables do exist, but are not detected due to small sample sizes or other extraneous factors (Shrout & Bolger, 2002). Nonetheless, running the mediation analyses did not yield significant model results.

As previously mentioned, several measurement biases may explain the lack of findings. First, the assessment of physiological sexual arousal in a laboratory setting is not equivalent to the physiological arousal experienced during a partnered sexual experience. Second, BSS is measured by the SDBQ, which presents an assessment bias by equating "bottom men's" experience with that of women, and "top men's" experience with that of men, in addition to failing to capture the experiences of the vast majority of men, who do not exclusively identify as "top" or "bottom". Finally, the negative automatic thoughts related to sex are likely experienced differently in a laboratory setting as compared to a realistic sexual experience. Therefore, negative automatic thoughts related to sex would likely not impact physiological arousal, as

assessed by genital temperature change scores, as this does not represent a realistic sexual experience.

Aim 4: Sexual Behaviour. Finally, Aim 4 was to evaluate the relationship between ED and condom removal among gay men. It was hypothesized that men with ED would report removing condoms during anal sex with casual partners more often, relative to healthy controls. In addition, it was hypothesized that BSS would mediate the relationship between ED and risky sex. Finally, it was hypothesized that men with ED would be more likely to have used erectile enhancing drugs during the previous six months

Removal of condoms during sex. In order to test the hypothesis that men with ED would report removing condoms during anal sex with casual partners more often, relative to healthy controls, an independent samples t-test was conducted. Contrary to our hypothesis, results revealed no significant group differences in reported use of condoms during receptive anal sex, as well as no significant group differences in reported use of condoms during insertive anal sex. Additionally, no significant group differences in reported removal of condom prior to completion of anal sex. These findings were surprising, as previous literature has shown that men with ED are more likely to report that they will remove a condom prior to completion of sex, due to an insufficient rigidity of their erection (Sanders et al., 2012). However, a medium effect was found. Upon further examination of the data, a substantial difference existed between groups on the number of individuals who reported "almost always" removing condoms prior to the completion of sex. Among healthy controls, only 5% of individuals endorsed almost always removing condoms prior to the completion of sex, compared to 23.3% of men with ED. Therefore, although no significant overall between-group differences were found, a subset

consisting of close to one quarter of the ED sample reported almost always removing condoms prior to the completion of sex.

Reasons for removal of condoms. In order to gain a better understanding of what led to the decision to remove condoms prior to completion to sex, and therefore, be better able to interpret the reason that close to one quarter of the ED sample reported almost always removing condoms prior to the completion of sex, compared to only 5% of healthy controls, participants were asked about their reason for condom removal. While 10% of healthy reported that the reason for removal of condoms during sex was loss of erection, this number was twice as high among men with ED (i.e., 20%). In addition, only 2.5% of healthy controls reported removing condoms prior to completion of sex due to difficulty attaining an erection, compared to 10% of participants with ED. These findings are consistent with previous research literature that suggests that men with ED are more likely to make a deliberate choice to not use condoms with casual sex partners, due to difficulty attaining and maintaining an erection while wearing a condom (Graham et al., 2006; Lammers et al., 2008).

While condom removal may facilitate the ability to attain or maintain an erection during sexual experiences, this behaviour is problematic, as it increases the risk for contracting a sexually transmitted infection. Indeed, research has shown that men with ED report higher rates of sexually transmitted infections, compared to men without ED (Jena et al., 2010). This may be the function of men with ED being more likely to remove almost always their condom prior to the completion of sex, due to relatively more difficulties in attaining or maintaining an erection, as compared to healthy controls.

In addition, due to the relatively higher rates of condom removal during sex in order to be better able to attain or maintain an erection among men with ED, in conjunction with the

increased risk of contracting a sexually transmitted infection when having condomless anal sex, men with ED may turn to alternative methods to protect themselves from contracting sexually transmitted infections. One such alternative method is the use of PrEP, which has been shown to reduce the risk of contracting HIV through condomless anal sex and vaginal sex by more than 90% among individuals who are considered to be at high risk for contracting HIV (Anderson et al., 2012). However, PrEP does not protect against sexually transmitted infections, other than HIV. Therefore, individuals engaging in condomless anal sex while using PrEP are still at significant risk for contracting antibiotic and macrolide resistant strains of syphilis (Stamm, 2009; Martin et al., 2009), antimicrobial resistant gonorrhoea (Unemo & Nicholas, 2012), and sexually transmitted infections that remain incurable (e.g., herpes; Tong et al., 2014). As such, condomless anal sex remains a risky activity even in cases where men are currently using PrEP.

Given the nascence of the research literature on PrEP, no studies have examined variables that make individuals more likely to seek out and use PrEP. However, given the higher rates of condom removal during anal sex among men with ED, it is likely that this group of gay men is particularly likely to seek access to this preventative treatment. It therefore remains important to gain a better understanding of how to improve the erectile function of men with ED.

Use of erectile enhancing drugs. In addition to examining differences between groups on condom use, the present study also sought to examine group differences in the use of erectile enhancing drugs. An independent samples t-test revealed significant group differences and a large effect in reported use of erectile enhancing drugs during the past six months, in which men with ED were significantly more likely to report having used erectile enhancing drugs as compared to healthy controls. Only 5% of healthy controls reported having used erectile enhancing drugs within the past 6 months, compared to 40% of men with ED. Among men with

ED, 23.3% of participants reported using erectile enhancing drugs at least half of the time. Among the two participants in the healthy control group that reported using erectile enhancing drugs in the past six months, both reported using it much less than half of the time. In addition, the reasons for the use of erectile enhancing drugs among the healthy control group were related to having sex for longer and to offset the effect of drugs, while 30% of men with ED reported using erectile enhancing drugs to be able to attain or maintain an erection.

Overall, the higher rates of use of erectile enhancing drugs among men with ED are not surprising, as these drugs are commonly used to treat ED (Pantalone, Bimbi, & Parsons, 2008; Zesiewicz, Helal, & Hauser, 2000; Chiang, Yafi, Dorsey Jr & Hellstrom, 2017). However, the use of erectile enhancing drugs has been associated with increase sexual risk taking behaviours. For example, the use erectile enhancing drugs among gay men has been associated with having a greater number of sexual partners (Paul et al., 2005). In addition, gay men who use erectile enhancing drugs have been found to engage in more condomless anal sex with casual partners (Sanchez & Gallagher, 2006; Rawstorne et al., 2007), as well as more condomless anal sex with serodiscordant partners (Sherr et al., 2000; Mansergh et al., 2006; Schwarcz et al., 2007; Pantalone et al., 2008). Although it is possible that individuals who use these erectile enhancing drugs within the context of ED may be engaging in fewer sexual risk taking behaviours than healthy individuals who use them as enhancers, among a community sample of gay men who endorsed using erectile enhancing drugs, 60% reported doing so in order to be able to maintain an erection (Pantalone et al., 2008). This suggests that a primary motivator for the use of erectile enhancing drugs among gay men is the erectogenic benefits. Nonetheless, among this sample, significant sexual risk taking behaviours were prevalent, including engaging in condomless anal sex with serodiscordant partners and using other recreational substances within the context of

sex. Therefore, although the use of erectile enhancing drugs may improve an individual's ability to attain or maintain an erection, it has also been associated with sexual behaviours that put individuals at a higher risk for contracting sexually transmitted infections. In addition, as men can expect to achieve an erection in approximately 85% of attempts to engage in sexual activity when using erectile enhancing drugs (McCarthy & Fucito, 2005), it remains important to find alternative treatments, including empirically supported psychological treatments for ED.

Relationship between condom removal and sexual arousal. In order to test the hypothesis that BSS would mediate the relationship between ED and condom removal, a mediational analysis was conducted, using the entire sample in order to ensure variability in outcome measure scores. The mediational model was not statistically significant, suggesting that that BSS does not mediate the relationship between ED and condom removal. These results were not surprising, given the lack of relationship found between condom removal and genital temperature change. However, as discussed above, there are cases in which, despite a non-significant relationship between the predictor and the outcome variable, the model produced does represent a significant mediation model, such as when a significant relationship between the predictor and outcome variables do exist, but are not detected due to small sample sizes or other extraneous factors (Shrout & Bolger, 2002). Nonetheless, running the mediation analyses did not yield significant model results.

It was initially hypothesized that BSS may represent a pathway through which ED predicts risky sex, as men high in BSS hold beliefs such as men always need to be able to attain an erection in order to be considered an adequate sexual partner, and the place high value on satisfying sexual partners through an erect penis. Therefore, individuals who are unable to attain

or maintain an erection would be more likely to remove condoms as a result of insufficient erectile rigidity, as a result of their strongly held beliefs about a perfect sexual performance.

The lack of support found for this hypothesis may be the result of several different factors. First, as previously discussed, genital temperature scores do not accurately represent sexual function during partnered sexual experiences. Second, the SDBQ is heteronormative in nature, makes inaccurate assumptions that require men to categorize themselves into either a top or bottom, while the majority of men identify as versatile. Third, removal of condoms during sex was measured as a general frequency, and did not pertain to a specific sexual experience. For example, if this hypothesis has been assessed immediately following an experience in which an individual had removed a condom during sex due to insufficient rigidity of erections, it is possible that their reported BSS would be higher, and would have influenced their decision to remove a condom prior to the completion of sex. However, when these constructs are measured in an artificial laboratory setting, in which erectile function is assessed by genital temperature change without any genital stimulation or demand cues, it is more difficult to establish an association between these variables. This is particularly relevant as use of condoms occurred within this study, and therefore, the construct of removal of condoms during sex is more abstract in nature, rather than focusing on a concrete sexual experience. Designing a study that examined these variables in a diary study, thus permitting for a realistic sexual environment would be particularly interesting.

Summary of Findings

Taken together, these findings suggest that, among gay men with ED and healthy controls, significant differences exist. Nonetheless, the proposed models were found to be statistically non-significant. This is believed to be the result of several interacting factors,

including the artificial laboratory environment in which physiological arousal was assessed and the heteronormative nature of the SDBQ, resulting in a potential failure to capture the experiences of the majority of men in the sample. Nonetheless, the use of the SDBQ was important in this study, as this is the first measure of BSS that has been adapted for use with gay men.

Despite the lack of significant model findings and significant findings related to BSS, important differences were found between groups when considering other types of cognitions. When examining negative automatic thoughts related to sex, men with ED had significantly higher levels of related concerns. This was particularly evident when the negative automatic thoughts related to sex being examined were self-focused in nature. This lends further support to research highlighting that that when individuals shift their attention to focus on internal cues and performance-related cues during sexual activity, they are more likely to experience negative affect, which then decreases both subjective and physiological sexual function. Furthermore, the results suggested that externalizing or other non-erotic cognitive distractions do not contribute to sexual dysfunction, as subscales that have an external, rather than self-focus, were not shown to be differentially endorsed across groups. It is particularly important to gain an understanding of the types of thoughts contributing to ED among gay men, as previous research has found that gay men experience significantly more negative automatic thoughts during sex related to sexual performance, in addition to having significantly more anxiety regarding these negative automatic thoughts during sex (Bancroft et al., 2005; Lacefield & Negy, 2012).

Furthermore, results showed a substantial difference in the rate of removal of condoms prior to the completion of sex. Men with ED reported much higher rates of removal of condoms, as compared to the rates reported by healthy controls. In addition, results suggested that, among

the ED group, ED directly influenced men's decision to remove their condoms, as the most commonly selected reason for removal of condoms prior to the completion of sex was difficulty attaining or maintaining an erection. Therefore, due to the high risk of contracting a sexually transmitted infection when removing condoms, these findings highlight the unique importance of developing empirically supported treatments for gay men with ED.

Limitations

Despite best efforts to minimize the limitations of the current study, several limitations were present. First, as previously discussed, a primary measure of the study, the SDBQ was found to have several problems with it, particularly when it has been adapted for use with a gay male sample. This questionnaire was initially designed to be used with a heterosexual population, however, in order to assess for BSS within the current gay male sample, the adapted version for gay men was used (Peixoto & Nobre, 2014). This was done by substituting the word "woman" for "bottom man," while the word "man" was substituted for "top man". The approach taken to adapting the questionnaire, that is, to equate "bottom men's" experience with that of women, and "top men's" experience with that of men, is problematic, particularly as it is not supported by the research literature on gender and anal sex roles (Wegesin & Meyer-Bahlburg, 2000). In addition, the questionnaire fails to consider that the vast majority of gay men do not identify exclusively as "top men" or "bottom men". Rather, many gay men, including 64.2% of the current sample, identify as versatile. Therefore, the questionnaire also fails to capture the experiences of the vast majority of gay men, who do not exclusively identify as "top" or "bottom".

A second limitation of the current study is the artificial environment in which the research was conducted. Assessing for ability to attain or maintain an erection in a laboratory

setting without the presence of a partner or any genital stimulation represents a drastically different environment, as compared to a partnered sexual experience. It is likely that the thoughts participants have related to sex are quite different in a laboratory environment, as compared to a naturalistic setting. For example, the demand cues experienced in a laboratory setting are different from those experienced with a partner, as there is no pressure to be able to provide pleasure to a partner by maintaining an erection. In addition, it is possible that a selection bias occurred, wherein participants who chose to participate in the research did so in order to gain insight into their ED. Therefore, it is possible that they experienced significantly less pressure to be able to attain or maintain an erection, as the lack of an erectile response would be expected within the context of this empirical investigation.

A third limitation of the study is the measurement of erectile function. The use of physiological measurements in research have significant merits. For example, research using primarily self-report measures is subject to the possibility of measurement bias. As such, when conducting an investigation of ED, using only self-report data to assess for the presence of ED is problematic, particularly as men have been found to overestimate the severity or presence of ED (Nobre et al., 2003). Therefore, the use of physiological measurements of ED, including thermography, provides an added benefit to sex research, as it can provide physiological confirmation of the presence of erectile difficulties. However, the measurement of erectile function acquired does not confirm the amount of blood flow in the penis during an actual sexual experience, but rather assesses for the amount of blood flow in the penis while watching a sexually explicit video without any genital stimulation. As such, although we can expect erectile function to be similar across these situations, it is not possible to confirm that the laboratory measure of erectile function provides an accurate representation of actual erectile function during

sexual experiences involving stimulation, the presence of a partner, and the presence of demand cues.

It is also possible that the lack of significant findings related to BSS are due to the study being underpowered. However, a priori power calculations to determine sample size suggest that this was likely not the case.

Finally, although best efforts were made to ensure a sample of individuals with ED who had psychogenic, rather than organic ED, this was not confirmed. For example, while eligibility criteria did exclude individuals with medical conditions known to be associated with organic ED (e.g., diabetes, HIV), it is impossible to assess for the presence of organic ED without access to sophisticated medical tests. Therefore, the sample of men with ED likely consisted of both individuals with organic ED and individuals with psychogenic ED. The consideration of whether the sample of men with ED consisted of individuals with organic ED or psychogenic ED is particularly important for the present research study. While individuals with psychogenic ED may not experience the same inability to physiologically achieve an erection that men with organic ED have, men with psychogenic ED are likely to experience that anxiety significantly impedes their ability to attain or maintain an erection. That is, while men with psychogenic ED would likely be able to achieve an erection if they were given an intracavernous penile injection, suggesting that they do not have any physiological indicators of ED, for this subset, anxiety during sexual performance situation may be what impedes their ability to attain or maintain an erection. Among men with ED under 40, it is estimated that approximately 15-20% of these individuals have an organic cause of the ED (Papagiannopoulos, Khare, & Nehra, 2015). As such, despite efforts to include only individuals with psychogenic ED, it is likely that at least some of these individuals experienced organic ED. It is possible that the scores of negative

automatic thoughts related to sex and BSS would have been higher, had the sample consisted solely of individuals with psychogenic ED, however, this is difficult to confirm without medical tests.

Future Directions

Future research would benefit from incorporating a number of proposed methodological adjustments. First, in order to address the potential power issues that have resulted in a lack of significant findings despite moderate effect sizes, a larger sample size should be accrued. Second, in order to address the limitation of the laboratory environment being artificial in nature, conducting a diary study would be warranted. For example, participants who had been identified to have erectile dysfunction would complete a package of questionnaires immediately following a sexual encounter. These questionnaires would include measures of perceived erectile function, condom use and potential removal, negative automatic thoughts related to sex that were present, and perceived demand cues. By having participants complete these after all sexual experiences, it would allow for this future research study to examine variability in sexual function and condom use, and to gain a more accurate representation as to how negative automatic thoughts during sex impacted these variables.

Another limitation related to conducting sex research within a laboratory study is the lack of or different quality of demand cues that are present within this artificial setting. While participants with ED may still feel pressure to attain an erection, the pressure experienced is likely different in nature than that experienced during partnered sexual experiences. For example, there is no pressure to maintain an erection in order to satisfy a partner sexually within laboratory settings. This results in some difficulty interpreting the generalizability of the findings associated

with genital temperature changes, as it is unclear whether the findings would be replicated within a naturalistic setting.

One methodological consideration that may allow for a more realistic assessment of erectile function within a laboratory setting would be to conduct a study in which individuals were instructed to masturbate within the laboratory setting. Previous research incorporating masturbating and thermal imaging within a laboratory setting have been conducted (e.g., Patterson, Amsel, & Binik, 2013). However, although this may allow for a more accurate understanding of overall erectile function, it would likely not elicit the demand cues individuals experience in partnered sexual experiences.

A second potential methodological consideration to increase generalizability of findings would be to conduct a simulation study. Given the recent advances in virtual reality technology, incorporating this technology into research studies would be of interest. For example, having a virtual reality simulation of a sexual encounter may elicit demand cues that are more realistic in nature, and more consistent with the demand cues participants experience in the real-life scenarios. By having a virtual reality simulation in a laboratory, in combination with the use of thermal imaging, researchers would be able to get a more accurate representation of the sexual function of individuals in partnered sexual experiences, in a laboratory environment. Therefore, the incorporation of virtual reality into sex research may represent an important consideration for future research studies, in particular, research studies examining the impact of BSS and negative automatic thoughts related to sex on sexual function.

In addition, future research evaluating BSS and negative automatic thoughts during sex should incorporate qualitative components. As current measures of BSS are heteronormative in nature, and make inaccurate assumptions about gay men, having a qualitative component could

provide valuable insight into potential areas of BSS specific to gay men that have not previously been considered. In addition, the findings of this qualitative study could be used to develop a measure of BSS for gay men that is not heteronormative, and makes more accurate assumptions about the sexual beliefs of gay men.

Finally, future research examining the role of negative automatic thoughts during sex in gay men with ED would benefit from incorporating samples of gay men with ED who have been confirmed to have psychogenic ED. As such, partnering with a urologist who can run the medical tests needed to rule out organic causes of ED would be of benefit, as it would be expected that men with psychogenic ED have higher rates of negative automatic thoughts during sex, and that these negative automatic thoughts during sex impact their erectile functioning more so than individuals who have an organic cause for their ED.

Implications

This study has several important implications for understanding the relationship between ED and negative automatic thoughts related to sex among gay men. To our knowledge, this was the first study to use thermal imaging to assess for the erectile function of gay men, with and without ED, and therefore adds to the research literature. As previously stated, although several treatment protocols aimed at reducing symptoms of psychogenic ED have been published, no treatment manual has been published that specifically aims to reduce ED among gay men. This is problematic, as the existing treatment protocols are heteronormative in nature, and therefore they require adaptation in order to be used with a gay male population. This study sought to identify potentially important variables to consider in developing empirically-based, psychological treatments for gay men with ED.

This study showed that men with ED have significantly more negative automatic thoughts during sex, as compared to healthy controls. Although negative automatic thoughts during sex were not significantly correlated with genital temperature, it remains important to consider that these thoughts are a contributing factor to ED in gay men. It is likely that negative automatic thoughts related to sex do not independently cause psychogenic ED, but rather, that they contribute to a complex interplay between affect, behaviour, and self-focused attention during sex. In addition, the negative automatic thoughts related to sex were assessed using measures that were created for use in a heterosexual population. Therefore, it remains important to consider how the heteronormative scripts used in these measures may have influenced the results, as they may not have adequately captured other sexual experiences such as non-coital activities and communication around anal sex roles.

Nonetheless, the significant differences between groups suggest that, among gay men, individuals with ED have more negative automatic thoughts related to sex, as compared to healthy controls. Therefore, psychological treatments for gay men with ED should incorporate cognitive restructuring to challenge the unrealistic and unbalanced thoughts that gay men with ED have during sex. In addition, behavioural considerations, such as removal of condoms, should be addressed. Finally, given the significant increase in self-focused attention that occurs in individuals with ED, psychological treatments for gay men with ED would benefit from incorporating mindfulness based strategies as an intervention, as this will allow gay men with ED to remain focused on the present moment, rather than scanning their body for the presence and intensity of an erection.

The finding that no between-group differences exist in BSS should be cautiously interpreted. While current treatment protocols (e.g., Wincze & Barlow, 2009) emphasize the

importance of addressing BSS, or myths about sexual performance, the current findings suggest that this may be less important. However, as discussed, there are significant limitations with the measurement of BSS in the current study. Given the heteronormative nature of the measure, in addition to problematic assumptions that all gay men identify exclusively as a "top" or "bottom", the lack of findings a relationship between BSS and ED is likely the result of a measurement error. While future research would benefit from further exploring this, it is likely premature to discontinue to address BSS in psychotherapy for ED.

Finally, the findings of the current study suggest that it remains important to address condom use within the context of psychotherapy for gay men with ED. While no between-group differences were found in condom use, a substantial difference in the rate of removal of condoms prior to the completion of sex was found, wherein 5% of healthy controls endorsed almost always removing condoms prior to the completion of sex, compared to 23.3% of men with ED. Moreover, participants ED were most likely to report that they removed their condoms due to difficulty attaining or maintaining an erection, suggesting that ED directly influenced their decision to remove condoms. This is problematic, particularly among gay men, due to the high rates of sexually transmitted infections within this population (Jena et al., 2010).

In addition, men with ED were significantly more likely to report having used erectile enhancing drugs over the past six months, which have been associated with increased number of sexual partners, (Paul et al., 2005), higher rates of condomless anal sex with casual partners (Sanchez & Gallagher, 2006; Rawstorne et al., 2007), as well as more condomless anal sex with serodiscordant partners (Sherr et al., 2000; Mansergh et al., 2006; Schwarcz et al., 2007; Pantalone et al., 2008). Therefore, although removal of condoms and the use of erectile enhancing drugs may contribute to improved erectile functioning, they also put individuals at

significant risk for contracting a sexually transmitted infection. As such, it is important to have alternative treatments for ED, and to ensure that these treatments are empirically supported and have been adapted for use with gay men.

As such, these results highlight that important considerations which need to be taken into account when designing empirical psychological treatments for gay men with ED. For example, the creation of measures to assess for constructs such as BSS and negative automatic thoughts during sex needed to be created for gay men specifically, rather than adapting heteronormative measures and instructing gay men to fit their sexual experiences into these scripts. This would be best achieved by conducting qualitative interviews with gay men with ED to get a sense of the beliefs and thoughts that they perceive to be particularly distressing. By gaining a better understanding of the overarching BSS that exists within the gay male community, researchers will be able to develop more effective treatment protocols for gay men with ED. In addition, it remains important to incorporate discussions about sexual health more broadly, including the risk of sexually transmitted infections associated with condom removal during sex.

Conclusion

ED is a complex condition, which can be caused by both organic and psychological factors. As a result of the multifaceted nature of ED, it is important to gain a comprehensive understanding of contributing psychological factors of ED in order to develop effective, low-cost, empirically based treatments. This is particularly relevant for gay men, as gay men have been found to have higher rates of ED, relative to straight men. Gay men have previously been largely ignored in the research literature examining targets for treatment of ED. Among gay men with ED, negative automatic thoughts related to sex and beliefs about the importance of a perfect sexual performance are highly prevalent. In addition, gay men are significantly more likely to

report removing condoms prior to the completion of partnered sexual activity, due to difficulty attaining or maintaining an erection. This is problematic as sexually transmitted infections are significantly more prevalent among gay men. Therefore, by developing empirically-based treatments for gay men with ED, there would not only be improvements in overall erectile function, but also reductions in engagement in risky sexual activity, such as condom removal. As such, treatments for gay men with ED should incorporate cognitive restructuring to challenge negative automatic thoughts related to sex, in addition to psychoeducation around condom removal and risk of sexually transmitted infections.

Appendix A: Recruitment materials

STUDY OF PHYSIOLOGICAL SEXUAL AROUSAL IN GAY MEN:
Do you suffer from **sexual arousal difficulties?**

The HIV Prevention Lab at Ryerson University is investigating the relationship between sexual expectations or beliefs and sexual arousal in gay men

Seeking **cisgender gay men** who:

- **are between 18 and 40**
- **have difficulty attaining or maintaining an erection**
- **are comfortable viewing sexually explicit material**

Study participation involves:

- A 15 minute phone screen
- A 1.5 hour visit to the HIV Prevention Lab at Ryerson University
- Having genital temperature measured using thermal imaging technology
- Viewing sexually explicit material

Compensation:

- Participants receive **$50** for participation

This research study has been reviewed and approved by the Ryerson University Research Ethics Board. It is being conducted as part of a PhD dissertation project.

To participate or for more information, please contact us:
416-979-5000 ext. 2180
gqarousalstudy@gmail.com
www.hivprevlab.ca/research/gq-arousal-study

Ryerson University

STUDY OF PHYSIOLOGICAL SEXUAL AROUSAL IN GAY MEN:
How HOT are you?

The HIV Prevention Lab at Ryerson University is investigating the relationship between sexual expectations or beliefs and sexual arousal in gay men

Seeking **cisgender gay men** who:

- **are between 18 and 40**
- **have healthy sexual function**
- **are comfortable viewing sexually explicit material**

Study participation involves:

- A 15 minute phone screen
- A 1.5 hour visit to the HIV Prevention Lab at Ryerson University
- Having genital temperature measured using thermal imaging technology
- Viewing sexually explicit material

Compensation:

- Participants receive **$50** for participation

This research study has been reviewed and approved by the Ryerson University Research Ethics Board. It is being conducted as part of a PhD dissertation project.

To participate or for more information, please contact us:

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gqarousalstudy@gmail.com
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Ryerson University

TELEPHONE SCREENING INTERVIEW

Name (first only) _____ Date of call: _____

Interviewer: _____

Scheduled for: _____ at __ : __ am / pm

(Items with a * indicate exclusion criteria. If caller endorses such an answer, thank them for their time and end call.)

"Hi. This is [name] calling from Ryerson University about the GQ Arousal Study. Is now a good time to speak?" [If not, ask when a better time would be to reach them. Schedule it].

1. Are you calling about a specific research study? **YES** **NO**

If YES, which one?

- ❑ GQ arousal study
- ❑ Other*

[IF YES]: I'd like to tell you a little bit about this study, and then will ask you some questions to assess whether you are eligible to participate at this time. This will take approximately 15-20 minutes. Is that ok?

[IF YES:]

2. How did you hear about this study?

- ❑ Social media (which site:_____ _____)
- ❑ Flier/ ad (where:_____)
- ❑ Word of mouth
- ❑ Other (how:_____)

(If **NO**, schedule a more appropriate time for the interview…)

Basically, we're interested in gaining an understanding of sexual arousal in gay men. In particular, we are hoping to understand how certain sexual expectations or beliefs can contribute to either healthy sexual function or difficulties with sexual arousal in gay men. We'll be assessing the impact of these expectations on both self-reported and physiological sexual arousal, and will be looking at whether these two types of arousal are related. Participation will require completing this 15-20 minute phone interview about your medical and sexual health. If you are eligible, your participation will involve one 1.5 hour visit to our laboratory at Ryerson University. During this testing session, you will complete:

1) A package of questionnaires inquiring about your demographics, your sexual function and satisfaction, your sexual behavior, sexual beliefs and thoughts, and anxiety. These questionnaires will be completed on the computer, and will take about 45 minutes to complete.

2) During your testing session, aside from completing the questionnaires, you will also be required to watch 15 minutes of a neutral film and 15 minutes of a sexually explicit

film showing consenting men engaging in a variety of sexual activities, including kissing, masturbation, mutual oral sex and anal sex. The scenes are quite explicit. These film clips will be displayed on personal and private DVD goggles. So there is no TV in the room – you will have the privacy of being behind the goggles while you watch the videos.
3) As you watch the neutral and sexually explicit films, your genital arousal will be measured using a thermal imaging camera. Now how this works is that it relies on infrared technology, and picks up heat that's emitted from the body, but requires no actual physical contact with your body. It does, however, require removal of the clothing from the waist down in order for the camera to be able to accurately assess for genital temperature. This will occur while you are alone in a room that you will lock from the inside in order to protect your privacy. The thermal imaging camera will be used to measure changes in genital temperature as an indicator of arousal. Participants typically report that they do not notice the camera once the testing session has begun. There will be no one else in the room with you during this procedure.
4) During and after you view the films, you will be asked to rate your feelings about what you have seen.

You will receive $50 for participating in the testing session, and should you withdraw from the study, you will receive full compensation for your participation in the testing session. Any information you give us will of course remain strictly confidential. Either the lead graduate student of this study or a trained research assistant will guide you through the study, and you are free to stop at any point.

Do you have any questions about this study so far? (Screener addresses questions.)

3. Are you interested in continuing with this interview to assess your eligibility to participate in this study? YES
NO*

(**If YES**, continue. **If NO**, thank caller for their time.)

4. To assess whether you are eligible to participate in this study, I will need to ask you some questions about your general medical, urological and sexual history. If any question makes you feel uncomfortable, just let me know and we can stop the interview.

5. How old are you? _____ (Must be between the ages of 18-40)

6. Are you able to read and understand material written in English at the 6^{th} grade level?
YES **NO***
(Must be able to complete questionnaires in English.)

7. Are you currently taking any medications, including vitamins or natural supplements, on a regular basis? **YES**
NO

- **IF YES,** which one(s) and for how long? (clarify purpose/ effects, if unknown)

_____

(exclude those taking medications with known sexual side effects, such as antidepressants, antihypertensives, beta blockers, antipsychotics, H2-receptor antagonists)

8. Have you ever had any major surgeries or injuries (e.g., to your pelvic area) that may have affected your sexual functioning? **YES***
NO
- **IF YES,** specify:_____

9. Are you currently receiving any hormone therapy or treatment? **YES*** **NO**
- **IF YES,** which one(s)?_____
_____

10. Do you have any chronic medical conditions? **YES** **NO**
- **IF YES,** which one(s)? _____
_____

(*exclude those with medical conditions known to affect sexual functioning, such as diabetes, thyroid disorder, stroke, HIV, cardiovascular or neurological disease)*

11. Have you ever been diagnosed with a psychological or psychiatric condition? **YES**
NO
- **If YES**, what was your diagnosis? _____
  - Did you receive treatment? **YES** **NO**
  - **If YES,** are you still receiving treatment for this problem? **YES***

NO
  - Are you still struggling with these difficulties? **YES*** **NO**
  - **IF NO**, when was the last time you had symptoms?_____
_____

(exclude those currently in treatment for or with major psychological difficulties within the past 6 months [e.g., psychosis])

12. Are you currently engaging in sexual activity with one or multiple partners? **YES**
NO
- **If NO**: Have you ever engaged in sexual activity with a partner? **YES**
NO*
- When was the last time you engaged in sexual activity with a partner?_____
- When was the last time you engaged in sexual activity by yourself?___ _____

13. With what sexual orientation do you identify?
13.a. Are you currently in a committed sexual relationship? **YES** **NO**
13b. [IF YES]: How long have you been with your partner_ _____

14a. Have you ever watched sexually explicit material? (e.g., movie/ porn video) **YES**
NO
- **If YES**, how often have you watched sexually explicit material?

_____

➢What types of sexually explicit material do you prefer? _____ _____ (e.g. online videos? Magazines? Erotic clubs? Lesbian/group/hetero? Fetishes? Any particular type of activity you prefer?)

15. Do you feel uncomfortable about or object to the idea of watching a sexually explicit video or movie in a laboratory? **YES***

NO

16. As far as you know, do you have difficulty getting sexually aroused by sexually explicit movies or videos? **YES** **NO**

➢ **If YES**, why?___ _____

[I'd now like to ask you a few questions about some sexual difficulties that people commonly experience. But before I get into the specifics….]

17. Do you believe you are currently experiencing any sexual difficulties? **YES**

NO

If YES, please describe your problem:____ _____

_____

_____

(Are there any other difficulties you think you might be experiencing? When did this begin? Ask for triggers or causal factors at SOME point in the interview)

Circle the relevant categories:

a) low desire b) low physical arousal c) anorgasmia or delayed ejaculation

d) low mental arousal e) sexual/ genital pain f) premature ejaculation g) sexual aversion

18. Over the past 6 months, have you experienced difficulty attaining or maintaining an erection (circle if attaining/ maintaining) until completion of sexual activity with a partner? **YES** **NO**

➢ **18a)** Has this occurred while masturbating? **YES**

NO

➢ **18b)** Are you still experiencing morning erections? **YES**

NO*

➢ **19c)** Has this caused you **concern** or interfered in your relationships? **YES**

NO*

➢ **19d)** When did this difficulty begin? _____

➢ **19e)** How often has this difficulty occurred? _____

➢ **If clarification is needed**, Has this occurred at least 50% of the times that you've attempted to engage in sexual activity, either by yourself or with a partner? **YES**

NO*

➢ **19f)** Has this occurred with other partners or in multiple sexual situations? **YES** **NO***

_____

➢ **19g)** How much of a change (reduction) have you experienced in the rigidity of your erections as compared to how they were before?_____

*(**If yes** to these ED questions, they will be placed in the ED group, and can report other sexual dysfunctions. **If NO** to these ED questions, they must deny problems with the following sexual dysfunctions:)*

---

20. Over the past 6 months, have you experienced difficulties with premature ejaculation, following minimal stimulation before, on, or shortly after penetration? **YES** **NO**

➢ **20a) If YES, specify if** ejaculation occurs *before*, *on* or *during* penetration:_____

➢ **20b)** How long has it typically been taking you to ejaculate?_____

➢ **20c) If < 2 mins,** has this caused you concern or interfered in your relationships? **YES** **NO**

➢ **20d)** When did this pattern begin?_____

➢ **20e)** How often has this difficulty occurred?

_____

➢ **If clarification is needed**, has this occurred at least 50% of the times that you've attempted to engage in sexual activity, either by yourself or with a partner?

YES **NO**

➢ **20f)** In what situations has this difficulty occurred?_____

21a) Over the past 6 months, how often have you experienced positive or pleasurable sexual thoughts or fantasies (per week)?____ _____

21b) Over the past 6 months, would you say that you've experienced little or no interest in sexual activity? **YES** **NO**

➢ **21c)** (**If YES to 21b)** Has this caused you concern or interfered in your relationship? **YES** **NO***

➢ **21d)** When did this pattern begin?_____

➢ **21e)** Have you noticed this lack of interest with other partners or in other sexual situations? **YES NO***

➢ **Specify** situations of disinterest (e.g., masturbating, initiating or seeking out sexual situations, attraction towards potential partners, when not stressed/ fatigued)_____

_____

➢ **21f)** How much of a change (reduction) have you experienced in your level of sexual interest (as compared to how it was before) (%)?

_____

---

22. Over the past 6 months, what percentage of the time have you experienced sexual interest **in response** to being in a sexual situation, such as when a partner initiates sexual activity or you see erotic material?____ _____%_____

➢ **22a)** Has your level of response caused you concern or interfered in your relationship? **YES NO**

➢ **22b)** When did this pattern begin?_____

➢ **22c)** Have you noticed this lack of responsiveness with other partners or in other sexual situations?
(e.g., in response to sexually stimulating material or other sexual opportunities, and when the sexual stimulation is good or equivalent to what's been arousing in the past) **YES NO**
Specify:_____

_____

➢**22d)** How much of a change (reduction) have you experienced in your level of sexual responsiveness (as compared to how it was before) (%)?

_____

---

23. Over the past 6 months, have you experienced difficulty reaching orgasm during sexual activity with a partner? YES NO

➢ **23a) What about while masturbating? YES NO**

➢ **23b) If YES, have you ever been able to reach orgasm? YES NO***

➢ **23c) Over the past 6 months, how often have you been unable to reach orgasm?_____**

➢ **If clarification is needed**, has this occurred at least 50% of the times that you've attempted to engage in sexual activity, either by yourself or with a partner?
YES NO

➢ **23d)** When did this difficulty begin?_____

➢ **23e)** Has this difficulty caused you concern or interfered in your relationship? **YES NO**
➢ **23f)** Has this difficulty occurred with other partners or in other sexual situations? (i.e., when the stimulation is adequate) **YES* NO**
Specify:_____
_____

----
24. Over the past 6 months, have you experienced difficulties with genital pain during intercourse or sexual activity?
YES NO

➢ **24a)** When did this difficulty begin?_____

➢ **24b)** How often has this occurred?
_____
➢ **If clarification is needed**, has this occurred at least 50% of the times that you've attempted to engage in sexual activity, either by yourself or with a partner?
YES NO

➢ **24c)** Has the pain improved through the use of lubricants? **YES NO***
➢ **24d) Where is the pain located?_____**
➢ **24e) Has this difficulty caused you concern or interfered in your relationships? YES NO**
➢ **24f)** Has this difficulty occurred with other partners or in other sexual situations? **YES NO**
(e.g., bike riding, friction, sitting for long periods of time, etc.) Specify pain triggers:_____

_____
_____

(If caller meets all inclusion criteria, the screener informs the participant that they seem eligible, gets contact info and reminds participant that a self-report questionnaire will be emailed to them, which they are to complete and return by email as soon as possible.

Pending appropriate scores, the participant is informed that they will be contacted to schedule a testing session.)

BOOKING SUBJECTS

➢ **When are some good times for you to participate in this study?**
M T W Th F S Su
Times:_____

(Schedule participants according to availability in study calendar. If there are currently no availabilities matching the participant's availabilities, indicate that you will need to call them back when more time slots are available, and ask:

(➢ What are some good times for me to call you?
M T W Th F S Su
Times:_____

- Phone # 1: _____ (Leave a message? ❑ YES ❑ NO)
- Phone # 2: _____ (Leave a message? ❑ YES ❑ NO)
- Email: _____) ** *Only if not scheduled already*

(If the caller does NOT meet inclusion criteria, the screener informs the participant that based on what they've said, the study is not appropriate for them at the time, answers any questions, provides them with any requested referrals and asks them if they wish to be contacted by lab members for future studies that come up that may be more suitable)

Appendix B: Informed Consent Form

Ryerson University
Consent Agreement

You are being invited to participate in a research study. Please read this consent form so that you understand what your participation will involve. Before you consent to participate, please ask any questions to be sure you understand what your participation will involve.

PHYSIOLOGICAL INVESTIGATION OF SEXUAL AROUSAL IN GAY MEN

INVESTIGATORS: This research study is being conducted by Marie Faaborg-Andersen in partial fulfillment of a doctoral dissertation. It is being supervised by Dr. Trevor A. Hart from the Department of Psychology at Ryerson University.

If you have any questions or concerns about the research, please feel free to contact:

Marie Faaborg-Andersen, M.A.
350 Victoria St.
mfaaborg@psych.ryerson.ca
416-979-5000 ext 1-2179

Dr. Trevor A. Hart
350 Victoria St.
trevor.hart@psych.ryerson.ca
416-979-5000 ext 1-2179

PURPOSE OF THE STUDY: This study aims to investigate the relationship between sexual expectations or beliefs and sexual arousal in gay men, aged 18 to 40. The study will recruit 80 participants.

Eligible participants must:

1) Be between the ages of 18 and 40
2) Report not having any chronic medical conditions associated with sexual arousal difficulties
3) Report not currently taking any medications known to effect sexual arousal
4) Have and identify with a flesh male penis
5) Report not having any discomfort with viewing sexually explicit videos
6) Be able to communicate orally and read in English

In addition, 40 participants must report currently having difficulties attaining or maintaining an erection, while the remaining 40 participants must deny any current issues with sexual function.

This research is being completed by a graduate student in partial completion of a PhD in Clinical Psychology, and these results will contribute to their dissertation.

WHAT YOU WILL BE ASKED TO DO: If you volunteer to participate in this study, you will be asked to do the following things:

1) Answer a brief demographic questionnaire, including items on age, gender, sexual orientation, employment status, education level, income, and relationship status, as well as questions pertaining to condom use and erectile-enhancing drug use
2) Answer a number of questionnaires about sexual arousal, sexual expectations, and anxiety
3) You will be shown two video segments. The researcher will not be in the testing room during the film, and the room door will be securely locked so that you may exit at any time, but no one else can enter. The first video will be a neutral film without sexual content. This time period will also allow genital temperature to stabilize and will also allow you to become acclimatized to the setting, and will serve as a baseline measurement of genital temperature. The third video will be sexually explicit in nature, and will consist of two men engaging in sexual activity with one another. During each video you will be asked to continuously monitor your sexual arousal with the use of a computer mouse. In addition, after each video, you will be asked to rate subjective reactions to the film (relaxation, sexual arousal, etc.).
4) You will have your genital area monitored via a non-intrusive heat-sensing camera that will be focused on the genitalia while you watch the film clips. This camera measures temperature change in the genitalia as an indicator of blood flow. The camera remotely detects changes in temperature and does not require direct contact. You will be asked to view the videos after undressing from the waist down and sitting upright on an examination table with your legs apart. The camera will be focused on the penis and will include an area of the inner thigh of the right leg.

If you choose to participate in this study, the laboratory visit will take place at the HIV Prevention Lab at Ryerson University and will take approximately 1.5 hours of your time.

POTENTIAL BENEFITS: There is no direct benefit to you by participating in this study. However, some individuals may find it helpful to answer questions about their thoughts, feelings, behaviours and experiences as a way of gaining greater insight into their own patterns and experiences. Moreover, the results of this study may contribute to a better understanding of the factors leading to erectile dysfunction in gay men. These findings may ultimately help us to improve the sexual lives of healthy and dissatisfied gay men men through redefining norms about sexual experiences, and through improved assessments and treatments for those struggling with sexual problems. As the data becomes published, all journal articles will be posted to the lab website: hivprevlab.ca. As such, interested participants can access the findings through this method.

I cannot guarantee, however, that you will receive any benefits from participating in this study.

WHAT ARE THE POTENTIAL RISKS TO YOU AS A PARTICIPANT: This project involves the removal of articles of clothing from the waist down. The primary risk involved is that some of the above procedures may feel embarrassing and may cause you to feel awkward. If at any point you have any concerns about your health or general well-being you may ask any questions of the researchers or withdraw your participation from the study. Every effort will be made to ensure your comfort during the course of this study. If at any point you experience any distress, please tell the interviewer and they will discuss these feelings with you and/or provide you with some contacts if you would like counseling. Your participation is completely voluntary and you may stop at any time should you feel discomfort. You may also contact the principal investigator to discuss any concerns you may have. In addition, following participation, you will be provided with a list of resources for counseling and community centers. Please consult with the investigator if you have any specific questions about the resources provided.

CONFIDENTIALITY: Every effort will be made to protect the identity of our participants. To ensure confidentiality, identification numbers will be assigned to information to prevent the association of any individual with specific data. A record of identification numbers and accompanying names will be kept in a locked filing cabinet accessible only to the principal investigators. Signed consent forms will be kept in a separate secure location from all other participant information. If a participant chooses to stop participation and to withdraw their data from the study, their information will immediately be shredded. All digital data will stored on a password protected computer in a locked room. Data will be stored for a period of 5 years following study completion and data publication, after which time it will be destroyed. Data publication will consist of dissertation, journal articles, and peer reviewed conference presentations.

INCENTIVES FOR PARTICIPATION: You will receive a total of $50 as reimbursement for expenses incurred by participating in this study (e.g., transport, parking, loss of work, babysitting etc.). Should you decide to withdraw from the study, full compensation will be provided.

By agreeing to participate in this research, you are not giving up or waiving any legal right in the event that you are harmed during the research.

VOLUNTARY PARTICIPATION AND WITHDRAWAL: Participation in this study is completely voluntary. You can choose whether to be in this study or not. If any question makes you uncomfortable, you can skip that question. You may stop participating at any time and you will still be given the incentives and reimbursements described above. If you choose to stop participating, you may also choose to not have your data included in the study. This is also possible following the testing session, permitting that the data has not yet been published. Your choice of whether or not to participate will not influence your future relations with Ryerson

University or the investigators (Marie Faaborg-Andersen, Dr. Trevor Hart and Dr. Tuuli Kukkonen) involved in the research.

QUESTIONS ABOUT THE STUDY: If you have any questions about the research now, please ask. If you have questions later about the research, you may contact:

Dr. Trevor A. Hart
350 Victoria St.
trevor.hart@psych.ryerson.ca
416-979-5000 ext 1-2179

This study has been reviewed by the Ryerson University Research Ethics Board. If you have questions regarding your rights as a participant in this study please contact:

Research Ethics Board
c/o Office of the Vice President, Research and Innovation
Ryerson University
350 Victoria Street
Toronto, ON M5B 2K3
416-979-5042
rebchair@ryerson.ca

PHYSIOLOGICAL INVESTIGATION OF SEXUAL AROUSAL IN GAY MEN

CONFIRMATION OF AGREEMENT:

Your signature below indicates that you have read the information in this agreement and have had a chance to ask any questions you have about the study. Your signature also indicates that you agree to participate in the study and have been told that you can change your mind and withdraw your consent to participate at any time. You have been given a copy of this agreement.
You have been told that by signing this consent agreement you are not giving up any of your legal rights.

_____
Name of Participant (please print)

_____ _____
Signature of Participant Date

I agree to have my genital temperature measured using thermal imaging technology for the purposes of this study. I understand that this requires the removal of clothing from the waist down. I understand how these recordings will be stored and destroyed.

_____
Name of Participant (please print)

_____ _____
Signature of Participant Date

Appendix C: Study Questionnaires

Socio-Demographic Questionnaire

Instructions: Here are some basic questions about YOU. Remember, all of your answers are confidential and you can not be identified by any of the pieces of information you provide on this, or any other sheet in the questionnaire package.

1) Please enter your year of birth: _____

2) Please enter your age: _____

3) My gender is:

- ❑ (Cis) Male
- ❑ Queer
- ❑ Transman
- ❑ Two spirited
- ❑ Other

4) My sexual orientation is:

- ❑ Gay or homosexual
- ❑ Bisexual
- ❑ Queer
- ❑ Straight or heterosexual
- ❑ Two spirited
- ❑ Other

5) My employment status is:

- ❑ Full time employed
- ❑ Part time employed
- ❑ Self-employed
- ❑ Housewife/husband
- ❑ Unemployed
- ❑ Retired
- ❑ Other (please specify) _____

6) The highest level of education I reached/completed is:

- ❑ Did not attend high school
- ❑ Some high school education

- ❑ High school diploma
- ❑ Some university, college or technical school education
- ❑ Bachelor's degree, college diploma, or technical certificate
- ❑ Some graduate or professional school
- ❑ Graduated graduate or professional school

7) My annual income is:

- ❑ Under $20,000
- ❑ $20,000 - $39,999
- ❑ $40,000 - $59,999
- ❑ $60,000 - $79,999
- ❑ Over $80,000

8) I live with: (Check as many as apply to you)

- ❑ By myself
- ❑ Roommate(s)
- ❑ Partner(s) or spouse(s)
- ❑ Parent(s)
- ❑ Grandparent(s)
- ❑ Other Family Member(s) – [e.g. sibling(s), aunt(s), uncle(s), cousin(s)]
- ❑ Child(ren)
- ❑ Group or residential program
- ❑ Other (please specify) _____

9) My current relationship status is (Check as many as apply to you)

- ❑ Single
- ❑ Have a boyfriend(s)
- ❑ Have a girlfriend(s)
- ❑ Living with a male partner(s) for a year or more
- ❑ Living with a female partner(s) for a year or more
- ❑ Have a husband
- ❑ Have a wife
- ❑ Separated/Divorced/Widowed

10) Which ethnicity best describes you? (Check as many as apply to you)

- ❑ White
- ❑ Black
- ❑ Latin American
- ❑ South Asian
- ❑ East/South East Asian
- ❑ Middle Eastern

- ❑ Native/Cree

The following questions pertain to your sexual activity:

11) I identify with the following sex role:

- ❑ Top
- ❑ Top/Versatile
- ❑ Versatile
- ❑ Bottom/Versatile
- ❑ Bottom
- ❑ Other (please specify) _____

12) During the previous 6 months, how often did you use a condom while having receptive anal sex?

None of the time
Almost never/never
A few times (much less than half the time)
Sometimes (about half the time)
Most times (much more than half the time)
Almost always/always

13) During the previous 6 months, how often did you use a condom while having insertive anal sex?

- ☐ 0 None of the time
- ☐ 1 Almost never/never
- ☐ 2 A few times (much less than half the time)
- ☐ 3 Sometimes (about half the time)
- ☐ 4 Most times (much more than half the time)
- ☐ 5 Almost always/always

During the previous 6 months, how often did you remove your condom prior to the completion of sex?

- ❑ 0 None of the time
- ❑ 1 Almost never/never
- ❑ 2 A few times (much less than half the time)
- ❑ 3 Sometimes (about half the time)
- ❑ 4 Most times (much more than half the time)
- ❑ 5 Almost always/always

If answered anything other than “None of the time”:

Which of these responses best describes your reason for removing the condom?
Partner requested I remove it
To intensify pleasure

I was losing my erection
I was having difficulty getting an erection
I decided I felt safe enough not to use a condom with that partner
Other: _____

During the past six months, how often did you use erectile-enhancing drugs (e.g., Viagra, Cialis) during sexual activity?

- ❑ 0 None of the time
- ❑ 1 Almost never/never
- ❑ 2 A few times (much less than half the time)
- ❑ 3 Sometimes (about half the time)
- ❑ 4 Most times (much more than half the time)
- ❑ 5 Almost always/always

If answered anything other than “None of the time”:

Which of these responses best describes your reason for using erectile-enhancing drugs?

To enable me get an erection
To allow me to maintain my erection despite putting on a condom
To offset effects of drugs preventing me from getting an erection
To have sex for longer

Sexually Dysfunctional Beliefs Questionnaire (Gay Male Version)

The list presented below contains statements related to sexuality. Please read each statement carefully and circle the number in the right hand column which correspond to the extent to which you agree or disagree with each statement (circle only one option per statement—from 1—completely disagree to 5—completely agree). There are no wrong or right answers, but it is very important that you be honest and that you answer all items. In this questionnaire, the term "Top" refers to the insertive anal sex partner and the term "Bottom" refers to the receptive anal sex partner.

		Completely	Disagree	Don't disagree or	Agree	Completely Agree
1.	A "real man" has sexual intercourse very often	1	2	3	4	5
2.	Orgasm is only possible by anal sex	1	2	3	4	5
3.	Penile erection is essential for a bottom man's sexual satisfaction	1	2	3	4	5
4.	"Bottom men" have no other choice but to be sexually subjugated by a "top men's" power	1	2	3	4	5
5.	A "real man" must wait the necessary amount of time to sexually satisfy his partner	1	2	3	4	5
6.	A man may have doubts about a partner's virility when he fails to get an erection	1	2	3	4	5
7.	Repeated engagement in oral or anal sex can cause serious health problems	1	2	3	4	5
8.	A shorter duration of intercourse is a sign of a man's power	1	2	3	4	5
9.	Sex is an abuse of a top male's power	1	2	3	4	5
10	The consequences of a sexual failure are catastrophic	1	2	3	4	5
11	Gay men only pay attention to attractive younger men	1	2	3	4	5
12	It is not appropriate to have sexual fantasies during sexual intercourse	1	2	3	4	5
13	There are certain universal rules about what is normal during sexual activity, between two men	1	2	3	4	5
14	In bed the "top man" is the boss	1	2	3	4	5
15	"Top men" who are not capable of penetrating his partner can't satisfy him	1	2	3	4	5
16	In sex, getting to the climax is most important	1	2	3	4	5
17	In sex, anything but anal sex is unacceptable	1	2	3	4	5
18	A man's body is his best weapon	1	2	3	4	5
19	A man may stop loving another man if he is not capable of satisfying him sexually	1	2	3	4	5
20	Anal sex is the only legitimate type of sex	1	2	3	4	5
21	The quality of an erection is what most satisfies gay men	1	2	3	4	5
22	A successful career implies the control of sexual urges	1	2	3	4	5
23	Foreplay is a waste of time	1	2	3	4	5
24	Sex is meant only for procreation	1	2	3	4	5
25	In sex, the quicker/faster the better	1	2	3	4	5
26	People who don't control their sexual urges are more easily controlled by others	1	2	3	4	5
27	A "real man" is always ready for sex and must be capable of satisfying any other	1	2	3	4	5

	man					
28	If a man lets himself go sexually he is under his partner's control	1	2	3	4	5
29	Anal sex is a perverted activity	1	2	3	4	5
30	A "top man" must be capable of maintaining an erection until the end of any sexual activity	1	2	3	4	5
31	There is only one acceptable way of having sex	1	2	3	4	5
32	Sexual intercourse before marriage is a sin	1	2	3	4	5
33	Sex is a violation of a bottom man's body	1	2	3	4	5
34	A man who doesn't sexually satisfy his partner is a failure	1	2	3	4	5
35	Whenever the situation arises, a "proper top man" must be capable of penetration	1	2	3	4	5
36	Sex can be good even without orgasm	1	2	3	4	5
37	A "real man" doesn't need much stimulation to reach orgasm	1	2	3	4	5
38	A gay man at his sexual peak can get whatever he wants from another gay man	1	2	3	4	5
39	The greater the sexual intimacy, the greater the potential for getting hurt	1	2	3	4	5
40	In a relationship between two men, sex comes before love	1	2	3	4	5
41	Gay men must be either the "top" or the "bottom"	1	2	3	4	5
42	If I am not ready for anal sex, I am a bad partner	1	2	3	4	5
43	Erection = sexual performance	1	2	3	4	5
44	Something is wrong with my sex drive if I am not always erect when sexually stimulated	1	2	3	4	5
45	Sex = anal sex	1	2	3	4	5
46	A "good top" always can have/keep an erection during his sexual encounters	1	2	3	4	5
47	If I am not ready for anal sex, I should not have sex	1	2	3	4	5

IIEF-MSM

INSTRUCTIONS: Each of the following questions has several possible answers. Check off the answer that best describes your own situation over the past 4 weeks. Please answer the following questions as honestly and clearly as possible. Your responses will be kept completely confidential. In answering these questions, the following definitions apply:

Sexual activity can include caressing, foreplay, masturbation, and intercourse.
Active Anal intercourse is defined as penetrating (entry) your partner's anus.
Passive Anal intercourse is defined as being penetrated (entry) by your partner.
Sexual stimulation includes situations like foreplay with a partner, looking at erotic pictures, sexual fantasy, etc.
Sexual desire or interest is a feeling that includes wanting to have a sexual experience, feeling receptive to a partner's sexual initiation, and thinking or fantasizing about having sex.
Ejaculate is defined as the ejection of semen from the penis (or the feeling of this)

1. How often were you able to get an erection during sexual activity?
- ☐ 0 No sexual activity
- ☐ 1 Almost never/never
- ☐ 2 A few times (much less than half the time)
- ☐ 3 Sometimes (about half the time)
- ☐ 4 Most times (much more than half the time)
- ☐ 5 Almost always/always

2. When you had erections with sexual stimulation, how often were your erections hard enough for penetration?
- ☐ 0 No sexual activity
- ☐ 1 Almost never/never
- ☐ 2 A few times (much less than half the time)
- ☐ 3 Sometimes (about half the time)
- ☐ 4 Most times (much more than half the time)
- ☐ 5 Almost always/always

3. Have you had, or attempted to have, active anal intercourse (i.e., where you penetrated or attempted to penetrate your partner)?
- ☐ 0 No
- ☐ 1 Yes

4. When you attempted active anal intercourse, how often were you able to penetrate (enter) your partner?

- ☐ 0 Did not attempt intercourse
- ☐ 1 Almost never/never

☐ 2 A few times (much less than half the time)
☐ 3 Sometimes (about half the time)
☐ 4 Most times (much more than half the time)
☐ 5 Almost always/always

5. During active anal intercourse, how often how were you able to maintain your erection after you had penetrated (entered) your partner?

☐ 0 Did not attempt intercourse
☐ 1 Almost never/never
☐ 2 A few times (much less than half the time)
☐ 3 Sometimes (about half the time)
☐ 4 Most times (much more than half the time)
☐ 5 Almost always/always

6. During active anal intercourse, how difficult was it to maintain your erection to completion of intercourse?

☐ 0 Did not attempt intercourse
☐ 1 Extremely difficult
☐ 2 Very difficult
☐ 3 Difficult
☐ 4 Slightly difficult
☐ 5 Not difficult

7. Have you had, or attempted to have, passive anal intercourse (i.e., where you were penetrated by your partner)?
☐ 0 No
☐ 1 Yes

8. During passive anal intercourse, how often were you able to maintain your erection after you had been penetrated (entered) by your partner?

☐ 0 Did not attempt intercourse
☐ 1 Almost never/never
☐ 2 A few times (much less than half the time)
☐ 3 Sometimes (about half the time)
☐ 4 Most times (much more than half the time)
☐ 5 Almost always/always

9. During passive anal intercourse, how difficult was it to maintain your erection to completion of intercourse?

☐ 0 Did not attempt intercourse
☐ 1 Extremely difficult
☐ 2 Very difficult
☐ 3 Difficult
☐ 4 Slightly difficult
☐ 5 Not difficult

10. During non-intercourse sexual activity (e.g., masturbation, oral sex), how often were you able to maintain your erection until the completion of sexual activity?

☐ 0 Did not attempt intercourse
☐ 1 Almost never/never
☐ 2 A few times (much less than half the time)
☐ 3 Sometimes (about half the time)
☐ 4 Most times (much more than half the time)
☐ 5 Almost always/always

11. How many times have you had or attempted to have sexual intercourse or other sexual activity?

☐ 0 No attempts
☐ 1 One to two attempts
☐ 2 Three to four attempts
☐ 3 Five to six attempts
☐ 4 Seven to ten attempts
☐ 5 Eleven+ attempts

12. When you had or attempted to have sexual intercourse or other sexual activity, how often was it satisfactory for you?

☐ 0 Did not attempt intercourse
☐ 1 Almost never/never
☐ 2 A few times (much less than half the time)
☐ 3 Sometimes (about half the time)
☐ 4 Most times (much more than half the time)
☐ 5 Almost always/always

13. How much have you enjoyed sexual intercourse or other sexual activity?
☐ 0 No intercourse
☐ 1 No enjoyment
☐ 2 Not very enjoyable
☐ 3 Fairly enjoyable
☐ 4 Highly enjoyable
☐ 5 Very highly enjoyable

14. When you had sexual stimulation or intercourse, how often did you ejaculate?

☐ 0 No sexual stimulation/intercourse
☐ 1 Almost never/never
☐ 2 A few times (much less than half the time)
☐ 3 Sometimes (about half the time)
☐ 4 Most times (much more than half the time)
☐ 5 Almost always/always

15. When you had sexual stimulation or intercourse, how often did you have the feeling of orgasm or climax with or without ejaculation?

☐ 0 No sexual stimulation/intercourse
☐ 1 Almost never/never
☐ 2 A few times (much less than half the time)
☐ 3 Sometimes (about half the time)
☐ 4 Most times (much more than half the time)
☐ 5 Almost always/always

16. How often have you felt sexual desire?
☐ 1 Almost never/never
☐ 2 A few times (much less than half the time)
☐ 3 Sometimes (about half the time)
☐ 4 Most times (much more than half the time)
☐ 5 Almost always/always

17. How would you rate your level of sexual desire?
☐ 1 Very low/ none at all
☐ 2 Low
☐ 3 Moderate
☐ 4 High
☐ 5 Very high

18. How satisfied have you been with your overall sex life?
☐ 1 Very dissatisfied
☐ 2 Moderately dissatisfied
☐ 3 Equally satisfied and dissatisfied
☐ 4 Moderately satisfied
☐ 5 Very satisfied

19. How satisfied have you been with your sexual relationship with your regular partner?

☐ 1 Very dissatisfied
☐ 2 Moderately dissatisfied

☐ 3 Equally satisfied and dissatisfied
☐ 4 Moderately satisfied
☐ 5 Very satisfied
☐ 6 I do not have a regular partner

20. How do you rate your confidence that you could get and keep an erection?
☐ 1 Very low
☐ 2 Low
☐ 3 Moderate
☐ 4 High
☐ 5 Very high

21. How often do you wake up with an erection?
☐ 0 None of the time
☐ 1 Almost never/never
☐ 2 A few times (much less than half the time)
☐ 3 Sometimes (about half the time)
☐ 4 Most times (much more than half the time)
☐ 5 Almost always/always

22. When you masturbated, how often could you get an erection?
☐ 0 No masturbation
☐ 1 Almost never/never
☐ 2 A few times (much less than half the time)
☐ 3 Sometimes (about half the time)
☐ 4 Most times (much more than half the time)
☐ 5 Almost always/always

Sexual Modes Questionnaire – Male Version

The items presented below are a list of thoughts one can have during sexual activity. In the first column, please indicate the frequency of which you experience these thoughts by circling a number (1-never to 5-always).

THOUGHTS					
TYPE OF THOUGHTS	FREQUENCY				
	Never	Seldom	Sometimes	Often	Always
SM	1	2	3	X	5

THOUGHTS					
TYPE OF THOUGHTS	FREQUENCY				
	Never	Seldom	Sometimes	Often	Always
1. It would be better to die than to be like this	1	2	3	4	5
2. This time I cannot disappoint my partner	1	2	3	4	5
3. He will replace me with another guy	1	2	3	4	5
4.I'm condemned to failure	1	2	3	4	5
5. I must be able to have intercourse	1	2	3	4	5
6. This is not going anywhere	1	2	3	4	5
7. I'm not satisfying him	1	2	3	4	5
8. I must achieve an erection	1	2	3	4	5
9. I'm not penetrating my partner	1	2	3	4	5
10. My penis is not responding	1	2	3	4	5
11. Why isn't this working?	1	2	3	4	5
12. I wish this could last longer	1	2	3	4	5
13. What is he thinking about me?	1	2	3	4	5
14. These movements and positions are fabulous	1	2	3	4	5
15. What if others knew I'm not capable…	1	2	3	4	5
16. If I fail again I am a lost cause	1	2	3	4	5
17. I'm the happiest man on earth	1	2	3	4	5
18. This is turning me on	1	2	3	4	5
19. If I don't climax now, I won't be able to later	1	2	3	4	5
20. He is not being as affectionate as he used to	1	2	3	4	5
21. He doesn't find my body attractive anymore	1	2	3	4	5
22. I'm getting old	1	2	3	4	5
23. This is disgusting	1	2	3	4	5
24. This way of having sex is immoral	1	2	3	4	5

25. Telling him what I want sexually would be unnatural	1	2	3	4	5
26. He is really turned on	1	2	3	4	5
27. I must show my virility	1	2	3	4	5
28. It will never be the same again	1	2	3	4	5
29. If I can’t get an erection, I will be embarrassed	1	2	3	4	5
30. I have other more important matters to deal with	1	2	3	4	5

Non-Erotic Cognitive Distraction Questionnaire

People often have thoughts during their sexual encounters that detract from the quality of the experience. Please respond to the following items in reference to the last few times you have engaged in sexual activity.

	Never	Rarely	Sometimes	Often	Always
1. During sexual activity, I worry about how my body looks.	**1**	**2**	**3**	**4**	**5**
2. It is difficult to enjoy sex because of my concerns over how my body appears to my partner.	**1**	**2**	**3**	**4**	**5**
3. During sexual activity, I think about how unattractive my body is.	**1**	**2**	**3**	**4**	**5**
4. During sexual activity, I worry that my partner will get turned off by seeing my body without clothes.	**1**	**2**	**3**	**4**	**5**
5. During sexual activity, I prefer to be in a position such that my partner cannot see my body.	**1**	**2**	**3**	**4**	**5**
6. During sexual activity, I worry that my partner may not enjoy the activity with me.	**1**	**2**	**3**	**4**	**5**
7. During sexual activity, I worry that my partner will not have an orgasm.	**1**	**2**	**3**	**4**	**5**
8. I worry about whether my actions are satisfying my partner during sexual activity.	**1**	**2**	**3**	**4**	**5**
9. During sexual activity, I am distracted by thoughts about my sexual performance.	**1**	**2**	**3**	**4**	**5**
10. During sexual activity, I have concerns that someone may see or catch me in the act.	**1**	**2**	**3**	**4**	**5**
11. I worry about getting a sexually transmitted disease (STD) during sexual activity.	**1**	**2**	**3**	**4**	**5**
12. I worry about getting AIDS during sexual activity.	**1**	**2**	**3**	**4**	**5**
13. During sexual activity, I worry that someone may overhear what I am doing.	**1**	**2**	**3**	**4**	**5**
14. During sexual activity, I feel guilty about having sex.	**1**	**2**	**3**	**4**	**5**
15. During sexual activity, I feel like I am doing something immoral or sinful.	**1**	**2**	**3**	**4**	**5**

STICSA: Your Mood at This Moment

Below is a list of statements which can be used to describe how people feel. Beside each statement are four numbers which indicate the degree with which each statement is self-descriptive of mood at this moment (e.g., 1 not at all, 4 very much so). Please read each statement carefully and circle the number which best indicates how you feel right now, at this very moment, even if this is not how you usually feel.

	Not at all	A little	Moderately	Very much so
1. My heart beats fast	1	2	3	4
2. My muscles are tense	1	2	3	4
3. I feel agonized over my problems.	1	2	3	4
4. I think that others won't approve of me.	1	2	3	4
5. I feel like I'm missing out on things because I can't make up my mind soon enough.	1	2	3	4
6. I feel dizzy.	1	2	3	4
7. My muscles feel weak.	1	2	3	4
8. I feel trembly and shaky.	1	2	3	4
9. I picture some future misfortune.	1	2	3	4
10. I can't get some thought out of my mind.	1	2	3	4
11. I have trouble remembering things.	1	2	3	4
12. My face feels hot.	1	2	3	4
13. I think that the worst will happen.	1	2	3	4
14. My arms and legs feel stiff.	1	2	3	4
15. My throat feels dry.	1	2	3	4
16. I keep busy to avoid uncomfortable thoughts.	1	2	3	4
17. I cannot concentrate without irrelevant thoughts intruding.	1	2	3	4
18. My breathing is fast and shallow.	1	2	3	4
19. I worry that I cannot control my thoughts as well as I would like to.	1	2	3	4
20. I have butterflies in the stomach.	1	2	3	4
21. My palms feel clammy.	1	2	3	4

Date:_____
Group:_____
Tick #:_____

Post-Erotic Film Questionnaire

Please circle the number that best describes your experience:

1. Overall, how relaxed did you feel during this film?

0	1	2	3	4	5	6	7	8	9	10
not at all relaxed										The most relaxed I've ever felt

2. Overall, how much did you enjoy the film?

0	1	2	3	4	5	6	7	8	9	10
not at all										The most enjoyable film I've ever seen

3. Overall, how anxious did you become during this film?

0	1	2	3	4	5	6	7	8	9	10
not at all anxious										The most anxious ever been

4. Overall, how funny did you find this film?

0	1	2	3	4	5	6	7	8	9	10
not at all funny										Funniest film I've ever seen

5. Overall, how distracted did you feel during this film?

0	1	2	3	4	5	6	7	8	9	10
not at all distracted										The most distracted I've ever been

6. Overall, how sexually aroused did you become during this film?

0	1	2	3	4	5	6	7	8	9	10
not at all sexually aroused										The most sexually aroused I've ever been

Appendix D: Referral Resources

PHYSIOLOGICAL INVESTIGATION OF SEXUAL AROUSAL IN GAY MEN

Resources

Crisis & Emergency Phone Lines

In the event of an emergency in which you feel you are at risk for hurting yourself, please call 911 or go to the nearest emergency room immediately.

Toronto Police Service
For fire department, police, ambulance, or mental health crisis unit
9-1-1

Toronto Distress Centre
For suicide and mental health crisis response and intervention
416-408-HELP (4357)

Gerstein Crisis Centre
For suicide and mental health crisis response and intervention
416-929-5200

Trans Life Line
Crisis line for trans and gender-questioning people, staffed by trans-identified volunteers 24 hours/day
1-877-330-6366

LGBT Youth Line
Online, telephone, and text-based peer support services for LGBTQ youth
1-800-268-9688
http://www.youthline.ca/

Counseling Options for Sexual Dysfunction

Step Stone Psychology
Private practice specializing in LGBTQ populations and sexual dysfunctions.
416 551 7284 (PATH)
1033 Bay Street, Suite 221,
Toronto, ON, M5S 3A5
http://www.stepstonepsychology.com/

Centre For Interpersonal Relationships
Private practice specializing in sexual dysfunctions and relationship issues.
10 St Mary St,

Toronto, ON M4Y 1P9
1 855-779-2347
http://www.cfir.ca/torontolocation.php

Men Therapy Toronto
Private practice specializing in men's health, with a focus on sexual dysfunction.
2300 Yonge Street, Suite 1600
Toronto, ON
647-677-8281
http://mentherapytoronto.com

KMA Therapy
Private practice specializing in sexual dysfunctions with two locations:

Liberty Village
60 Atlantic Avenue
Toronto, Ontario
416-487-6288
https://www.kmatherapy.com/index.html

King West
500 King Street West
Toronto, Ontario
416-487-6288
https://www.kmatherapy.com/index.html

Couples In Step Counseling
Private practice specializing in sexual dysfunctions and relationship issues.
14 Purdon Dr.,
Toronto, ON M3H 4W8
416-459-0956
https://couplesinstep.com/

LGBTQ Specific Counseling

Making the Links
Short-term counselling for gay, bi, and queer men, including trans men, who face difficulties engaging in safer sex and/or have recently tested positive for HIV
Hassle Free Clinic
66 Gerrard Street East, 2nd Floor
416-922-3549 x 128
http://hasslefreeclinic.org/home/men-trans-clinic/making-the-links/

ACT Drop-In Counselling
Drop-in counselling for people living with HIV and people affected by HIV, including people concerned about their risks for HIV

ACT
543 Yonge Street, 4th Floor
416-340-2437
http://www.actoronto.org/programs-services/counselling

David Kelley Services
Ongoing and walk-in counselling for LGBTQ people and people living with, affected by, or concerned about HIV; waitlist in effect for ongoing counselling
Family Service Toronto
128A Sterling Road, Suite 202
416-595-9618
http://familyservicetoronto.org/our-services/programs-and-services/david-kelley-services/

Egale Youth OUTreach
Counselling and peer support services for LGBTQ youth up to age 29
Egale Youth OUTreach
290 Shuter Street
416-964-7887 x 9
https://egale.ca/outreach/

Trauma Informed Counselling Services
Short-term, ongoing counselling for LGBTQ people; waitlist in effect
The 519 Church Street Community Centre
519 Church Street
416-392-6878 x 4000
http://www.the519.org/programs/community-counselling

Counseling Options for Anxiety (Private Practice)

The Clinic on Dupont
Private practice specializing in CBT for anxiety, depression, couples therapy, and other mental health concerns.
101 Dupont Street
416-515-2649
http://www.theclinicondupont.com/

CBT Associates: Cognitive Behavioural Therapy Toronto
Private practice specializing in CBT for anxiety, depression, and other mental health concerns with multiple locations:
647-693-8187
http://www.cbtassociates.com/

Toronto
85 Richmond Street West, Suite 900

Etobicoke
3250 Bloor St. West, East Tower, 6th Floor

North York
4950 Yonge Street, Suite 1810

Aurora
2 Orchard Heights Blvd., Unit 41

EBT3: Evidence-Based Therapy, Training & Testing
Private practice specializing in CBT for anxiety, depression, couples therapy, and other mental health concerns.
2 Carlton Street, Suite 1803
416-628-4336
http://www.ebt3.com/

Substance Use & Harm Reduction

The Works
Harm reduction supplies and counselling, opioid substitution (methadone) clinic, and testing and vaccinations
Toronto Public Health
277 Victoria Street, Ground Floor
416-392-0520
https://www1.toronto.ca/wps/portal/contentonly?vgnextoid=3732be9b82e0b410VgnVCM10000071d60f89RCRD

SPUNK!
Support group for gay, bi, and queer men, including trans men, who want to make positive changes regarding drug use
ACT
543 Yonge Street, 4th Floor
416-340-8484 x 235
http://www.actoronto.org/programs-services/groups#spunkforgaymenwhowanttomakechangesintheirsubstanceuse

Crystal Meth Anonymous Toronto
Fellowship of people who share their experience, strength, and hope with each other to recover from addiction to crystal meth
The 519 Church Street Community Centre
519 Church Street
416-392-6874
http://www.the519.org/programs/crystal-meth-anonymous

Rainbow Services
Assessment and referrals, individual and group therapy, weekly support groups, relapse prevention, psychiatric consultations, and concurrent disorder programs for LGBTQ people
Centre for Addiction and Mental Health
60 White Squirrel Way, 4th Floor
416-535-8501
http://www.camh.ca/en/hospital/care_program_and_services/addiction_programs/Pages/guide_rainbow_services.aspx

Bellwood Health Services
Treatment centre for addiction and mental health disorders; detox programs, inpatient and outpatient programs, and family programs available
Bellwood Health Services
175 Brentcliffe Road
1-800-495-6198
http://edgewoodhealthnetwork.com/locations/bellwood

Sexual Health Clinics

Hassle Free Clinic
Medical and counselling services for a variety of sexual health issues, with separate clinics for men/trans people and women/trans people
Hassle Free Clinic
66 Gerrard Street East, 2nd Floor
416-922-0566
http://hasslefreeclinic.org/

Planned Parenthood Toronto
Community health centre that provides primary, sexual/reproductive, and mental health services for youth ages 13-29
Planned Parenthood
36B Prince Arthur Avenue
416-961-0113
http://www.ppt.on.ca/

Walk-In Clinics & Community Health Centres

MCI The Doctor's Office at Atrium
Walk-in medical clinic in downtown Toronto
595 Bay Street, Lower Level
416-598-1703
http://mcithedoctorsoffice.ca/patients/35-clinic-Atrium

Church Wellesley Health Centre
Comprehensive care clinic, including walk-in medical services, located in Toronto's Church-Wellesley village

491 Church Street, Suite 200 (2nd Floor)
416-463-1500
http://www.cwhealth.ca/

Church & Carlton Medical & Walk-In Centre
Medical walk-in clinic located near Toronto's Church-Wellesley village
Mattamy Athletic Centre/Loblaws
60 Carlton Street
416-646-1890

Sherbourne Health Centre
Community health centre specializing in the health of LGBTQ, newcomer, and urban populations
333 Sherbourne Street
416-324-4180
http://sherbourne.on.ca/

South Riverdale Community Health Centre
Harm reduction services, counselling, anonymous HIV testing, and other health promotion/community programs for the South Riverdale community
955 Queen Street East
416-461-1925
http://srchc.ca/

Regent Park Community Health Centre
Harm reduction services, counselling, and other health promotion/community programs for the Regent Park community
465 Dundas Street East
416-364-2261
http://regentparkchc.org/

Parkdale Community Health Centre
Harm reduction services, counselling, anonymous HIV testing, and other health promotion/community programs for the Parkdale community
1229 Queen Street West
416-537-2455
http://www.pchc.on.ca/

Queen West/Central Toronto Community Health Centre
Harm reduction services, counselling, anonymous HIV testing, and other health promotion/community programs for people located in the central Toronto area
168 Bathurst Street
416-703-8482
http://ctchc.org/

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Footnotes

[1]Given that some of the subscales had Cronbach alpha's < .60, all results were replicated, removing the subscales with alphas < .60. However, there were no differences found in the overall pattern of results, and therefore, the results were presented with these subscales included.