

Love on the Brain: The Impact of Sexual Arousal on Sexual Decision-making

BY

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A thesis

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Acknowledgments

A powerful king once asked his wisemen to “Create for me a ring such that when I am happy, and I look at the ring, I will become sad and when I am sad, I will look upon the ring and be happy”. The wise men went away for six months and when they returned, they gathered before the king and presented him with a simple, silver ring adorned only with a short phrase that read “This, too shall pass”.

I believe this quote perfectly exemplifies emotion, as no emotion whether good or bad lasts forever.

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Abstract

Does sexual arousal predict riskier sexual decision-making? A study by Ariel and Lowenstein (2006) first investigated this relationship and found that sexual arousal significantly increased sexually risky and aggressive behaviour. The primary aim of our study was to replicate the findings of Ariel and Lowenstein (2006) using both male and female participants ($N = 91$). Our study also investigated the role of trait impulsivity and sexual decision-making, as well as examining the physiological and self-report concordance of arousal. Sexually explicit video clips as well as hypothetical romantic scenarios were used to evaluate the effects of sexual arousal on sexual risk-taking intentions. Additional anger, amusement and neutral conditions were used as comparison conditions. The findings from this study suggests that sexual arousal impacted sexual decision-making but to a lesser degree than what was found in Ariely & Loewenstein (2006). Impulsivity was also shown to be a significant factor within this relationship as individuals higher in trait impulsivity, self-reported riskier sexual decisions. Physiological and self-report measures showed no concurrency. Taken together, these findings suggest that in scenarios where both men and women are sexually aroused, they may lower their inhibition and experience impaired decision-making. This effect becomes further compounded if individuals are also high in trait impulsivity. This interaction may have a negative impact during sexual encounters and be a key contributor to the STI and sexual violence pandemic.

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The Issue

The world health organisation has declared sexual violence a “global public health problem of epidemic proportions” (World Health Organisation [WHO], 2013, p.3). Sexual violence and abuse have been associated with higher levels of guilt, shame, self-blame, eating disorders and numerous other mental disorders (Borumandnia et al., 2020). Whilst drugs and alcohol are known to contribute to sexual violence; we often underestimate the effect of visceral emotions such as anger and sexual arousal that affect our inhibitory control. Inhibitory control refers to regulating emotions either before they unfold via cognitive pathways, through reappraisal, attention deployment, or by suppressing behaviours after they have been activated. However, if sexual arousal is initiated, individuals may use avoidant actions or suppression mechanisms. However, if these inhibitory mechanisms are not activated, it may lead to potentially dangerous and reckless behaviours. Thus, the complex interplay between the cognitive, emotional, and physiological processes produces a balance of inhibitory and excitatory mechanisms that can both facilitate and suppress behaviours (Rodriguez-Nieto et al., 2019). However, heightened levels of sexual arousal have been shown to override the reasoning processes leading to distorted beliefs and disruption in self-control (Pham, 2007). Thus, further research is required to uncover the cognitive and physiological processes leading to risky and irresponsible decision-making.

A Review of The Theories of Emotion

The field of emotion research has been widely explored over the decades. Yet despite the enormous amount of scientific literature surrounding emotion, key terms such as arousal and valence are often misconstrued. Much of this confusion is due to the wide variety of approaches and understanding of emotion. A commonality in most theories is that emotion is essential to the human experience and is a foundational element of the human conscious. Whilst theorists agree that emotion is essential to the human experience, pinpointing emotion to a specific

definition has led to the formation of several theoretical models attempting to conceptualise emotion to extrapolate its core purpose. These range from theories suggesting emotion as a motivational influencer, an initiator of behaviours, such as the pursuit of nutrition, reproduction, and a fight-or-flight response (Moors, 2009).

Defining Emotion

The most widely accepted definition of emotion is the coordinated activity of subjective, physiological and behavioural systems that become activated in response to external and internal stimuli (Barrett, 2009). Emotions serve an adaptive function in that they prepare us to deal with present challenges and scenarios by filtering and appraising situations using information from previous experiences (Scherer, 2009). Humans can experience a wide range of emotions that fluctuate to environmental needs. Positive and negative emotions serve adaptive functions, with emotions such as anger providing the necessary motivation to overcome obstacles or aversive situations (Williams, 2017). The hedonic tone of emotions is defined as "*valence*". Emotions can be described as positively or negatively valenced, with emotions such as happiness and joy having positive valence, whilst emotions such as anger, fear and disgust are considered negatively valenced. Individual emotions, both positive and negative, greatly vary in strength, as a single emotion such as anger can range from minor irritation to full-on outrage. This "*energy*" difference is conceptualised as arousal. Early theories of arousal defined it as the dimension between tension and relaxation, but more recent arousal models refer to arousal as the strength, intensity or excitement of an associated emotion (Barrett & Russell, 1999; Russell, 2009; Storbeck & Clore, 2008).

The Affect Grid was produced using the core components of valence and arousal. The Affect Grid was introduced by (Russell et al. (1989) and was initially designed as a quick assessment tool for assessing affect. The Affect Grid is composed of two dimensions, valence and arousal. Valence is marked along the x-axis, and arousal is marked along the y-axis.

Emotions such as sadness, which have a low arousal rating and negative valence, are marked in the bottom left corner of the grid, and emotions such as excitement have high arousal and positive valence is marked in the top right. Despite the affect grid providing an adequate description of individual underlying components that form emotion, it oversimplifies emotion, simplifying it to only arousal and valence. Moreover, terms such as arousal can be further differentiated into physiological arousal and emotional arousal. Whilst, Russel (1989), in his conceptualisation of arousal, refers to arousal as a physiological experience. Research on physiological arousal shows elevated levels can cause the body to go into a state of heightened responsiveness and activation of various parasympathetic systems (Niven & Miles, 2013). This idea of physiological arousal has been well researched, with numerous studies investigating galvanic-skin response, heart rate and pupil dilation in relation to arousal. However, this level of scientific exploration has not occurred within emotional arousal, despite even early theories hypothesising the existence of emotional arousal (Cannon, 1929).

Early Models of Emotion

Somatic theories of emotion, such as the James-Lange theory, suggest that bodily responses rather than cognitive interpretation cause emotion (James, 1884). James (1884) argues that emotions are secondary to physiological responses, and it is the activation of the autonomic nervous system (ANS)/arousal that produces the emotional experience in the brain. This theory rejects the idea of emotional arousal as an underlying mechanism for emotion, emphasising arousal purely as a physiological experience. The Cannon-Bard theory builds on the James-Lang theory agreeing that physiological responses were crucial in emotional responses, but physiological responses alone could not explain the subjective emotional experiences (Cannon, 1929). Cannon (1929) argued that physiological responses were too slow and could not account for the rapid and intense subjective changes in emotional experience. Thus this process must pass through conscious experience first. For this to occur, external stimuli activate receptors

within the thalamus, and it is the firing of the neurons in the thalamus that is responsible for both the emotional experience and the physiological responses (Cannon, 1929). This theory argues that the thalamic region coordinates emotional reactions, allowing bodily and emotional changes to coincide. Whilst, this theory does well to bridge the gaps found within the James-Lang theory, it assumes that physical responses do not influence emotions, yet research into emotional expression shows that emotion can be induced simply by expressing specific facial expressions (Laird & Lacasse, 2014). The vast amount of research conducted on facial expression has shown that facial expressions can produce emotional feelings of anger, sadness, fear, and happiness (Duclos et al., 1989; Flack et al., 1999; Strack et al., 1988). Moreover, the Canon-Bard theory limits the emotional processes to just the thalamus and underutilises other brain structures. Whilst the thalamic region is important for emotional responses, other core brain structures such as the amygdala have been shown to be essential in processing pleasant and negative emotions (Weymar & Schwabe, 2016). However, in contrast to the James-Lange theory of emotion, the Canon-Bard theory supports the existence of emotional arousal and emphasises it as the initiator of emotional experience.

Two Factor Approach

Later theories of emotion use a two-factor approach, with researchers such as Schachter & Singer (1962) proposing the two-factor cognitive-arousal theory. Schachter & Singer (1962) propose that physiological arousal triggers cognitive interpretation where individuals determine what emotion is appropriate by linking the arousal experienced with external stimuli and using cognitive appraisal, label the experience to an emotion. More simply, the two-factor theory argues that the arousal we experience is the same in every emotion and that all emotions are differentiated only by cognitive appraisal. Thus the experience of emotion is firstly determined by the intensity of the arousal, and then cognitive appraisal determines the typology of the emotion (Schachter & Singer, 1962). Research examining this theory by Schachter &

Singer (1962) injected male participants with either epinephrine or a placebo (saline solution) and were told they were testing a new drug. Participants were then placed in a room with a confederate, who either acted angry or euphoric. Participants unaware of the side-effects were more susceptible to the confederates' mood, showing anger or happiness when they had no explanations for their bodily states. This provides empirical support for the two-factor approach as anger and happiness are contrasting emotions with converse valences producing distinct emotional experiences. However, a flaw of choosing these emotions is that they hold similar levels of arousal, which according to Schachter & Singer (1962), is the trigger for cognitive appraisal. Thus, it may be lower arousal emotions such as sadness may be interpreted differently through cognitive appraisal. Moreover, an attempted replication of this study by Marshall & Zimbardo (1979) found that whenever individuals felt heightened physiological arousal, it more often produced negative affect, and the affective tone of the social environment had minimal effect on individual arousal, suggesting negative affect may serve as a default state when subjected to uncertainty. Thus greater examination is needed into the underlying mechanisms of arousal, to better understand the physiological and cognitive interplay contributing to emotional experience.

Somatic Marker Hypothesis (SMH)

Building of the physiological models of emotion such as the James-Lang model, Damasio (1994) argues that emotion is the process of physiological change in the body, which is then relayed to the brain (ventromedial prefrontal cortex), where it becomes emotion. Over time, this process creates "somatic markers" related to specific stimuli. The activation of these somatic markers and corresponding emotions can be consciously or unconsciously associated with past experiences, influencing decision-making. For instance, if a negative somatic marker is activated, an individual may feel sad or anxious, thereby leading the individual to disengage from the associated behaviour. Thus, emotions directly respond to physiological activations,

such as changes in heart rate, sweat, and muscle tone. Despite some experimental evidence supporting the SMH hypothesis (Iowa gambling task and ventromedial prefrontal cortex lesions), the theory lacks external cohesion. One key critique is that it overlooks the role of working memory, as the SMH assumes somatic markers influence decision-making, but Hinson et al. (2002) identified that deficits in working memory could also lead to deficits in decision-making. However, despite the SMH's flaws, it holds many commonalities to previous theories such as James-Lang's theory of emotion and Schachter & Singer's (1962) two-factor approach, which emphasises physiological arousal as the primary initiator of emotion.

Barret's Theory of Constructed Emotion

More recent theories of emotion, such as Barrett's theory of constructed emotion, suggests emotions are not hardwired; that humans are not built with emotional circuits that are specifically designed to detect and manage emotion but rather the emotions we feel and detect in others and ourselves are culturally and socially calibrated through experience (Barrett, 2006). Barret (2017) analogises that emotional experience is similar to how individuals experience colour. Colours are experienced by all people from all cultures and are placed into discrete categories; blue, red, yellow. However, the physics of colour remains constant in that it is measured using wavelengths broken down into nanometres along a scale from ultraviolet to infrared. Despite the objectivity of colours in terms of wavelengths, when an individual experiences an object as red, they use previously established colour schemas to categorise the wavelength into the classification of red. Similarly, according to the theory of constructed emotion, emotions are considered in discrete categories such as happiness, sadness and anger. These emotions can be measured using the continuous scale of affect (arousal and valence). Barrett's theory of constructed emotion suggests that at any given moment, our brain categorises present affect via interoceptive predictions and uses earlier established emotion schemas from one's culture to construct the phenomenological experience of emotion. Using this model,

physical expressions of emotions such as crying to display sadness or smiling to express happiness are meaningless without earlier contextual knowledge of what these expressions mean. Thus Barret's model of emotion emphasises cultural heuristics that allow us to quickly identify internal and external emotions as the foundations of emotion rather than inbuilt circuitry that predisposes us to emotional experiences. Barret's theory of constructed emotion holds many similarities to Schachter & Singer's (1962) cognitive appraisal model as both emphasise internal appraisal systems as the underlying mechanism for emotion. However, Barret (2017) models reliance on cultural knowledge and provides an inadequate rationale for how an individual unlearns and relearns emotional concepts when encountering new and possibly conflicting cultures. This is especially a problem in today's era of interconnectivity, as individuals can learn and experience cultures virtually, allowing for more instances of conflicting information to be encountered.

Where Does Arousal Fit In?

When reviewing the wide variety of theories that attempt to conceptualise and understand emotion, the majority of models hold arousal as a central component of emotion. However, even within these theories, arousal is conceptualised in many different ways. Early theories by James-Lange and more recent models by Damasio (1994) argue that physiological responses are essential to emotional experience and that the ANS essentially is the backbone of emotion. Yet, in contrast to this, Cannon-Bard's theory puts forward the notion that physiological arousal alone cannot explain the emotional experience as these are too slow and thus unable to account for the subjective changes in emotional experience. Cannon-Bard supports the concept that emotional arousal triggers the thalamus, which is seen as the coordinating centre, allowing physiological changes to transpire. Alternative theories such as Schachter & Singer (1962) propose a dual-factor approach triggered by physiological arousal, causing cognitive appraisal to occur. Cognitive appraisal pulls both internal and external cues to determine emotion. This

process is not too dissimilar to Barrett's theory of constructed emotion, where the experience of emotion is the interpretation of affect through prior cultural and experiential knowledge.

When reflecting upon the multitude of theories, it is easy to be overwhelmed by the complexity and nuance of each theory and overlook theoretical commonalities. Both Barret (2017) and Schachter & Singer (1962) refer to affect, which from previous work by Russell (1999) is understood to encapsulate arousal. Damasio (1994) and James-Lange characterise arousal as a physiological phenomenon, whilst Cannon-Bard's model refers to it as an emotional experience. Despite each theory using arousal to explain emotion, they characterise arousal differently and spend little time explaining or providing a rationale for their conceptualisations of arousal. This disconnected approach towards arousal has caused a divergence of ideas that assume different arousal characteristics. Although it is not unusual for theoretical models to morph concepts to best suit their perspectives, the dynamic manner in which arousal is conceptualised in emotion research begs further research. Thus, the key to gaining a more comprehensive understanding of emotion may lie within arousal, as both researchers and theoretical models alike have incorporated arousal in numerous ways but with no universal consensus on what arousal is. The contrasting definitional approaches researchers have taken when conceptualising arousal require further examination to understand whether arousal is physiological, emotional, or a combination of both.

General Arousal

Self-report Arousal

On a neural level, arousal impacts specific brain regions involved in executive functioning, feedback processing and reward sensitivity. Regions such as the dorsolateral prefrontal cortex have been shown to impact decision making, as individuals with dorsolateral cortex lesions make poorer decisions under stress (Arnsten, 2009). Other regions such as the ventral striatum and ventral media prefrontal cortex have also been shown to be activated during stress and

risky decisions, highlighting the interplay between brain regions, cognitive processing, reward processing and decision making under risk (Xue et al., 2011). This interplay of physiological and psychological processes during arousal provides basic information about the environment that is then used as a foundation for guiding key judgements and decisions. It is important to differentiate between emotional traits and emotional states when evaluating emotional arousal. Emotional traits are defined as enduring individual tendencies to react to identical or similar situations (Alegre et al., 2019). Emotional traits remain stable through an individual's experience and are frequently referred to as habitual emotions as they repeatedly occur in the presence of specific situations. In contrast, emotional states are momentary occurrences that lead to transient emotional experiences (Geiser et al., 2017). State emotions are more strongly influenced by situational variables (availability of sex, funny videos), while trait emotions are a person's stable characteristics. This often presents a unique challenge for researchers when measuring emotional arousal. Researchers use both trait and state self-reports of study participants to understand their emotional states when attempting to study traits and states. This involves asking participants about their current emotional state before or after stimuli presentation (e.g., how much anger are you experiencing now). Whilst this form of measurement is both inexpensive and efficient (McDermott, 2007), the accuracy of self-report measures has recently been debated. Early studies by Krosnick (1988) suggest that individuals often cannot pinpoint specific reasons for specific attitudes and actions. Similarly, Berinsky, (2004) showed that individuals in uncomfortable and taboo conditions hesitate to give honest answers regarding preferences and attitudes in fear of social undesirability. So, whilst self-report measures are a simple, quick and cost-effective measure of collecting data, external influence and individual inability to pinpoint emotions may hinder and compromise the effectiveness of self-report measures of arousal. This is best exemplified (McKenna et al., 2018) results, who conducted an evaluation of psychometrics of self-reported measures of

alcohol consumption. They discovered that the combination of the need for social acceptance and memory issues were common problems faced by many researchers and suggested anonymised interview types and interviewer prompts may aid in overcoming these barriers. However, this only help in increasing the reliability of scientific studies and do not aid in improving clinical measures, especially in societally taboo conditions such as sexual arousal.

Physiological Arousal

The alternative to self-report measures of arousal is measuring physiological responses. The earliest form of physiological research can be seen as early as the 1960s, with researchers using pupil dilation to predict sales rates of products and the effectiveness of advertisements (Goldwater, 1972; Krugman, 1965). More recent studies of children and adolescents with conduct problems and aggression have shown that these young people had a lower resting heart rate and skin conductance than their non-offending youth counterparts (Lorber, 2004; Ortiz & Raine, 2004). Thus, physiological measures may be a viable alternative to self-report as physiological responses are not susceptible to social desirability and can capture responses outside of the individual's conscious control (J. T. Larsen et al., 2003). The ANS has previously been shown to effectively measure human emotion (Wang et al., 2018). The ANS is a key component in the peripheral nervous system that primarily regulates involuntary physiological processes such as heart rate (HR), galvanic skin response (GSR) and pupil dilation, which is the balancing of the parasympathetic and sympathetic systems (Wang et al., 2018). Fluctuations in arousal can be reliably measured by recording sympathetic and parasympathetic systems (Wang et al., 2018). The sympathetic system initiates the fight or flight response, whilst the parasympathetic system controls rest and digestion responses when the body is relaxed and undoes the work of the sympathetic system after a stressful situation (McCorry, 2007). The sympathetic system controls the sweat glands and increases sweat production during higher sympathetic activity and, by extension, increases in GSR. This increase has been well

documented with early studies by Geer (1966) showing higher GSR scores when in states of high fear and even more recent studies associating GSR with anxiety, emotional responses and threat detection (Craske et al., 2008). Whilst, HR is predominantly linked to the parasympathetic system as it is responsible for the deactivation of HR, both the sympathetic and parasympathetic systems can increase and decrease HR, respectively (Craft & Schwartz, 1995). Thus heart-rate variability has shown to be a reliable measure of the continuous interplay between sympathetic and parasympathetic activity (Appelhans & Luecken, 2006). HR has also been closely linked to emotional responding, with heart-rate variability becoming an objective measure of regulated emotional responding (Appelhans & Luecken, 2006). Similarly, pupil size behaves similar to HR as it is modulated by the balance of both the parasympathetic and sympathetic systems (Mendelowitz, 1999). Pupil size has shown to be an accurate measure of arousal, with pupil diameter variation showing discernible differences in both positive and negative emotional states (Kawai et al., 2013). A study by Wang et al. (2018) investigated the impacts of arousal on pupil size, heart rate and skin conductance in an emotional face task and found that all three responded to changes in arousal. However, physiological measurements still contain many limitations. Precision has shown to be an issue as accuracy estimated on physiological measures equals approximately 70-80%. Moreover, physiological equipment is often obtrusive in nature (John et al., 2006). Many tools are intrusive to the wearer, interfering and restricting the natural body movement of the individual and even interfering with bodily fluid (i.e. sweat), causing inaccuracies in data. However, despite these limitations, physiological measures allow for the objective measure of arousal.

Self-report and Physiological Concordance

From the available literature, it is clear that both physiological and self-report measurements of arousal have their benefits and disadvantages. Thus, it is reasonable to assume that combining these two measurement types would lead to the most accurate measure of arousal.

However, despite the wealth of research on self-report and physiological measures, there remains a lack of understanding of the degree to which these two measures converge. Much of psychological research looks at these two methods individually, but further research is needed to evaluate these processes collaboratively. Previous studies by Mauss et al. (2004) exemplify the gaps in our cognitive and physiological arousal knowledge. Their study used anxiety inductions on high- and low-trait social anxiety participants and assessed the degree to which anxiety influenced experiential, behavioural and physiological systems. Their study showed that anxiety induction did cause differences in experiential and behavioural measures but no discernible differences in physiological measures. However, a follow-up study by Mauss et al. (2005) found strong associations between experiential and behavioural responses and a moderate association with physiological responses. The disparity between these two studies led to a study by Ciuk et al. (2015) investigating the predictive value of self-report and physiological indicators. Their study had participants complete questions regarding ideology, social desirability and emotion regulation whilst linked amps that measured skin conductance. The study showed that the relationship between the two measurement types was related but was very minimal. Cuik & Troy (2015) concluded that they did not have enough strength in the data to come to a comprehensive conclusion on the degree to which self-report and physiological methods converge. Their limitation section discusses a critical issue within their study: the stimuli used were not "strong" enough and thus did not elicit a robust enough emotional reaction. This is because the "stimuli" they used were questions and statements rather than pictures or videos typically used in arousal induction. Thus, further research is needed, incorporating a stronger emotion induction to elicit a stronger reaction to gain significant findings.

Sexual Arousal

Sexual arousal is a central physiological state experienced universally throughout human societies (Ariely & Loewenstein, 2006). Sexual arousal is one component of the larger human sexual response cycle, which consists of four key phases: desire, arousal, orgasm, and resolution (Buss & Schmitt, 1993). The first phase, sexual desire, consists of sexual fantasies, thoughts and motivations to engage in sexual behaviour in response to internal and external cues such as partner opportunity, mood and health (Calabrò et al., 2019). During this excitement phase, if the body is subjected to erotic physical and mental stimulation, the individual will go into sexual arousal. Sexual arousal is both a subjective feeling (sexual excitation) and physiological experience (genital activation). During this stage, individuals have shown inhibited levels of risk appraisal and increased motivation for pleasure-seeking behaviours (Galentino et al., 2017). However, traditional research has noticeably neglected investigating the potential role of sexuality-related constructs such as sexual arousal, sexual sensation seeking (SSS), satisfaction and sexual decision making (Dixon-Mueller, 1993; Higgins & Hirsch, 2008). Unlike other human behaviours, the genesis of sexuality research was and is still burdened with taboos, anxieties, legal restrictions and an overarching theme that investigations into sexual arousal are somehow not respectable (Byrne, 1977). Thus, the role of sexual arousal is often underestimated, with the scope of its impact being reduced to simple moments within the reproduction process, but it is an essential motivational force driving human behaviour.

Induction Of Sexual Arousal

In the literature on sexual arousal, numerous stimuli are used to induce sexual arousal. Sexual arousal is typically elicited through two distinct methods: introspective and external. Introspective methods typically involve asking the participant to self-fantasies, whilst external methods involve the use of visual images or audiotaped/written descriptions. Overall, both men

and women show greater subjective and genital responsiveness to audio-visual depictions than just audio descriptions of sexual intercourse and sexual fantasy (Heiman, 1980; Stock & Geer, 1982). Static images of nude or partially clothed men or women did not generate either self-report or genital responses in heterosexual women but were sufficient to generate subjective and genital responses in heterosexual men (Snowden et al., 2017). Similarly, Chivers et al. (2008) showed that both heterosexual, homosexual men and homosexual women experienced genital responses when shown film depictions of their preferred sex engaged in nude, nonsexual activities. Other differences between genders include the hormonal state and the specific content presented within the stimuli (Rupp & Wallen, 2008). Thus, whilst men and women differ in the sorts of stimuli that they find sexually arousing, audio-visual stimuli show the most significant capabilities in inducing sexual arousal.

Measurement of Sexual Arousal.

Measurement of sexual arousal has been operationalised using various methodologies. Due to sexual arousal containing both physiological and cognitive elements, self-reported measures of sexual arousal have been developed focussing on both self-reported emotional arousal or self-reported genital response. These self-report methods often ask participants to rate their level of sexual arousal (emotional or genital) using Likert-type items after or during the presentation of sexual stimuli. Other methods use a lever apparatus that participants can move to report their arousal during arousal. Self-report measures are dependent on the purpose of the task. Psychometrics such as the sexual functioning questionnaire (Symonds et al., 2012), female sexual function index (R. Rosen et al., 2000) and international index of erectile dysfunction (R. C. Rosen et al., 2002) are used more within a clinical setting, especially within the field of sexual dysfunctions, to understand underlying disorders better, whilst lever tasks and more functional measurement methods are often used within laboratory settings to confirm inductions of arousal (Ariely & Loewenstein, 2006; Ditto et al., 2006).

While sexual arousal occurs in men and women, their physiological experiences greatly differ. Men experience erections, whilst women produce mucus and vaginal secretion to lubricate the vaginal area to ensure sexual intercourse is more comfortable (Yucel et al., 2004). Despite these differences, there are many commonalities. Both genders during the excitement phase experience increased heart-rates and blood pressure (Calabrò et al., 2019). Moreover, increased blood flow leads to skin flushing (typically in the chest and neck area), which disappears soon after orgasm. The conclusion of orgasm also leads to quick muscle contractions, accompanied by a euphoric sensation causing further increases in heart-rate. Using these biological processes, many methods of arousal measurement have been developed. The measurement of HR shows significant change when both men and women are subjected to sexual stimuli (Rowland & Crawford, 2011; Stanton et al., 2018). Other parasympathetic mechanisms that have been shown to demonstrate variation is GSR, respiration and pupil dilation (Berry & Martin, 1957; Gerulf Rieger et al., 2016). In the forensic setting, a widely used test to determine the risk of sexual violence is phallometric testing (Howes, 2009). Phallometric testing involves the measurement of the circumferential change in the penis from flaccidity to erection in response to both normal and sexually deviant stimuli. A study by Howes (2009) investigated the effectiveness of phallometric tests, using a sample of 100 individuals who had raped, individuals with paedophilic interests, and nonsexual offenders. Their study showed that 32% of people who had raped and 10% of individuals with paedophilic interests were able to inhibit their deviant sexual arousal, whilst 98% of the control group accomplished this. In regard to the objective assessment of female genital response, vaginometry is a commonly used method. This involves the use of a small acrylic probe the size of a menstrual tampon that records the haemodynamic changes in the vaginal epithelium using light reflectance. This signal, known as the photoplethysmography signal, is filtered into two distinct components: Vaginal pulse amplitude (VPA), which reflects phasic changes in

vasocongestion in response to the heartbeat and vaginal blood volume, which is the slowing change in blood pooling. Vaginometry has been shown to demonstrate good reliability, with studies showing evidence for strong predictive and discriminative validity (Prause et al., 2008). VPA especially was shown to accurately measure physiological vaginal responses to sexual stimuli within a laboratory setting, but are extremely intrusive to the individual (M. Chivers et al., 2008)

Whilst it may seem the use of physiological measures gives accurate and objective measures of sexual arousal; the exclusive use of physiological measures may not necessarily equate to a perfect measurement of sexual arousal. Participants in Rieger et al. (2005) reported feeling strong subjective sexual arousal but reported no genital changes. Likewise, studies attempting to induce male participants into a state of sexual arousal have shown to increase penile erections without affecting subjective sexual arousal (Janssen & Everaerd, 1993). This phenomenon is not gendered, as studies have reported women showing genital responses without reporting and experiencing subjective sexual arousal (Chivers & Bailey, 2005). This lack of sexual concordance also permeates within different age bands. It is reasonable to presume that older women would be more sexually concordant, as they have had more sexual experiences, allowing for a better understanding of their sexual preferences. Yet Chivers et al. (2010) found no significant correlation between average sample age and sexual concordance. Similarly, it is presumed that individuals with little experience with their genitalia (post-operative transsexuals) would be less concordant than those with more experience, yet results by Chivers et al. (2004) suggests the contrary. A meta-analysis by Chivers et al. (2010) investigating the agreement of self-reported and genital measures of sexual arousal in both men and women suggest that these discrepancies may be due to methodological moderators, particularly stimulus variability and the timing of self-reported sexual arousal assessment. Though we define sexual arousal as both a cognitive and physiological experience, the

available literature suggests we are not able to induce arousal in a manner that is sexually concordant. Thus, further, development is needed within this area to understand sexual arousal the underlying mechanisms of sexual arousal.

The Impact of Sexual Arousal on Behaviour

Sexual arousal has been frequently cited within the literature to induce a form of sexual myopia that influences individual decision-making. During this myopic state, the attentional and motivational focus is directed towards immediate gratification, and abstract inhibitory information is discounted (Ariely & Loewenstein, 2006; S Skakoon-Sparling & Cramer, 2020). This myopic state is typically activated when visceral cues indicate the availability of the desired object (sexual gratification) is nearby. Researchers suggest this myopic state is an adaption that allows us to focus cognitive resources to obtain a commodity (sex) rather than debating the potential long-term consequences (Ditto et al., 2006; Loewenstein, 1996). This behaviour is exemplified in a study by Suvivuo et al. (2009) who examined the sexual scripts of urban young women and found they were less likely to use prophylactics when they experienced intense sexual arousal during encounters. Participants from their study described feelings of helplessness as a response to the strong visceral feelings they experienced. Similar studies by Blanton & Gerrard (1997) investigated the risk appraisal ability of young men in contracting STDs from partners with either high- or low-risk sexual histories. Their study showed that following sexual arousal induction; individuals showed reduced levels of risk perceptions and an overall inhibition to appraise risk. Additional studies by Skakoon-Sparling et al. (2016) build on the work of Blanton & Gerrard (1997) and extend the gender demographic, finding similar levels of reduced risk appraisal in women. Although the deprivation of sexual gratification does not lead to death like other deprivation systems (hunger and thirst), we often underestimate the degree to which sexual arousal inhibits our decision-making ability. The seminal study by Ariely and Loewenstein (2006) emphasises the power of

sexual arousal on our judgement and decision-making. Ariely and Loewenstein (2006) provided participants with computers to complete the study in the privacy of their own homes. The laptops contained software that showed participants erotic imagery alongside a thermometer-type rating scale. Using the thermometer scale, participants were told to self-stimulate (not to orgasm) while viewing the images and periodically self-rate their subjective sexual arousal. Once participants reached a 75% arousal threshold, they were asked their willingness to engage in a series of sexual hypothetical situations. Participants completed this task twice, once with sexual imagery and another without. Their study found that sexually aroused individuals were more likely to engage in morally questionable unsafe sex and become more likely to engage in a wider range of sexual stimuli and activities than those in the non-aroused condition. This further exemplifies how sexually visceral cues narrow motivational focus. Though the work of Ariely and Loewenstein (2006) helps us to understand the impact of sexual arousal better, this study used only male participants, neglecting the potential impacts women may face. Additionally, sexual arousal is a subjective feeling as it is a physiological one, and neglecting measurement of the physiological responses only gives us half the picture. Thus, further research is needed to understand better the impact sexual arousal plays on women's decision-making process and the underlying physiological responses that contribute to sexual arousal.

Anger

Anger is arguably one of the most debated primary emotions as it is difficult to detect its functional and affective meaning within the human emotional spectrum. Anger plays different roles within societies. Western, more individualistic societies tend to be relatively comfortable expressing anger, whereas collectivist and Eastern cultures may feel more embarrassment and shame and perceive anger to be a destructive emotion. Yet, whilst individuals may attempt to

suppress negative emotions, anger seizes our attention quickly, with infants as young as ten weeks old respond differently to angry faces than sad ones, exemplifying the inbuilt judgemental cues that drive our behaviour (Ichikawa & Yamaguchi, 2014). Anger may range from minor irritation to all-out outrage but is a necessary and natural phenomenon within the emotion spectrum. Anger is a universal feature among humans and serves to show off an individual's negative feelings (Ekman, 1999). However in doing so, angry individuals often illicit distorted appraisals. Therefore, many anger-management interventions utilise cognitive reappraisals to lessen biased processing and evaluations attributed by anger-evoking situations (Cutuli, 2014). Uncontrolled anger can colour people's perceptions and decisions even to situations unrelated to the source of their anger. Gino & Schweitzer (2008) showed that anger diminished individuals' receptivity to advice resulting in less accurate responses. This becomes a concern when other feelings, such as sexual arousal are also activated, as individual may use sex as an outlet for anger.

Measurement and Induction of Anger

The induction of anger can be accomplished in numerous ways. A study by Seidel & Prinz (2013) recently showed that music has been shown to increase self-reported levels of anger in response to genres such as rap, heavy metal, and Japanese noise music. However, only self-report methodology has been able to corroborate this finding as little physiological evidence is available to suggest music induces anger effectively (Siedlecka & Denson, 2019). Another common form of anger induction is through autobiographical recall. This method of induction asked participants to think or write about experiences in their own lives where they have felt anger. This has proven to be an effective induction method as a study by Marci et al. (2007) increased physiological responses in HR, SC and systolic blood pressure when individuals recounted angry situations compared to neutral states. The most common induction method is visual imagery. Visual imagery uses images and film excerpts from popular culture. This

typically includes scenes of mistreatment such as domestic violence or one method by Greži & Pilárik (2012) used emotionally saturated images of abused animals. Methods such as these were shown to induce subjective levels of anger. Moreover a review of 26 articles by Lobbestael et al. (2008) showed that anger-related visual stimuli increased HR, blood pressure, startle response and respiration. Thus it seems visual stimuli are the most effective, in producing both self-reported and physiological arousal.

The Impact of Anger on Behaviour

Due to the immediate impacts of anger and its relation to violence, considerable research has been done investigating the influence of anger within the decision-making process. Anger presents itself as an outlier among negative emotions as unlike sadness or fear, anger produces a fight response, leading to greater self-confidence and sense of strength. From a cognitive perspective, anger produces a similar response to sexual arousal, producing a myopic state, where once angry, a cascading effect takes place, causing individuals to focus more on anger-congruent stimuli, consequently exacerbating their anger further. It is often said that individuals become "blind with rage" as studies by Lerner et al. (1998) and Bodenhausen et al. (1994) showed anger greatly simplified the cognitive processing ability of humans causing a reduction in attentional awareness to the quality of arguments and over-reliance on superficial cues. Consequently, the reduction in cognitive processing combined with the reliance of superficial cues shows an activation of punitive heuristics, leading to greater inferences of responsibility to others, bias judgements, and the inclination to give out harsher and more punitive punishments (Goldberg et al., 1999; Lerner et al., 1998). This desire for externalisation of behaviour towards others has been well documented as studies show that anger activates a revenge mentality leading to a desire to attack and humiliate opposing individuals (Izard, 1977; Shaver et al., 1987). More recent studies by Beisswingert et al. (2015) showed that anger plays a mediating role between subjective loss of control experiences and increased risk-taking

behaviour. Beisswingert et al. (2015) suggested that anger compensates for the lack of control by counteracting overly cautious behaviour and contributes to more confident and optimistic perceptions on decision, leading to riskier decision-making.

Anger and sexual arousal are closely related with early researchers hypothesising that human sexual excitement arises out of hostile feelings (Stoller, 1976). Even popular media interweave anger, aggression and sexual arousal, implicating that sexual arousal forms out of negative feelings. Studies investigating the quality of sexually explicit magazines, even showed that the inclusion of sadomasochistic themes, was believed to be proportional to consumer interests in the topic (Malamuth & Spinner, 1980). Freud had hypothesised that subjugating another by force leads to excitement as there is no anxiety over the chance of rejection. Despite the popularity of books and media depicting such imagery, limited studies are available investigating the influence of anger and sexual decision making. Most literature examining sexual arousal and aggression primarily focus on men, as it is often male's that initiate the courting process. Studies examining this link showed that college men were shown to be sexual aroused by fantasies involving the infliction of pain on others. Heilbrun & Loftus (1986) found that males with high sexual aggression perceived images of distressed female faces as more sexually attractive than non-sexually aggressive males. Similar findings by Heilbrun & Seif (1988) found that the more facial distress portrayed in photographs of semi-nude females in bondage, the greater the sexual satisfaction for the viewer. Whilst such findings help us understand that there is a link between anger and sexual arousal, the actual influence of the two states is still unclear. Yates et al. (1983) hypothesised that either anger disrupts the discrimination between depictions of mutually consenting sex and rape or increases the power of rape cues to elicit sexual arousal. Yet a study by White (1979) indicated that sexual arousal negatively impacted anger, with exposure to positive erotic stimuli significantly reducing retaliatory behaviour in angered males. In the forensic setting, research has looked at the

influence of anger and deviant sexual arousal. It is known that individuals who had previously committed rape showed similar levels of arousal to depictions of mutually consenting sex and rape videos (Yates et al. 1984). However a study by Kelley et al. (1983) investigating the facilitation of sexual arousal via anger and aggression, found results that neither anger nor the opportunity to engage in aggressive acts influenced self-reported sexual arousal

Therefore, it seems the available literature on anger and sexual arousal establishes a relationship between the two states, but the extent of its impact requires further research. One possible hypothesis is that the build-up of anger may become a catalyst for sexually risky behaviour as it may serve as an outlet to express aggression. Previous literature establishes that anger distorts perceptions leading to riskier decisions and diminishes an individual's receptivity to others (Cutuli, 2014; Gino & Schweitzer, 2008). Moreover, recent studies also show that sex and anger are closely linked with studies by Mussweiler & Förster (2000) showing priming sexual arousal facilitated aggressive behaviour. Therefore, similar to sexual arousal, individuals who are angry may feel the same myopic motivation causing inhibited decision-making and consequently facilitate sexually aggressive and sexually risky behaviour.

Amusement

Positive emotions are a core component of wellbeing but historically, the study of human emotion, both clinically and experimentally focussed primarily on the management, alleviation and effects of negative emotions such as anger, sorrow and fear (Tugade & Fredrickson, 2007). However, in recent years the field of positive psychology has emerged as an alternative approach to treatment. Positive psychology focuses on the positive individual traits and experiences to improve quality of life. The basic principle of positive psychology is that human beings are intrigued more by their future than their past and the combination of positive experiences and emotions lead to a pleasant and happy life (Duckworth et al., 2005). One such emotion is an amusement which is the state of experiencing humorous and entertaining events

associated with enjoyment, happiness and pleasure (Krys, 2010). Unlike anger and sexual arousal, present studies have not reached a consensus on the exact purpose of amusement, but some evolutionary theories suggest it may aid in in-group cohesion and act as a tool for encouragement and support (Coser, 1959). Amusement has been shown to enhance individuals' physical and psychological health and a systematic review on the effects of amusement showed that it reduced stress, improved interpersonal interactions, creative thinking, and problem-solving (Mora-Ripoll, 2010; Wilkins & Eisenbraun, 2009). Moreover, individuals with a high sense of humour could also cope with higher amounts of stress with fewer physical repercussions.

Measurement and Induction of Amusement

The measurement of amusement has been operationalised in a multitude of ways. Subjective amusement experiences are often measured using self-report measures such as Likert scales. Whilst Likert scales are the most common self-report construct to measure emotions, recent studies have implemented alternatives such as the Smileyometer (Sluis et al., 2008). The Smileyometer uses the linear model of Likert scale but instead of numbers, uses faces indicating different emotional experiences, ranging from awful (indicated by a sad face) to brilliant (indicated by a smiley face). Other adaptations of this model include the Premo, an online measurement tool that uses drawn characters portraying emotions that can be selected to convey emotional responses to questions and stimuli (Desmet, 2004). Physiological methods of recording amusement have also been used within the literature, typically alongside self-report methods. Research by Wu et al. (2019) on the influence of amusement on physiological activation suggests that amusement significantly impacts the parasympathetic system, especially increased heart-rate variability. The measurement of heart-rate may provide the necessary evidence discriminate emotions. Gross & Levenson's (1997) study on emotional regulation in both positive and negative emotions showed significant physiological changes in

heart-rate, skin conductance, and respiratory activation during amusement. Similar findings were found in Giuliani & McRae (2000) during cognitive up-regulation of amusement, where measures of heart rate, skin conductance and respiration all showed discernible changes. Thus, evidence from previous studies suggests that amusement can be adequately measured and monitored using physiological measures such as heart rate, GSR and respiration, as well as self-report methods such as Likert type scales (Christie & Friedman, 2004; Gross & Levenson, 1997a).

The nature of content in today's ever-increasing entertainment library has allowed for numerous methods of amusement induction. Music with a fast tempo and dancelike rhythm was shown to effectively induce self-reported feelings of amusement (Krumhansl, 2002). Other modes include eating enjoyable foods and receiving gifts and pleasurable odours, which were all shown to increase amusement (Westermann et al., 1996). However, researchers often use visual stimuli in pictures or videos to induce amusement. Films often included comedy sets, monologues, TV segments and cartoons and all had shown to increase self-reported levels of amusement (Gross & Levenson, 1997b; Hubert & de Jong-Meyer, 1990; Lench et al., 2011).

The Impact of Amusement on Behaviour

Unlike anger and sexual arousal, the impact of amusement and behaviour has shown fewer academic publications. Prior to the positive psychology movement, psychological research focussed more on the management of negative emotions and, as a consequence, has led to a scarcity in positive emotion research. Moreover, when positive emotion is studied, emotions such as happiness, joy and amusement are often clumped together in the overarching condition of positive emotion (Kahneman et al., 2004; Kahneman & Krueger, 2006; Meghana & George, 2019). Both early and recent studies on positive emotion and risk-taking by Isen & Patrick (1983) and Nguyen & Noussair (2014), respectively, use happiness to measure positive emotion, whilst other researchers such as Cahir & Thomas (2010) use positive affect generally

without targeting a specific emotions directly. Whilst, this approach has been shown to give us a greater understanding of the impact of positive emotion and risk-taking, the broad spectrum of emotions encapsulated under positive effect has shown to impact the results of these studies significantly. Some studies investigating positive effects and risk showed individuals were more risk-prone (Moore & Chater, 1999), whilst other studies found the positive effect to cause risk avoidant behaviour (Cahir & Thomas, 2010). Thus, when trying to understand the impact of amusement on behaviour, very few studies are available evaluating this relationship. Moreover, the available literature shows inconclusive findings when attempting to look at the overarching relationship of positive affect and risk-taking. A similar pattern emerged when reviewing the literature surrounding positive emotion and sexual decision-making with one study by Houck et al. (2014) investigating the affective states prior to sex, and sexual risk-taking showed individuals more likely to be in a positive affect state when engaging in sex. However, Houck et al. (2014) also found both positive and negative affective states reported risky sexual behaviour, such as the decreased likelihood of condom use.

Reviewing the literature around amusement showed an abundance of studies investigating and successfully inducing both self-report and physiological states of amusement. However, the literature surrounding the impact of behaviour on risk-taking and sexual risk-taking has shown to be inconclusive and very limited. Thus, further research is needed to fill this gap in the literature so we are able to understand the interplay between sexual decision-making and amusement better.

Impulsivity

Impulsivity covers a wide range of behaviours that are considered unduly, risky, premature and often prioritise immediate small short-term rewards over long-term larger rewards. Impulsivity plays a significant role within emotion as it has been identified as one of the direct inhibitors of emotional regulation (Gratz & Roemer, 2004). Whilst earlier models of impulsivity sought

to define impulsivity as a single construct, more recent conceptualisation of impulsivity suggest it as a multifaceted construct with elements such as urgency, sensation seeking, premeditation and perseverance(Whiteside & Lynam, 2001). The multifactorial nature of impulsivity creates significant discrepancies when attempting to define impulsivity but is generally defined as a predisposition to rapid and unplanned reaction to internal and/or external stimuli without adequate regard for negative consequences (Moeller et al., 2001). Whilst, impulsivity is well recorded within scientific literature, with both the ICD and the DSM recognising it as a diagnostic criterion for numerous mental disorders, it is also a facet of personality that all individuals possess and has shown to produce adaptive outcomes (Fenneman & Frankenhuys, 2020). Nevertheless, impulsive behaviour is more often associated with maladaptive behaviours that cause significant disruption in an individual's life.

Impulsivity and Behaviour

The importance of impulsivity is being increasingly recognised in clinical settings as it closely relates to risk-taking and can aid in determining the integrity and stability of an individual's everyday life. Impulsivity has been linked to maladaptive and self-sabotaging behaviours such as substance abuse, impulsive overeating and impulse buying (Beatty & Ferrell, 1998; Perry & Carroll, 2008; Vohs & Heatherton, 2000). Moreover, the risk of aggression greatly increases for individuals high in impulsivity leading to higher chances of physical outbursts, especially when in irritable moods (Hatfield & Dula, 2014). Sexual risk-taking has also been associated with impulsivity. Whilst many aspects of impulsivity have been associated with risky sexual behaviours, sensation seeking has seen a significant amount of research. Sensation seeking, as defined by Zuckerman (1990), is the "*varied novel and complex sensations and experiences and the willingness to take physical and social risks for the sake of such experience*" (p.313). Based upon this definition, it is easy to under that this trait acts almost like a predisposition for risky behaviours. Impulsivity and sexual decision-making have shown numerous negative

impacts on individual health as those high in impulsiveness are more likely to engage in sex with strangers (Deckman & Nathan DeWall, 2011), have multiple sex partners (Derefinko et al., 2014), infrequent condom use (Cooper et al., 2000) and sex whilst under the influence of substances (Charnigo et al., 2013). In addition, a meta-analysis by Hoyle et al. (2000) found impulsivity to have a consistent but not strong positive association with sexual risk-taking. However, their research inconsistently conceptualised impulsivity, sometimes holding it as an individual personality trait and other times including it within neuroticism, conscientiousness, and extraversion. Thus, with the available literature, it seems that impulsivity may play a significant role in individuals engaging in risky sexual behaviours.

Thus, it seems arousal alone may not be responsible for risky sexual behaviours as from previous literature, it seems impulsivity too plays a significant contributing role in sexual risk-taking. However, the interaction between arousal states and impulsivity is unknown, as few studies have explored this relationship. One study Cooper et al. (2000) investigated personality influence on risky behaviours finding certain broad personality traits such as neuroticism and extraversion increased the likelihood of risky behaviours. However, they noted that risky behaviours such as risky sex acted as coping mechanisms and individual traits had different ways of coping with negative emotions. Moreover, investigation into impulsivity and sexual violence is a necessary and important investigation as many myths surrounding sexual violence predicate on the notion that sexually violent behaviours just happen and are spur of the moment acts (Freeman et al., 2015). The myths are even used within the judicial systems as arguments against victims to justify sexual violence. Thus, understanding the underlying mechanisms driving these behaviours grounds these actions as purposeful and controlled rather than spontaneous and involuntary.

Present Study

The present study aims to expand the research on sexual arousal by investigating the effect of sexual arousal on sexual decision-making. The primary goal of the experiment was to determine if sexual arousal impacted sexual decision-making, to the same extent as seen in Ariel & Lowenstein (2006). Using video clips, a heightened state of arousal was induced in participants in four different conditions: sexual arousal, anger, amusement, and neutral to compare the impact these have on decision-making. It was hypothesised that sexual arousal and anger will cause riskier sexual decision-making, whilst amusement will show a reduction in risky sexual decision-making. The second goal of this study was to investigate the concordance of physiological and self-reported arousal. We hypothesise based on previous literature that physiological measures of arousal will align with self-report measures of arousal. Finally, this study also aimed to understand the role of trait impulsivity within sexual decision-making. It was hypothesised individuals higher in impulsivity will chose riskier choices.

Methods

Participants

A total of 91 participated in this study. The participants were invited through the Introduction to Psychology Research Programme (IPRP) and community participants. IPRP is a mandatory course requirement for first-year psychology students where they are required to complete five hours of research participation or write a report on a scientific paper. Participants who completed this study were awarded one credit (equivalent to 1 hour). Community participants were invited using posters placed around Victoria University and were awarded \$20 for participating in the study. Inclusion criteria required the individuals to be above 18 and have previously watched and comfortable watching sexually explicit and violent videos. Participants were also unable to participate if they required the use of glasses for reading as it interferes with the Eyelink.

Ethics approval was sought from the Victoria University Human Ethics Committee, and the project was approved on 22 April 2021, for a period of three years (Application ID: 0000029396). Participants were informed about the purpose of the study and gave their written consent before participation based on the following process:

Consent Process

Due to the explicit material involved within this study, extra steps were taken to minimise harm and to obtain consent in a sensible manner. To ensure participants were comfortable viewing explicit and violent content, participants completed an online pre-screening questionnaire (administered through IPRP and email) that asked questions such as “are you willing to participate in a study that involves watching videos with violence or sexually-explicit content...” and “... have you watched movies, television shows or other online videos involving violence as part of your regular entertainment?”. Participants were also asked if they are comfortable participating in a study that involved the use of physiological

measurements. If the participants agreed to these conditions, they are then directed to the consent form, which includes a brief outline of the study. Participant gave consent by checking the yes option at the bottom of the consent form and by providing either their student ID number or email. The completion of this form allowed participants to then sign up for the lab study. When the participants arrived at the lab, they were shown the consent form again to ensure they were aware of the study details and still comfortable to participate. After the participants completed the study, they were given a debrief form that outlined the aims and relevance of the study and also provided mental health resources, in case participants felt any distress after the completion of the study. Additionally, participants were given the option to watch a video from the amusement condition to ensure participants leave in a positive mood. Participants also received an email 24 hours after the study, that contained a list of mental health services they can contact if they feel any ongoing discomfort, after taking part in the study.

Apparatus and Stimuli

The experiment was run on an ASUS PC with a 22-in. flat-screen monitor with 1024 × 768 px resolution and a 120-Hz refresh rate. The experiment was programmed and run on MATLAB (The MathWorks Inc., 2018). The BIS-11 and demographics questionnaire were administered using Qualtrics (Qualtrics, 2005).

Arousal Induction

Video clips were selected based on an earlier study by Gilman et al. (2017) that aimed to create a catalogue of videos that were accurately able to elicit specific emotions. Using the norm ratings provided by Gilman et al. (2017), we selected videos based on those ratings to match the emotion categories we wanted to target/elicit. The anger and amusement conditions contained six videos each, whilst the sexual condition contained twelve videos to account for individual sexual preference. Participants in the neutral condition watched a single compilation video of conversations from three different films. During the video selection process,

participants were shown a list of videos, each with corresponding letter and a short description. Participants were able to select any video and in the sexual arousal condition, instructed to choose videos that best represented their sexual preferences.

These stimuli were selected because of their similarity in the brightness, degree of movement, and the number of people (see appendix 2 for video descriptions). Participants were randomly assigned to one of the four arousal conditions in the experiment.

While watching the clips, participants were told to that they *“will use the mouse to continuously indicate how intensely [they] are feeling an emotion... it doesn’t matter whether this is positive or negative- the rating is about how strong or intense the arousal is”*. Participants rated their arousal using a bar below the video. If participants felt no arousal, the mouse would be all the way to the left, if they felt very intense arousal, it would be all the way to the right. Participants were also told to rate how they are truly feeling in the moment and not how they think the video is supposed to make you feel.

Participants were able to watch the videos for a maximum of ten minutes or until they reach a 75% arousal threshold for 6 seconds, where they will be automatically moved to the next part of the study.

Training Phase

Prior to the start of the study participants were given an opportunity to familiarise themselves to use the moment-by-moment rating structure and complete questionnaires in a short training phase. The training phase and the Eyelink calibration was implemented on the same display and software used for the actual experiment. The training phase started by providing a detailed descriptions on how to answer the experiment questions and complete the continuous arousal task. This was done by showing participants a video of people walking along a street and giving them an opportunity to practice the continuous-arousal task. The training process required the participants to watch the full video.

Questionnaires

Demographics Questionnaire. The demographics questionnaire asked questions regarding the gender, sex, age and if participants had completed an alternative online version of the study.

Arousal Questionnaire. Psychological components of arousal were assessed using self-report questions. The order of the questions was randomised for each participant and asked the participants to rate how intensely they feel an emotion with the left of the slider indicating “*not at all*” and on the right “*extremely*”. Example emotions included general arousal, amusement, anger and happy.

Hypothetical Sexual Decision-making Questionnaire. The hypothetical sexual decision-making questionnaire was based on Ariely and Loewenstein (2006) sexual decision-making questionnaire. The original questionnaire contained 33 items; but was reduced to 10 items and all items were reworded due to the male-centric nature of questions. Example questions include “*can you imagine being attracted to a 12-year-old?*” and “*could you enjoy sex with someone you hated*”. This is rated on a scale with “*no*” on the left, “*possibly*” in the middle and “*yes*” on the right (see full questionnaire in the appendix). Responses were converted to a 0-1 scale, where 0 is absolute no and 1 is absolute yes. Participant questionnaire answers were then summed together to create a total decision-making score (DM score). Participants high in risky sexual decision-making would have scores closer to 10.

The Barratt Impulsiveness Scale (BIS-11). The BIS-11 (Patton et al., 1995) is the most widely used measure of impulsiveness and consists of 30 items that are designed to assess the personality/behavioural construct of impulsiveness. This measure specifically measures trait impulsivity and is scored on a 4-point scale from rarely/never on the left to almost always/ways on the right. Example questions include “*I plan tasks carefully*” and “*I am self-controlled*”. Responses were converted to a 1-4 scale, where 1 is rarely/never and 4 is absolute yes almost

always/ways. Each participant answers were then added together to create a total overall BIS-11 score.

Physiological Measures

Pupil Dilation. Pupil dilation was collected using an EyeLink 1000 (SR Research, Ottawa) linked to an external monitor and computer outside the participant study room. The EyeLink 1000 recorded pupil dilation using the right eye. Participants were tested in a dimly lit room. Participants completed two nine-point calibrations and validations after the training phase.

Heartrate and Skin Conductance. Heartrate was measured via electrocardiography (ECG) using disposable adhesive. ECG electrodes were placed underneath the right and left collarbone as well as underneath the lower left ribcage. The ECG signal was amplified by AD Instruments ML138 Octal Bio Amp (AD Instruments, Dunedin)

Skin conductance was recorded from the non-dominant medial phalanges of the index and ring fingers using dry stainless steel GSR electrodes and a ML116 AC GSR Amp with a sampling rate of 1 kHz. Responses were measured in micro-Siemens (uS).

Physiological Data Pre-processing

Data pre-processing was done by removing extraordinarily high and low GSR, pupil and heart-rate data points that were due to equipment error and replacing them with the next valid point.

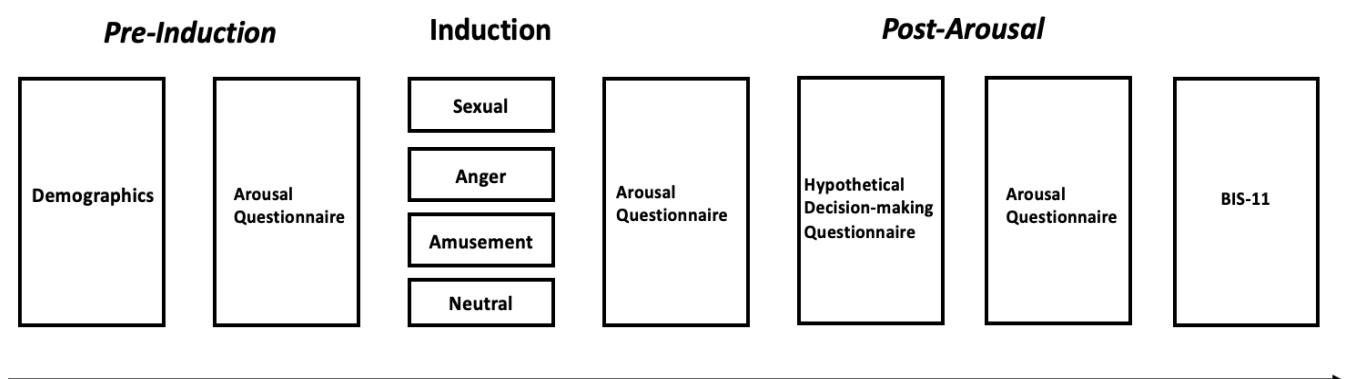
Procedure

The study took place at Victoria University and with each session lasting approximately 1 hour. After reviewing the consent form, participants were invited to sit in the dimly lit room and complete the demographics questions via an online Qualtrics survey. Upon completion participants were given instructions by the experimenter to attach the skin-conductance and heartrate instruments. The sensors were then connected to the AD Instruments equipment.

Participants then started the training phase of the study and upon completion, were asked if they had any questions. Afterwards, with the experimenter helped the participant in adjusting their chin rest and seat to their liking. Finally, once the participant is ready, the study commences. At the start of the experiment, the eye-link system is calibrated, and upon completion, the experimenter's monitor is turned off to maintain privacy. After the calibration process, the participant answers the baseline arousal questionnaire and then move on to the arousal induction. After the induction process, participants completed the post-arousal questionnaire followed by the hypothetical sexual decision-making questionnaire, the end arousal questionnaire and then the BIS-11. Once the BIS-11 is completed a message displayed on the monitor asks the participant to notify the experimenter.

Figure 2

Experiment Procedure



Missing Data

A total of 91 participants completed the study. Three participants started the study but due to physical constraints such as eye strain and could not complete the entire study. Five participants completed the study but due to saving failure and Eyelink failure, this data was not used. 1 participant in the amusement condition was also removed due to data collection failure. Early software issues also led to the loss of 5 participant BIS-11 data but all other questionnaire and physiological data was still used.

Results

Manipulation Check

Sexual Arousal

A repeated measures ANOVA for sexual arousal, with the within-subject factor time (pre vs. post vs. end) and the between-subject factor sex revealed a significant main effect of time on sexual arousal, $F(2,46) = 45.600, p < .001, \eta^2 = 0.464$, no significant main effect of sex, $F(1,23) = 3.40, p = .078, \eta^2 = 0.129$, and no significant interaction of sex and time, $F(2,46) = 2.420, p = .100$. Post hoc comparisons using the Tukey HSD test indicated a significant increase ($p < .001$) in sexual arousal between pre ($M = -0.388, SD = 0.050$) and post ($M = -0.161, SD = 0.260$) timepoints followed by a significant ($p < .001$) decrease of sexual arousal from post to end arousal ($M = -0.034, SD = 0.154$). Pre and end sexual arousal also showed a significant difference ($p < .001$). These results, illustrated in Figure 2, suggest that the sexual arousal induction was successful. In addition, Figure 3a also shows that the change in emotional states was specific for sexual arousal.

Anger

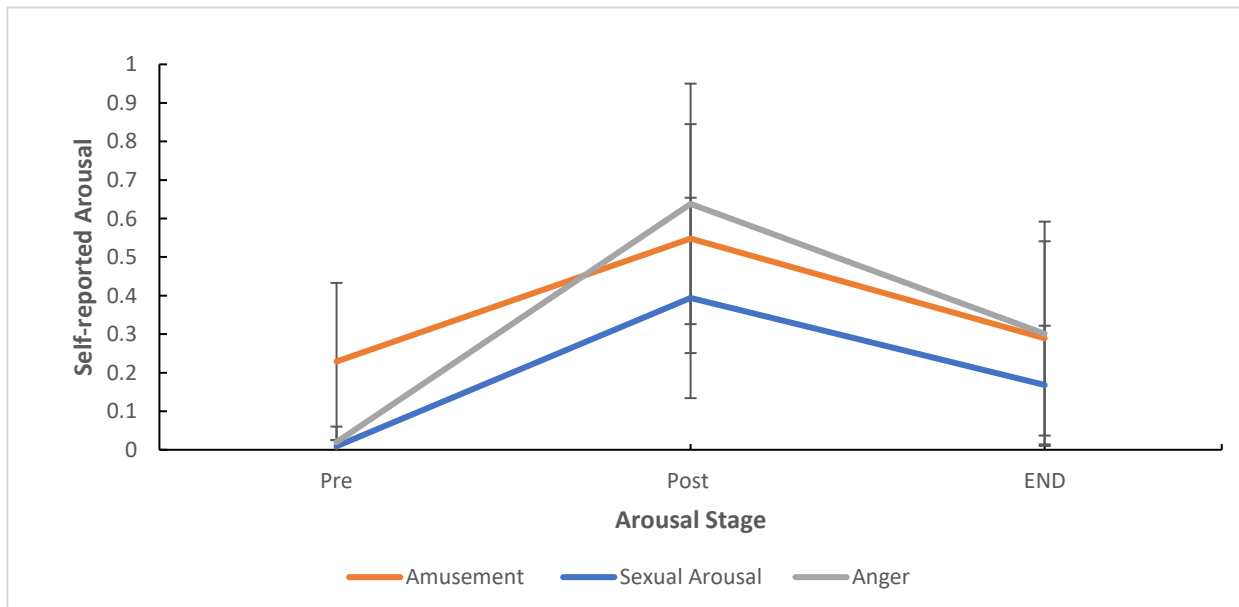
A similar repeated measures ANOVA was used for the anger condition. The analysis revealed a significant within-subject main effect of time on anger, $F(2,34) = 38.88, p < .001, \eta^2 = .526$, and the between-subject factor sex revealed a no significant main effect of sex on anger, $F(1,17) = 2.520, p = .131, \eta^2 = .029$, and no significant interaction of sex and time, $F(2,34) = 1.39, p = .263$. Post hoc comparisons using the Tukey HSD test indicated a significant increase ($p < .001$) in anger from pre ($M = -0.621, SD = 0.04$) to post ($M = -0.288, SD = 0.312$) timepoint, and a significant increase ($p < .001$) from post to end timepoint ($M = 0.344, SD = 0.291$). Pre and end anger were also significantly different ($p < .001$). These results illustrated in Figure 2, suggest the anger induction was successful. However, Figure 3b shows that the

change in emotional state was not specific to anger, but participants also reported an increase in disgust and general arousal.

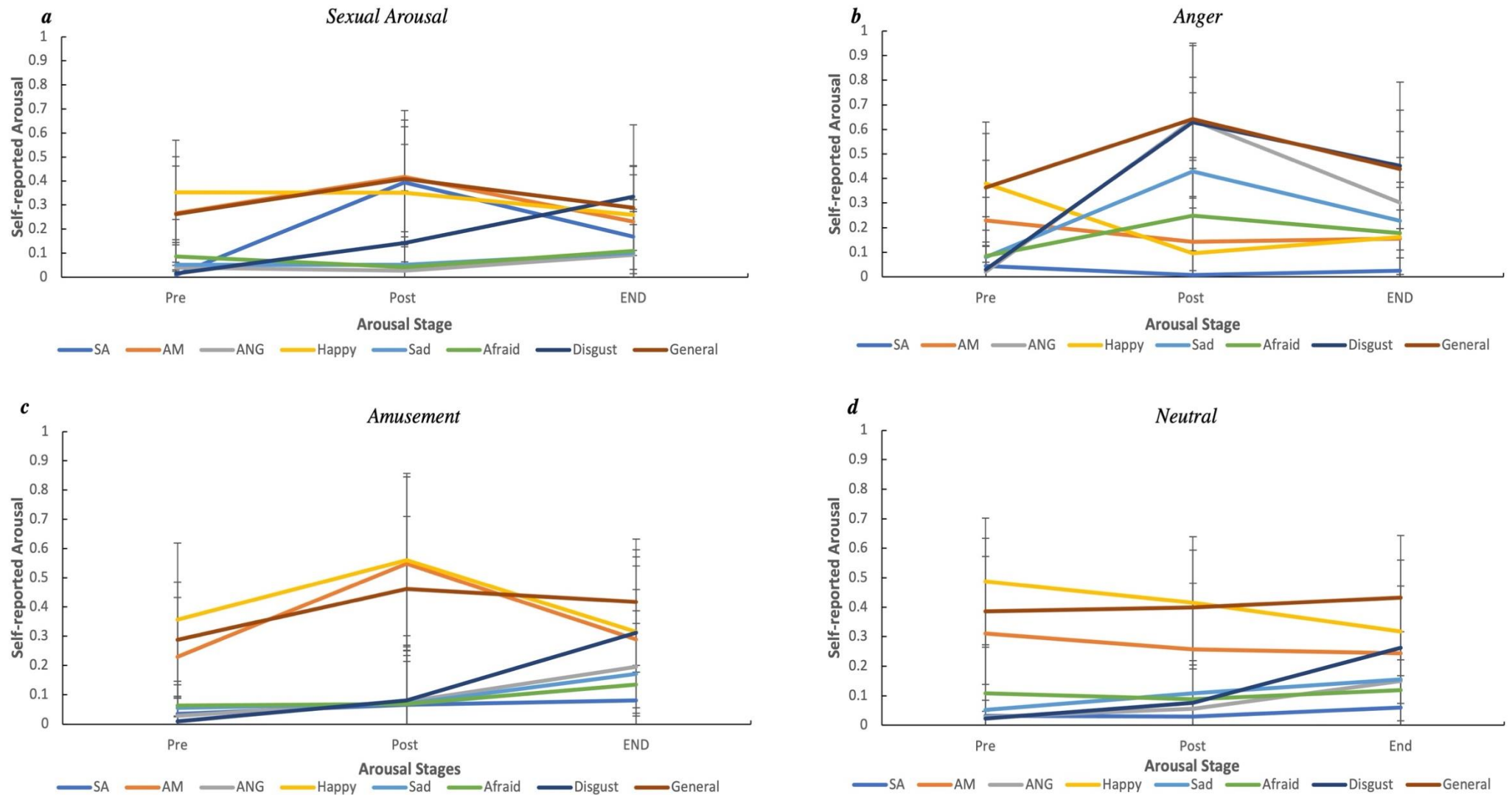
Amusement

The repeated measures of ANOVA revealed a significant within-subject main effect of time on amusement, $F(2,34) = 17.39, p < .001, \eta^2 = 0.250$, and a between-subject factor sex revealed no significant main effect of sex on amusement, $F(1,17) = 0.435, p = .518, \eta^2 = 0.025$, and a no significant interaction of sex and time, $F(2,34) = 5.95, p < .060, \eta^2 = 0.011$. The post hoc comparison using the Tukey HSD test indicated a significant ($p < .001$) increase from pre ($M = -0.328, SD = 0.204$) to post ($M = 0.269, SD = 0.297$) timepoint and a significant ($p = .002$) decrease between post and end ($M = -0.0594, SD = 0.252$). timepoint. However, no significant ($p = .392$) change was found between pre and end. These results illustrated in figure 3c suggests our induction was successful. However, figure 4 shows that this arousal change was not specific to amusement as participants reported increases in happiness and general arousal.

Figure 2
Arousal across the induction process



Note: Pre = Before arousal induction; Post = After arousal induction; End= After decision-making task

Figure 3*Self-reported arousal and emotion states across the three time points during the four arousal inductions*

*Does Sexual Arousal Impact Sexual Decision-making? (Research Question 1)***Table 1***Sexual risk-taking scores by condition*

Condition	N	DM Score	DM Score	Adjusted	Adjusted
	(Male, Female)	Mean	SD	DM Score	DM Score
				Mean	SD
Sexual	25 (13,12)	1.78	1.21	1.62	1.03
Anger	19 (9,10)	1.29	0.93	1.18	0.83
Amusement	19 (10,9)	1.58	1.02	1.51	0.96
Neutral	20 (10,10)	1.52	1.16	1.47	1.04

Note: DM score: Full Sexual Decision-making Questionnaire Score; Adjusted DM Score: Post difficulty Test Score

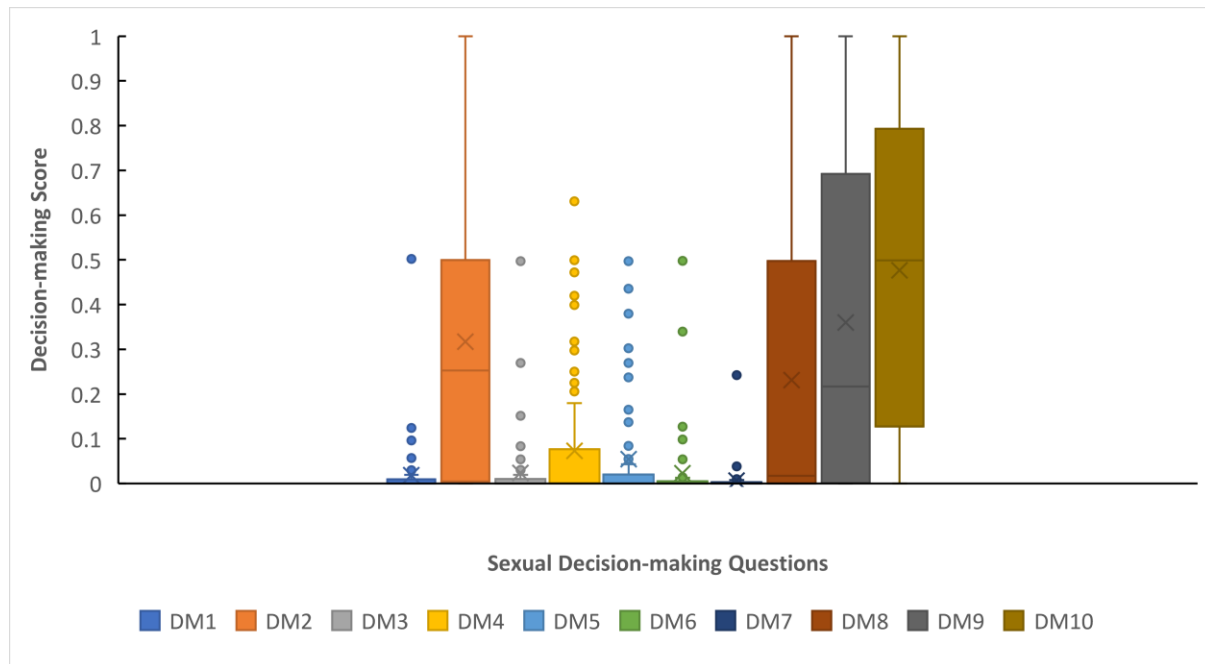
A linear regression model was tested to investigate if self-reported sexual arousal significantly predicted sexual decision-making. The regression model was statistically insignificant, $R^2 = .14$, $F(1,23) = 3.60$, $p = .070$. An additional analysis was conducted to address the observation that several questions in the sexual decision-making task had very low mean scores (see Figure 4). We therefore implemented an arbitrary threshold of .05 for the difficulty (mean) of each question. A total of 5 questions were removed (1, 3, 5, 6, 7) and a new sum score was computed (referred to as adjusted DM score). A linear regression model was tested predicting this adjusted DM score by self-reported sexual arousal. This regression model was statistically significant, albeit a small amount of explained variance, $R^2 = .18$, $F(1,23) = 3.69$, $p = .035$; $\beta = .424$, $p < .04$, CI95% [-0.00, 0.03]. Thus, the second regression analysis suggests that arousal contributed positively to explain sexual decision-making (adjusted DM score).

Another regression model was tested using the maximum scores of GSR, pupil dilation and heart-rate as predictors for the full sexual decision-making score. This regression model was not

significant, $R^2 = .30$, $F(3,20) = 0.660$, $p = .580$. A linear regression model predicting the adjusted DM score by the physiological maximum scores was also not significant, $R^2 = .09$, $F(3,20) = 0.610$, $p = .620$. Taken together these results suggests physiological measures of arousal were unable to determine risky sexual decision-making.

Figure 4

Item difficulty for sexual decision-making questions across all conditions



Note: DM = Sexual Decision-making Questions (see appendix 1 for full questions)

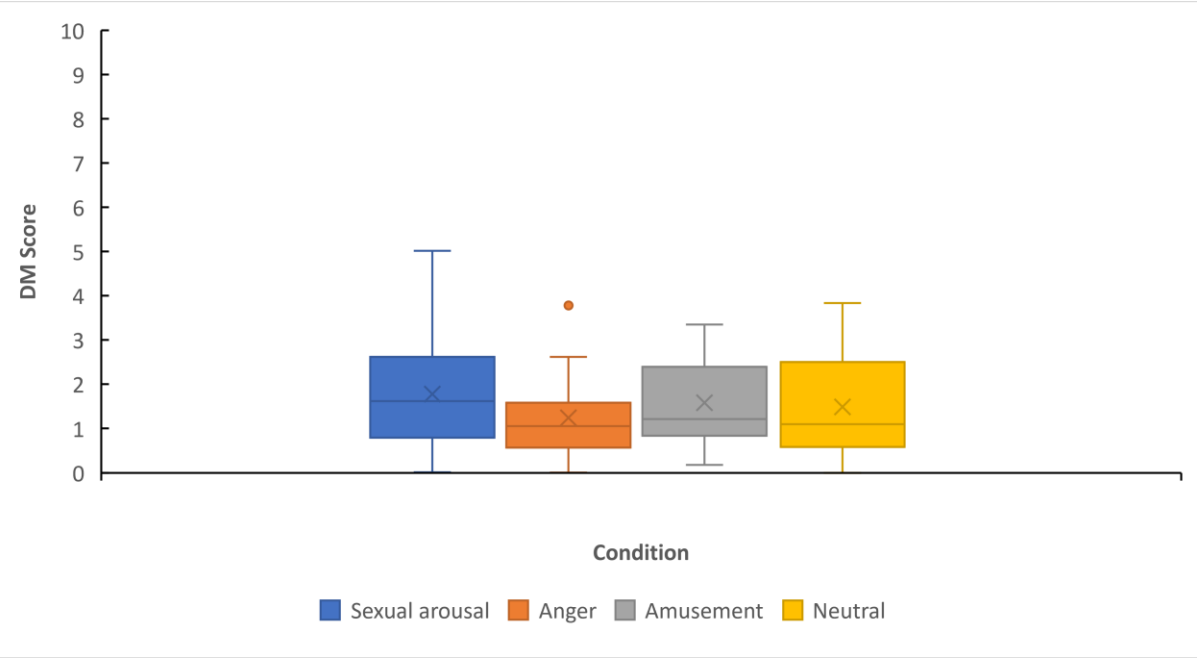
To test if the anger predicted sexual risk-taking, two regression models were tested to investigate if self-reported anger significantly predicted sexual decision-making. The regression model using the full DM score was not significant, $R^2 = .19$, $F(1,17) = 3.86$, $p = .066$. Similarly, the regression model predicting the adjusted DM score by self-report anger was not significant, $R^2 = .15$, $F(1,17) = 2.96$, $p = .104$. Using the physiological maximum scores as predictors for the anger condition to predict the full DM score also did not lead to a significant model, $R^2 = .39$, $F(3,14) = .293$, $p = .070$. To test if physiological anger arousal predicted risky sexual decision-making a regression model using the physiological maximum scores to predict the adjusted DM score was tested. This

regression showed again no significant model, $R^2 = .38$, $F(3,14) = 2.85$, $p = .076$. Thus these results suggest neither self-report anger or physiological measures of anger were able to determine risky sexual decision-making.

To test if amusement contributed to sexual risk-taking, two regressions were tested to investigate if self-report amusement predicted sexual decision-making. The regression model using the full DM score was statistically insignificant, $R^2 = .06$, $F(1,17) = 1.08$, $p = .327$. A similar model using the adjusted DM score to predict self-reported sexual arousal showed again no significant model, $R^2 = .05$, $F(1,17) = 0.969$, $p = .339$. Additional regressions were also conducted using the amusement physiological max's as predictors for sexual decision-making to tests if physiological amusement arousal predicted risky sexual decision-making. This regression was statistically insignificant, $R^2 = .66$, $F(3,17) = 9.44$, $p = .283$. A similar regression was conducted using the physiological maximum's as predictors for the adjusted DM score. This regression showed non-significant results $R^2 = .700$, $F(3,17) = 9.44$, $p = .680$. Taken together these results show neither self-report or physiological amusement was able to predict sexual decision-making.

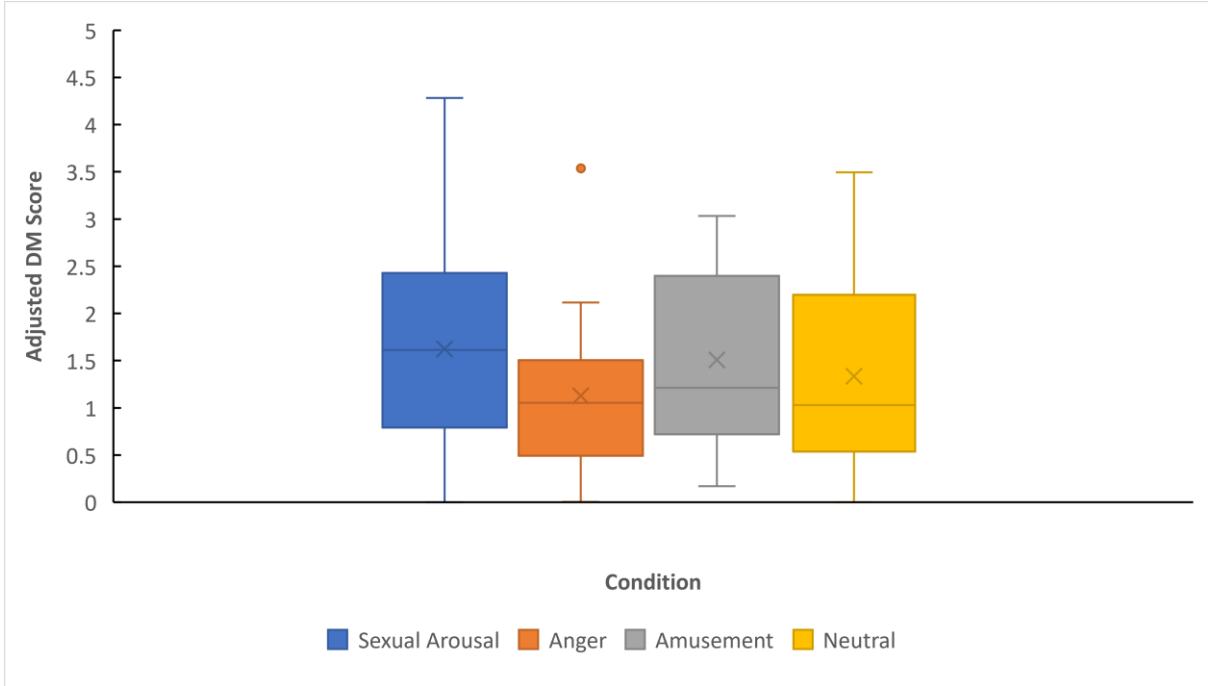
Figure 5.

Full DM score by arousal condition



Note: DM Score = Full Sexual Decision-making Score

Figure 6
Adjusted DM score by arousal condition



Note: Adjusted DM Score = Adjusted Sexual Decision-making Score

Association Between Physiological and Self-report Arousal (Research Question 2)

A set of Pearson's correlation coefficients was computed to test if the physiological arousal measures (means of HR, pupil dilation and GSR) and self-reported arousal across all conditions were related (see table 1). None of the correlation coefficients were significant. A secondary set of correlation coefficients was computed using the maximum responses from the physiological variables and self-report arousal (see table 2). No significant correlations were found. Finally, a set of correlation coefficients was computed using the difference score for the physiological measures, which was calculated by subtracting the minimum activity from the maximum activity for each of the different physiological measures. This difference score therefore reflects the maximum change in physiological activity during the arousal induction. However, none of the Pearson's correlation coefficients, were significant. Taken together this suggests that there was no concordance between self-reported arousal and physiological arousal.

Table 2*Correlation coefficients between mean physiological measures and self-reported arousal*

	Arousal	Pupil mean	HR mean	GSR mean
Arousal				
Pupil mean	-.096			
HR mean	.084	.141		
GSR mean	-.071	-.096	-0.092	

Note: HR = Heart-rate, GSR= Galvanic Skin Response,

Table 3*Correlation coefficients between maximum physiological measures and self-reported arousal*

	Arousal	Pupil max	HR max	GSR max
Arousal				
Pupil max	-.017			

HR max	.099	-.051	
GSR max	.039	-0.128	-0.072

Note: HR max =Maximum Heart-rate, GSR max=Maximum Galvanic Skin Response

Table 4

Correlation among difference scores for the physiological measures and self-report arousal

	Arousal	Pupil difference	HR difference	GSR difference
Arousal				
Pupil difference	-.025			
HR difference	.032	-.035		
GSR difference	.082	-0.057	-.023	

Note: HR = Heart-rate, GSR= Galvanic Skin Response,

How Does Impulsivity Moderate Sexual Decision-making (Research Question 3)

A Pearson's correlation coefficient was computed to access the relationship between the DM score and the total BIS-11 score (see table 5). There was a significant positive correlation between the two variables ($r = .33, p < .01$). Similar Pearson's correlation coefficients were computed to access the subscales of Self-control and Non-planning. The Pearson's correlation to access the relationship between Self -control and the DM score found a significant positive correlation between the two variables ($r = .23, p < .05$). However the Pearson's correlation coefficient accessing non-planning score and DM score, indicated a non-significant relationship ($p = .190$).

Follow up linear regression were computed to investigate if the total BIS-11 total score predicted the DM score. The regression model was statistically significant $R^2 = .100$ $F(1,78) = 9.06, p = < .01$. This result shows that the BIS-11 total score significantly predicted DM score, $\beta = 0.05, p < .05, CI95\% [0.02, 0.10]$. Additionally, a linear regression model predicting the DM

score by self-reported arousal after the arousal induction (post timepoint) and total BIS-11 score was tested. The regression model was significant, $R^2 = .20$, $F(2,54) = 6.67$, $p < .01$. This findings suggests that the condition specific arousal after the induction (post timepoints) and the total BIS-11 score contributed significantly and positively to explain the DM score $\beta=1.38$, $p < .05$, CI95% [0.18, 2.59]. Similarly a related linear regression was fitted with the predictor self-control I score and the dependent variable as the DM score. The regression model was statistically significant with a small amount of explained variance, $R^2 = .05$, $F(1,78) = 4.21$, $p < .05$. Thus the self-control subscale score contributed significantly and positively to explain the DM score, $\beta=.09$, $p < .05$, CI95% [-0.60, 0.00]. Additionally a linear regression was computed using the non-planning subscale score as a predictor for DM score. This regression model was statistically insignificant, $R^2 = .02$ $F(1,78) = 1.73$, $p = .190$.

Table 5

Correlation coefficients between full DM score and BIS-11 total score and subscales

	DMscore	Non-planning	Self-Control
DMscore			
Non-planning Score	.147		
Self-control Score	.226*	.857***	
BIS-11 Score	.326**	.579***	.001***

*Note: DM=Full Sexual decision-making questionnaire score; $p < .05$, ** $p < .01$, *** $p < .001$*

Discussion

The present study examined the impact of sexual arousal on sexual decision-making. Our results showed that self-report sexual arousal did impact sexual decision-making but to a lesser degree than what was found previously found in Ariely & Loewenstein (2006). Physiological arousal showed no association with sexual decision-making or self-report arousal across all conditions. Moreover, individuals high in trait impulsivity and low in self-control were shown to be associated with riskier sexual decisions.

The findings from our study suggests that sexual arousal does not impact sexual decision-making to the extent that was found in Ariel & Lowewenstien (2006). Their original study suggested that activities that had previously been non-arousing for individuals became more attractive when under the influence of sexual arousal. Yet this effect was not pronounced within our study. However, our study showed that sexual arousal reduced self-reported usage of contraceptives and increased likelihood of unprotected sex. Thus, these results suggests sexual arousal may not be the cause for sexual violence, but may contribute to the ever increasing STD cases worldwide. Sexual arousal has gained significant notoriety across numerous studies as an important situational factor that impacts self-report condom use decisions (Patel et al., 2006; Shayna Skakoon-Sparling et al., 2016; Strong et al., 2005). This is concerning as condom use intentions have been found to correlate significantly with actual condom use (Turchik & Gidycz, 2012). This effect is presumably due to the myopic effects of sexual arousal, where the greater attentional focus is placed on sexual gratification rather than safer sex practices. Consequently, the need for sexual gratification overrules the need for sexual safety, causing individuals to become more motivated to appraise their partner, the situation and themselves as posing a low risk and accordingly deeming the use of a barrier such as a condom a hindrance (Ditto et al., 2006). This

effect has seen direct ramifications in the real world as sexually transmitted infection incidences have rapidly increased worldwide (Shannon & Klausner, 2017). The World Health Organisation estimated that in 2016 the global annual incidence of STI among people 15-49 years of age was 376.4 million infections (Rowley et al., 2019). This increase has shown to disproportionately impact adolescents, as of the approximately 20 million new STIs each year in the United States, almost half of those cases are adolescents. STIs have been shown to lead to numerous negative psychological and health issues such as depression, neurologic damage, infertility, ectopic pregnancy and even death (Otu et al., 2021; Shrier et al., 2002). In response to this epidemic, the WHO made STI prevention one of its priorities for 2016-2021 (World Health Organization, 2018). Yet given our present findings, it suggests greater work is needed within this sector to prevent the spreading of STIs. One avenue to improve contraceptive usage is educating individuals to become more aware of the possible deficits in their decision-making ability when engaging in sexual situations. This may be accomplished by preparing individuals in advance of sexual activity by not only ensuring that prophylactics are easily accessible but that they discuss safe-sex practices with their partners in advance before their cognition is hindered by sexual arousal. By understanding the antecedents that lead to unsafe sexual behaviour we are better able to develop more effective and preventative measures for STIs. Nevertheless, it is encouraging to see a reduction in sexually violent and manipulative attitudes since Ariely & Loewenstein (2006). Whilst these findings differ from Ariel & Loewenstein (2006), it is important to examine why our study differed from Ariely & Loewenstein (2006) and what has changed both methodologically and globally since their study that may have caused these differences.

Differences From Ariely & Loewenstein (2006)

Methodological Differences

The premise of the present study builds on the seminal work of Ariely & Loewenstein (2006), which was published over 15 years ago. Findings from their study showed a lack of empathy towards women with the post arousal induction showing men more likely to keep trying to have sex with women after they said “no”, say “I love you” to have sex and even drugging women to achieve sexual intercourse. However, the present study results show a reduction in these behaviours as our sexual decision-making questionnaire derived from Ariely & Loewenstein (2006) showed sexual arousal had no impact on sexual decision-making.

Whilst the present study aimed to replicate the original study, there were some key methodological differences that may explain the difference in outcomes. Their study asked participants to self-stimulate (masturbate) by viewing a range of erotic images but only to a sub-orgasmic level of arousal. Participants in their study also recorded their arousal on a bar using two keypads on the laptop that allowed the user to move the probe on the arousal meter to indicate their momentary level of arousal. Our study had participants select and watch sexually arousing videos and record their arousal levels using a bar located below the screen. In both studies participants were only presented questions after they reached 75% arousal (or in our study after 10 minutes has passed). Firstly, the induction method used within our study greatly differs from that of Ariely & Loewenstein (2006). The use of self-stimulation to achieve arousal is a much stronger method of induction with Ariely & Loewenstein's (2006) reporting arousal levels up to 85% whilst our induction showed participants reaching mean levels of 40% post arousal induction (see figure 1). Moreover, it was mandatory for participants to reach 75% arousal in order to progress in the study, whereas our study allowed participants to move forward after 10 minutes. Thus, the stronger arousal elicited within their study in combination with a mandatory need to reach 75% arousal may have contributed to a stronger induction.

Secondly, Ariely & Loewenstein's (2006) allowed participants to take laptops home with them and complete the experiment in the comfort of their own home. This allows participants to feel more comfortable and secure as others are not observing their behaviour. This difference has shown to be a significant factor, especially when sexual arousal is involved, as a study by Bloemers et al. (2010) showed sexual arousal significantly increased when the individual was at home compared to institutional laboratories. Additionally, the use of physiological instruments within our study such as the eye tracker created some physical constraints for the participants. Individuals were told to limit their movement in their non-dominant hand as GSR instruments are sensitive to movement. The eye-tracker required individuals to keep their chin in a holder whilst limiting their head movement in order for the adequate recording of the pupil. Thus, the combination of these factors may have caused significant discomfort for participants, which in return may have diminished overall levels of arousal.

Finally, Ariely & Loewenstein's (2006) included only male participants, whilst our study included both male and female participants. This is a key differentiator as the original study was designed specifically for male participants. The questions used gendered language such as "*would you tell a woman that you love her to increase the chance she would have sex with you?*" and used male centric stereotypes such as "*Would you take a date to a fancy restaurant to increase your chance of having sex with her?*". Whilst, all the questions used within our study used non-gendered language it is difficult to ignore the male centric nature of Ariely & Loewenstein's (2006) study. This has a significant impact on our present study as previous studies have shown that aggression is more strongly linked to sexuality for men than for women. Males in heterosexual relationships are commonly more assertive than women and take the lead in sexual interactions (Andersen et al., 1999; Impett & Peplau, 2003). Thus, questions that were used within our study

such as “*would you encourage your date to drink to increase your chance that they would have sex with you?*” and “*would you slip a person a drug to increase the chance that they would have sex with you?*” may not be as relatable to female participants as these are more male centric behaviours. Hence, the addition of female participants combined with the male centric nature of the questions may have led to the variation in our findings.

A more recent study by Skakoon-Sparling et al. (2016) holds many similarities to both Ariely & Loewenstein (2006) and the present study. Skakoon-Sparling et al. (2016) investigated the relationship between sexual arousal and sexual decision-making, using a similar methodological structure to our study. Their study employed video clips to induce sexual arousal, as well as using a questionnaire with hypothetical sexual risk-taking questions. Skakoon-Sparling et al. (2016) questions resembled the shortened sexual decision-making used within our study, primarily focussing on the topic of sexual health, in relation to condom usage. Similarly Skakoon-Sparling et al. (2016) used a mixed gender sample and even discussed this as a limitation of Ariely & Loewenstein (2006). The addition of female participants within Skakoon-Sparling et al. (2016) showed to be a significant factor, as gender differences were present in sexual arousal, with male participants being significantly more sexually aroused by the videos. This gender difference was not present within our study, potentially due to the ability for participants to select the video that best suited their sexual preference. Skakoon-Sparling et al. (2016) presented the same four videos to all participants, whilst our study gave not only the autonomy to the participants to choose but also provided a wider range sexual stimuli for participants to watch, better encapsulating different sexual preferences. Nevertheless, Skakoon-Sparling et al. (2016) results validate our present study as they too found that men and women who reported higher levels of sexual arousal after viewing sexually explicit videos, showed a greater disregard to safe sex practices such as condom

negotiation and use. Looking more broadly it is evident that our results, as well as Skakoon-Sparling (2016) parallel previous findings by Velten et al. (2016), Santelli et al. (2009) and Graham et al. (2011), whom identified sexual arousal to play a inhibitory role in sexual safety.. Therefore, whilst our findings did not align with Ariely & Loewenstein (2006), similar and more recent studies such as that by Skakoon-Sparling et al. (2016) have identified that sexual arousal impacts sexual decision-making but in ways relating to sexual health rather than sexual violence.

In summary the aim of this study was to replicate the findings of Ariely & Loewenstein's (2006) study. However, key methodological difference between studies may have caused variations in results. The induction methods, whilst similar showed discernible differences as Ariely & Loewenstein's (2006) use of self-stimulation showed greater levels of sexual arousal compared to the watching of sexual videos method used in our study. The lab environment also may not have been conducive to sexual arousal as discomfort being in an unfamiliar environment and the restriction of natural movement may damped arousal. Additionally, the inclusion of female participants to a study designed for male participants may have contributed to the variation in results, as many of the decision-making questions were male centric. Despite these difference more recent studies show comparable findings to the present study with Skakoon-Sparling et al. (2016) showing sexual arousal significantly impacting the use and negotiation of condoms.

External Factors Contributing to Present Findings

The Me-Too Movement

Though methodological differences may have contributed to the differing results, external factors should also be considered as many sociological and cultural shift have taken place since Ariely & Loewenstein's original study. One possible difference may lie in the progression of the women's rights movement, especially within the last 15 years. Since the publication of Ariely &

Loewenstein's (2006) study, considerable socio-political and cultural shifts have transpired, greatly impacting the social ecology around the world. One such shift is the Me-Too movement that has brought the issue of sexual harassment to the forefront of international discourse, highlighting the gender disparities in work, income, power, and the entrenched gender stereotypes that underly many sexual misconducts. The establishment of this movement has significantly challenged judicial systems, pushing for changes in laws and policies that acknowledge sexual abuse and grant the due process and justice that victims deserve. Victims are no longer required to remain silent in fear of retaliation as new legislative laws supported victims instead of the employers. While it may be easy to overlook the power of a social media movement, a *New York Times* analysis found that since the Me-Too movement's virality, over 200 influential men have been terminated due to public allegations of sexual misconduct (Carlsen et al., 2018). The social implications of this have been felt across the world. The Me-Too movement has brought significant awareness to sexual violence, creating a zero-tolerance culture that educates individuals around healthy sexual behaviours and prevents sexual violence within the community through facilitation and promotion of sexual violence prevention initiatives. One study by Keplinger et al. (2019) investigating the changes in female sexual harassment between September 2016 and September 2018 found reduced levels of explicit forms of sexual harassment and unwanted sexual attention. Additional qualitative interviews collected from the women concluded that the changes in sexual harassment are due to the increased scrutiny of the topic post the Me-too movement. Thus, this increased scrutiny around sexual misconduct may have played a role in the lack of association between sexual arousal and sexual decision-making found in our study. A study by Szekeres et al. (2020) supports this hypothesis as their study investigated the views of sexual assault following the Me-Too movement and found both men and women were less dismissive of sexual assault following the Me-Too

movement. Whilst our present study did not evaluate the individual attitudes of participants in regard to the Me Too movement and general women's rights, it is reasonable given the globality of the movement and significant progression of women's rights since Ariely & Loewenstein (2006) that these factors contributed to the difference in results.

Female Sexual Arousal Research

An important component to consider when reviewing our results is the inclusion of female participants within our data. Historically, academic ventures regarding sexual arousal are plagued by taboos, anxieties, and legal restrictions and only recently have researchers truly investigated human sexuality. Yet, even so, the investigation into sexual arousal has always focussed on male sexual arousal because men are always perceived as the primary perpetrator of sexual violence and women, the victims (Comartin et al., 2021). However, this brings forth a greater issue of the devaluation of female-based scientific research. The investigation of female sexual arousal literature within academia is shown to be very limited and recent findings suggest this may be due to a gender bias within the literature review and publication process (Murrar et al., 2021). A recent study by Murrar et al. (2021) investigated whether the gender of the research participants influenced the recommendation to publish the study. Their results showed reviewers found no significant differences was perceived between male and female studies and research conducted in women was even perceived to be of greater contribution to medical science. Nevertheless, reviewers were almost twice as likely to recommend the paper involving men than the same paper conducted using women. This devaluation of women within academia represses the dissemination of research findings relevant to the health of women, negatively impacting not only female scientists as they are more likely to conduct research involving women but women overall.

This disregard for female research, especially in the field of sexual arousal may reflect the patriarchal structures that lay the foundations of modern-day society, often linking sex and female sexual freedom to shame and impurity. As a consequence of these social expectations, participants within our study may inhibit their responses to match their socialised gender roles, in which women should not display high levels of sexual response (Alexander & Fisher, 2003). A study examining the biases in self-reporting sexual behaviour by Alexander & Fisher (2003) found that women more often underreported their sexual behaviours when they felt their anonymity was at risk. This effect was shown to be especially obvious within sex-based research. Whilst our study de-identified participant data, the identity of the individual was visible to the experimenter, potentially causing insecurity for participants. This insecurity in turn may have caused female participants to mask their true sexual behaviours to match their perceived societal expectations and consequently underreport sexual activity. Therefore, the amalgamation of a societal shift that now punishes sexual misconduct in men combined with traditional female gender norms may provide some rationale for the lower levels of sexual risk-taking.

Thus, whilst it may seem that our results differ from earlier studies such as that of Ariel & Loewenstein (2006), a potential explanation for this discord, may lie within the progression of society that now holds men accountable for their sexual misconduct. The emergence of social movements such as The Me-Too movement have brought sexual misconduct to the forefront of international discourse and with the power of social media, formed a culture of intolerance towards sexual misconduct. This impact is directly visible in the present study with an overall low level of sexual risk-taking within the sexual arousal condition. Whilst this exemplifies the positive progression of society, some areas remain stagnant. The gender bias combined with traditional gender norms not only impede the honest capturing of female sexual decision-making but the

publication of said studies too. Thus, the present literature, even with its limitations, gives us an insight into the current attitudes towards sexual risk-taking whilst expanding the field of female sexual arousal research, which has been overlooked for many years.

Anger and Sexual-Decision-making

The present study also examined the impact of anger on self-reported sexual decision-making. It was hypothesised that anger would cause riskier self-reported sexual decision-making, but our results showed that anger did not impact sexual decision-making. Whilst, this finding rejects our initial hypothesis, the literature surrounding anger and sex had shown considerable discrepancies. Early studies by Yates et al. (1984) revealed a significant relationship between sexual arousal and anger in the form of sexual aggression. Additional studies by Mussweiler & Förster (2000) reported similar results. Yet contradictory findings were found by Kelley et al. (1983) showed that neither anger nor the opportunity to engage in aggressive acts influenced self-reported sexual arousal. Thus, whilst it seems at face value these studies contradict each-other, it may be that the relationship between sexual aggression and anger is unidirectional.

To expand both Yates et al. (2000) and Mussweiler & Förster (2000) induced sexual arousal and then measured aggression, whilst Kelley et al. (1983) induced anger and then measured sexual aggression. The present study is more reflective of the latter where anger was induced and the hypothetical sexually aggressive scenarios were presented. Nevertheless, this provides an interesting comparison, as anger and sexual arousal hold many similarities. Sexual myopia and anger blindness, both have been established as tremendous, overwhelming emotions that significantly inhibit the decision-making ability of the individual. Once a person is angry, a series of cascading effects takes place, causing individuals to focus more on anger-congruent stimuli, consequently exacerbating their anger. In addition to this cognitive processing is simplified and

greater reliance of superficial cues during intense anger stages. These effects are also observed during sexual myopia where the attentional and motivational focus is directed towards immediate gratification, and abstract inhibitory information is discounted (Ariely & Loewenstein, 2006; Skakoon-Sparling & Cramer, 2020). Thus, the similarities of these two arousal states suggests they would result in similar responses, yet from our findings we can see that is not the case.

One possible explanation for the difference, may be the evolutionary purposes of sexual arousal and anger. Anger produces a fight or flight responses that serves the purpose of self-preservation. This primary goal of self-preservation may cause individuals to ignore secondary needs such as sexual arousal. This is seen in Bozman & Beck (1991) where the effects of anger on sexual stimuli was investigated. They found that anger significantly decreased sexual desire, even more so than other arousal states like anxiety in men. A mixed-gender follow up study was also conducted and found this disinhibition was not only also present in female participants but feelings of anger played a greater role in disinhibition than in male participants (Beck & Bozman, 1996). Thus, it seems from an adaptive standpoint that sexual response inhibition is a necessary process to prevent individuals from experiencing disadvantages to survival that may occur during ill-timed episodes of sexual arousal.

Another possible explanation maybe the effects of secondary emotions that were brought forth during the anger induction. During the anger induction, disgust was also shown to be induced to similar levels as anger. This is not an exclusive finding as the overlap in anger and disgust is a widely reported findings within scientific literature (Heerdink et al., 2019; Molho et al., 2017; Oaten et al., 2018). Scientific literature examining the role of disgust has shown that it serves a disease avoidance function (Curtis & Biran, 2001; Marzillier & Davey, 2004). Disgusts can manifest through the presence of pathogens such as touching something slimy or gooey, which

results in the person immediately withdrawing to avoid the eliciting cue. Additionally disgust can also arise more distally in disease avoidance situations (Curtis & Biran, 2001). Both these sources are closely linked to sexual behaviour with the exchange of bodily fluids and concerns of sexual transmitted diseases being present. Thus, in line with these observations, disgust is known to be a primary inhibitor of sexual arousal and in many cases is shown that once sexually aroused, disgust is reduced, so that individuals may engage in sexual behaviours (Oaten et al., 2019). Priming disgust has also shown to lead to reduced arousal-related judgements of sexually arousing stimuli (Andrews et al., 2015; Fleischman et al., 2015). Moreover, it has been suggested that higher levels of trait disgust play a contributory role to sexual dysfunction in women, by inhibiting sexual arousal (Van Overveld et al., 2013). Thus, in line with our findings, the presence of disgust may have acted as a buffer for sexual risk-taking by inducing feelings of withdrawal when answering the hypothetical sexual decision-making questionnaire.

In summary the present study showed that anger did not impact sexual decision-making. Whilst anger and sexual arousal hold many similarities their roles within the human emotion spectrum provide different mechanisms for survival. The fight or flight response elicited when anger is induced has shown to inhibit sexual desire. This was suggested to be an adaptive function to prevent individuals from ill-timed episodes of sexual arousal during life-threatening situations. Another explanation for the present findings is the overlap of disgust within our anger condition. Disgust has been closely linked with anger and serves a disease avoidance function. This function may disinhibit sexual desire and arousal in fear of either the possibility of infection or pathogens causing individuals to withdraw. Therefore, the present study, provides invaluable insight into anger related sexual decision-making, showing that anger does contribute to risky sexual decision-making.

The Potential Role of Amusement in Decision-making

The present study adds to the field of emotion research by examining the impact of amusement on sexual decision-making. Our study suggests that sexual decision-making is not impacted by amusement and aligns with previous research by Cahir & Thomas (2010) that found positive emotions did not cause riskier decision-making. A potential explanation for this derived from the mood-maintenance hypothesis, which suggests that positive emotions such as amusement produce risk-avoidant behaviour, so that individuals can preserve their current affective state. Thus, individuals within the amusement condition, may have become sexual risk averse when induced into an amused state. Similarly, recent work by Wang et al. (2017) showed that positive emotion promotes cognitive flexibility and cognitive control, reducing activation of brain areas related to conflict. Thus, individuals within a heightened amusement state are better able to prioritise their health over short term pleasure. Given these underlying mechanisms that inhibit risky decision-making, amusement functions very differently than both anger and sexual arousal. The myopic effect experienced within anger and sexual arousal had shown from previous literature to drastically inhibit and simplify cognitive functioning. Yet it seems amusement shows a contrasting effect enabling risk-averse heuristics and enabling cognitive flexibility reducing risky decision-making. Further research is needed within the area on positive emotions as our present study only shows that amusement does not negatively impact sexual decision-making. Thus, further research is needed within the field of positive emotion to understand the potential positive impacts of positive emotions such as amusement.

Trait Impulsivity and Sexual Violence

The role of impulsivity within sexual decision-making has been established as that of a significant exacerbator. Impulsivity is often characterised as sensation seeking and thus acts as a catalyst for

sexually risky behaviours. Our study illustrated this, as individuals higher in trait impulsivity were shown to report riskier sexual behaviour. This inability to inhibit one's desires and seek out short term sensation has numerous negative impacts on an individual's life. Studies examining delay discounting found individuals who had offended, discounted future rewards substantially more than non-offenders (Arantes et al., 2013; Hanoch et al., 2013). This also extends to sexual delay discounting as a recent study by Sweeney et al., (2020) observed a significant positive relationship between sexual delay discounting and self-reported sexual risk behaviours. Sweeney et al., (2020) found that impulsivity played an integral role in sexual decision-making even more than some demographic factors. A similar study by Zinzow & Thompson (2015) found that college men who perpetrated sexual assault reported greater levels of impulsivity and engaged in risky behaviours such as drug use, high levels of alcohol consumption and higher numbers of sexual partners than their non-perpetrating counterparts. Thus, our findings confirm existing literature showing that sexual aggression is not an uncontrollable or random behaviour but linked to key dynamic personality traits. The present study allows for significant societal shifts in the perception of sexual violence and rape. Early studies by Larsen & Long (1988) showed that rape and sexual assaults were viewed as “*an expression of an uncontrollable desire for sex*”, rather than a voluntary act. Since then, great strides have been made to debunk such myths, yet victim-blaming is still prevalent today. Rape myths promote a culture that shifts the blame from the perpetrator to the victim. This has widespread impacts as recent studies show that rape myths are routinely used within trials to portray the victim as blameworthy for being in high-risk situations and even used by defence barristers to portray the victim's behaviour as suspicious or immoral to lower their credibility with the jury (Ellison & Munro, 2009; Smith & Skinner, 2017). A follow-up study by Ellison & Munro (2013) showed that such tactics often work in discrediting the victim. As a direct

result of this victim-blaming culture, survivors experience guilt and shame concerning their conduct or character and may refuse to report their experiences of sexual violence to authorities (Suarez & Gadalla, 2010). This link between impulsivity and sensation-seeking has shown to be of great interests with academia as more research is now being done to develop interventions to reduce impulsive behaviours. A meta-analysis by Vekety et al. (2020) found mindfulness based interventions to decrease overall inattentive and hyperactive-impulsive behaviour. Similar findings by Klingbeil et al. (2017) and Zoogman et al. (2015) suggest that mindfulness activities, specifically focussing on attention and emotional control are able to impulsive behaviours. However, most studies within this area target children and greater research is needed to apply these interventions to adolescent and adult samples. Thus, it is important to continue research within impulsivity as to better understand the underlying mechanisms that contribute to risky behaviours and not contribute sexual violence to false myths that these behaviours “*just happen*”.

The Variability of Impulsivity Measurement

Whilst, clear links have been established between sexual decision-making and impulsivity, there is still variability within the literature. A potential reason for this may be due to impulsivity's non-rigid and multifactorial nature. Previous literature by Hoyle et al. (2000) found a significant but not strong relationship between impulsivity and sexual risk-taking. This is present within our study as whilst impulsivity accounted for a statistically significant amount of variance of sexual risk-taking, this variance was shown to be very minimal. This suggests, impulsivity does play a role but not as strongly as arousal states such as sexual arousal. This is reflected within the literature as qualitative analyses of self-interviews of 470 men found a significant perpetration of sexual aggression and certain facets of impulsivity (Hoyle et al. 2000). However, this relationship was shown to be indirect and was better explained by societal factors such as hostile masculinity and

situational influences such as heavy alcohol consumption. This variability may also be due to the conceptualisation and operationalisation of impulsivity. Currently, impulsivity can be measured as a trait measure and a state measure. State measures examine impulsivity at a specific time, typically after some form of induction, whilst trait measures examine a person's stable, long-term and habitual patterns. Previous work by Skakoon-Sparling et al. (2016) had shown that both men and women were more likely to lower their inhibitions and experience impaired decision-making in situations where sexually visceral cues are present. Their study used the blackjack game to measure state impulsivity, whilst our study used the BIS-11, which is a trait measure. State measures, examine the situational behaviour of an individual whilst trait measures examine impulsivity through the self-perception of the individual. In Skakoon-Sparling et al. (2016) study, they chose to use a state measure in the form of a modified BlackJack game. Whilst state measures are important to understand the impact of arousal on risk-taking, these measures are only effective if the arousal induction sufficiently elevates levels of sexual arousal. This is especially important in the case of sexual arousal because sexual preferences vary heavily from person to person, yet Skakoon-Sparling et al. (2016) only used four video clips involving heterosexual partners across their sexual arousal condition. This may be a potential issue as individual preferences may have diminished sexual arousal levels. Whilst, Skakoon-Sparling et al. (2016) reported successful sexual arousal, greater arousal may have been achieved by using a method that accounts for the individual sexual preferences of each of the participants. This is an important factor when using state measures such as the black-jack game, which is dependent on "in the moment" levels of arousal. In contrast to this, our study used the BIS-11, a trait measure of impulsivity, and because it is not dependent on arousal or the "state" of the person and gives a stable long-term overview of an individual's level of impulsivity. The inclusion of these measures may help inform treatments

and intervention as trait impulsivity is less volatile in the long-term and thus give more informative and consistent data on a person's impulsivity.

The Lack of Self-report and Physiological Responding

The results found within our study shed some light on a body of literature that has been shown to produce conflicting results. Our study used numerous medians to accurately capture physiological experience but showed no concordance with self-reported arousal across all conditions. This finding aligns with studies such as Mauss et al (2004) and by Ciuk & Troy (2015) who found no discernible association between self-reported emotion and physiological measures. Thus, this begs the question, why physiological and self-report arousal shows no significant levels of concordance. One possible explanation may be that emotions may not be a unitary phenomenon. Previous literature had established that the measurement of physiological arousal is dependent on the ANS. However, certain emotions can coactivate sympathetic and parasympathetic responses (Ottaviani et al., 2013). This is evident within our study as across all conditions, secondary emotions are also activated during the induction process. One such emotion prevalent in both anger and sexual arousal condition is disgust. Studies by Ottaviani et al. (2013) and Kreibig (2010) evaluated the autonomic response of disgust and found that disgust was able to elicit both sympathetic and parasympathetic responses. This is because the physiological response to disgust is dependent on whether the disgust is morality-related or pathogen (physical) related (Ottaviani et al., 2013). Ottaviani et al. (2013) supported that physical disgust elicited enhanced activity of the parasympathetic nervous system without concurrent changes in HR whilst moral disgust elicited increased HR but no other parasympathetic activation. This is observable in our study as during the induction process, disgust is seen to increase. This may have played a role in the present study as pornography may elicit physical disgust due to reasons such as viewing the exchange of bodily

fluid causing no difference in HR. However, participants may also have felt moral disgust due to the taboo nature of watching pornography causing an increase in HR but no other physiological activation. This effect is not exclusive to disgust as other emotions such as surprise have been shown to evoke different physiological responses depending on whether the surprise is positive or negatively valenced (Levenson & Ekman, 2002). Therefore, the potential existence of these secondary emotions may disrupt or diminish the physiological effect of the primary emotion that is being self-reported. Thus, the nuances of emotion may not be effectively encapsulated using just self-report and physiological measures. It may be that even basic emotions produce complex and nuanced outputs that we do not fully understand, requiring further examination to truly understand their underlying mechanisms.

Rethinking How We Conceptualise Emotion

The lack of self-report and physiological concordance across arousal conditions requires us to review how emotion is conceptualised. Our results suggest that emotion is not a unitary phenomenon but rather a combination of different emotions. Whilst our study attempted to target the emotions; sexual arousal, anger and amusement, it was clear other emotions such as disgust and happiness become coactivated in the process influencing the physiology of the individual. This in combination with the discordance between subjective experience and physiological arousal suggests, that the experience of emotion may have other underpinnings. One such avenue that may aid in the understanding these results is the two-factor approach and Barret's theory of constructed emotion. Both these theories suggest for emotions to be experienced; physiological activation is needed but acts as a threshold that triggers cognitive appraisal. These models suggest that it is cognitive appraisal and arousal intensity that determines the typology of the emotion (Schachter & Singer, 1962; Barret, 2017). These models, place greater importance on self-report measures as

physiological activation is necessary but acts only as a trigger for cognitive appraisal. Thus, the individual experience of emotions is dependent on the individual's perception of the stimuli. For example, it is possible that within our study, a participant in the sexual arousal condition to see the nudity and romance causing only feelings of sexual arousal. However, another participant may also be sexually aroused from the videos but in addition feel shame or embarrassment, given the taboo nature of pornography. Similarly, within the anger condition individuals may feel only anger for the immoral acts they witnessed whilst, others may feel anger but also disgust for the same actions. Thus, the individual experience of a singular emotion greatly varies from person to person. Similar to colour, the cognitive interpretation of emotion may be uniquely different to each individual. Literature examining this phenomena show that personal influences such as culture can impact emotion expression. Lim (2016) show that collectivist cultures often discourage experiencing high arousal regardless of emotion, with some eastern medicines suggesting excessive emotional experience can be harmful and cause diseases, no matter how positive the emotion. Thus, individuals induced to high states of sexual and amusement arousal may feel shame for experiencing this level of arousal. Whilst, our study did not directly measure cultural differences, it is reasonable to assume given the multi-ethnic population of NZ that this may have contributed to our findings. Thus, taken together, our findings provide evidence for the two-factor model, as the experience of emotion may be unique to each individual.

In summary, the present study found no concordance between physiological and self-report measures of arousal, suggesting that perhaps emotional experience is more nuanced than the up and downregulation of heart rate, GSR or pupil dilation and emotions may not produce unique independent physiological patterns but rather each individual experiences the same emotion uniquely. This was shown within our study, where during induction, other emotions such as disgust

became co-activated. Previous studies had shown that disgust has different impacts on the ANS, dependent on whether the individual is experiencing morality-related or pathogen related disgust (Ottaviani et al., 2013). Both forms of these disgust are plausible during sexual arousal and is dependent on the individuals' previous experiences. Additionally, these findings provide further evidence for the two-factor and Barret's constructed theory of emotion as these models perceive emotion from a cognitive standpoint, with each individual experiencing emotion differently.

Limitations

The intimate nature of sex and sexual behaviour had led us to use several self-report instruments within the present study to protect the anonymity of the participants. Whilst this provides a simple and private method of data collection, self-report methods are vulnerable to a multitude of biases. The social desirability bias has already been briefly discussed regarding gender norms, but the honesty of individuals may also prove to be an issue when sexual violence is studied. The taboo nature of sexual violence may cause an individual to intentionally suppress their answers or lie during the sexual decision-making task to avoid scrutiny or shame. The introspective ability may also influence the outcome of tasks, especially the BIS-11. Given the intensity of the study (watching sexually explicit material), individuals may become overwhelmed and have difficulty assessing themselves accurately.

Another potential limitation is it is unknown whether every participant reached sufficient levels of arousal. This can be due to a number of different factors. Firstly, the induction process used within this study requires the participant to do a multitude of different actions. Individuals must view a video, whilst continuously introspecting and translating their levels of arousal onto a bar using a computer mouse. This requirement of multi-tasking, especially in an unfamiliar environment, where participants are aware they are being monitored may be overwhelming for

some individuals. Additionally, the stimuli exposure time for each participant greatly varies. Because individuals are only required to watch videos until a 75% threshold is reached or until 10 minutes has passed, this allows for varying stimuli exposure time. This may influence later decision-making questions as individuals who were only exposed to stimuli for a short period may have reduced or no levels of arousal.

Application/Future Studies

The Induction Process

The process of induction used within the present study provides a new methodology for researchers to induce arousal in participants. This form of induction was shown to effectively induce amusement, sexual arousal, and anger. This form of induction builds on traditional methods of presenting visual stimuli but implements a more personalised stimuli selection process for the individual. By giving participants the ability to directly choose stimuli that are most conducive to enhancing their arousal level, we can overcome individual preferences and utilise stimuli more effectively. This is especially important for sexual arousal as sexual preference greatly differs across persons. Literature investigating sex differences in visual sexual stimuli responses show men appeared more influenced by the sex of the actors whilst women placed more importance on the context (Rupp & Wallen, 2008). Additionally, men generally prefer stimuli that allow the objectification of actors (Koukounas & Over, 2001), whereas women favour stimuli that aid in self-projection (Rupp & Wallen, 2008). Moreover, men have shown a significantly lower level of self-reported arousal to films depicting two men, compared to heterosexual and lesbian films. Women in contrast show no significant differences between heterosexual or female homosexual films (Costa et al., 2003). Our methodology gave individuals a wide variety of stimuli to choose from that match the sexual preferences for a wider range of people within a singular induction.

Moreover, the implementation of an arousal bar during induction allows researchers to capture individuals at their peak levels of arousal. This allows researchers to present tasks or self-report measures to participants when they are at their peak levels, which more mimics real-life moments.

Utilising Social Media To Promote Sexual Health

The present study adds to the body of literature that highlights the devastating impacts of sexual arousal and impulsivity on sexual decision-making. From our study, it was clear that sexual arousal significantly impacted the sexual safety of individuals and requires immediate intervention to reduce the long-term impact on human life. The WHO identified STI prevention as one of its top priorities, yet very little impact has been made in the attitudes and behaviours around sexual safety (World Health Organization, 2018). One such avenue that has garnered significant international attention is the use of social media to educate the general population. The globalisation of the world, through internet connectivity, has enabled more than 2 billion active users worldwide, and online social media represents a powerful channel for sexual health promotion (Meta Platforms, 2022). Social media-based interventions may prove to be especially prudent in educating young people as an estimated 80% of teens report using social networking sites like Facebook (Jones et al., 2014). Early implementation of mass social media interventions yielded promising results. An HIV preventative social media campaign conducted in multiple cities across Africa found young people within the trial improved in areas such as normative condom-use negotiation expectancies and increased sex refusal self-efficacy. Additionally, older adolescents aged 16-17 exposed to the campaign showed a less risky age trajectory of unprotected sex than non-affected cities (Sznitman et al., 2011). Similar interventions by Jones et al. (2012) piloted the use of Facebook sites that addressed signs, symptoms, screening and prevention of Chlamydia infection in 15 to 24 year-olds. Jones et al. (2012) found that the dissemination of STI information through social media

showed a 23% increase in condom utilisation and a 54% reduction in positive Chlamydia cases among 15–17-year-olds. A review of 51 scientific papers on the use of online social media for sexual health promotion by Gabarron & Wynn (2016) found that the use of social media for promoting sexual health showed positive results but noted that many interventions only target one or two social media services. Facebook was identified as the most frequently used channel (86%), but recent studies suggest that Facebook has recently seen a significant decline in recent years (Hong & Oh, 2020). Thus, other avenues, such as online dating apps like tinder and Bumble, should be explored. Some interventions have taken this approach such as Huang et al. (2016) who advertised free HIV self-tests on Grindr. Huang et al. (2016) found that the HIV testing website gained over 11,000 new visitors during this campaign, with 55% of these visitors reported using an HIV self-test and an additional two persons reported testing positive for HIV and seeking medical care. This is not an isolated finding as to the utilisation of dating applications such as Grindr, SCRUFF, and Jack'd to advertise HIV prevention campaigns has shown positive results. However, many of these campaigns specifically target only homosexual men, and little effort has been made to target other sexual preferences.

Therefore, more work is needed in collaboration with companies such as tinder and bumble that cater to a more diverse range of sexual preferences, providing educational resources not only on sexual health but also topics such as sexual violence. These campaigns and interventions should be multifaceted, endorsing positive sexual health attitudes across multiple avenues and not just through social media. The implementation of such campaigns and interventions may reduce strain on the healthcare and justice system and in doing so positively impact thousands of lives.

Conclusion

Whilst the present study aimed to replicate and extend the findings of Ariely & Loewenstein (2006), the findings of our study suggest sexual arousal appears to have a far less of an impact on sexual decision-making than what was found in Ariely and Loewenstein (2006). However, our study found that sexual arousal did negatively impact contraceptive usage and lead to greater disregard for one's own sexual safety. Our study also showed that impulsivity contributes to risky sexual behaviours albeit minimally. Taken together it seems a lot has changed since the original Ariely & Loewenstein (2006) study and though sexually aggressive and manipulative behaviour has greatly decreased, significant work is still needed to improve contraceptive use and bring greater awareness to sexual health.

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Appendix

Appendix 1

Sexual Decision-making score comparison with Ariel & Loewenstein (2006)

Questions	Ariel & Loewenstein Mean Response	Present Study Mean Response	Mean Difference
<i>Can you imagine being attracted to a 12-year-old?</i>	65	2	63
<i>Could you enjoy having sex with someone you hated?</i>	77	6	71
<i>Can you imagine getting sexually excited by contact with an animal?</i>	16	3	13
<i>Would you tell a person that you loved them to increase the chance that they would have sex with you?</i>	51	8	43
<i>Would you encourage your date to drink to increase the chance that they would have sex with you?</i>	63	5	58
<i>Would you keep trying to have sex after your date says "no."?</i>	45	4	41
<i>Would you slip a person a drug to increase the chance that they would have sex with you?</i>	26	0	26
<i>Would you always use a condom if you didn't know the sexual history of a new sexual partner?</i>	69	24	45
<i>Do you think a condom interferes with sexual spontaneity?</i>	73	38	35
<i>Do you think condom decreases sexual pleasure?</i>	78	57	21

Appendix 2*Video Descriptions*

Genre	Name	Description
	<i>Police</i>	
<i>Anger</i>	<i>Brutality</i>	Video shows police be overly aggressive towards civilians.
<i>Anger</i>	<i>Enough</i>	Video shows man physically abusing his partner.
<i>Anger</i>	<i>Racism</i>	Video shows women being overtly racist towards workers in her home.
<i>Anger</i>	<i>Cop Stop American</i>	Cops stop and harass African American couple.
<i>Anger</i>	<i>History X The</i>	A white supremacist assaults and beats African American thief.
<i>Anger</i>	<i>Bodyguard</i>	The new kid is bullied at school.
<i>Sexual</i>	<i>M&M 1</i>	Two Caucasian males having sex in a kitchen
<i>Sexual</i>	<i>M&M 2</i>	Two brown men having sex by the pool
<i>Sexual</i>	<i>M&M 3</i>	Two African American men having sex in the sauna
<i>Sexual</i>	<i>M&M 4</i>	Three men having sex
<i>Sexual</i>	<i>M&W 1</i>	Middle Eastern women and African American man having sex in bed
<i>Sexual</i>	<i>M&W 2</i>	A man and two women having sex on a couch
<i>Sexual</i>	<i>M&W 3</i>	A Caucasian man and women having sex
<i>Sexual</i>	<i>M&W 4</i>	A Caucasian man and women having sex by the pool.
<i>Sexual</i>	<i>W&W 1</i>	Two women having sex with a sex toy
<i>Sexual</i>	<i>W&W 2</i>	Two Caucasian women having sex.
<i>Sexual</i>	<i>W&W 3</i>	W&W 3: Three women having sex in a bed.
<i>Sexual</i>	<i>W&W 4</i>	W&W4: African American women and Caucasian women having sex
<i>Amusement</i>	<i>Funny kids</i>	Funny videos with kids
<i>Amusement</i>	<i>Funny animals</i>	Funny videos with animals
<i>Amusement</i>	<i>Horse & Cameraman</i>	A video of a horse continuously interrupting an interview.
<i>Amusement</i>	<i>The Office</i>	A short extract from <i>The Office</i> with Dwight trying to teach the office fire safety.
<i>Amusement</i>	<i>The Hangover</i>	A short extract from <i>The Hangover</i> where after a night out the guys find a tiger in the bathroom.
<i>Amusement</i>	<i>NZ world maps</i>	Reece Darby investigates why NZ is being left off maps.
<i>Neutral</i>	<i>Neutral</i>	A series of conversation from various movies
<i>Practice</i>	<i>Street Scene</i>	On a busy pedestrian street, tourists enjoy a meal and walk

