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Sexual Desire, Sexual Behaviour and Sexual Distress in Committed Couples

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Résumé

Malgré le rôle central qu'ils jouent dans la sexualité, le désir sexuel et le comportement sexuel restent mal compris – particulièrement chez les couples. La rareté des résultats empiriques dans ce domaine contribue à l'écart qui existe actuellement entre la recherche en sexualité et la pratique clinique, et peut impacter négativement la qualité des soins disponibles aux nombreux couples qui consultent pour des problèmes de désir sexuel - la plainte la plus courante en thérapie sexuelle.

L'objectif des trois articles de cette recherche doctorale était d'aider à combler cette lacune en étudiant le désir sexuel dans le cadre d'une perspective relationnelle. L'hypothèse de départ de ce travail était que le bien-être de chaque partenaire est influencé en interaction avec l'autre partenaire, et que cette influence est médiée en partie par le comportement sexuel du couple. Les résultats obtenus appuient cette hypothèse : Ils suggèrent que les interactions positives pendant les rapports sexuels, telles que les motivations d'approche « pour soi » et « pour l'autre » des deux partenaires et les comportements génitaux et affectifs du couple sont associées à une plus grande satisfaction sexuelle et à un plus fort sentiment d'intimité (étude 1). À l'inverse, les difficultés sexuelles telles que le faible désir sexuel sont associées à des restrictions de comportement sexuel et à l'insatisfaction sexuelle (étude 2). De même, les asynchronies entre partenaires telles que les décalages de désir sexuel sont associées à une plus grande détresse sexuelle (étude 3). Enfin, la troisième étude commence à établir une direction et une portée à ces associations, en suggérant que les problèmes de décalage de désir sexuel prédisent la détresse sexuelle d'un jour à l'autre, et que ces associations

quotidiennes sont reflétées par des associations plus distales sur des périodes d'un an ou plus. Ces résultats sont cohérents avec les recherches récentes sur la régulation émotionnelle en sexualité, et plus spécifiquement, avec des modèles où le désir sexuel joue un rôle régulateur, médié par des variations de comportement sexuel.

Il est espéré qu'au-delà de ces contributions conceptuelles, la présente recherche sera utile aux cliniciens. En particulier, ces résultats soutiennent les thérapies qui se concentrent sur les interactions quotidiennes entre les partenaires pour aider les couples aux prises avec des problèmes de désir sexuel.

Mots-clés : Désir sexuel ; comportement sexuel ; décalage de désir ; satisfaction sexuelle ; détresse sexuelle

Abstract

Despite the central role they play in sexuality, sexual desire and sexual behaviour remain poorly understood in committed couples. The paucity of empirical results in this area contributes to the distance between research and clinical practice, and negatively impacts the quality of care offered to the many couples seeking help for sexual desire issues – the most common complaint in sex therapy.

The objective of the three articles in this doctoral research was to help address this gap by studying sexual desire within a relational perspective, working from the assumption that each partner's wellbeing was influenced by that of the other partner, and that this influence was mediated in part by the couples' sexual behaviour. Results from this research suggest that positive interactions during sex, such as self- and other-approach motives and genital and affective behaviours, are associated with greater sexual satisfaction and intimacy (study 1). In contrast, sexual difficulties such as low sexual desire are associated with restrictions in sexual behaviour and sexual dissatisfaction (study 2), and asynchronies between partners such as sexual desire discrepancy are associated with sexual distress (study 3). Furthermore, the third study begins to establish a direction and span to these associations, by suggesting that issues with sexual desire discrepancy are predictive of sexual distress from one day to the next, and that these daily associations are mirrored by more distal associations spanning a year or more. These results are consistent with recent research on emotional regulation in sexuality, and more specifically, with proposals that sexual desire plays a regulatory role in the couple, mediated by variations in sexual behaviour.

It is hoped that, beyond these conceptual contributions, this research will be of use to clinicians. In particular, these results support the use of therapies that focus on everyday interactions between partners to help couples struggling with sexual desire issues.

Keywords: Sexual desire; sexual behaviour; sexual desire discrepancy; sexual satisfaction; sexual distress

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Glossary

5-HT	Serotonin
ANOVA	Analysis of Variance
APIM	Actor-Partner Interdependency Model
APIMeM	Actor-Partner Interdependency Mediation Model
CBT	Cognitive-Behavioral Therapy
CFI	Comparative Fit Index
DA	Dopamine
DSM, DSM-5	Diagnostic and Statistical Manual of Mental Disorders (v. 5)
ED	Erectile Difficulty
F-SIAD	Female Sexual Arousal and Interest Disorder
FSFI	Female Sexual Functioning Index
GABA	Gamma Aminobutyric Acid
GPPPD	Genito-Pelvic Pain/Penetration Disorder
HSDD	Hypo-Sexual Desire Disorder
HSEM	Hierarchical Structural Equation Models
HYP	Hypothalamus
IERM	Interpersonal Emotion Regulation Model
IIEF	International Index of Erectile Function
IMN	Incentive Motivation model
LGBTQ+	Lesbian, Gay, Bisexual, Transgender and Queer
NAcc	Neucleus Accumbens
NE	Norepinephrine
OFC	Orbito-Frontal Cortex
PDE-5	Phosphodiesterase Type 5 Inhibitor
PPR	Perceived Partner Responsiveness
RMSEA	Root Mean Square Error of Approximation
SA	Sexual Approach (motive)
SADI	Sexual Arousal and Desire Inventory
SDD	Sexual Desire Discrepancy

SDI-2	Sexual Desire Inventory-2
SEM	Structural Equation Model
SES/SIS	Sexual Excitation Scale and Sexual Inhibition Scale
SIS1	Inhibition Due to Threat of Performance Failure
SIS2	Inhibition Due to Threat of Performance Consequences
SRMS	Standardized Root Mean Square Residual
TLI	Tucker Lewis Index
VSA	Vunerability-Stress-Adaptation Model
VTA	Ventral Tegmental Area

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It has been said that the more we grow older, the more we come to resemble our parents. Certainly, I have over time come to recognise in myself traits that I have long admired in my own parents: From my father, his passion, his curiosity, keen intellect, and his joy in a well-turned sentence. From my mother, her drive, focus and intensity. For these gifts, for their lessons and love, I am grateful; were it only for this, I could not have envisaged completing this work without them. Further, when she lived, my mother was a Gestalt couple therapist. As I complete this doctorate, I find myself following in her footsteps – and leave it to our psychodynamically-oriented colleagues the pleasure of interpreting this! And, a prayer for my departed grandfather Emile, who took pride in my studies and regretted that he would not see me finish my first PhD. Here I am again Grandfather, praying that you find joy in seeing me complete this one.

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INTRODUCTION

There is something ironic about sexual desire: It is strongest in individuals without a partner, where sex is arguably the least available and the most infrequent (Herbenick et al., 2014). In contrast, in committed couples, where sex should be the most freely available, sexual desire decreases on average with relationship duration (Klusman, 2002).

The deficit of sexual desire in committed couples has been and continues to be a subject of much attention in the media (Tiefer et al., 2002). Unsurprisingly, the market for couples seeking a solution to issues of sexual desire is significant – witness the voluminous self-help literature (Joannides & Gross, 2018; Nagoski, 2015; Perel, 2006), booming "sexual wellness market" (estimated at over 26 $Bn in 2017; Shahbandeh, 2018) and pharmaceutical support for waning sexual desire (PDE5 inhibitors, collectively estimated at over 4.8 Bn in 2017; Zion Market Research, 2018). Within the scientific community, sexual desire has also been studied extensively (Levine, 2002). Google Scholar returns over 2.2M publications in response to keyword search on sexual desire, some dating from the early 1800s[1]. Research in this area has been particularly intense since the advent of PDE5

[1] Kiernan, J. G. (1891). Psychological aspects of the sexual appetite. *Alienist and Neurologist (1880-1920)*, *12*(2), 188.

Graham, Sylvester (1938) *A Lecture to Young Men on Chastity: Intended Also for the Serious Consideration of Parents and Guardians*. GW Light.

inhibitors such as Sidenafil (Viagra), and more recently, its feminine counterpart Flibanserin (Addyi).

Despite all this attention, sexual desire remains poorly understood. Difficulties with sexual desire remain among the most frequent motives for consulting a sex therapist, and are considered by clinicians to be among the most difficult to address (Corona et al., 2005; Davies et al., 1999).

One possible explanation for this continued difficulty is that the majority of research to date has focused on individual psychological and physiological factors. As some authors have argued, sex is by majority a relational experience (Dewitte, 2014; Impett et al., 2014). Hence, it may be within the context of relationships that we may best understand the phenomenon. More specifically, being a shared experience between the couple's partners, sexual desire has recently been studied in the context of interpersonal emotion regulation. Indeed, it has been proposed that sexual desire emerges from and is regulated by the interaction between the two partners (Butler, 2015; Niven, 2017; Rosen & Bergeron, 2019; Schoebi & Randall, 2015). This is the perspective considered here. The focus of the present thesis is on the dynamics of sexual desire within committed couples and its associations with sexual behaviour, sexual satisfaction and sexual distress.

The Ever-Evolving Couple

Long-term romantic relationships (committed couples) have changed considerably in the past decades, particularly across North America and Europe. Prior to the '60s, the norm for committed couples was lifetime marriage between a man and a

woman (Arnup, 2001). Today, same-sex couples are increasingly visible, recognized and accepted (Valverde, 2006), and homosexual marriage is legal in Canada since 2005 (Canada, 2005). A growing proportion of couples choose to eschew marriage altogether. In Canada's 2011 national census, 20% of cohabiting couples were in a common-law union, compared to 6% in 1981 (Milan, 2013). Finally, the long-term perspective of a couples' commitment has also changed. A century ago in Canada, couples were married "for life", and separation or divorce was infrequent and considered socially unacceptable (Arnup, 2001). Today, the average duration of a committed relationship continues to diminish. In 2011, 42% of married couples were divorced or living separately within 10 years – and although figures are difficult to obtain, this percentage is generally believed to be higher for unmarried couples (Milan, 2013).

The speed and scope of this evolution, and particularly the decrease in the longevity of committed relationships, can be a cause for concern. Indeed, it is generally understood that the quality and stability of long-term romantic relationships affect not only the health and wellbeing of the partners, but also of their eventual progeny. Relationship quality has been associated with a variety of psychological and physiological measures of wellbeing, including life satisfaction and longevity (Whitson & El-Sheikh, 2003). Conversely, poor quality relationship (and in particular, couple conflicts) has been associated with depressed immune responses, and more generally, to increased susceptibility and lower survival to life-threatening illnesses such as cardiovascular diseases (Coyne et al., 2001; Kiecolt-Glaser et al., 2005; Robles & Kiecolt-Glaser, 2003). Similarly, divorce and separation have been associated with increases in

unhealthy behaviour such as smoking and poor eating habits in both men and women (Eng et al., 2005; Lee et al., 2005). Divorcees, widows and people living alone after a separation have a higher mortality rate than people in couples or living together, even after having controlled for variables such as age (Johnson et al., 2000). Finally, children of couples with poor relationship quality or frequent conflicts are also at greater risk of difficulty, including poorer performance at school, behavioural problems and health problems (Gager et al., 2015; Tartari, 2015; Whitson & El-Sheikh, 2003).

…and the Pivotal Role of Sexual Desire

Amongst the factors that contribute to or hinder committed couples' wellbeing and duration, the quality of the couples' sexuality, and more specifically, of sexual desire, plays a pivotal role. In the modern couple, the purpose of the relationship has shifted from economic and reproductive to companionship and love (Tiefer, 2004). Unsurprisingly, the quality of the couples' sexuality has come to play an important part in partners' perception of their relationship quality. Sexual satisfaction has repeatedly been associated with the stability and longevity of the relationship, and this for both heterosexual and same-sex couples (Heiman et al., 2011; McNulty et al., 2016; Sanchez-Fuentes et al., 2014; Scott & Sprecher, 2000; Sprecher, 2002).

Sexuality becomes particularly important to the partners when it is problematic or absent. Sexual difficulties and sexual disorders are associated with lower intimacy between the partners, more frequent relationship difficulties, and more separations (McCabe, 1997; McCabe et al., 2010; Rust et al., 1988; Trudel & Goldfarb, 2010).

Given the importance for modern couples of living a satisfying sex life, it is striking that so many are unsatisfied with their sexuality. Surveys of the general population repeatedly show high rates of sexual dissatisfaction, with estimates ranging from 25% to 50%, depending on the study and its country (Dunn et al., 2000; Erens et al., 2019; Laumann et al., 1996).

Within this difficult context, sexual desire is conceptualized as a key predictor of both sexual satisfaction and relational intimacy. Indeed, issues with sexual desire are often considered central to most couples' sexual difficulties (McCarthy & Ross, 2018), leading some authors to propose that healthy sexual desire can be considered a protective factor for the couple (Gonzaga et al., 2006; Impett et al., 2005; Impett et al., 2008b; Levine, 2002; Mark, 2012).

Our Research and This Dissertation

Despite its pivotal and often problematic role in committed couples, much remains unknown about sexual desire. Indeed, much of the work to date has focused on the individual (Mark & Lasslo, 2018). Even when committed relationships were the object of the study, the relationship context was studied from an individual perspective (i.e., by measuring respondents' perceived intimacy or relational satisfaction), rather than including both partners' responses in a common model. Further, a large proportion of the work to date has focused on clinical samples, usually where sexual desire was reported to be absent or perceived to be insufficient. Finally, very few studies have included both same- and mixed-sex couples in their analyses. Furthermore, sexual desire is known to vary, and authors have noted event-level and daily variations in sexual

desire (Derogatis et al., 2011). Despite this, most studies to date have been cross-sectional, with participants reporting retrospectively over periods generally spanning four weeks or more. In addition to being sensitive to retrospective biases (Gillmore et al., 2010; Hoppe et al., 2008), the ecological validity of such designs has been questioned (Gunthert & Wenze, 2012).

The present doctoral thesis aimed to fill these gaps. Studies were conducted with samples of committed couples from the general population, and took both partners into account in the analyses. Although our first two studies are limited to heterosexual couples, the final set is more inclusive, and involves both same- and mixed-sex couples, with an oversampling of same-sex couples. Furthermore, these studies use repeated daily measures and a longitudinal design.

The thesis is structured as follows: The first part reviews some of the literature on individual and dyadic sexual desire, and provides a conceptual framework for the work. The second part discusses some of the methodological considerations we encountered regarding the inclusive study of sexual desire in naturalistic settings, and outlines the methodological choices made therein. The empirical work of the PhD is then presented in the form of three articles. The thesis concludes by a discussion of theoretical and clinical implications of the work, and by outlining future directions suggested by our research.

PART I: LITERATURE REVIEW

What is Sexual Desire?

Despite being one of the most studied areas in sex research, sexual desire continues to be difficult to define. By 2002, satisfying operational definitions of this construct had proven so elusive that, after a number of attempts, Levine (2002) defined sexual desire simply as "… the sum of the forces that incline us towards and away from sexual behaviour" (p.48).

Today, it is generally accepted that sexual desire is multi-dimensional, and best understood within a Bio-Psycho-Social framework (Engel, 1977). Given this very wide scope, different authors have focused on facets of sexual desire. Some have emphasized its neurological and endocrine underpinnings (Pfaus, 2009; Pfaus & Scepkowski, 2005), others its affective components (Everaerd et al., 2006; Leiblum & Rosen, 1988), and yet others its cognitive aspects (Brezsnyak & Whisman, 2004; Diamond, 2004; Impett et al., 2008b). All of these approaches share in common that they study sexual desire as an *intra-individual* phenomenon, and this remains the most common perspective adopted by sex researchers today. That said, a number of authors, emphasizing the fundamentally relational nature of sexual desire, study sexual desire within an *inter-individual* (relational or dyadic) context (Dewitte, 2014; Holmberg & Blair, 2009; Impett et al., 2014). The present research falls within this latter, more recent perspective.

This section provides a rapid overview of the literature on sexual desire. Firstly, the definition of sexual desire is clarified by contrasting it with other related constructs. Different conceptual models of sexual desire are then discussed. Intra-individual models

are reviewed first, then inter-individual models. Sexual desire is then examined in its association with sexual behaviour, and with outcome variables used in our work, namely, sexual satisfaction, perceived partner intimacy, and sexual distress. Finally, the section ends with an overview of individual and dyadic difficulties with sexual desire.

Distinguishing Sexual Desire from Sexual Excitement, Interest and Arousal

Sexual desire's resistance to being defined satisfactorily has profound implications for sex research. Indeed, the existing variety of definitions makes it often difficult to compare conceptual models and empirical research from different authors. Adding to this difficulty is a lack of clarity in the related terminology, in particular with regards to *sexual interest, subjective sexual arousal, and sexual excitement*. This terminological difficulty has been exacerbated by the clinical decision to collapse these constructs for women only in the most recent incarnation of the DSM (American Psychiatric Association, 2013), resulting in a combined Female Sexual Interest/Arousal Disorder (F-SIAD) – a diagnosis that has been the subject of considerable controversy (Sarin et al., 2013). The following section attempts to clarify these terms, and to contrast them with sexual desire.

Sexual arousal. First, *physiological sexual arousal* is distinct from *subjective sexual arousal*, as evidenced by studies reporting subjective arousal in the absence of its physiological counterpart, and the converse (Chivers et al., 2007; Chivers et al., 2010; Janssen et al., 2000).

Many authors (Both et al., 2007a; Laan & Both, 2008) emphasize the clear difference that exists between *sexual desire* (which is an internal experience) and *physiological sexual arousal* (which describes our physiological responses to anticipated sexual activity), based in part on the observation that sexual desire and physiological sexual arousal have been associated with different biological mechanisms. Despite having been blurred in the definition of F-SIAD, this distinction between sexual desire and physiological arousal is of profound importance in our everyday understanding of sexuality. Where sex is consensual, many people report regularly engaging in sexual activity and being aroused, despite an absence of sexual desire (Muise et al., 2016; O'Sullivan & Allgeier, 1998). In cases of non-consensual sex, this distinction is even more important. For example, rape survivors have reported being aroused and even experiencing orgasm during their ordeal; this is often for them a source of shame and confusion (Levin & van Berlo, 2004). Because it is interpreted as sexual desire, the survivors' arousal is often misinterpreted as implicit consent for the sexual activity. This misconception has been the source of regrettable consequences, including the dismissal of certain rape cases in courts of law (Berkowitz, 2015).

In contrast to physiological sexual arousal, definitions of *subjective sexual arousal* are often confusingly similar to sexual desire, with the latter generally referring to an *appetitive* state prior to sexual activity, and the former to a *consummatory* state during sex (Pfaus, 2009). Alternatively, some authors define subjective sexual arousal as the respondent's awareness and consciousness of their own physiological arousal (Chivers et al., 2010). Beyond these distinctions, the difference in experience between sexual

desire and subjective sexual arousal remains unclear, and is not consistently recognised (Bancroft et al., 2009). Relatedly, it is unclear how *sexual interest* differs from *sexual desire*. Indeed, Meana (2010) observes that in qualitative studies, women do not reliably distinguish between the two terms. Finally, while *sexual desire* and *sexual excitement* are occasionally distinguished in the literature; this distinction has also been challenged (Both et al., 2007b) on the basis that there is no operationally significant difference between the terms, except possibly that – similar to subjective sexual arousal, the latter implies a greater attentional focus on genital arousal.

Models of Sexual Desire

Working with the clarifications above, the following section summarises some of the more influential models of sexual desire.

Early Models of Sexual Desire

Sexual Desire as a "Drive"

Early models of sexual desire likened it to a life force (or *libido*) similar to hunger (Freud, 1905), which increased until satisfied by the sexual act. In motivation research, such *Drive models* (Deckers, 2018; Hull, 1954) posit that individuals are innately motivated to maintain a stable internal state. Departures from this stable state create a tension or a discomfort that drives individuals to act and repair the imbalance; this return to stability is generally felt as pleasurable. For example, a lowering of blood sugar triggers sensations of hunger; subsequent eating then allows the body to return to equilibrium, and results in pleasurable feelings of satiety and satisfaction.

In the same spirit, drive models of sexual desire held that healthy individuals experienced sexual desire regularly, with greater sexual desire being a sign of greater health and vitality. Most authors of the period attributed a greater drive to men – in fact, the Victorian conception was that sexual desire was an entirely masculine attribute (Berkowitz, 2012; Tolman & Diamond, 2001). One consequence of this model was that low or absent sexual desire was symptomatic of a disorder, particularly in men, which required correcting. Another consequence is that it pathologized women's desire (Stulhofer et al., 2016).

Sexual Desire as a Stage in Human Sexual Response and the DSM

This drive model of "sexual desire-as-libido" continued to be popular well into the 1980s, and had profound effects on sex research and sex therapy. For example, the psychoanalyst Helen Singer Kaplan included sexual desire as a first stage in her proposed three-stage model of human sexual response (Kaplan, 1977), before sexual arousal and orgasm. Based on this model, and consistent with the view that a given level of sexual desire was a normative indicator of health, Kaplan argued that insufficient or *hypoactive* sexual desire should be considered a psychiatric disorder. Accordingly, the DSM III included "Inhibited Sexual Desire" in its nomenclature, described as a "recurrent and pervasive inhibition of sexual desire" (American Psychiatric Association, 1980, p. 278), and replacing the earlier and more general disorders of *male impotence* and *female frigidity* (Angel, 2010). This normative view of sexual desire was carried over from revision to revision, and served as the basis for the DSM-5's two current disorders,

namely, Male Hypoactive Sexual Desire Disorder and Female Sexual Interest/Arousal Disorder (American Psychiatric Association, 2013).

Limitations of the "Sexual Desire-as-Libido" Drive Model

Although drive models of sexual desire continue to be encountered in lay and scientific literature, this view has proven inconsistent with both empirical results and clinical reports. Indeed, contrary to popular myth, sex is not a physiological need in humans, and unlike breathing, drinking, eating and sleeping, humans suffer no physiological damage from sexual abstinence (Singer & Toates, 1987). This observation runs contrary to drive models' fundamental assumption, and suggests that sexual desire is better compared to an appetite than to a physiological need (Both et al., 2007b).

Consistent with this, many authors refute the belief that low sexual desire per se is a sexual disorder, citing for example the large proportion of women who warrant a clinical diagnosis solely on this basis – despite the absence of any associated distress (Basson et al., 2003; Brotto et al., 2009; Meana, 2010). Accordingly, most recent models of human sexuality include sexual desire, but do not consider it to be a necessary precursor to sexual excitement or activity. This is the case of Barlow's circular Sexual Response Model, originally proposed for both men and women (Basson, 2001a) and increasingly adapted to describe women's experience of sexual desire (Basson, 2002).

Biological Models of Sexual Desire

Sexual Desire and Hormones

An often-cited biological explanation for sexual desire is that it is caused by the ebb and flow of hormones in the blood (Pfaus & Scepkowski, 2005). In fact, there is strong empirical evidence in both men and women that the level of sexual desire is affected by blood-level concentrations of hormones – and in particular, of androgens (testosterone and oestrogen; (Regan, 2015). These associations appear particularly significant when such androgens are in short supply. For example, administering androgens to men with hypogonadism and to women having undergone ovariectomies was shown to increase sexual desire (Morley & Perry, 2003; Rizk et al., 2017; Shifren et al., 2000). Furthermore, women report their sexual desire to be higher on average during ovulation, where levels of estrogen are at their highest (for a more complete review of these results, see (Pfaus, 2009)). However, it is now well documented that hormones alone are insufficient to explain variations in sexual desire (Giles, 2008). For instance, in non-clinical individuals, administering androgen supplements has no discernable effect on sexual desire (Goldey & van Anders, 2014; van Anders, 2012). In fact for women, under normal conditions, the day of the week is observed to be a greater predictor of sexual activity than their monthly cycle (Palmer et al., 1982).

Sexual Desire and Gratification

A more complete biological model of sexual desire may be obtained by focusing on the brain. Firstly, sexual desire appears to be mediated by the much of the same neurological machinery as other desires, such as the craving for drugs (chocolate, coffee,

cigarettes, cocaine; (chocolate, coffee, cigarettes, cocaine; Hoffman et al., 2015). Accordingly, it has been proposed that sexual activity may be biologically related to *reward or pleasure-seeking behaviours*, such that sexual desire is best understood as an urge which orients, evaluates and impels us towards sexual gratification (Berridge & Kringelbach, 2015; Pfaus, 2009).

Models arising from this reward perspective often emphasize the automatic and conditioned nature of sexual responses such as physical arousal and impulsive sexual behaviour. Indeed, many of the neurological structures associated with sexual desire are believed to be phylogenetically primitive, being similar across all vertebrates (Alcaro & Panksepp, 2011; Panksepp, 2011). In humans, these subcortical structures are interdigitated with higher-level cortical components, responsible for more complex functions such as delay of gratification and inhibition (Berridge & Kringelbach, 2015). Taken together, it is suggested that the combined action of these bottom-up and top-down systems allow us both to respond automatically and rapidly to sexually relevant situations, and to adapt our sexuality to the specifics of our environmental, relational and social contexts.

A Three-Component Model

It has been suggested that the structures associated with sexual desire and behaviour are composed of three distinct and interconnected sub-systems, namely, an *attentional* system, an *evaluative* system, and a *motivational and learning* system (Berridge, 2004; Berridge & Kringelbach, 2013; Kingelbach & Berridge, 2015).

The sexual attentional subsystem. This subsystem is responsible for automatically "noticing" or "expecting" sexually salient cues in the sensorium, and for preparing our bodies to engage in sexual activity. When presented with sexually salient sensory cues, the sexual attentional subsystem triggers the endocrine and autonomous nervous responses associated with sexual arousal, including genital engorgement and vaginal lubrication. In humans, it is believed that the sexual attentional subsystem is mediated by neurotransmitters including norepinephrine (NE), dopamine (DA) and serotonin (5-HT), and includes such brain areas as the orbitofrontal cortex (OFC). The OFC is believed to be critical in making predictions about the valence (positive, negative) of future outcomes, and thus for guiding decision-making based on the expectation of rewards and/or penalties. In support of this hypothesis, the activity of the OFC has been shown to vary according to the anticipation and delivery of rewards, with neurons firing most strongly for predicted large rewards, and least strongly to an expectation of equally large penalties (Kingelbach & Berridge, 2015).

The set of cues considered salient by the sexual attentional subsystem appears to be both innate and acquired. The capacity to acquire cues is an important feature of this subsystem because it allows us to adapt our reactions to the particulars of our environment. The process of learning which stimuli are sexually relevant is generally implicit (e.g., occurs via classical conditioning) and is thought to begin early in our lifetime – leading some authors to suggest that it is also involved in developing paraphilic sexual interests (Pfaus et al., 2012).

The automatic, conditioned nature of humans' sexual attentional subsystem has been demonstrated in numerous studies. For example, (Chivers et al., 2007) exposed participants to a variety of films, including a video of sexual activity between bonobo monkeys. Physiological arousal was observed in female participants presented with sexually salient cues, even when they did not report perceiving the experimental stimuli as sexually exciting.

The sexual evaluative subsystem. This subsystem is responsible for "liking" or "disliking" sexual activity. It evaluates the cues highlighted by the attentional system and assigns to them hedonistic (pleasure) and aversive (fear/dread) valences. As is the case for the attentional system, key neurotransmitters in this system include dopamine, modulated by opioids and other neurotransmitters. The sexual evaluative subsystem appears to be related to the brain's "pleasure center", and a number of pleasure "hotspots" have been identified in many of its components, critically including the Nucleus Accumbens (NAcc). Indeed, the NAcc appears to play an evaluative function for much of our sensory input, including sexual stimuli. In support of this hypothesis, topological organizations have been observed in the neurons situated in the NAcc's shell, with activity in the NAcc's rostral sites associated with fear reactions, and activity in caudal sites, with pleasure – see (Berridge & Kringelbach, 2013, 2015) for reviews of this subsystem.

Finally, a particularity of the evaluative system is that it attributes hedonic valences to stimuli according to many different factors, including stimulus intensity and duration. Hence, a stimulus registered as pleasurable within a certain range of intensity

(e.g., a tickle), may be perceived as aversive at higher levels of intensity. Similarly, a touch which is perceived as pleasurable within certain contexts can be evaluated as irritating or even painful in others.

The motivational / reward subsystem. This subsystem is responsible for "wanting" sex. It promotes impulsive, goal-directed approach behaviour, based on inputs from the attentional and evaluative systems. In this sense, the sexual motivational subsystem most closely approaches lay definitions of sexual desire. Originally identified by using micro-electrode stimulation (Olds & Milner, 1954), this subsystem was originally believed to be responsible for pleasure. However, human participants did not report pleasurable sensations resulting from its stimulation (Berridge & Kringelbach, 2015). It is now believed that this subsystem, also known as the *reward system,* is responsible for encouraging behaviour through feelings of desire or craving. This important distinction between wanting and liking helps to understand how we can be motivated to pursue behaviours that provide little to no pleasure.

In humans, the sexual motivational subsystem includes structures clustered around the medial forebrain bundle, and includes the ventral tegmental area (VTA), the NAcc, the hypothalamus (HYP) and the amygdala. The NAcc outputs to the Basal Ganglia (Striatum), and is believed to act as a bridge between incentive cues, incentive motivation and goal-directed approach behaviour (Fonteille & Stoléru, 2011).

The sexual motivational subsystem has been extensively studied in association with the neurotransmitters DA, and 5-HT (which appear to share antagonistic roles) and

is known to be potentiated by neurotransmitters including enkephalins (e.g., endorphins) and the GABA (Lopez et al., 2015; Pfaus, 2009). The subsystem is inhibited by both opioid and endocannabinoid receptors, which helps understand how drugs such as morphine and cannabis result in a decrease in motivated activity. Here again, implicit, conditioned learning shapes the system's function, driven by the reinforcing effect of sexual gratification and orgasm (Hoffmann, 2007; Pfaus et al., 2012; Toates, 2009).

Synthesis: A Multi-Faceted, Differentiated System

This three-component model of our sexual response system has a number of implications for both researchers and clinicians. Perhaps the most important is the recognition that sexual desire is distinguishable from sexual arousal. Indeed, whereas sexual desire is conditional on both bottom-up and top-down processes, it appears that physiological sexual arousal is a largely bottom-up and automatic phenomenon, triggered by our attentional system in response to cues which we recognize as sexually salient. Hence, being sexually aroused in itself does not imply that we desire sex, nor even that the arousing cues are perceived as pleasurable.

Sexual Desire as an Emotion / Motivation: "Excitatory-Inhibitory" Models

Consistent with the neurobiological models described above, sexual desire has also been studied using the frameworks of emotion and motivation research (Bindra, 1974; Both et al., 2007b; Panksepp, 2011; Singer & Toates, 1987). Although often studied separately, emotion and motivation are closely related concepts. As noted by Both et al. (2007a, p. 330), "Emotion and motivation mechanisms interact in such a way that it is sometimes hard to distinguish them; they are two sides of one coin". According to this

perspective, emotions are considered to be part of the human motivational system, to play the bridge between stimulus, appraisal and behaviour, and to sit between automatic, *bottom-up* and deliberate, *top-down* cognitive processes (Toates, 2004).

There is considerable support for modelling sexual desire in this way. Like other emotions, sexual desire arises automatically from internal and external cues, influences our physiology, and can trigger impulsive and habitual responses. Like other emotions, sexual desire influences behaviour (Pfaus, 2007). Just like other emotions, sexual desire affects our cognition, and is associated with intrusive thoughts, mental simulations and fantasies (Hoffman et al., 2015). Finally, there is considerable evidence that sexual desire interacts with other emotions, such as anxiety and stress (Bradford & Meston, 2006; Meston & Bradford, 2007). For example, stressful events such as relational difficulties and traumatic events such as physical or sexual aggression have been associated with Hypo-Sexual Desire Disorder (HSDD) in both men and women (Anastasiadis et al., 2002; Brotto et al., 2010; Brotto et al., 2011; Laumann et al., 1999). Relatedly, Ter Kuile et al. (2007) conducted a controlled study with 59 women where participants were asked to complete a computer-based task. For the experimental group, this was a high-stress task; for the control group, a low-stress task. Participants were then shown an erotic video, during which subjective and physiological measures of arousal were taken. The authors reported that the sexual arousal of the high-stress group was significantly lower than that of the low-stress group.

The Dual-Control Model

One influential excitation-inhibition model is Janssen and Bancroft (2007)'s Dual Control Model, originally intended to describe *subjective sexual arousal*, and which is often applied to sexual desire more generally (Birnbaum, 2018). The Dual Control model posits that sexual desire (or subjective sexual arousal) is driven by the concurrent processing of two streams of information, one excitatory and the other, inhibitory. The inclusion of an inhibitory stream is a central and distinguishing feature of this model, as sexual desire and arousal were at the time understood as being solely excitatory processes (Janssen & Bancroft, 2007). The model further proposes that individual differences in arousability can be explained by individual differences in sensitivity to sensory cues, both excitatory and inhibitory.

Finally, the Dual Control model was used as the conceptual basis for the widely-used Sexual Excitation Scale and Sexual Inhibition Scale (SES/SIS) questionnaire, whose reliability and validity have been largely demonstrated (Janssen et al., 2002), and who have been shown to be correlated with other measures of sexual desire such as the SDI-2 (Spector et al., 1996). Interestingly (and clinically important), the Scale's inhibition items were found to further factor into two sub-scales, named *Inhibition Due to Threat of Performance Failure (SIS1)* and *Inhibition Due to Threat of Performance Consequences (SIS2)*, sensitive to the presence of external and internal inhibitory cues, respectively. Since its introduction, the Dual Control model has received considerable empirical and clinical support (Bancroft et al., 2009), and is cited in lay literature (Nagoski, 2015).

Cognitive – Motivational Models

In contrast to the Emotional-Motivational models described above, some researchers have focused their study on the higher-level, cognitive-motivational aspects of sexual desire (Levine, 2002). In this framework, sexual behaviour generally arises in response to multiple, possibly competing, internally-perceived *sexual motives* – and indeed, human sexual motives turn out to be surprisingly varied. Based on a survey of 444 students of the university of Texas, Meston and Buss (2007) list 237 distinct sexual motives, and note that this list is certainly not exhaustive.

Amongst the possible frameworks for categorizing these many sexual motives, two axes, drawn from more general motivation research, have proven particularly useful. The first axis differentiates so-called *approach* (or appetitive) motives from *avoid* (or aversive) motives, depending on whether the motive is to approach a desirable state (e.g., to please one's partner), or to avoid an undesirable state (e.g., to minimize conflict), respectively (Elliot & Covington, 2001; Elliot et al., 2006; Gable, 2006; Gable & Impett, 2012). Although this first differentiation is very general, it appears to be a fundamental one. For example, approach and avoid motives appear to engage different neural circuitry (Carver et al., 2000; Gray, 1987). These two types of motives have also been associated with different personality traits including different attachement styles (Impett et al., 2008a). Importantly, Gable (2006) reports that approach and avoid motives are not mutually exclusive. This fundamental distinction between approach and avoid motives is relevant to sex research. In a number of studies, *sexual approach motives* have been associated with greater sexual satisfaction (Muise et al., 2012) and frequency

(Cooper et al., 1998). In contrast, *sexual avoid motives* have been associated with lower sexual satisfaction and relational intimacy (Muise et al., 2012). For example, Impett et al. (2005) performed a study with 62 couples studying psychology at the University of California. For 14 consecutive days, each student reported on their emotional state, on their wellbeing and their relational satisfaction, and, on days where they had had sexual activity, on their sexual motives. Hierarchical regression of the results showed a same-day association between sexual approach motives and higher scores of positive emotions, wellbeing and relational satisfaction. Conversely, sexual avoid motives were associated with higher scores of negative emotions, of relational conflict, and lower relational satisfaction. In another study, Rosen et al. (2015b) recruited 107 heterosexual couples, where the female partner had been diagnosed with genito-pelvic pain. Each of the participants completed questionnaires about their sexual motives, sexual and relational satisfaction, and their level of depression; female partners additionally reported on their sexual function and pain. The authors observed that women reporting greater sexual avoid motives also reported lower sexual and relational satisfaction and higher scores for depression. Male partners reporting greater sexual avoid motives also reported lower relational satisfaction.

A second important axis is the distinction between *self* and *other* motives. Self-motives concern goals related to oneself (e.g., having sex to please ourselves), whereas other-motives concern goals related to others (e.g., having sex to please ones' partner). Although less well studied, this axis also appears to be relevant. For example, Muise et al. (2013) evaluated sexual communal traits (i.e., the tendency to attend to the needs of

others) in 45 heterosexual couples. These couples then completed questionnaires daily for 21 days, including questions on their sexual motives. Partners with higher sexual communal scores reported on average more sexual approach motives. In a subsequent study, Muise and Impett (2015) noted that partners of participants with higher sexual communal scores reported higher daily scores of relational satisfaction.

These two axes, approach/avoid and self/other were crossed by Cooper et al. (2011). The authors note that *sexual approach* motives factored clearly into self- and other- categories, whereas *sexual avoid* motives tended to cluster into a single category. Hence, of the four possible categories of sexual motives, these authors propose a three-factor model.

Relational Perspectives of Sexual Desire

The models reviewed to date consider desire to be an intra-individual phenomenon. This perspective is useful, in that it simplifies research designs, allows for a nosology of sexual disorders which is consistent with other (intra-individual) psychological disorders, and justifies the use of individual therapy to address sexual issues.

However, focusing on individual sexual desire may lead to an over-simple view of sexual desire, given that most sexual activity, whether partnered or solo, takes place within the context of relationships (Herbenick et al., 2014). Clinically, this intra-individual focus may also lead to identifying one of the partners as the dysfunctional element of the couple (i.e., to "pathologize" them), and to focus the treatment on that

client and on their "symptoms" (Aubin & Heiman, 2004; Davies et al., 1999). For example, individuals may come to therapy with a belief that their sexual desire is abnormal, whilst it later becomes clear that this is because it is lower in comparison to that of their partner (Hurlbert & Apt, 1993; Hurlbert et al., 2000). Such a clinical focus may also miss out on conflict and other relational causes of the complaint, such that the resulting treatment may be less effective or durable as a result (McCarthy & Thestrup, 2008a, 2008b).

Sexual Desire in a Relational Context

In response to these limitations, many authors from both research and clinical worlds have proposed that sexuality in general, and sexual desire more specifically, are best understood within a relational context (Dewitte, 2014; Impett et al., 2014; McCarthy & Wald, 2012). And indeed, many studies have shown that sexual desire is strongly associated with its relational context – see (Brotto et al., 2016; Meana, 2010) for reviews of such results for women. For instance, Bancroft et al. (2003b) note that the most strongly predictive factor for low sexual desire in individuals is relationship status and context. Furthermore, a strong positive association between sexual desire and intimacy has often been reported (Impett et al., 2008b) – although whether sexual desire is enhanced or diminished in couples with very high intimacy remains a matter of debate (Perel, 2006), as it warrants further empirical scrutiny.

Interaction and Coregulation of Sexual Desire in the Couple

As social primates, humans have strong evolutionary reasons to communicate our emotional states to our conspecifics (Smith & Mackie, 2015). Indeed, there is general

agreement amongst emotion researchers that emotional interaction is a critical component of most social behaviour in primates. It encourages helping behaviour, contributes to regulate group interaction and mediates mating and child-rearing (Keltner & Haidt, 1999). Emotions are communicated between individuals multi-modally, by specialized facial expressions, dedicated signalling behaviours and vocalizations (Cordaro et al., 2018; Ketlner & Lerner, 2010). Physiologically, the Mirror Representation System has been proposed as a neural substrate for this "emotion sharing", working in conjunction with emotion-processing components in the limbic system (including the amygdala, hypothalamus, cingulate) and with regulatory functions in the pre-frontal cortex (Bernhardt & Singer, 2012; Decety, 2011). Such observations about primates apply naturally to the study of human couples. Indeed, partners of committed couples are known to reciprocally influence each other's emotional state (Butler & Randall, 2012; Schoebi & Randall, 2015), and there is evidence that this interaction both reflects and influences the relationship's evolution over time (Karney & Bradbury, 1995). For example, the presence of contempt and other negative affects in couple interactions have been associated with dyadic variables, notably relationship breakup (Gottman & Levenson, 2000; Gottman & Notarium, 2000).

The Interpersonal Emotional Regulation (IER) Model of Women's Sexual Dysfunction

The importance of emotional interaction in committed relationships has strong implications for the study of sexual desire, and authors such as Dewitte (2014) have suggested that sexuality in general and sexual desire in particular play a regulating role in the dyad. In support of this proposal, sexual activity has been observed to play an

emotion regulation function in long-term couples, helping to regulate such emotions as stress (Ein-Dor & Hirschberger, 2012). Relatedly, in a sample of mixed-sex couples, Mark et al. (2019) observed that one partner's higher daily sexual desire was associated with the other partner reporting greater quality of their sexual experience.

Consistent with this research, conceptual frameworks have been proposed that consider the effect of partner interactions on the couple's sexuality. One such proposal is the Interpersonal Emotion Regulation Model (IERM) of Women's Sexual Dysfunction (Rosen & Bergeron, 2019), which hypothesizes a bridge between intra-personal factors, dyadic patterns of interaction and individual and relational outcomes. Initially described in the context of couples dealing with women's genito-pelvic pain/penetration disorder (GPPPD), this framework readily generalizes to other sexual dysfunctions, including sexual desire problems.

The IERM recognises that in couples, partners routinely co-regulate the emotions which arise from their everyday interaction (Butler, 2017; Butler & Randall, 2012). The model posits that the couple's use of effective emotional regulation strategies influences the wellbeing of both partners – as measured by individual factors such as sexual function, sexual satisfaction and sexual distress, as well as relational factors such as relationship satisfaction. In turn, the couples' ability to prefer more effective strategies over less effective ones is influenced by distal factors, such as early childhood experiences and attachment preferences. Strategy choice is also influenced by more proximal factors, such each partner's mood and sexual motivation, as well as relational factors such as one partner's response to sexual difficulties in the other. IERM recognises

that these distal and proximal factors are not independent, and posits that one influences the other.

Hence, according to the IERM model, couples experiencing sexual difficulties may adopt less-than-ideal modes of interacting, such as avoidance or conflict, instead of more adaptive strategies such as greater communication (Herbenick et al., 2014). This sub-optimal interaction would in turn lead the partners to experience poorer sexual, individual and relational outcomes such as sexual dissatisfaction, sexual distress and relationship dissatisfaction.

Factors Affecting Sexual Desire

Sexual desire has been positively and significantly associated with many factors, both individual and relational (Mark & Lasslo, 2018). This section reviews some of this work, focusing on those variables most relevant to the present doctoral research.

Sexual Desire, Sexual Satisfaction, Relational Intimacy

As may be expected, greater sexual desire between partners is associated with positive outcomes, including sexual satisfaction and relational intimacy. Both these variables are pivotal outcomes in the study of couple sexuality, and both have been associated with individual and relational indicators of wellbeing (Birnbaum et al., 2016; Reis & Gable, 2015; Sanchez-Fuentes et al., 2014). Although strongly interrelated, these two variables have also been observed to vary independently, emphasizing the fact that they reflect distinct constructs (Byers, 2005).

In cross-sectional studies, greater sexual desire has been shown to be associated with both higher sexual satisfaction (Sanchez-Fuentes et al., 2014) and greater relational intimacy (Birnbaum et al., 2016; Brezsnyak & Whisman, 2004), as well as with other indicators of relationship quality including relationship satisfaction and duration (Brezsnyak & Whisman, 2004; Mark & Lassio, 2018). For example, sexual approach motives have been associated with greater sexual satisfaction (Gable & Impett, 2012; Impett et al., 2010; Impett et al., 2005; Impett et al., 2008b; Impett & Tolman, 2006) and relational satisfaction and quality (Impett et al., 2005; Impett et al., 2008b; Muise, 2011; Muise et al., 2013).

Although the existence of positive associations between sexual desire and sexual satisfaction is generally accepted, there are indications that these may not hold under certain conditions. For instance, in a US-based survey of 3,167 middle-aged women, 42% of the respondents reported feeling little or no sexual desire, whilst 86% reported high levels of sexual satisfaction (Avis et al., 2017; Brotto, 2010b). Such results remain difficult to interpret, particularly given that the processes that mediate the association between sexual desire and sexual satisfaction have not been well studied.

Sexual desire and Sexual Distress

Sexual distress describes the negative affect (e.g., guilt, frustration and anger, feelings of inadequacy and inferiority) and intrusive thoughts (e.g., regrets, worries) attributed to one's sexuality. Sexual distress is distinct from (Stephenson & Meston, 2010), but strongly associated with low sexual satisfaction (Rosen et al., 2009) and lower relationship quality (Blumenstock & Papp, 2017).

The most common measure of this construct was originally proposed for women by Derogatis et al. (2002). It was later validated for men by (Santos-Iglesias et al., 2018), who report that the scale's factor structure was invariant across gender and degree of sexual function. This work is recent however, and much of the early work on sexual distress has been conducted among women.

The presence of sexual distress is a necessary criterion in the diagnosis of sexual disorders (American Psychiatric Association, 2013). However, the association between sexual function and sexual distress is not strong, particularly in cases of low sexual desire. In a sample of 10 429 women reporting low sexual desire, only 27% of the participants concomitantly reported sexual distress (Rosen et al., 2009). Similarly, Witting et al. (2008) found that the proportion of women reporting both sexual dysfunction and distress ranged from 7% to 23%. These results are of the same magnitude, if a little lower than, those summarized by Meana (2010), and similar to the 12% prevalence of distressing sexual difficulties reported by (Shifren et al., 2008). This poor correlation between low sexual function and sexual distress has also been found in men. In a sample of 3332 men, Jern et al. (2008) showed that the associations between many objective measures of premature ejaculation and sexual distress were not strong. Associations between sexual distress and poor sexual function is sufficiently low that authors such as Hayes (2008) warn that introducing sexual distress as a necessary criterion for diagnosing sexual disorders dramatically reduces their reported prevalence.

This poor correlation, although counter-intuitive, may find its explanation in the fact that a number of correlates interact with sexual desire and sexual distress. These

include age, anxiety, depression, sexual dissatisfaction (Rosen et al., 2009), fatigue and stress (Connor et al., 2011). Among these, relational factors appear to play a prominent role (Burri et al., 2011). For example, Rosen et al. (2009) note, in a sample of 10 429 women reporting low desire, that after age, the strongest correlate of sexual distress was having a current partner. Similarly, (Bancroft et al., 2003b) report that, in a sample of women in mixed-sex couples, the quality of the emotional relationship and of the participant's emotional wellbeing during sex were stronger predictors of sexual distress than indicators of sexual function (arousal, vaginal lubrication, orgasm). Furthermore, women reporting both low sexual function and associated distress also report significantly lower relationship satisfaction (Hendrickx et al., 2016) and greater negative feelings for the partner (Dennerstein et al., 2008).

It is therefore likely that, more than low individual sexual desire itself, partner interactions may determine whether couples experience sexual distress (Dewitte, 2014; Meana, 2010). However, studies of sexual distress to date have mostly focused on individual experience rather than on partner interactions, and used cross-sectional designs rather than daily or event-level methodologies. As a result, the associations between sexual desire, partner interactions and sexual distress remain poorly understood.

Sexual Desire and Sexual Behaviour

Sexual behaviour, including penetrative and non-penetrative partnered sexual activity and masturbation, has long been considered an external and measurable manifestation of sexual desire. This strong association warranted using the frequency of

sexual behaviour (or sexual outlets) in early measures of sexual desire (Kinsey et al., 1948). The use of sexual behaviour (or sexually satisfying events) continues to be a proxy measure for sexual desire today, such as in the recent clinical trials for flibanserin as a treatment for hypoactive sexual desire disorder in women (Jaspers et al., 2016; Katz et al., 2013). However convenient, this practice has been repeatedly challenged, on the basis that individuals regularly experience sexual desire without engaging in sexual activity (Regan & Berscheid, 1996), and conversely, engage in sexual activity in the absence of desire (Meana, 2010; O'Sullivan & Allgeier, 1998).

In addition to being associated with high sexual desire, sexual behaviour also mirrors difficulties with sexual desire. For example, low sexual desire is associated with a lesser duration of sexual activity, of foreplay (Heiman et al., 2011), and of post-sex affectionate exchanges (Muise et al., 2014), and a more restricted range of sexual behaviours (Gillespie, 2016).

Hence, there are strong arguments for studying sexual behaviour in its association with sexual desire. However, most studies to date have been cross-sectional, with respondents reporting individually using 4-week retrospective measures. In contrast, very few studies have worked with couples and studied sexual behaviour in detail, at the level of individual sexual activity. The paucity of event-level, dyadic research in this area is surprising, given that sex occurs most frequently in the context of committed relationships (Lindau et al., 2007). And of course, sexual behaviours are shared between partners when they have sex together, making it a natural event-level, dyadic measure.

Sexual Desire, Gender and Sexual Orientation

Are Men's and Women's Sexual Desire Different?

Although our understanding of gender is evolving rapidly (van Anders, 2015), the great majority of the sexual research literature to date assumes a dichotomous definition (i.e., man, woman) of gender. Within this literature, one of the recurring questions in research on sexual desire is whether it is experienced differently for men and for women. This question has clinical as well as theoretical implications, as some authors have argued for gendered models of sexual desire (Basson, 2000; Baumeister, 2000) and gendered approaches to diagnosis and therapy (Basson, 2001b). In support of these proposals, gender differences are generally reported for outcome-focused measures of sexual desire (frequency of solitary and partnered sexual activity and fantasies), consistent with the proposal that sexual desire is greater for men (Baumeister et al., 2001), and more sensitive to personal and relational factors for women (Bancroft et al., 2003b; Peplau, 2003).

It is also worth noting that these results have been challenged, on the basis that the operational measures and reporting biases tend to overestimate male participants' sexual desire and to underestimate women's (Dawson & Chivers, 2014). For example, many measures of sexual desire rely on frequency of sexual activity and fantasy, or on the intensity of sexual desire in the absence of a relational context (Baumeister et al., 2001). In addition, a number of authors have suggested that presentations of low desire in men may be masked by other disorders, such as erectile dysfunction (Meana & Steiner, 2014; Sarin et al., 2013), further exaggerating the observed differences. In the wake of

this debate, some authors suggest that gender effects be considered afresh in all studies of sexual desire (Dawson & Chivers, 2014). The present research aimed to adhere to these relevant recommendations.

Sexual Desire and Sexual Orientation

In the same vein, the literature is inconsistent as to whether sexuality is experienced differently for individuals of different sexual orientations (Peplau & Fingerhut, 2007). Recent comparative studies of committed couples report differences in some aspects of sexuality, and not others. For example, compared to mixed-sex couples, man-man couples are reported to have sex more frequently, and the duration of sexual activity to be greater in woman-woman couples (Blair & Pukall, 2014; Bridges & Horne, 2007). Regardless of these differences, sexual satisfaction was found to be similar between couple types (Bridges & Horne, 2007).

When Sexual Desire Becomes Difficult

The difficulties associated with operational definitions of sexual desire are reflected in clinical definitions of sexual disorders. Indeed, previous versions of the DSM defined low sexual desire in terms of infrequent sexual activity and sexual fantasy – which we have seen are unreliable measures of sexual desire (Brotto, 2010a, 2010b). The DSM-5 (American Psychiatric Association, 2013) proposes a wider and more multifactorial definition of sexual desire for women, whilst maintaining the original and problematic definition for men. According to many authors, this differentiated definition adds to the existing confusion by emphasizing presumed differences between masculine and feminine sexual desire, at the expense of the similarities, making conjoint and

comparative studies more difficult (Sarin et al., 2013), and emphasizing a dichotomous view of gender which has been criticized by many authors (Hyde et al., 2019).

Low Sexual Desire

Low sexual desire has been the focus of considerable attention, particularly since the commercialization of type 5 phosphodiesterase inhibitors such as Sildenafil (Viagra) in 1998, and more recently, of flibanserin (addyi), approved for use in the US in 2015 (Deeks, 2015), and in Canada in 2018 (Health Canada, 2018). Low sexual desire is highly prevalent, with some authors reporting that this disorder is the most frequently encountered in individual sex therapy (Brezsnyak & Whisman, 2004). Prevalence is generally estimated at 20% to 28%, but according to the definition and measures used, can be as high as 40% (Brezsnyak & Whisman, 2004; Laumann et al., 1999). Low sexual desire is often reported as more prevalent in women (Baumeister et al., 2001). However, many authors observe equivalent prevalence in men, and note that men often initially report insufficient sexual desire as erectile or ejaculatory difficulties (Althof, 2016).

In the DSM-5, male hypoactive sexual desire disorder is now defined as the insufficiency or persistent absence of erotic thoughts, fantasy and the desire for sexual activity. The equivalent disorder for women, sexual arousal / interest disorder, covers a larger set of symptoms, including insufficient interest, lack of response to a partners' initiatives and to sexually salient stimuli, and low sexual pleasure. In both cases, the presence of significant sexual distress is required. This is an important criterion, as Brotto et al. (2010) observe that amongst women whose sexual desire would otherwise be diagnosed as clinically low, 71% do not report any distress.

Consistent with its multidimensional nature, many factors have been associated with low sexual desire (Bergeron et al., 2008; McCarthy & Farr, 2012), namely, biological factors, including hormonal imbalances (e.g., in androgens), some of which are age-related (e.g., menopause), and the comorbid presence of chronic diseases and/or their pharmaceutical treatments (e.g., diabetes); psychological factors, such as low self-esteem, poor self-image, depression, anxiety and stress; relational factors, including the loss of attraction to one's partner, the presence of relational conflict and communication issues within the couple; and socio-cultural, religious and environmental factors, such as having received a strict moral or religious education.

Sexual Desire Difficulties in the Couple: Sexual Desire Discrepancy

Given that sexual desire varies daily and naturally ebbs and flows in long-term couples (Vowels et al., 2018), it is to be expected that one of the partners may desire sex more frequently or intensely than the other, or that one attempts to initiate sex at times when the other is not receptive (Clement, 2002; Herbenick et al., 2014). This discrepancy in sexual desire between partners can be a source of distress, particularly when it is persistent (Dewitte et al., 2020).

Although not a diagnosable sexual dysfunction (American Psychiatric Association, 2013), *sexual desire* discrepancy (SDD), described as the difference in sexual desire between partners in a couple, is frequently described in lay literature (Perel, 2006). SDD has been observed in couples who do not report any associated distress (Bridges & Horne, 2007). However, SDD does appear to be considered problematic for many couples, and is a frequent motive for consulting a therapist – numbers which may be

even higher if one considers those couples consulting for low sexual desire in one of the partners (Corona et al., 2005).

Unsurprisingly, SDD has been the subject of considerable clinical attention, where it is it is considered to particularly difficult to treat (Kleinplatz et al., 2017; Levine, 2002; McCarthy & Oppliger, 2019; McCarthy & Ross, 2018; McCarthy & Wald, 2012). SDD has been associated in this literature with a number factors in addition to those previously cited for low sexual desire (McCarthy & Farr, 2012). These include couple lifestyle (e.g., over-prioritizing work, with a consequential de-emphasis on sexuality; a change in the couple's situation, such as a change in employment, pregnancy and young children, menopause, etc.), role conflicts (e.g., finding it difficult to reconcile the role of parent [mother, father] and of lover), and comorbid difficulties within the couple (e.g., conflict, difficult communication, and poor intimacy).

In contrast to the availability of case studies on the subject, SDD has received scant attention in sex research. The majority of this work has studied SDD's putative associations with sexual and relationship satisfaction. Results of this work have proven inconsistent and difficult to interpret – although the general consensus appears to be that greater SDD would predict lower sexual satisfaction (Dewitte et al., 2020; Mark, 2015). Studies of SDD's associations with other important sexuality outcomes are exceedingly rare. In particular, we are aware of no studies of the possible associations between SDD and sexual distress, despite the fact that from the clinical literature, one would expect that a strong relationship between the two variables.

SDD has been measured in different ways in the sex research literature: Early work used an intra-individual approach, where participants were asked to evaluate the difference between their own sexual desire and that of their partner (Bridges & Horne, 2007; Davies et al., 1999; Pereira et al., 2019; Sutherland et al., 2015). Although straightforward in its implementation, this approach may be strongly biased, as one's perception of their partner's state has been shown to be rarely accurate, and influenced by many individual and relational factors (Gagné & Lydon, 2004). Where the partners in the couple can be differentiated (e.g., by gender in mixed-gender couples), SDD has often been defined as the difference between one partner's sexual desire and the others' (Mark, 2012; Reece, 1987; Rosen et al., 2017; Sutherland et al., 2015; Willoughby et al., 2014). This signed, dyadic measure is not subject to the same biases as the previous. However, it is difficult to apply to samples where partners cannot be reliably differentiated (e.g., in non-clinical, gender-inclusive samples). Further, this signed measure may focus results on differences between partners, making dyadic effects harder to identify. A third approach is to use an unsigned measure of SDD, where only the magnitude of the variable is retained, e.g. by taking the absolute value of the difference between the partners' sexual desire. This was the approach taken in our own research, a choice based on the fact that couples in our sample were undifferentiated, and by our focus on dyadic phenomena.

PART II: RESEARCH OBJECTIVES AND HYPOTHESES

This research sought to better understand sexual desire and sexual behaviour in non-clinical samples of committed couples. The work was based on a relational and interactive view of sexuality, on the assumption that sexual desire in committed couples is shaped by the partners' behavioural interactions, and that sexual desire both affects and reflects the individual wellbeing of the partners and the quality of the dyadic relationship. These assumptions are consistent with the Interpersonal Emotional Regulation Model (IERM) of Women's Sexual Dysfunction (Rosen & Bergeron, 2019).

Our first two studies each examined two important aspects of sexual desire, namely, *sexual approach motives* and *subjective sexual arousal*. This work used a non-clinical, daily diary sample of newlywed mixed-sex couples that had been previously collected at the Kinsey Institute by Dr. Erick Janssen and his team. In both studies, it was hypothesized that the couples' sexual behaviour mediated the association between aspects of sexual desire and individual and relational outcomes. APIMeMs (Ledermann et al., 2011) were used to test for the presence of actor, partner and mediation effects, with dependencies in the data being controlled using multilevel models (Kenny & Ledermann, 2010; Laurenceau et al., 2005).

The first study was based on interactive models of intimacy proposed by Reis and colleagues (Reis & Gable, 2015; Reis & Shaver, 1988), and tested the associations between *Sexual Approach (SA) motives* and both *sexual satisfaction* and *perceived partner responsiveness*. Following Cooper et al. (1998), a distinction was made between self-SA motives (motives focused on oneself) and other-SA motives (motives focused on the

partner). It was expected that on days where the couple reported sexual activity, participants reporting higher-than-average self-SA motives and their partners would report greater sexual satisfaction, and that participants reporting higher-than-average other-SAMs and their partners would report greater perceived partner responsiveness. Further, based on the assumption that partner interactions were at least partly realized through their behaviour during sexual activity, it was hypothesized that any associations observed in the data would be mediated by the couples' event-level sexual behaviour. Finally, it was expected that gender effects would be found, whereby associations between self-SA motives and sexual satisfaction would be significant for men, and associations between other-SA motives and perceived partner responsiveness would be significant for women. Results from this study were published in *The Archives of Sexual Behaviour* (Jodouin et al., 2018a).

The second study, based on the Dual Control Model (Bancroft et al., 2009), tested the associations between event-level, subclinical sexual difficulties, including subjective sexual arousal, the range of behaviours during sexual activity, and sexual satisfaction in newlywed couples. It was expected that on days where the couple reported sexual activity, participants who reported greater levels of sexual difficulties would report lower sexual satisfaction, as would their partners. Based on the assumption that couples with sexual difficulties would exhibit a more restricted variety (or range) of behaviours during sex, it was hypothesized that any associations between greater levels of sexual difficulties and lower sexual satisfaction would be mediated by a more restricted range of event-level sexual behaviour. Gender effects were also examined, but given the paucity

of prior results in the empirical literature, no hypotheses were formulated. Results from this study were published in *The Journal of Sexual Medicine* (Jodouin et al., 2018b).

Although the two above studies produced novel results, their generalizability was limited – in particular by the fact that only certain aspects of sexual desire were considered in the analysis, and because the population sample was small and homogeneous. In an attempt to address these limitations, a third study was performed. These analyses used a more general measure of sexual desire, and worked with a larger and more diverse sample of non-clinical couples, collected in the context of the Sexual Well-Being Study. This project, a collaboration between Dr. Bergeron of Université de Montréal and Dr. Rosen of Dalhousie University, collected data using both 30-day daily diaries and 12-month longitudinal surveys from the same sample of couples.

Working within the same conceptual framework of the IERM, our third study focused on discrepancies in dyadic sexual desire between the partners, and on the association between this discrepancy and each partner's sexual distress. Based on the IERM, it was expected that higher levels of dyadic sexual desire discrepancy (SDD) in the couple would be associated with higher sexual distress in each partner. It was expected that any associations between SDD and sexual distress would show directionality over time. Specifically, and controlling for participant age and pre-existing associations between SDD and sexual distress, it was assumed that both proximally, from one day to another, and distally, over a 12-month span, higher SDD would predict higher sexual distress, but not vice-versa. The results from this work have been submitted accepted for publication to by *The Archives of Sexual Behaviour*.

PART III: METHODOLOGICAL CONSIDERATIONS

Studies of inclusive, non-clinical samples of committed couples remain surprisingly rare in sex research. This is unfortunate, because information about the community is essential for developing baseline data and models of "normal sexuality", and is therefore fundamental to understanding both sexual wellbeing and sexual dysfunction. However, non-clinical "community" samples are by their nature more heterogeneous than targeted clinical samples, and this raises methodological issues during recruitment and data collection. For example, ecologically valid designs such as online daily diaries require protocols where careful attention is paid to participants' participation throughout the collection period so as to avoid undue attrition (Bolger et al., 2003). Further, participants' self-definition of gender and orientation is rapidly evolving, requiring us to adapt the surveys and measures used in data collection, as many have been developed with heteronormative assumptions and terminology (Hyde et al., 2019).

The measures and data analytic techniques used in these studies have also been a source of consideration. Indeed, working with repeated measures and including data from both partners into a single statistical model introduces dependencies in the data, which must be taken into account during the analysis. This requires the use of more complex and recent analytical techniques such as multilevel models (Nezlek, 2012; Peugh et al., 2013). Further, studying the interaction between both partners' experiences implies newly-developed models such as the Actor-Partner Interdependence Mediation Model APIMeM (Cook & Kenny, 2005; Ledermann et al., 2011), where both actor and partner effects can be tested simultaneously. Similarly, taking advantage of the temporal

dimension available in this data also calls for specialized analytical techniques such as Cross-Lagged models (Selig & Little, 2012), still rare in sex research. Finally, very few authors have used "pure" dyadic variables, which capture the experience of the couple as a whole, and not of each partner individually. The present research has worked with two such dyadic variables, sexual behaviour and sexual desire discrepancy, both of which are obtained by integrating individual reports from both partners into a single variable. These calculations require a number of practical and methodological questions that need to be addressed. For example, what to do when a shared experience such as sexual activity is reported differently by both partners? Finally, difference measures such as sexual desire discrepancy (Mark, 2015) are not often studied in psychology, and their reliability and validity require careful consideration (Feldt, 1995; Griffin et al., 1999; Johns, 1981).

These methodological questions are the subject of the present section. First, issues related to the study design are discussed, then those related to data modeling and analysis. The choices made in our own research are then summarized.

Study Design Considerations

Working with Couples

Studies of couples involve issues above and beyond those focusing on individual participants. These issues range across the entire study, and authors such as Wittenborn et al. (2013) emphasize the importance of considering these into account early in the

study's design. The following recommendations have been integrated into our study designs.

Two points of contact. It is important for investigators to establish contact with each partner independently, rather than relying on a single partner to speak for the couple.

Participant consent. It is also important for both participants to provide their informed consent independently. This question is particularly relevant when one of the two partners is more motivated than the other in participating, and/or when participants receive financial compensation.

Confidential and independent responses. Partners may also need to provide their responses independently one from another, and each of these should then be kept confidential. This confidentiality may prove difficult to ensure, particularly when using online questionnaires – as partners may choose to complete them when they are together.

Difficult questions. Related to the above, information collected in these questions often describes difficulties within the couple (e.g., sexual difficulties, conflicts, poor relational or sexual satisfaction). How to ensure these are reported as accurately as possible, whilst minimizing the risk of exacerbating the difficulties by repeatedly asking participants to report on them?

Participant retention. Participant retention during diary and longitudinal studies is particularly an issue when working with couples. Firstly, all else being equal, the

probability of both partners remaining committed for the duration of the study is half of that of individual participants. Further, for many studies, losing one of the partners may entail having to remove the second partner's data, doubling the impact of the loss.

Working Inclusively with Gender

Much of sex research to date has focused explicitly or implicitly on heteronormative participants. This restrictive approach has been criticized on the basis that the ensuing results may not be representative of the growing proportion of individuals who do not fall outside of this category for reasons of gender or orientation (Chivers, 2016; Hyde et al., 2019; van Anders, 2015). It was therefore considered important in our research to work with inclusive samples of the general population. This implied working with participants who self-identified as transgender or genderqueer, and whose orientation was other than heterosexual. Given that most of sex research to date has been with cis-gender, heteronormative populations, this choice had implications throughout our study designs.

Firstly, during recruitment, we have found it important to target LGBTQ+ populations specifically, e.g., by creating advertisements ostensibly written for LGBTQ+ couples and by posting them to LGBTQ+ online communities. Indeed, few LGBTQ+ couples responded to advertisements for more general community groups and channels. This issue was important because the prevalence of LGBTQ+ participants in the general population, although rising, remains low. In the absence of such targeted efforts, their number in the sample would be insufficient to allow comparative analyses.

Working with Daily Diaries

Many studies in sex research are based on cross-sectional designs, and use retrospective measures spanning one or more months. Although this single-measure approach has practical advantages, such as enabling larger sample sizes and using more detailed scales, it also suffers from limitations making such designs poorly applicable to some research questions.

Firstly, retrospective measures of sexual activity are known to be subject to significant memory bias, the magnitude of which may exceed reported effect sizes (Gillmore et al., 2010; Hoppe et al., 2008; McAuliffe et al., 2007; McCallum & Peterson, 2012). Furthermore, long-term retrospective measures do not help us understand couples' sexuality at the fine-grained level of individual sexual activity. This is regrettable, because most variables studied in sexual research show significant daily or event-level variability, including in particular, sexual desire (Derogatis et al., 2011; Rosen et al., 2014; Rosen et al., 2015a; Rubin & Campbell, 2012).

Online daily diaries provide a good compromise between practicality and ecological validity. Indeed, although daily diaries remain retrospective, the delays between sexual activity and the measure remain sufficiently short that recall bias is minimized and that much of the variability in the data is captured . As a result, many authors consider daily diary data as a "gold standard" in accuracy (Graham et al., 2003). Furthermore, since the online diaries are now available using a variety of devices (including smartphones and electronic pads), participants may complete the diaries where they wish, with minimal interference to their everyday activity, adding to the

ecological validity of the results. Note that these designs also have limitations. One important practical issue is that, because the questionnaires are completed daily, completion times need to be kept short. This implies that many of the best-known scales must be set aside or abridged in favour of shorter, less well-validated questionnaires. Relatedly, participants may lose interest in the study, and closer attention must therefore be paid to completion rates and to attrition (Laurenceau & Bolger, 2012; Wittenborn et al., 2013) via mitigation strategies such as follow-up phone calls.

Another possible issue is that daily diary surveys, by repetitively questioning the participants, may affect the very phenomena they are studying. Possible biases include both measurement reactivity and measurement fatigue. Although these have been observed in some studies (Repetti et al., 2015; Reynolds et al., 2016), the impact of such biases have been reported to be modest (Barta et al., 2012).

Analytical and Data Modeling Considerations

Choice of Measures

Measures of Sexual Desire

This section discusses some of the considerations associated with measures of sexual desire.

Today's measures of sexual desire reflect the conceptual difficulties, described in the previous section, that sex researchers encounter in searching for a satisfying conceptual definition for this construct. We have seen for example that using sexual

behaviour as a proxy for sexual desire is a debatable practice, particularly for women (Meana, 2010). In the absence of a satisfying definition, most of the well-validated measures of sexual desire ask participants to self-report on their sexual desire directly. This is the case, for example, of the well-known International Index of Erectile Function (IIEF; Rosen et al., 1997) and Female Sexual Functioning Index (FSFI; Rosen et al., 2000) both include single-item, 5-point Likert scale questions about *frequency* and *intensity* of their sexual desire over the past month. Measures using this approach generally attempt to avoid circularity and ambiguity by providing a lay definition of sexual desire in the scale's instructions. For example, the Sexual Arousal and Desire Inventory (SADI) defines sexual desire in its instructions as:

> an energizing force that motivates a person to seek out or initiate sexual contact and behaviour. You can think of it as a hunger or a sexual "drive" that leads you to seek out sexual contact. Sexual desire involves the more psychological aspects of wanting sex (Toledano & Pfaus, 2006, p. 196).

Although this approach allows these scales to circumvent the definitional issues surrounding sexual desire, it also has its limitations. Firstly, respondents may interpret the concept of sexual desire idiosyncratically, even in the presence of definitions in the scale's instructions. Furthermore, such scales may not encourage participants to distinguish reliably between sexual desire and related but distinct constructs such as sexual arousal, thereby potentially confounding the effects of both in subsequent analyses (Sarin et al., 2013).

In the present research, the Sexual Desire Inventory (SDI-2; Spector et al., 1996) was chosen to measure the participants' sexual desire. This is a frequently-used and much validated scale (Cartagena-Ramos et al., 2018), which provides this work with a measure of comparability to other work on sexual desire. Importantly, although the measure shares with e.g., the IIEF and FSFI the weakness of including items with circular references to sexual desire, it nevertheless provides respondents the opportunity to report their sexual desire along multiple dimensions (solo, dyadic) and according to multiple criteria (thoughts, behaviours, self-perceived importance).

Dyadic Variables: Sexual Behaviour, Sexual Desire Discrepancy

When studying couples, a number of measurement options are available. At one end of the scale, one can focus on individual partners, and use variables such as individually-reported sexual desire. Alternatively, the couple itself can be the object of study, a so-called *nomothetic* level of analysis (Kenny et al., 2006). This implies using *dyadic variables* which describe the couple as a whole. An intermediate level of analysis, and the one taken here, is to include both individual and dyadic variables in the models. Two such dyadic variables are used in our work.

Sexual Behaviour, which refers to the set of acts performed between the partners during the couple's sexual activity (e.g., caresses, fellatio, penetrative intercourse, the use of sex toys), and is therefore an experience common to both partners.

Sexual desire discrepancy, which describes the magnitude of the difference in sexual desire between the partners, and is defined as follows:

$$Sexual\ desire\ discrepancy = Abs[\ sexual\ desire_{\ partner\ A} - sexual\ desire_{\ partner\ P}\ ]$$

Of the two, sexual desire *discrepancy* is worth discussing in more detail here, as it is a *difference score*, a form of variable which, although frequently used in social sciences (Griffin et al., 1999), is rarely used in sex research.

A Note on Difference Measures

Formally, *difference scores* include all measures comparing two or more constructs. Such scores are used widely in psychology and the social sciences, and include such measures as self-discrepancy, relative happiness, and body image (Thomas & Zumbo, 2011). Despite their importance, difference scores remain less well understood than other composite measures, and require particular attention when considering their reliability and validity.

Reliability. Numerically, difference scores are less reliable than the variables from which they are calculated (Cronbach & Furby, 1970), a property which is shared with other composite measures. More specifically, the reliability of difference measures has been shown to be lower when the variables they compare have low variability (Rogosa & Willett, 1983; Trafimow, 2015). This is a limitation which needs to be taken into consideration on a case-by-case basis by estimating the scores' reliability empirically, in the samples where they are used (Edwards, 2001). On this point, we note that well-known reliability scores such as Cronbach's alpha are not appropriate for difference measures. Instead, the following test is generally applied (Feldt, 1995):

$$r_{1\text{-}2} = \frac{\frac{1}{2}(r_1 + r_2) - \rho_{1,2}}{(1 - \rho_{1,2})}$$

…where $r_{1\text{-}2}$ is the reliability of the difference measure; r_1 and r_2, the reliability of each component score; and $\rho_{1,2}$ the correlation between the component scores.

Validity. Cronbach and Furby (1970) have criticized the practice of using difference scores without verifying their validity independently, on the basis that the variables they compare have themselves been validated: "There is little reason to believe and much empirical reason to disbelieve the contention that some arbitrarily weighted function of two variables will properly define a construct" (p. 79). A second criticism of these scores is that they may overly simplify the phenomena under study: "The practice of using difference score correlations alone to draw inferences about the benefits or costs of similarity or accuracy is like characterizing the movie *Casablanca* as a story about a man, a woman, and an airplane" (Griffin et al., 1999, p. 517)

This is where proposals such as Response Surface Analysis (RSA) are interesting (Edwards, 2002; Shanock et al., 2010; Venkatesh & Goyal, 2010). These analysis techniques allow us to examine the algebraic properties of the effects of two or more independent variables on a dependent variable, and in particular, to confirm whether the simplifying assumptions used in calculating the difference score are warranted.

In summary, a number of verifications are warranted in using difference measures such as sexual desire discrepancy. Firstly, the reliability of the measure should be assessed empirically on the sample under study. Secondly, it is important to verify the construct and discriminant validity of sexual desire discrepancy. Among others, this

implies eliminating alternative hypotheses that either of the variables alone explains the data better than the difference score.

Working inclusively with LGBTQ+ participants

During data collection, some LGBTQ+ participants have proven sensitive to both the form and content of the surveys they were requested to complete (Fraser, 2018). Indeed, some LGBTQ+ participants reported difficulty in describing their experience in terms of existing scales, which are often based on heteronormative definitions and assumptions. As a result, one can question the validity of the data collected for these populations – all the more so, because this heteronormative bias can lead to greater attrition in this population, and even prove to be a source of distress for some LGBTQ+ participants. For example, one difficulty we encountered is the practice of collecting demographic data where participants were required to identify with binary (man-woman) sex or gender categories (Broussard et al., 2017; Hyde et al., 2019; van Anders, 2015).

Another issue was that many of the best-known indicators of sexual function, e.g., the International Index of Erectile Function (Rosen et al., 2002); the Female Sexual Function Index (Rosen et al., 2000) are based on phallocentric or heteronormative assumptions. Indeed, measures such as sexual frequency, ability to achieve penile-vaginal penetration or to orgasm may not be reliable indicators of sexual health outside of heteronormative couples (Cohen & Byers, 2014; Scott et al., 2018).

The challenge for inclusive researchers is thus to develop new measures which are both generally relevant, whilst remaining amenable to statistical analysis. Current recommendations (Bauer et al., 2017; Broussard et al., 2017) are to use multi-level or branching scales, where the participants initially describe their "sex assigned at birth" and indicate whether they feel this value also describes their gender (i.e., whether they are "cis"). Non-cis participants are then asked to describe their gender more completely using a second, more extensive categorical list (ranging from 4 to 58 items, according to the scale), and additionally offered the opportunity to provide their own description (e.g., in an "other" list item) (Fraser, 2018). Offering participants the possibility of refusing to answer these questions altogether was also seen as important. This approach has been reported to be favourably received by most participants, whether cis, trans or genderqueer (Bauer et al., 2017; Fraser, 2018).

Choice of Model

The study's design has implications on the type of statistical models which can be used to describe the data being analysed. These implications are described here.

Distinguishable and Indistinguishable Dyads

One important modeling consideration is whether it is possible to reliably distinguish between the couples' partners (Kenny et al., 2006; Peugh et al., 2013). Indeed, in some studies, the couples' partners can be differentiated naturally according to a stable criterion. For example, in most mixed-sex samples, partners can be differentiated by gender; in clinical studies, a more relevant distinction is to identify

which partner of the two holds the diagnosis. Statistically, this differentiated situation is the simplest, and many couple studies assume the partners are distinguishable.

In inclusive, non-clinical studies, the couples' partners often cannot be systematically differentiated by a meaningful criterion, implying that simpler dyadic models cannot be reliably applied. To deal with such *indistinguishable* couples, two approaches have been proposed (Ledermann & Macho, 2014). The first is to arbitrarily differentiate the dyad (i.e., arbitrarily naming one of the partners "A" and the other, "B"); the second is to double the sample, with each partner appearing once as "A" and once as "B" for each measure. Both of these approaches have their potential issues. In the first approach, the arbitrary assignment of roles introduces a potential bias in many analyses, particularly in smaller samples. In the second, the doubled data may also introduce a bias into the analyses. Both these biases are asymptotic with respect to the sample size, and Kenny et al. (2006) note that they become trivial for sample sizes of 50 or more; hence for larger sample sizes, both approaches obtain reasonable results. For practical reasons, the latter ("double-entry") approach was used in our work. Finally and importantly, note that in such undifferentiated couples, one would expect that associations within and between partners be symmetrical. This assumption should be built into the model by constraining symmetrical parameters to be equal (Ledermann et al., 2011; Peugh et al., 2013). Indeed, these additional constraints have the double advantage of being a more stringent test of the study's hypotheses, and of improving the study's power by limiting the number of free parameters in the model.

Dealing with non-independence: Multilevel models, Person-Centering

One important feature of daily diary methodologies is that the measures they collect from each couple and participant are repeated over time. Although an advantage, such repeated measures introduce dependencies in the data. These dependencies can be controlled using multilevel models (Cribbie, 2007; Hox, 2002).

Additionally, to ensure that the diary entries are comparable across individuals, measures are typically *person-centered* (aka., *group mean-centered*, (Nezlek, 2012)). Using this approach, each value can be interpreted as the degree to which the variable departs from each participant's mean scores.

Testing for direct and Indirect Effects between Partners: APIM and APIMeM

An important aspect of our work has involved testing for the influence of one partner on another, so-called "partner effects". Many analytical techniques have been proposed for this, most of which involve including the variables from both partners in a common model. One of the most well-known is Cook and Kenny (2005)'s Actor Partner Interdependence Model (APIM), adapted to Structural Equation Models by (Laurenceau et al., 2005).

In APIM, one partner is designated the *Actor*, and the other, the *Partner*. Variables from both partners are included in the model, and both intra-individual associations (so-called *actor effects*) and inter-individual associations (*partner* effects) are tested simultaneously; in indistinguishable couples, this model is assumed to be symmetrical (see above note on working with indistinguishable dyads).

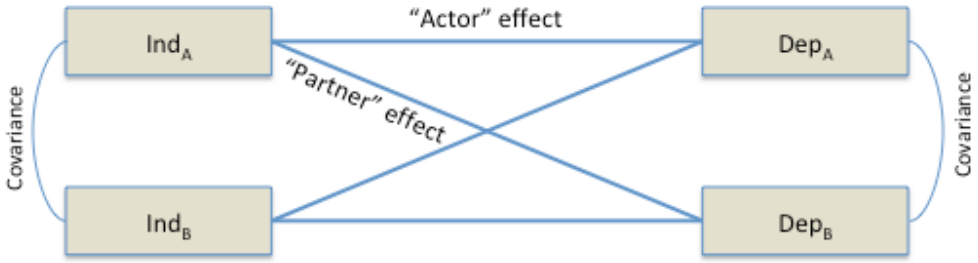

Figure 1. Actor-Partner Interdependence Model (APIM).

Ind_A = Independent variable, measured for partner A (resp. B); Dep_B = Dependent variable measured for partner A (resp. B)

Recently, the APIM framework has been extended to allow tests of indirect (i.e., mediation) effects. Ledermann et al. (2011) have proposed the Actor-Partner Interdependence Mediation Model (AIMeM), which introduces additional variables and tests for hypothesized mediation.

Multilevel moderation: Cross-level and Groupal Models

In contrast to mediation, an indirect route which purports to explain an association between two variables, *moderation* occurs when a variable affects the strength of the association between two variables (Frazier et al., 2004). In sex research, *gender/sex* (commonly operationalized as a male-female binary) is often hypothesized as a moderating variable. In general, variables posited as moderators are assumed to be stable, distal and categorical; however, this need not be the case, and proximal variables such as sexual arousal have also been proposed as moderators (Maisto & Simons, 2016).

Accounting for moderation is considerably more complex in multilevel models. Indeed, stable variables such as gender/sex (i.e., so-called *Level-1* or *Between* variables,

which do not vary from one point of measure to another) cannot be modeled at the same level as variables with per-measure variability (so-called *Level-2* or *Within* variables). Hence, most moderation tests either involve cross-level models (Preacher et al., 2007; Preacher et al., 2016), or for categorical moderators such as gender/sex, so-called *groupal models,* which divide the sample into distinct groups (Muthén & Muthén, 2015) according to the value of the moderator.

Practical Considerations

A Note on Structural Equation Modeling

Following Laurenceau and Bolger (2012), Hierarchical Structural Equation Models (HSEM; (Muthén & Muthén, 2015) were used in our work, in preference to, for instance, Hierarchical Linear Model frameworks (Bauer, 2003; Curran, 2003). HSEMs are an application of Structural Equation Models (SEMs; Hox & Bechger, 1998) a framework for modeling and testing hypothesized associations between variables. SEMs are particularly useful in multivariate analyses where many associations need to be tested simultaneously.

Formally, hypotheses are expressed in SEMs as a set of constrained regression equations. Testing the model involves solving its defining equations simultaneously, given the sample data. In practice, this resolution is an iterative procedure, generally based on gradient descent, and guided by cost or distance indices such as Maximum Likelihood (Hox & Bechger, 1998; Muthén & Muthén, 2015). The model solution is considered acceptable when the model's solved equations "fit" (or describe) the data

sufficiently well. Following Gefen et al. (2000), a model's degree of fit is typically assessed using one or many indices, among which the most used are the Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Square Residual (SRMR), and Tucker Lewis Index (TLI)

One of the advantages of this approach is that many of the issues encountered in more traditional statistical analyses are not relevant for SEMs. For example, many SEM estimation procedures do not assume that the data being fit is multivariate normal. Similarly, most SEM estimation methods naturally work around missing data and do not require imputation (Muthén & Muthén, 2015).

Power Analysis in Multilevel Models

Power calculations are not to our knowledge available for SEMs. In the absence of analytical methods for determining power, Bolger et al. (2012) recommend empirical tests using Monte-Carlo simulations. However, this approach is complex, and more importantly, may prove to be inaccurate when the characteristics of the variables' distributions in the general population are not known.

Alternatively, some rule-of-thumb recommendations have been proposed for assessing minimal sample sizes. For non-hierarchical SEMs, samples sizes are recommended to be greater than 200, and for the ratio of cases to free parameters to exceed 5:1 (Bentler & Chou, 1986; Hox & Bechger, 1998) – although Kenny (2015) notes that many studies have been published with smaller samples. For multilevel models, (Usami, 2014) shows that, all other things being equal, a sample's power is sensitive both

to the number of repeated measures (here, the length of the diary exercise) and the sample size (the number of couples). Zhang and Willson (2006) further suggest that SEMs tend in general to be more powerful than HLMs for a given sample size. In their simulations, SEMS models showed an asymptotic growth in efficiency when first-level unit size reached about 35.

Family-wise Corrections in Multilevel Models

Many multivariate statistical analyses, particularly those based on ANOVAs, need to be corrected for simultaneous multiple tests within a same dataset. Indeed, it is a known statistical result that running multiple t-tests increases the probability of finding a statistically significant result – much the same that increasing the number of coin flips increases the probability of obtaining a "Tail". This effect is variously known as familywise or experimentwise error, and is often corrected by penalizing the significance of the results with an analytical adjustment (e.g., the Bonferroni adjustment; McDonald, 2009).

As noted by (Cribbie, 2007), such corrections are not applicable to SEMs. Indeed, SEMs do not rely on null hypothesis testing as do for instance ANOVAs; and further, it is unclear how to determine the number of tests represented by a SEM, where parameter estimation is performed by gradient descent. For example, using the number of parameters in the model to adjust the significance of the result (as per the Bonferroni adjustment) has been shown to be overly conservative.

About our Research

In light of the considerations above, the following choices were made while carrying out our doctoral work.

Study Design

Over-sampling from the LGBTQ+ community. In our study, we chose to target some of our advertisements directly at the LGBTQ+ community, and to over-sample non-heteronormative participants.

Encouraging completion. Completion rates and risk of attrition were minimised by naming a single investigator for each couple, and by running weekly calls to both partners in the couple. In this manner, the individual contribution was promoted with each partner and dyad, and issues and questions were raised and resolved quickly.

Gender measures. Data for the first two studies presented here were collected before our work began, and were based on a hetero-normative framework. In designing our third study, it was decided to address this limitation to the best of our ability. Two different measures of sex and gender were included, including a 7-item "extended format" (Broussard et al., 2017). The wording of the questionnaire and scales was reviewed with an eye to inclusivity, and some of the older scales were reworded – in particular where gender was referred to explicitly, where male-female couples were implied, or where sexual activity was defined in terms of penile-vaginal penetration. Despite this work, some of the participants raised issues with the questions they were asked to answer, particularly the ones related to biological sex. Hence, much work

remains moving forward to better understand how simultaneously to address the concerns of the LGBTQ+ community, remain comprehensive to the cis-gender, heteronormative participants, and generate data amenable to statistical analyses.

Data Preparation

In the present studies, responses from each couples' two partners were matched, giving a single record per couple per day (in cases where one of the partners had missed an entry, their half of the record was left blank). Models were then based on a two-level (couple-day) structure, where diary responses were nested within the couple who had produced them (Nezlek, 2012).

Distinguishable and indistinguishable couples. Of the three studies reported here, the first two were based on a sample of heterosexual, newlywed couples. This is a distinguishable dyad, and female partners were assigned the "Actor" role in the models used to analyze the data. The third study was based on a community sample of mixed- and same-sex couples, which were therefore undifferentiated. In this third study, analyses were performed with both (arbitrary differentiation and double-entry) approaches discussed above (Ledermann & Macho, 2014), with both approaches yielding similar results; results from the double-entry approach are reported here.

Sexual behaviour as a dyadic variable. In all samples used here, sexual behaviour was reported independently between partners and matched during analysis to obtain a single value. As expected, differences were occasionally observed in both partners' the reports of the same sexual activity, even once missing and misaligned records were

resolved. These errors were infrequent, and t-tests between both partners' answers were non-significant, suggesting that these errors would not overly affect the model's overall results. The approach taken here was to favour sensitivity over specificity, and to record a behaviour as having occurred when at least one partner reported it.

Sexual desire discrepancy. The discrepancy in sexual desire between a couple's partners was the object of this thesis' third study. As couples were indistinguishable in this sample, and because our intent was to focus on the magnitude of this difference, the variable was calculated using the following symmetrical definition, also used by other authors (Mark, 2015):

$$Sexual\ desire\ discrepancy = Abs[\ sexual\ desire_{\ partner\ A} - sexual\ desire_{\ partner\ P}\ ]$$

Modeling Approach

Direct and indirect effects between variables were assessed and data dependencies were controlled by using Hierarchical Structural Equation Modeling (HSEM; Hox & Stoel, 2005; Peugh et al., 2013). Since daily phenomena were the focus of the work, no between-level modeling was performed, so that results obtained are for the within (daily) level only. Following Laurenceau and Bolger (2012), potential linear effects of time were also controlled through an additional regression term (the day of the diary entry). These effects were not found to be significant and the term was removed in the final model. Further, in accord with recommendations from Ledermann et al. (2011), APIMeM models were constrained to be symmetrical by ensuring parameters representing equivalent paths to be equal. Finally, all daily models in our study used the

multilevel approaches recommended by (Laurenceau, 2000; Laurenceau & Bolger, 2012; Nezlek, 2012), and in particular, person-centered variable values.

Model Fit, Parameter Estimation and Stepwise Refinement

Robust ML estimators were used in HSEM model and parameter estimation, since the independent variables in this study were not multivariate normal (Kline, 2012; Muthén & Muthén, 2015). Estimation was performed using stepwise refinement, where a full, saturated model was initially defined. Parameters not reaching significance were then iteratively removed (set to 0), and parameters with the highest error value were removed first. Where removal order was ambiguous, the parameters least in accord with the study's hypotheses were removed first. In the final model, only significant parameters were retained. The overall (unsaturated) model was assessed for fit and identification once all parameters estimates were significant.

Model fit and parameter significance were assessed as follows: Overall model fit was considered acceptable when Root Mean Square Error of Approximation (RMSEA) < .08, "within" Standardized Root Mean Square Residual (SRMSR) < .08, Comparative Fit Index / Tucker-Lewis Index (CFI/TLI) > 0.9, and individual standardized residuals (σ) were "small" (Gefen et al., 2000; West et al., 2012). Parameter estimates were considered significant when their t-value (i.e., the ratio of the estimate over its standard error) was < .05. Significance of mediation effects was tested following recommendations by (Preacher, 2011, 2015) and used intervals of 95% confidence. As MPlus does not support bootstrapping for hierarchical models, these were calculated using the Delta method.

PART IV: RESEARCH RESULTS

Article 1: Sexual Motives, Sexual Behaviour and Sexual Outcomes

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RUNNING HEAD: SEXUAL APPROACH MOTIVES, BEHAVIOR AND OUTCOMES

TITLE: Sexual Behavior Mediates the Relationship Between Sexual Approach Motives and Sexual Outcomes: A Dyadic Daily Diary Study

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Abstract

Recent studies show that sexual approach (SA) motives, i.e., having sex to achieve a positive state such as sexual pleasure, are associated with higher sexual and relationship satisfaction. However, mechanisms linking SA motives to these outcomes are poorly understood, and the important distinction between SA motives that are self-directed (e.g., self-gratification) and other-directed (e.g., pleasing one's partner) has received little empirical attention, particularly in the everyday context of couples' sexuality. The present study focused, at an event level, on the associations between self-directed and other-directed SA motives, and sexual satisfaction and perceived partner responsiveness (PPR, an aspect of relationship intimacy). We also examined the mediating role of the couple's sexual behavior in these associations. Data were collected over a month-long daily diary study involving 35 newlywed heterosexual couples and analyzed using the Actor Partner Interdependence Model. Results showed that men and women's self-directed SA motives were associated with their own higher sexual satisfaction, and in men, with their female partners' sexual satisfaction as well. For both men and women, these associations were mediated by sexual behavior: self-directed SA motives were associated with more genitally focused sexual behavior (e.g., vaginal intercourse, oral sex), in turn associated with higher sexual satisfaction. For men, other-directed SA motives were associated with their own greater PPR and with that of their female partners. For women, self-directed SA motives were associated with their own greater PPR and with that of their male partners. Sexual behavior did not mediate associations with PPR. Theoretically, these findings support dyadic models of sexual satisfaction and intimacy, and indicate that self-directed SA motives may be more

important to sexual satisfaction than other-directed motives. Clinically, they support sex therapy approaches that integrate both partners and suggest that sexual motives and behavior may be relevant targets for intervention.

Keywords: Sexual approach motives, relationship intimacy, perceived partner responsiveness, sexual behavior, dyadic daily diary study

Introduction

Sexuality plays an important role in the quality of romantic relationships. Sexual function and satisfaction have been liked to both partners' wellbeing and to the stability of the couple relationship (Heiman et al., 2011; McNulty, Wenner, & Fisher, 2016; Scott & Sprecher, 2000; Sprecher, 2002). Empirical studies have also shown associations between sexuality and feelings of intimacy (Byers, 2005; Diamond, 2004). Unfortunately, many couples do not report a satisfying sex life. A survey of over 1400 English adults reported that more than 25% were sexually dissatisfied, and over 50% of individuals from general population samples report being dissatisfied with the sexual aspects of their relationship (Dunn, Croft, & Hackett, 2000; Laumann, Gagnon, Michael, & Michaels, 1995).

Recent research suggests that sexual motives play a pivotal role in sexual satisfaction. In particular, individuals engaging in sexual activity for sexual approach motives (i.e., seeking a positive state such as personal gratification or greater intimacy) report higher levels of sexual satisfaction and relational well-being (Impett, Peplau, & Gable, 2005). These results are important because they begin to identify the aspects of sexuality that positively influence sexual and relationship wellbeing. Unfortunately, the mechanisms that link sexual approach motives to sexual and relationship outcomes remain poorly understood. It is plausible that the couple's sexual behavior (i.e., the behaviors performed during sexual activity) plays a role in this association, as it has been linked independently to both motives and personal and relationship outcomes (Frederick, Lever, Gillespie, & Garcia, 2016; Muise, Giang, & Impett, 2014). However, this

hypothesis has not been examined empirically. Furthermore, much of the research in this area has focused on individuals, and the everyday sexuality of couples has received little attention to date. The present study sought to address this gap by focusing on the event-level associations between sexual approach motives, sexual behavior and sexual and relational outcomes in newlywed couples.

Motives for Sex

Theorists have proposed that most if not all human behavior is purposeful (Ajzen, 1991; Austin & Vancouver, 1996). Although sexuality is distally influenced or shaped by socio-cultural factors, it is generally accepted that sexual behavior is proximally determined by sexual motives (Cooper, Barber, Zhaoyang, & Talley, 2011; Cooper, Shapiro, & Powers, 1998; Ingledew & Ferguson, 2007). A number of different frameworks have been proposed to facilitate the study of sexual motives, including the empirically derived YSEX? Scale (Meston & Buss, 2007). The validity and relevance of this scale have received recent empirical support (Armstrong & Reissing, 2014, 2015; Moore, Kulibert, & Thompson, 2017; Stephenson, Ahrold, & Meston, 2011), particularly in survey-based studies where the size of the measure is not an issue.

Conceptual frameworks have also been proposed for sexual motives, derived from the more general field of motivation. Perhaps the most studied is the *approach / avoidance* framework (Elliot & Covington, 2001; Gable, 2006; Gable & Impett, 2012), which distinguishes motives according to whether they orient behavior towards or away from a goal state. This distinction is a fundamental one, as approach (or appetitive) and avoidance (or aversive) motives appear to engage different neuronal circuitry (Carver,

Sutton, & Sheier, 2000; Gray, 1987). Sexual approach and avoidance motives have also been associated with dispositional attributes such as attachment orientation (Gewirtz-Meydan & Finzi-Dottan, 2018; Impett, Gordon, & Strachman, 2008). A second important, although less well studied, distinction is between self-directed and other-directed motives. Self-directed motives are focused on oneself (e.g., the desire for self-gratification). In contrast, other-directed motives focus on the other (e.g., the desire to please one's partner). Self-directed and other-directed sexual motives are differentially associated with outcomes such as sexual desire and sexual satisfaction, and are reported with different frequencies by men and women (Impett et al., 2005; Muise, 2011; Stephenson et al., 2011). Cooper and colleagues have crossed these two dimensions (approach/avoid and self-/other-directed), resulting in four possible quadrants (Cooper et al., 2011; Cooper et al., 1998). Importantly, they note that self-directed and other-directed motives differentiate into two clearly observable groups at the approach end of the spectrum, and that this difference is less marked for avoidance motives (Cooper et al., 1998).

The present study focused on daily *sexual desire, sexual behavior and positive sexual outcomes* in the dyad. *Sexual approach motives* have been strongly associated both with sexual desire and positive outcomes, in contrast to sexual avoid motives (Impett et al., 2005). Importantly, the *approach* end of the sexual motives spectrum is also where the distinction between self-directed and other-directed motives is most clear (Cooper et al., 1998).

Sexual Satisfaction, Intimacy and Perceived Partner Responsiveness

Sexual satisfaction and relationship intimacy are two pivotal outcomes in the study of couple sexuality. These constructs have been studied both separately and together, and research to date suggests that they are associated with distinct, interrelated processes (Byers, 2005; Diamond, 2004).

Sexual satisfaction is associated with many measures of well-being, both physical and mental (Sanchez-Fuentes, Santos-Iglesias, & Sierra, 2014). In particular, greater levels of sexual satisfaction have been reported for individuals engaging in sexual activity for sexual approach motives (Gable & Impett, 2012; Impett et al., 2010; Impett et al., 2005; Impett, Strachman, Finkel, & Gable, 2008; Impett & Tolman, 2006), and there are indications that these associations may differ in significance between self- and other-focused sexual approach motives (Muise, 2011; Stephenson et al., 2011). For example, Stephenson et al. (2011) report, from a sample of 544 students responding to a 4-factor proxy of the YSEX? scale, that sexual motives associated with sexual satisfaction differed between men and women. In particular, individual, self-focused approach motives were significantly and positively associated with sexual satisfaction for men, whereas social, other-focused approach motives were associated with sexual satisfaction for women. Muise (2011) reported similar results from a sample of 207 cohabiting couples, with the addition that individual, self-focused approach motives were associated with sexual satisfaction for both genders.

Intimacy is considered by many authors to be a fundamental human need (Baumeister & Leary, 1995). Indeed, being intimate with one's partner is associated with

positive sexual outcomes, including sexual frequency, sexual satisfaction and relationship satisfaction (Rubin & Campbell, 2011; Štulhofer, Ferreira, & Landripet, 2013; Witherow, Chandraiah, Seals, & Bugan, 2016). Reis & Shaver (1988) define intimacy as a dynamic process between two people involving interactions comprised of two components: One person's verbal or non-verbal self-disclosures and the other's empathic responses to them. In this model, the discloser's perception of the other's responses, and in particular, how the discloser feels understood, valued and validated (Perceived Partner Responsiveness, or PPR) is the "active component" which drives variations in everyday feelings of intimacy. This proposal has received considerable empirical support (Laurenceau et al., 1998; Reis, Clark, & Holmes, 2004; Reis & Gable, 2015). PPR has been studied at the event level in committed couples, where it has been associated with relational outcomes such as dyadic adjustment (Gadassi et al., 2016; Laurenceau, Barrett, & Rovine, 2005), and sexual outcomes such as sexual desire (Birnbaum et al., 2016).

Sexual approach motives have been associated with greater relational outcomes such as relational satisfaction and quality (Impett et al., 2005; Impett, Strachman, et al., 2008; Muise, 2011; Muise, Impett, Kogan, & Desmarais, 2013). However, there are to our knowledge no studies that have directly assessed the associations between self- and other-directed SA motives and relationship intimacy, nor its key component, PPR.

Genital Sexual Behavior, Affectionate Sexual Behavior

There are indications that sexual behaviors (i.e., the behaviors performed during sexual activity) are associated both with sexual motives and outcomes such as sexual

satisfaction and relationship intimacy. For example, Browning, Hatfield, Kessler, & Levine (2000) reported from a convenience sample of students that motives such as Love and Pleasure were, with gender, the strongest predictors of a range of statistically usual (i.e., frequently-reported) and unusual (i.e., infrequently-reported) behaviors, the former group including kissing, genital touch, intercourse and oral sex. Variations in sexual behavior have also been associated with outcomes such as sexual satisfaction, sexual functioning and relationship happiness (Fisher et al., 2015; Muise et al., 2014).

In the present study, the term *genital sexual behavior* refers to aspects of sexual behavior that have a more obvious focus on sexual pleasure (e.g., oral sex, vaginal and anal intercourse). Genital sexual behavior has been examined within the context of romantic relationships, and recent correlational studies support the hypothesis that it is associated with both self-directed motives and sexual satisfaction. For example, an online survey of university students in the US indicated that greater self-reports of SA motives (*enhancement* motives) were associated with greater frequency of genital sexual behaviors such as penetrative and oral sex (Patrick, Maggs, Cooper, & Lee, 2011). Similarly, a recent large online survey showed that more frequent genital sexual behavior (intercourse, oral sex) and more frequent orgasms were correlated with higher sexual satisfaction (Frederick et al., 2016).

In contrast with genital sexual behavior, we use the term *affectionate sexual behavior* to refer to behavior during sex that has a stronger focus on demonstrations of affection. Affectionate behavior (including touching, holding, cuddling and kissing) has been studied outside the context of sexuality, and there is general agreement that this

behavior has beneficial effects both for the individual and for the couple. Affectionate touch between romantic partners is associated with improved relationship satisfaction, perceived intimacy and mood (Fisher et al., 2015; Gallace & Spence, 2010; Gulledge, Gulledge, & Stahmannn, 2003; Gulledge, Hill, Lister, & Sallion, 2007; Heiman et al., 2011). In long-term relationships, physical intimacy (physical expressions of affection, such as kissing and hugging) was found to be one of the determinants of psychological intimacy (Mackey, Diemer, & O'Brien, 2000). In a sample of women suffering from genito-pelvic pain, a positive association was observed between hugging and kissing, and sexual satisfaction, relationship satisfaction and sexual function (Vannier, Rosen, Mackinnon, & Bergeron, 2016). Despite the importance of affectionate touch generally, this behavior has received relatively little empirical attention within the context of sexual activity. The few studies that do exist in this area suggest that the benefits of affectionate sexual touch also occur when having sex. For example, Muise and colleagues observed that the duration of post-sex affectionate behavior (*afterglow*) was positively related to sexual and relationship satisfaction for both partners (Muise et al., 2014). Similarly, a recent study by Dewitte, Van Lankveld, Vandenberghe, & Loeys (2015) showed that affectionate and genital sexual behavior both predicted and were predicted by positive mood and relational context in heterosexual couples.

Clearly, genital and affectionate sexual behaviors tend to co-occur to varying degrees during a couple's sexual activity. Nevertheless, the differences in associations observed in empirical research suggest that these two forms of behavior may have different meanings for couples, and may be differentially involved in the processes

underlying sexual satisfaction and intimacy in the couple. These forms of behavior have rarely been studied in a contrasted manner in the everyday sexuality of committed couples. The paucity of research in this area is surprising, given that sexual behavior is common to both partners during sexual activity, making it a natural event-level, dyadic measure.

Study Goals and Hypotheses

Much of the research in sexuality to date has focused on associations between intra-individual variables (so-called *actor effects)*, disregarding the potential influence of the partner's internal state and behavior (*partner effects*). The scarcity of available data is increasingly perceived as a limitation, given that sexuality in committed couples is largely a dyadic phenomenon (McCarthy & Thestrup, 2008). Dyadic studies to date have reported numerous effects between partners, in particular, that sexual approach motives in one partner were associated with greater relationship satisfaction and relationship quality in the other partner (Impett et al., 2010; Muise, Impett, & Desmarais, 2012). There are also indications that different facets of sexual behavior affect both partners. For example, a study of women suffering from genito-pelvic pain reported that on days with sexual activity where their partner reported more solicitous responses, both partners reported lower sexual satisfaction (Rosen, Muise, Bergeron, Delisle, & Baxter, 2015). However, partner effects have yet to be examined in a differentiated study of self-directed and other-directed approach motives.

Further, most sexuality studies involving couples are based on retrospective measures spanning one or more months. A potential difficulty with this approach is that

longer-term retrospective measures of sexual activity are known to be subject to significant memory bias, the magnitude of which may exceed reported effect sizes (Gillmore, Leigh, Hoppe, & Morrison, 2010; Hoppe et al., 2008; McAuliffe, DiFranceisco, & Reed, 2007; McCallum & Peterson, 2012). In addition, recent studies report considerable daily variability in outcomes such as sexual satisfaction and sexual desire (Derogatis et al., 2011; Rosen et al., 2014; Rosen et al., 2015; Rubin & Campbell, 2012)

The present study examined, at the event level, whether self-directed and other directed SA motives were associated both within and between partners with sexual satisfaction and PPR, as well as the mediating role of genital and affectionate sexual behaviors in these putative associations. It was hypothesized that self-directed SA motives would be significantly associated with reports of greater sexual satisfaction, and that other-directed SA motives would be associated with greater PPR. Empirical data on partner effects were scarce, but these were expected to be in the same direction as actor effects. It was further hypothesized that genital sexual behavior would mediate the association between self-directed SA motives and sexual satisfaction. Given insufficient data, no hypothesis was formulated concerning the mediating role of affectionate sexual behavior in the association between other-directed SA motives and PPR.

Method

Participants

Thirty-four newlywed heterosexual couples participated in this study. Drawing on the marriage registry in Monroe County, Indiana (US), 300 prospective couples were sent

an invitation to participate by mail. Participants were then telephone-screened for eligibility, based on the following selection criteria: Being aged between 18 and 40 years old, English-speaking, heterosexual, married for the first time within the year, no children, and not planning to move out of Indiana. Participants received a compensation of 1$ per day, with an additional 10$ for responding over the entire period.

Procedure

Participants first completed an initial baseline questionnaire, of which only the demographic information was used here; for a more complete description, see Lykins, Janssen, Newhouse, Heiman, & Rafaeli (2012). Participants were then equipped with TREO smartphones, which they were trained to use to complete an electronic diary, a questionnaire composed of items covering their personal and relational state, and, on days where the participant had had sex, their sexual motives, sexual behavior and sexual satisfaction. Diaries were to be completed every evening, individually and alone. Time required for this was 10-15 minutes per day, for up to 35 consecutive days.

Daily Measures

A single item identified the days where the participants had engaged in sex ("*Did you engage in sexual activity with your spouse in the last 24 hours?"*). On those days, the variables of interest were measured.

Sexual motives. Sexual motives were assessed using a single checklist item ("Why did you engage in this activity?") that allowed the participants to select between one and seven sexual motives; using a list adapted from previous work (Cooper et al.,

1998; Impett et al., 2005), see *Table 1*. Of these responses, this study focused on self-directed and other-directed Sexual Approach (SA) motives (checklist items: “to feel pleasure” and “to please my partner”, respectively). To facilitate subsequent analyses, these two dichotomous checklist responses were converted into two dichotomous variables, with no loss of information: Each variable was set to one if it had been selected in the checklist.

Table 1.

Checklist items for sexual motivation

1 = "To feel pleasure"
2 = "To feel close to my partner"
3 = "Reduce my negative feelings"
4 = "Reduce spouse's neg. feelings"
5 = "To please my partner"
6 = "Reduce/avoid marital problems"
7 = "To conceive a child"
8 = "No response"

Sexual behavior. Sexual behavior was also assessed using a checklist item (“What sort of sexual activity did you engage in?”), that allowed each participant to select between one and eight of the following behaviors: non-genital touch; genital touch; vaginal intercourse; anal intercourse; oral sex (me on my partner); oral sex (my partner on me); kissing; other sexual activities. This list is a subset of those studied elsewhere

(Browning et al., 2000). All behaviors reported by the participants were potentially pertinent to this study. However, after analysis, two behaviors were excluded: First, the behavior "anal intercourse" occurred only 9 times in the sample, and could not be analyzed reliably. The behavior "other activity" was also excluded, as it was unclear what participants were referring to when they selected this checklist option.

A three-level (couple, participant, day), latent-factor Confirmatory Factor Analysis was performed for the remaining sexual behaviors. Following recommendations by Raykov (2012), internal construct reliability of the factors was assessed using model fit and significance of factor loadings, an approach which is considered preferable to Cronbach's alpha in hierarchical models. In this analysis, a two-factor model was found to fit the data best. On the basis of these results, two composite variables were defined, and named *affectionate sexual behavior* (kissing, non-genital touch, non-penetrative genital touch) and *genital sexual behavior* (vaginal intercourse, oral sex self on other, oral sex other on self). Values for these variables were calculated by averaging item responses for each factor, resulting in continuous values ranging from 0 to 1. Paired t-tests confirmed that there was no significant difference between partner's reports of affectionate sexual behavior ($t(499)=.000$, $p=1.00>.05$) and genital sexual behavior ($t(499)=.000$, $p=1.00>.05$). Nevertheless, each partners' affectionate and genital behavior variables were kept separate and analyzed individually.

Sexual satisfaction. Participants' sexual satisfaction was measured using a single item ("How sexually satisfying was this activity for you?"), rated on a 5-point Likert scale (1, "not at all", to 5 "extremely"). Note that this item refers explicitly to the sexual

activity(ies) performed on that day. To facilitate interpretation between variables and to minimize any artificial bias introduced by scale differences, this variable was linearly rescaled, resulting in a continuous variable ranging from 0 to 1. This transformation does not affect the direction nor the significance of the analysis results; this was verified by comparing models of scaled and unscaled data and confirming that results were comparable.

Perceived Partner Responsiveness (PPR). PPR was determined by averaging three items assessing the partner's understanding ("To what extent today did you feel that your partner understood you"), encouragement ("To what extent today did you feel that your partner expressed liking and encouragement for you") and caring/valuing ("To what extent today did you feel that your partner valued your abilities and opinions"). All three items were rated on a 7-point Likert scale (1-"not at all" to 7-"very much"). To facilitate interpretation, this variable was linearly rescaled, resulting in a continuous variable ranging from 0 to 1. This measure of PPR was adapted from the Responsiveness model (Reis & Gable, 2015; Reis & Shaver, 1988), and has been used by other authors, in particular, in daily dyadic studies (Gadassi et al., 2016; Laurenceau et al., 2005).

Data Analytic Approach

Univariate analyses were performed using SPSS (IBM SPSS Statistics, v. 21.0). Modeling was based on the Actor-Partner Interdependence Mediation Model or AIMeM (Cook & Kenny, 2005; Ledermann, Macho, & Kenny, 2011). Intra-individual (actor) effects, inter-individual (partner) effects and indirect (mediation) effects between self- and other-directed SA motives (independent variables), and sexual satisfaction and PPR

(dependent variables) were assessed. We also tested whether genital and affectionate sexual behavior mediated these associations. Potential interactions between mediators were also tested; these were observed to be non-significant.

Independent and dependent variables from both the participant and the partner were included in the model, as well as the genital and affectionate sexual behavior reported by the participant. All variables were person-mean centered, and hence indicated differences from each participant's mean values. To reduce the number of free parameters, the models from both partners were crossed, and equivalent paths were constrained to be equal. To control for the nested dependencies present in daily dyadic journals, the model was adapted to a two-level (person, day) Hierarchical Structural Equation Model (HSEM) following recommendations by Laurenceau and Bolger (2012), and fixed (*between*) and variable (*within*) factors were disassociated by person-mean centering the variables (Preacher, Zhang, & Zyphur, 2011).

Analysis was performed in MPlus 7 (Muthen & Muthen, v.1.4). Robust ML estimators were used in model and parameter estimation, since the independent variables in this study were not multivariate normal (Kline, 2012; Muthén & Muthén, 2015). Model fit and parameter significance were assessed according to the following guidelines: Overall model fit was considered acceptable when Root Mean Square Error of Approximation (RMSEA) < .08, "within" Standardized Root Mean Square Residual (SRMSR) < .08, and individual standardized residuals (σ) were "small" (Gefen, Straub, & Boudreau, 2000; West, Taylor, & Wu, 2012). Parameter estimates were considered significant when their t-value (i.e., the ratio of the estimate over its standard error) was <

.05. Significance of mediation effects was tested following recommendations by (Preacher, 2011, 2015) and used intervals of 95% confidence. As MPlus does not support bootstrapping for hierarchical models, these were calculated using the Delta method (Xu & Long, 2005). Parameter estimates reported here were unstandardized.

Results

Sample Characteristics

Seventy participants (35 couples) completed the daily diaries. Participants ranged in age from 18 to 34 years (mean: 26, SD: 3). Ninety-seven percent of the participants were White / non-Hispanic (1.5% Hispanic, 1.5% "other"). Forty-six percent reported their religion as Christian, and 50% as "none", atheist or agnostic. Forty-seven percent were employed full-time, 12% employed part-time. Ninety-one percent were attending or had attended college. Participants had known their spouses 1 to 14 years (mean: 6, SD: 3.4) at the time of the study.

Participants followed the daily diary protocol on average for 31 days out of the 35 days of the study (SD: 1.4), an 89% completion rate. Diaries were completed in the evenings (i.e., between 18h and 24h) 84% of the time, as per requested; an additional 5% were completed between 12h and 13h. Of the 35 couples in the sample, one indicated they were having sex to conceive. Their results differed significantly from the others and they were removed from the sample. The final sample was composed of 2120 entries. On 645 (30%) of these days, respondents indicated having sex. Of these entries, seven were removed where the participants had not recorded their sexual satisfaction. The final

corpus was therefore composed of 638 entries. Self-directed and other-directed SA motives were observed to overlap in 20% (males) and 19% (females) of these entries. Covariance of genital and affectionate sexual behavior was non significant (p>.289).

Significant Direct and Indirect Associations

Model fit. Direct (actor, partner) and indirect (mediation) effects were assessed using APIMeM. This model converged without error and with an acceptable model fit (RMSEA: .000 < .08; SRMR (Within): 0.060<0.08).

Associations between SA motives and Sexual Satisfaction. Significant (actor) effects were found between self-directed SA motives and greater sexual satisfaction for both men (b=.231; β=.236; 95% CI=[.150, .312]; p=.000<0.01) and women (b=.233; β=.263; 95% CI=[.170, .297]; p=.000<0.01). A significant (partner) effect was found between men's self-directed SA motives and their female partner's sexual satisfaction (β=.299; β=.098; 95% CI=[.185, .413]; p=.000<0.01). Associations between other-directed SA motives and sexual satisfaction were not significant. See *Figure 2*.

Mediating role of genital sexual behavior. The couple's genital sexual behavior was found to mediate the (actor) association between self-directed SA motives and sexual satisfaction, for both men (a*b=.028, a*b (std)=.008, 95% CI=[.006, .049]; p=.032<0.05) and women (a*b=.023, a*b (std)=.007, 95% CI=[.007, 039]; p=.020<0.05), as well as the (partner) association between men's self-directed SA motives and their female partner's sexual satisfaction (a*b=027, a*b (std)=007, 95% CI=[.016, .038];

p=.000<0.001). Interaction effects between these mediation effects were not found to be significant (p=.239>.05). See *Figure 3*.

Associations between SA motives and Perceived Partner Response (PPR). A significant (actor) effect was found between men's other-directed SA motives and their own greater PPR (b=.059; β=.067; 95% CI=[.025, .093]; p=.004<0.01), and between women's self-directed SA motives and their own greater PPR (b=.059; β=.067; 95% CI=[.035, .084]; p=.011<0.05).

A significant (partner) effect was found between men's other-directed SA motives and their female partner's greater PPR (b=.052; β=.020; 95% CI=[.013, .091]; p=.047<0.05), and between women's self-directed SA motives and their male partner's greater PPR (b=.048; β=.013; 95% CI=[.027, .069]; p=.029<0.05). See *Figure 2*.

Affectionate sexual behavior. Self-directed SA motives were significantly and positively associated with the couple's affectionate sexual behavior, for both men (b=.168, β=.238, 95% CI=[.057, .209]; p=.004<0.01) and women (b=.133, β=.158, 95% CI=[.079, .257]; p=.002<0.05). Other-directed SA motives were significantly and positively associated with the couple's affectionate sexual behavior, for both men (b=.058, β=.098, 95% CI=[.013, .102]; p=.032<0.01) and women (b=.082, β=.153, 95% CI=[.022, .142]; p=.024<0.05). Associations between affectionate sexual behavior and sexual satisfaction and PPR did not reach significance. See *Figure 3*.

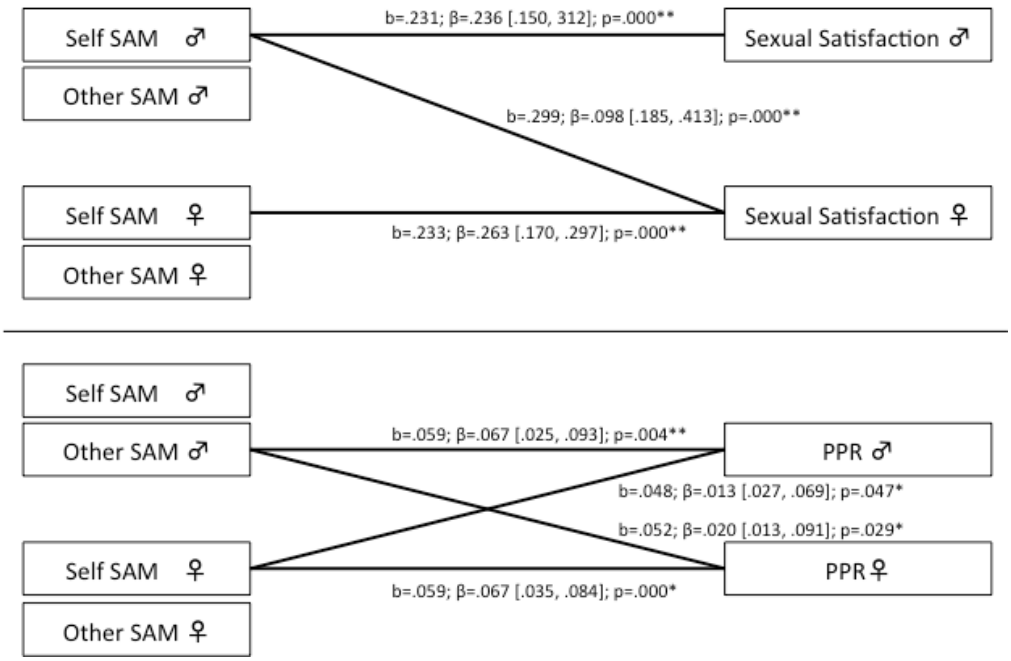

Figure 2. Top: Main effects (actor, partner) between sexual approach motivations (self, other) and sexual satisfaction for men (♂) and women (♀). Bottom: Main effects (actor, partner) between sexual approach motivations and PPR.

*Positive associations represented by full lines, and negative associations with dashed lines. Parameters values are unstandardized (b) and standardized (β). Significance of parameter estimates are represented as stars (*p<.05; **p<.01) and confidence intervals (95% CI) noted in square brackets. Not represented for clarity: covariance relations between independent variables, and between dependent variables.*

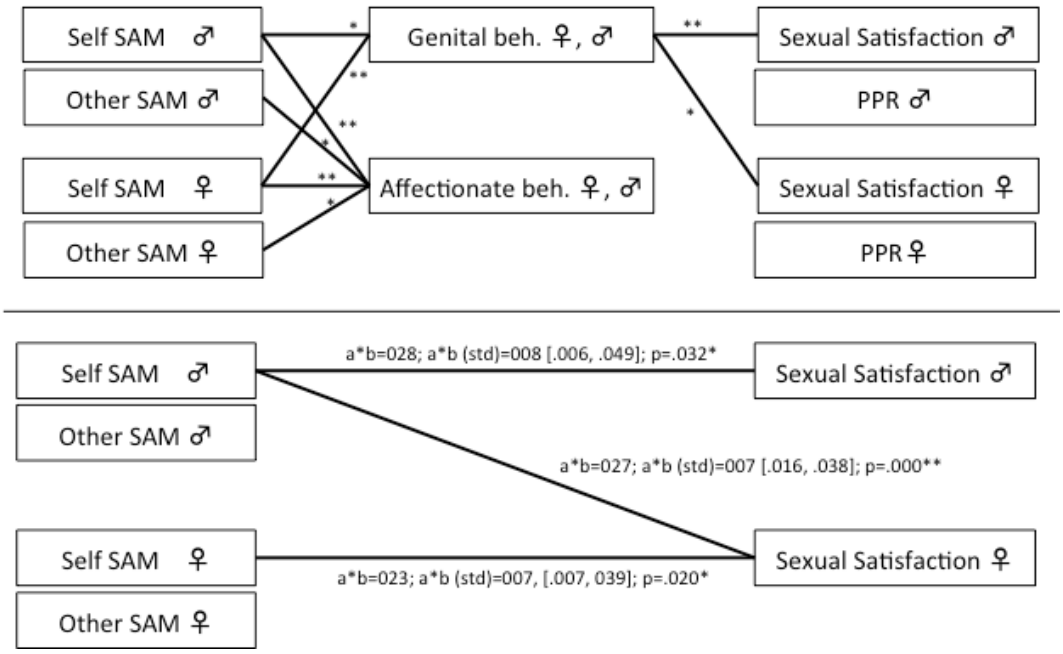

Figure 3. Top: Significant associations between sexual approach motivations (self, other) and sexual behavior (genital, affectionate), and between sexual behavior and sexual satisfaction, for men (♂) and women (♀). Bottom: Mediation of genital sexual behavior on the actor and partner associations between sexual approach motivations and sexual satisfaction

*Parameters values are unstandardized (a*b) and standardized (a*b(std)). Significance of parameter estimates are represented as stars (*p<.05; **p<.01) and confidence intervals (95% CI) noted in square brackets. Not represented for clarity: covariance relations between independent variables, and between dependent variables.*

Discussion

This study examined event-level associations between self- and other-directed sexual approach (SA) motives, and sexual satisfaction and perceived partner

responsiveness (PPR) in a sample of newlywed couples. The mediating role of sexual behavior in these associations was also tested. Significant positive associations were found between men and women's greater self-directed SA motives and their own greater sexual satisfaction, and between men's greater self-directed SA motives and their female partner's sexual satisfaction. These associations were mediated by genital sexual behavior, such that self-directed SA motives were associated with greater genital sexual behavior, which in turn was associated with greater sexual satisfaction for both partners. Furthermore, associations were found between greater SA motives and both participants' own and their partners' greater PPR. For men, this association was significant only for greater other-directed SA motives and for women, only for greater self-directed SA motives. These associations were not mediated by either genital or affectionate sexual behavior. Overall, these findings are in line with the study's hypotheses and support dyadic models of sexual satisfaction and intimacy (Byers, 1999; Dewitte, 2014).

For both men and women, engaging in sexual activity to please oneself was associated with greater genitally-focused behavior, and ultimately, with greater sexual satisfaction on the same day. Previous studies have reported associations between SA motives and sexual satisfaction (Muise et al., 2012). The present study adds to those results by suggesting that this association is most significant for self-directed SA motives. Nevertheless, our findings differ from those of Stephenson et al. (2011), which indicate that for women, other-focused approach motives were also associated with sexual satisfaction – an association that was observed to be positive but not significant in our

sample. This difference may be due to the fact that this study's sample was composed of relatively young newlyweds, where partners may have a greater focus on individual pleasure. Alternatively, these variations in results may be due to differences in the measures used to examine approach motives and sexuality outcomes, as well as to the event-level methodology espoused in the present study.

The mediating role played by genital sexual behavior in this association is, to our knowledge, a novel result, and suggests that at least in this sample, the motive to please oneself sexually is expressed through an increased likelihood of genital sexual behavior (here, vaginal intercourse and oral sex). A gendered partner effect was also observed in this process, whereby men's self-directed SA motives resulted in greater sexual satisfaction in their female partners, this association also being mediated by genital sexual behavior. A possible interpretation of this result is that in heterosexual couples, sexual activity such as vaginal penetration and oral sex is more frequently initiated by men than women (Clark, 1989; DeLamater, 1987), and that such genital sexual behavior may result in greater satisfaction for both partners given it is associated with sexual arousal and a higher likelihood of orgasm.

The associations between SA motives and greater PPR in men are generally consistent with the study's hypotheses. Specifically, men's other-directed SA motives were associated with their greater PPR. It is possible that for men, a greater focus on the partner results in greater feelings of intimacy. Indeed, there is some empirical support for this hypothesis. For example, a daily diary study reported an association between engaging in sexual activity to please the other, and greater feelings of authenticity and

greater relationship well-being (Impett, Javam, Le, Asyabi-Eshghi, & Kogan, 2013). The opposite interpretation is also plausible, such that on days of greater intimacy, men may be more open and perceptive of their partner's needs (thereby acting more strongly through other-directed motives). Findings also indicated that men's other-directed SA motives were associated with their female partner's PPR. Men's greater focus on their female partner during sexual activity may be expressed by more attention to what is unfolding in the sexual interaction, including erotic preferences, leading women to feel closer to their male partners.

Contrary to study hypotheses, women's self-directed SA motives were associated with their own greater PPR. This result may be understood in light of the Responsiveness model (Reis et al., 2004), which posits that a partner's feelings of intimacy are increased when they perceive that their disclosures is responded to positively by the other partner. Indeed, in these relatively highly satisfied couples, it is probable that when women were motivated by their own pleasure, they communicated their sexual needs more clearly and in turn, their male partners responded positively. Hence, according to Reis and colleagues' model, this positive response would result in the women feeling greater intimacy with their partner. The Responsiveness model is also helpful in interpreting the gender differences observed in the associations between sexual motives and PPR. Arguably, expressing motives that are less gender-stereotyped (for men, relational motives, and for women, a greater focus on self-pleasure (Browning et al., 2000; Impett et al., 2005)) is a more vulnerable form of disclosure. Assuming a positive reception from the partner, expressing these motives would therefore lead to a greater feeling of

intimacy than when expressing gender-typical motives. Alternatively, these gender differences may be due to "ceiling effects" in the analysis. Indeed, participants tended on average to report gender-stereotyped motives more frequently. Hence, person-centered variance for these variables was lower, and associations with PPR may not have reached significance because of it. In contrast, reports of motives that run contrary to gender stereotypes involve a greater difference from individual averages, and are more salient in this analysis. That none of the associations with PPR were mediated by sexual behavior suggests that the link between sexual motives and relational intimacy is not explained via sexual behavior, or that it is associated with more subtle forms of verbal and non-verbal behaviors than were measured in this study. Indeed, examples of subtle behavioral interactions between partners have been observed in other contexts such as the communication of feelings of pain through facial expressions (Craig, Prkachin, & Grunau, 2010; Vervoort, Trost, Prkachin, & Mueller, 2013); it is likely that they occur in sexual contexts as well. An alternative explanation for this result is that the sample may not have provided sufficient statistical power to reliably reject the hypothesis of sexual behavior's mediating role.

One important limitation of this study is that results reported here are correlational. Hence, care should be taken in considering both potential directions in the associations observed in these data. A further limitation is the use of a single-item measure of sexual satisfaction, which did not allow us to differentiate between the different possible interpretations of this term by the study participants. Furthermore, the use of PPR as a relational outcome measure may have contributed to the non-significant

role played by behavior. Indeed, although important, PPR is only one aspect of relationship intimacy, and this restricted focus may have missed associations present with other aspects of intimacy. More comprehensive measures of relationship intimacy may provide a clearer picture – particularly if these are worded to be more focused on the sexual activity that has just occurred. Further, the checklist measures of motives and behavior used here does not provide a view of the relative intensity of these variables. Using graded (e.g., Likert-style) measures would yield a more fine-grained understanding of sexual motives and their associations with sexual behavior in a future study. Finally, the homogeneity of the sample, being composed of young, primarily White, newly married heterosexual participants, may limit the generalizability of the results. It is hoped that future research will address this limitation by sampling from a more diverse population.

Despite these limitations, the present study contributes to our dyadic understanding of sexuality as involving interactive cognitive and behavioral processes between partners, some self-directed, others, other-directed, in which sexual approach motives and genital sexual behavior appear to play a role in sexual satisfaction. Studies based on dyadic daily diaries remain relatively rare in sex research, despite their ability to limit recall biases and to examine event-level phenomena (Bolger, Davis, & Rafaeli, 2003; Gunthert & Wenze, 2012). The present work's focus on the dyad at the level of daily sexual activity is novel in this regard and provides high ecological validity. Theoretically, these findings support dyadic models of sexual satisfaction and intimacy (Dewitte et al., 2015), and indicate that self-directed SA motives may be more important

to sexual satisfaction than other-directed motives. Clinically, they support sex therapy approaches that integrate both partners and suggest that sexual motives and behavior may be relevant targets for intervention. Specifically, cognitive-behavioral therapy (CBT) models that involve the modification of sexual behavior, including the sexual script, may be relevant for increasing couples' sexual satisfaction. Third generation CBT, which focuses on valued goals, may be particularly relevant for working on sexual motives as they relate to sexual behavior.

In conclusion, results showed that men and women's self-directed SA motives were associated with their own higher sexual satisfaction, and that these associations were mediated by sexual behavior. For men, other-directed SA motives were associated with their own greater PPR and with that of their female partners, whereas for women, self-directed SA motives were associated with their own greater PPR and with that of their male partners. Associations with PPR were not mediated by sexual behavior. These results support theoretical and clinical approaches that focus on partner interactions, and emphasize the motivational and behavioral aspects of these interactions during sexual activity. They suggest that clinical models such as third-generation CBT may be of particular relevance for working on sexual motives.

References

Ajzen, I. (1991). The theory of planned behaviour. *Organizational Behaviour and Human Decision Processes, 50*, 179-2111.

Armstrong, H. L., & Reissing, E. D. (2014). Factor reliability analyses of the YSEX? in a sample of women with same-sex attraction. *Sexual and Relationship Therapy, 29*(3), 339-350.

Armstrong, H. L., & Reissing, E. D. (2015). Women's motivations to have sex in casual and committed relationships with male and female partners. *Archives of Sexual Behaviour, 44*(4), 921-934.

Austin, J. T., & Vancouver, J. B. (1996). Goal construcxts in psychology: Structure, process, and content. *Psychological Bulletin, 120*(3), 338-375.

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin, 117*(3), 497-529.

Birnbaum, G., et al. (2016). Intimately connected: The importance of partner responsiveness for experiencing sexual desire. *Journal of Personality and Social Psychology*.

Bolger, N., Davis, A., & Rafaeli, E. (2003). Diary methods: capturing life as it is lived. *Annu Rev Psychol, 54*, 579-616.

Browning, J. R., Hatfield, E., Kessler, D., & Levine, T. (2000). Sexual motives, gender and sexual behaviour. *Archives of Sexual Behaviour, 29*(2), 135-153.

Byers, E. S. (1999). The interpersonal exchange model of sexual satisfaction: Implications for sex therapy with couples. *Canadian Journal of Counselling, 33*(2), 95-111.

Byers, E. S. (2005). Relationship satisfaction and sexual satisfaction: A longitudinal study of individuals in long-term relationships. *Journal of Sex Research, 42*(2), 113-118.

Carver, C. S., Sutton, S. K., & Sheier, M. F. (2000). Action, emotion and personality: Emerging conceptual integration. *Personality and Social Psychology Bulletin, 26*(6), 741-751.

Clark, R. (1989). Gender differences in receptivity to sexual offers. *Journal of Psychology & Human Sexuality, 2*(1), 39-55.

Cook, W. L., & Kenny, D. (2005). The actor-partner interdependence model: A model of bidirectional effects in developmental studies. *International Journal of Behavioural Development, 29*(2), 101-109.

Cooper, M. L., Barber, L. L., Zhaoyang, R., & Talley, A. E. (2011). Motivational pursuits in the context of human sexual relationships. *Journal of Personality, 79*(6), 1333-1368.

Cooper, M. L., Shapiro, C. M., & Powers, A. M. (1998). Motivations for sex and risky sexual behaviour among adolescents and adults: A functional perspective. *Journal of Personality and Social Psychology, 75*(6), 1528-1558.

Craig, K. D., Prkachin, K., M., & Grunau, R. E. (2010). The facial expression of pain. In D. C. Turk & R. Melzack (Eds.), *Handbook of Pain Assessment*. New York, USA: Guilford Press.

Davis, A. (1973). *Intimate Relations*. New York: Free Press.

DeLamater, J. (1987). Gender differences in sexual scenarios *Females, Males and Sexuality: Theories and Research* (pp. 127-140): SUNY Press.

Derogatis, L. R., et al. (2011). eDiary and Female Sexual Distress Scale((c)) in evaluating distress in hypoactive sexual desire disorder (HSDD). *Journal of Sexual Research, 48*(6), 565-572.

Dewitte, M. (2014). On the interpersonal dynamics of sexuality. *Journal of Sex & Marital Therapy, 40*(3), 209-232.

Dewitte, M., Van Lankveld, J., Vandenberghe, S., & Loeys, T. (2015). Sex in its daily relational context. *Journal of Sexual Medicine, 12*(12), 2436-2450.

Diamond, L. M. (2004). Emerging perspectives on distinctions between romantic love and sexual desire. *Current Directions in Psychological Science, 13*(3), 116-119.

Dunn, K. M., Croft, P. R., & Hackett, G. I. (2000). Satisfaction in the sex life of a general population sample. *Journal of Sex and Marital Therapy, 26*(2), 141-151.

Elliot, A. J., & Covington, M. V. (2001). Approach and avoidance motivation. *Educational Psychology Review, 13*(2), 73-92.

Fisher, W. A., et al. (2015). Individual and partner correlates of sexual satisfaction and relationship happiness in midlife couples: dyadic analysis of the international survey of relationships. *Archives of Sexual Behaviour, 44*(6), 1609-1620.

Frederick, D. A., Lever, J., Gillespie, B. J., & Garcia, J. R. (2016). What keeps passion alive? Sexual satisfaction is associated with sexual communication, mood setting, sexual variety, oral sex, orgasm, and sex frequency in a national U.S. study. *Journal of Sexual Research*, 1-16.

Gable, S. L. (2006). Approach and avoidance social motives and goals. *Journal Personality, 74*(1), 175-222.

Gable, S. L., & Impett, E. A. (2012). Approach and avoidance motives and close relationships. *Social and Personality Psychology Compass, 6*(1), 95-108.

Gadassi, R., et al. (2016). Perceived partner responsiveness mediates the association between sexual and marital satisfaction: A daily diary study in newlywed couples. *Archives of Sexual Behaviour 45*(1), 109-120.

Gallace, A., & Spence, C. (2010). The science of interpersonal touch: An overview. *Neurosci Biobehav Rev, 34*(2), 246-259.

Gefen, D., Straub, D. W., & Boudreau, M.-C. (2000). Structural equation modeling and regression: Guidelines for research practice. *Communications of AIS, 4*(7), 2-76.

Gewirtz-Meydan, A., & Finzi-Dottan, R. (2018). Sexual Satisfaction Among Couples: The Role of Attachment Orientation and Sexual Motives. *J Sex Res, 55*(2), 178-190.

Gillmore, M. R., Leigh, B. C., Hoppe, M. J., & Morrison, D. M. (2010). Comparison of daily and retrospective reports of vaginal sex in heterosexual men and women. *Journal of Sexual Research, 47*(4), 279-284.

Gray, J. A. (1987). *The psychology of fear and stress*. Cambridge: Cambridge University Press.

Gulledge, A. K., Gulledge, M. H., & Stahmannn, R. F. (2003). Romantic physical affection types and relationship satisfaction. *The American Journal of Family Therapy, 31*(4), 233-242.

Gulledge, A. K., Hill, M., Lister, Z., & Sallion, C. (2007). Non-erotic physical affection: It's good for you *Low-cost approaches to promote physical and mental health* (pp. 371-384): Springer.

Gunthert, K. C., & Wenze, S. J. (2012). Daily diary methods *Handbook of research methods for studying daily life* (pp. 144-159): Guildford Press.

Heiman, J. R., et al. (2011). Sexual satisfaction and relationship happiness in midlife and older couples in five countries. *Archives of Sexual Behaviour, 40*(4), 741-753.

Hoppe, M. J., et al. (2008). Agreement of daily diary and retrospective measures of condom use. *AIDS Behav, 12*(1), 113-117.

Impett, E. A., Gordon, A., M., & Strachman, A. (2008). Attachment and daily sexual goals: A study of dating couples. *Personal Relationships, 15*, 375-390.

Impett, E. A., et al. (2010). Moving toward more perfect unions: daily and long-term consequences of approach and avoidance goals in romantic relationships. *Journal of Personality and Social Psychology, 99*(6), 948-963.

Impett, E. A., Javam, L., Le, B. M., Asyabi-Eshghi, B., & Kogan, A. (2013). The joys of genuine giving: Approach and avoidance sacrifice motivation and authenticity. *Personal Relationships, 20*(4), 740-754.

Impett, E. A., Peplau, L. A., & Gable, S. L. (2005). Approach and avoidance sexual motives: Implications for personal and interpersonal well-being. *Personal Relationships, 12*, 465-482.

Impett, E. A., Strachman, A., Finkel, E. J., & Gable, S. L. (2008). Maintaining sexual desire in intimate relationships: The importance of approach goals. *Journal of Personality and Social Psychology, 94*(5), 808-823.

Impett, E. A., & Tolman, D. L. (2006). Late adolescent girls' sexual experiences and sexual satisfaction. *Journal of Adolescent Research, 21*(6), 628-646.

Ingledew, D. K., & Ferguson, E. (2007). Personality and riskier sexual behaviour: Motivational mediators. *Psychology & Health, 22*(3), 291-315.

Kline, R. B. (2012). Assumptions in structural equation modeling. In R. H. Hoyle (Ed.), *Handbook of structural equation modeling* (pp. 111-126): Guilford Press.

Laumann, E. O., Gagnon, J. H., Michael, R. T., & Michaels, S. (1995). *National health and social life survey*. Retrieved from Chicago, IL:

Laurenceau, J.-P., Barrett, L. F., & Rovine, M. J. (2005). The interpersonal process model of intimacy in marriage: A daily-diary and multilevel modeling approach. *Journal of Family Psychology, 19*(2), 314-323.

Laurenceau, J.-P., Feldman Barett, L., & Pietromonaco, P. R. (1998). Intimacy as an interpersonal process: The importance of self-disclosure, partner disclosure, and perceived partner responsiveness in interpersonal exchanges. *Journal of Personality and Social Psychology, 74*(5), 1238-1251.

Ledermann, T., Macho, S., & Kenny, D. A. (2011). Assessing mediation in dyadic data using the actor-partner interdependence model. *Structural Equation Modeling: A Multidisciplinary Journal, 18*(4), 595-612.

Lykins, A. D., Janssen, E., Newhouse, S., Heiman, J. R., & Rafaeli, E. (2012). The effects of similarity in sexual excitation, inhibition, and mood on sexual arousal problems and sexual satisfaction in newlywed couples. *Journal of Sexual Medicine, 9*(5), 1360-1366.

Mackey, R. A., Diemer, M. A., & O'Brien, B. A. (2000). Psychological intimacy in the lasting relationships of heterosexual and same-gender couples. *Sex Roles, 43*(3/4), 201-227.

McAuliffe, T. L., DiFranceisco, W., & Reed, B. R. (2007). Effects of question format and collection mode on the accuracy of retrospective surveys of health risk behaviour: a comparison with daily sexual activity diaries. *Health Psychology, 26*(1), 60-67.

McCallum, B., & Peterson, Z. D. (2012). Investigating the impact of inquiry mode on self-reported sexual behaviour: theoretical considerations and review of the literature. *Journal of Sexual Research, 49*(2-3), 212-226.

McCarthy, B. W., & Thestrup, M. (2008). Integrating sex therapy interventions with couple therapy. *Journal of Contemporary Psychotherapy, 38*(3), 139-149.

McNulty, J. K., Wenner, C. A., & Fisher, T. D. (2016). Longitudinal associations among relationship satisfaction, sexual satisfaction, and frequency of sex in early marriage. *Archives of Sexual Behaviour, 45*(1), 85-97.

Meston, C. M., & Buss, D. M. (2007). Why humans have sex. *Archives of Sexual Behaviour 36*(4), 477-507.

Moore, E. A., Kulibert, D., & Thompson, A. E. (2017). Is a kiss just a kiss?: Predicting variations in motives for romantic kissing. *Journal of Relationships Research, 8*.

Muise, A. (2011). *Gettin'it on vs. givin'it up: The association between sexual goals, interdependence and sexual desire in long-term relationships.* (PhD), University of Guelph.

Muise, A., Giang, E., & Impett, E. A. (2014). Post sex affectionate exchanges promote sexual and relationship satisfaction. *Archives of Sexual Behaviour, 43*(7), 1391-1402.

Muise, A., Impett, E. A., & Desmarais, S. (2012). Getting in on versus getting it over with: Sexual motivation, desire and satisfaction in intimate bonds. *Personality and Social Psychology Bulletin, 39*(10), 1320-1332.

Muise, A., Impett, E. A., Kogan, A., & Desmarais, S. (2013). Keeping the spark alive: Being motivated to meet a partner's sexual needs sustains sexual desire in long-term romantic relationships. *Social Psychological and Personality Science, 4*(3), 267-273.

Muthén, L. K., & Muthén, B. O. (2015). *Mplus user's guide. Seventh edition*: Muthén & Muthén.

Patrick, M. E., Maggs, J. L., Cooper, M. L., & Lee, C. M. (2011). Measurement of motivations for and against sexual behaviour. *Assessment, 18*(4), 502-516.

Preacher, K. J. (2011). Multilevel SEM strategies for evaluating mediation in three-level data. *Multivariate Behav Res, 46*(4), 691-731.

Preacher, K. J. (2015). Advances in mediation analysis: a survey and synthesis of new developments. *Annual Review of Psychology, 66*, 825-852.

Preacher, K. J., Zhang, Z., & Zyphur, M. J. (2011). Alternative methods for assessing mediation in multilevel data: The advantages of multilevel SEM. *Structural Equation Modeling: A Multidisciplinary Journal, 18*(2), 161-182.

Raykov, T. (2012). Scale construction and development using strucdtural equation modeling. In R. H. Hoyle (Ed.), *Handbook of structural equation modeling* (pp. 472-492): Guilford Press.

Reis, H. T., Clark, M. S., & Holmes, J. G. (2004). Perceived partner responsiveness as an organizing construct in the study of intimacy and closeness. In D. J. Mashek & A. Aron (Eds.), *Handbook of closeness and intimacy* (pp. 201-225): Psychology Press.

Reis, H. T., & Gable, S. L. (2015). Responsiveness. *Current Opinion in Psychology, 1*, 67-71.

Reis, H. T., & Shaver, P. (1988). Intimacy as an interpersonal process. In S. Duck, D. F. Hay, S. E. Hobfoll, W. Ickes, & B. M. Montgomery (Eds.), *Handbook of personal relationships: Theory, research and interventions* (pp. 367-389). Oxford, England: John Wiley & Sons.

Rosen, N. O., et al. (2014). Impact of male partner responses on sexual function in women with vulvodynia and their partners: A dyadic daily experience study. *Health Psychology, 33*(8), 823-831.

Rosen, N. O., Muise, A., Bergeron, S., Delisle, I., & Baxter, M.-L. (2015). Daily associations between partner responses and sexual and relationship satisfaction in couples coping with provoked vestibulodynia. *Journal of Sexual Medicine, 12*(4), 1028-1039.

Rubin, H., & Campbell, L. (2011). Day-to-day changes in intimacy predict heightened relationship passion, sexual occurrence, and sexual satisfaction: A dyadic diary analysis. *Social Psychological and Personality Science, 3*(2), 224-231.

Rubin, H., & Campbell, L. (2012). Day-to-day changes in intimacy predict heightened relationship passion, sexual occurrence, and sexual satisfaction. *Social Psychological and Personality Science, 3*(2), 224-231.

Sanchez-Fuentes, M. d. M., Santos-Iglesias, P., & Sierra, J. C. (2014). A systematic review of sexual satisfaction. *International Journal of Clinical and Health Psychology, 14*, 67-75.

Scott, C., F., & Sprecher, S. (2000). Sexuality in marriage, dating and other relationships: A decade review. *Journal of Marriage and Family, 62*, 999-1017.

Sprecher, S. (2002). Sexual satisfaction in premarital relationships: Associations with satisfaction, love, commitment, and stability. *Journal of Sex Resarch, 39*(3), 190-196.

Stephenson, K. R., Ahrold, T. K., & Meston, C. M. (2011). The association between sexual motives and sexual satisfaction: Gender differences and categorical comparisons. *Archives of Sexual Behaviour, 40*(3), 607-618.

Štulhofer, A., Ferreira, L. C., & Landripet, I. (2013). Emotional intimacy, sexual desire, and sexual satisfaction among partnered heterosexual men. *Sexual and Relationship Therapy, 29*(2), 229-244.

Vannier, S. A., Rosen, N. O., Mackinnon, S. P., & Bergeron, S. (2016). Maintaining affection despite pain: Daily associations between physical affection and sexual and relationship wellbeing in women with genito-pelvic pain. *Archives of Sexual Behaviour*.

Vervoort, T., Trost, Z., Prkachin, K. M., & Mueller, S. C. (2013). Attentional processing of other's facial display of pain: An eye tracking study. *Pain, 154*(6), 836-844.

West, S. G., Taylor, A. B., & Wu, W. (2012). Model fit and model selection in structural equation modeling. In R. H. Hoyle (Ed.), *Handbook of structural equation modeling* (pp. 209-231): Guilford Press.

Witherow, M. P., Chandraiah, S., Seals, S. R., & Bugan, A. (2016). Relational intimacy and sexual frequency: A correlation or a cause? A clinical study of heterosexual married women. *Journal of Sex & Marital Therapy, 42*(3), 277-286.

Xu, J., & Long, J. S. (2005). *Using the delta method to construct confidence intervals for predicted probabilities, rates, and discrete changes*.

Article 2: Sexual Difficulties, Sexual Behaviour and Sexual Satisfaction

Jodouin, J. F., Bergeron, S., & Janssen, E. (2018). The Mediating Role of Sexual Behaviour in Event-Level Associations Between Sexual Difficulties and Sexual Satisfaction in Newlywed Mixed-Sex Couples. J Sex Med, 15(10), 1384-1392, https://doi.org/10.1016/j.jsxm.2018.08.010

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RUNNING HEAD: Sexual Difficulties, Sexual Behavior and Sexual Satisfaction

TITLE: The Mediating Role of Sexual Behavior in Event-Level Associations Between Sexual Difficulties and Sexual Satisfaction in Newlywed Mixed-Sex Couples

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Abstract

Background: Many sexual difficulties encountered by couples in their day-to-day lives, although of insufficient intensity and persistence to warrant a clinical diagnosis of sexual disorder, are nevertheless frequent and a source of individual and relational distress.

Aim: The aim of this study was to assess the event-level associations between couples' everyday, subclinical sexual difficulties (specifically, low subjective sexual arousal, low physiological sexual arousal, and genito-pelvic pain), the range of sexual behaviors that these couples engage in, and their sexual satisfaction.

Methods: Seventy newlywed participants (35 couples, M_{age}=25.6 years, SD=3.2 years; average duration of relationship=5.4 years, SD=3.4 years) individually completed daily diaries about sexual difficulties, range of activities performed during sex, and sexual satisfaction over the course of five weeks. Analyses were guided by the Actor-Partner Interdependence Model.

Outcomes: The main outcome was sexual satisfaction, measured at the event-level on a 5-point Likert scale using a single-item question.

Results: On days of sexual activity, men and women's difficulties with subjective sexual arousal were associated with lower sexual satisfaction in both partners (*actor* and *partner* effects). This association was mediated by the range of couples' sexual behaviors, such that lower subjective arousal was associated with a more restricted range of sexual

activities, which in turn was associated with lower sexual satisfaction. Men and women's difficulties with physiological sexual arousal, and women's genito-pelvic pain, were each associated with their own lower sexual satisfaction. No partner effects were observed for these sexual difficulties, nor were they mediated by the range of couples' sexual activities.

Clinical Implications: The study's results highlight how couples' sexual difficulties can interfere with same-day sexual satisfaction, and how for subjective sexual arousal, this interference is reflected by a more restricted range of sexual behaviors.

Strengths & Limitations: Strengths of the study include the daily diary methodology, which allowed a focus on event-level sexual activities with minimal retrospective bias. Further, the dyadic analyses allowed both intra- and inter-individual effects to be assessed. Limitations include the lack of a more general measure of sexual desire and of a more diverse sample, in terms of age, race, and sexual orientation.

Conclusion: These findings underscore the importance of treatments that include both partners, and that target the types as well as range of sexual activities couples engage in.

Keywords: Sexual difficulties, subjective sexual arousal, physiological sexual arousal, sexual pain, sexual satisfaction, sexual behavior, dyadic diary study.

The Mediating Role of Sexual Behavior in Event-Level Associations Between Sexual Difficulties and Sexual Satisfaction in Mixed-Sex Newlywed Couples

Sexual difficulties are a source of distress in the daily lives of many couples. Sexual difficulties are prevalent in the general population, with estimates ranging from 31% to 50% for men and 43% to 77% for women (Frank, Anderson, & Rubinstein, 1978; Laumann, Paik, & Rosen, 1999). Of these sexual difficulties, many are subclinical, in that the intensity, persistence, and duration of the symptoms are insufficient to be diagnosed as a sexual disorder. Despite their lower intensity, subclinical sexual difficulties nevertheless may cause significant distress in couples. Studies have reported associations between problematic sexual functioning and poor personal and relational outcomes (Atlantis & Sullivan, 2012; Davison & McCabe, 2005; McCabe et al., 2010), including sexual and relationship dissatisfaction (Sanchez-Fuentes, Santos-Iglesias, & Sierra, 2014; Trudel & Goldfarb, 2010). Given their widespread occurrence, it is surprising that everyday, subclinical sexual difficulties have not received more attention in the scientific literature. Of the existing studies, most have used retrospective measures, spanning one or many months, which are subject to memory bias and fail to address daily or event-level phenomena. Finally, most studies have neglected the interpersonal or dyadic nature of sexual difficulties and, instead, focused on within-subject or intra-individual effects.

The current study sought to fill these gaps by examining event-level associations among sexual difficulties, the range of sexual behaviors, and sexual satisfaction in dyadic daily reports as provided by a nonclinical sample of couples. Although these objectives

are potentially relevant to other populations, the focus of the present study was on the experience of low subjective sexual arousal, low genital or physiological sexual arousal and genito-pelvic pain in newlywed, mixed-sex couples.

Sexual difficulties and sexual satisfaction

A recent consensus report indicated that individuals presenting clinical levels of sexual dysfunction score lower than the general population on many physiological and relational factors, including sexual satisfaction (L. Brotto et al., 2016). Although the authors caution that the presence of a sexual dysfunction does not necessarily imply sexual dissatisfaction, this association does appear to be statistically robust (Sanchez-Fuentes et al., 2014). Clinical levels of sexual dysfunction have also been shown to have interpersonal effects. For instance, women's experiences of genito-pelvic pain (Bergeron, Corsini-Munt, Aerts, Rancourt, & Rosen, 2015; Farmer & Meston, 2007; K. B. Smith & Pukall, 2014) and men's reports of erectile difficulties (Fisher, Rosen, Eardley, Sand, & Goldstein, 2005) are both associated with their partners' lower sexual satisfaction.

Studies of subclinical sexual difficulties suggest that they too are negatively associated with sexual satisfaction in both the individuals reporting the difficulty and their partners. For example, general population surveys reported that lower levels of satisfaction with sexual function correlated with lower reported sexual happiness (Laumann et al., 2006). However, these findings stem from single-occasion measures, and event-level associations between subclinical sexual difficulties and sexual satisfaction have not yet received empirical attention. This is an important gap, given that key variables such as sexual distress and sexual satisfaction vary significantly on a

daily basis (Derogatis et al., 2011; Impett, Strachman, Finkel, & Gable, 2008; Rosen, Muise, Bergeron, Delisle, & Baxter, 2015).

Sexual difficulties, sexual behavior and sexual satisfaction

A question of both conceptual and clinical relevance concerns the mechanisms by which sexual difficulties are associated with lower sexual satisfaction. Studies show that both sexual difficulties and sexual satisfaction are associated with the couple's behavior during sexual activity (Sanchez-Fuentes et al., 2014). Frequency and duration of sex, duration of foreplay (Heiman et al., 2011), duration of post-sex affectionate exchanges (Muise, Giang, & Impett, 2014), and of particular interest to this study, the range of sexual behaviors (Gillespie, 2016), have all been shown to correlate with greater sexual satisfaction. Conversely, cross-sectional studies have linked sexual difficulties with lower frequency of sex and lower sexual satisfaction (A. M. Smith et al., 2012). Further, restrictions in the range of sexual behaviors have been reported for both men and women experiencing difficulties in sexual arousal and orgasm (Gallinsky, 2012) and for women with genito-pelvic pain (Cherner & Reissing, 2013). Hence, one plausible hypothesis is that a couple's sexual difficulties may lead to restrictions in their range of behaviors during sexual activity, which in turn may result in lower sexual satisfaction. Support for this hypothesis to date has been indirect, and dyadic, event-level associations have not yet been investigated.

Study Goals and Hypotheses

The present study examined event-level associations between subclinical sexual difficulties, the range of behaviors during sexual activity, and sexual satisfaction in

newlywed couples. It was hypothesized that on days where the couple had had sexual activities, 1) reports of sexual difficulties would be associated with lower sexual satisfaction for both the respondents and their partners on the same day, and that 2) these associations would be mediated by restrictions in the range of the couple's sexual behaviors. Gender effects were also examined, but no a priori hypotheses were formulated, given that these effects have not yet been studied in the associations between sexual difficulties, sexual satisfaction and sexual behavior. Finally, the hypotheses in this study were post-hoc.

Methods

Participants

Working from the marriage registry of Monroe County, Indiana (US), approximately 300 newlywed mixed-sex couples were sent a letter explaining the goals and nature of the study and were invited to contact the researchers if they were interested in participating. Interested individuals were screened for eligibility during a telephone interview. To be eligible, couples were required to be English-speaking, aged between 18 and 40 years old, childless, and intending to remain in the country for the duration of the study. These criteria allowed the study to focus on a homogeneous group of couples with subclinical sexual difficulties not associated with the transition to parenthood, perimenopause, or health issues (Avis et al., 2017; M. Dewitte & Mayer, 2018).

The first 35 couples (70 participants) who proved eligible to participate took part in the study. Participants were compensated up to $45 for their contribution to the study ($1 per daily entry, with an additional $10 for having completed all diary days).

Procedure

The data for this study were drawn from a larger project on predictors of sexual and relationship satisfaction, which included questionnaires, daily diaries, and couple observations (Gadassi et al., 2016), which ran 9 months, from October 2006 to June 2007. Participants began by attending a training session during which the study was explained, the study's questions were read and explained, and informed consent obtained. Participants then completed a baseline questionnaire regarding their personal and relationship history, as well as their psychological and physiological state. The questions relating to socio-demographics and to sexual difficulties were used in the present analysis; for a more complete description of this study, see (Gadassi et al., 2016). Participants then completed a standardized, electronic daily diary for 35 consecutive days using TREO smartphones. On days where the participants had had sex, the diary included questions about their sexual satisfaction, about any sexual difficulties, and about their behaviors during sex. Finally, participants were debriefed in a final face-to-face session once the diary period was completed.

Measures

Sex today. Participants reported the days on which they had engaged in sexual activity through a single-item, yes/no question ("*Did you engage in sexual activity with your spouse in the last 24 hours?"*).

Sexual difficulties. On days where the participants reported having had sex, three single-item questions were asked, all on a 5-point Likert scale (1-"Not at all" to 5-"Extremely"), and worded to be gender-neutral: *subjective arousal* "Did you have difficulty becoming or staying sexually aroused mentally?"; *physiological arousal*: "Did you have difficulty becoming or staying sexually aroused physically?"; *genito-pelvic pain*: "Did you experience any pain or physical discomfort during sexual activity?"

Sexual behavior. Participants independently reported the couple's behavior during each sexual activity using a checklist ("What sort of sexual activity did you engage in?"), allowing one to eight answers among a list of sexual behaviors: "non-genital touch"; "genital touch"; "vaginal intercourse"; "anal intercourse"; "oral sex (me on my partner)"; "oral sex (my partner on me)"; "kissing". This list was a simplification of behavioral repertoires studied elsewhere (Browning, Hatfield, Kessler, & Levine, 2000), chosen for their higher frequency of occurrence. All behaviors were summed into a composite score, describing the range of their sexual behavior during sexual activity: The higher the score, the greater the range of behaviors reported by the participant. A paired t-test confirmed that there was no significant difference between the two partners' reported range of sexual behaviors ($t(499)=.000$, $p=1.00>.05$).

Sexual satisfaction. On sex days, participants' satisfaction associated with their sexual activity was assessed using a single diary question ("How sexually satisfying was this activity for you?", rated on a 5-point Likert scale (1, "not at all", to 5 "extremely"). This measure has been used in other daily diary studies (Muise, Impett, & Desmarais, 2012).

Data Analytic Approach

Data manipulation and descriptive analyses were executed on SPSS (v.21.0). Direct and indirect effects between variables were assessed using Hierarchical Structural Equation Modeling (HSEM) in Mplus 7 using maximum likelihood with robust standard errors, chosen for their greater robustness to non-normal data (Kline, 2012; Luinkda K. Muthén & Muthén, 2015). All other parameters in the simulation were set to Mplus defaults (Luinkda K. Muthén & Muthén, 2015). As recommended by Gefen, Straub, & Boudreau (2000) and Gefen et al. (2000), models in this study were validated using model fit indices (cutoff values: RMSEA<0.08, SMSEA<0.08, CFI/TLI>0.9) and p-values for individual estimates ($p<0.05$ for all associations reported). Furthermore, models were required to be non-saturated. Following recommendations for SEMs by Cribbie (2017), no adjustments were made to the study's results to correct for familywise error. Finally, power analyses were performed using Monte Carlo simulation in MPlus, based on acceptability criteria recommended by Linda K. Muthén & Muthén (2002). Note that Zhang & Willson (2006) report that multilevel SEMs showed an asymptotic growth in efficiency when first-level unit size reached about 35.

Analyses were based on the Actor Partner Interdependence Mediation Model (APIMeM) [26], an extension of the Actor Partner Interdependence Model (Cook & Kenny, 2005). All models included independent and dependent variables for both the participants and their partners: their daily sexual difficulties with arousal, desire and genito-pelvic pain, and their sexual satisfaction on the same day. The range of sexual behaviors, as reported by the participant, was used as a potential mediating variable.

Analyses were performed using only the reports from days on which the couple had had sexual activity. In the analyses, we tested the associations between women's own sexual difficulties and their sexual satisfaction (actor effects), and between women's sexual difficulties and their male partners' sexual satisfaction (partner effects). Similarly, we tested the associations between men's own sexual difficulties and their sexual satisfaction, and between men's sexual difficulties and their female partners' sexual satisfaction. The analysis was performed using a two-level cross model, where persons were nested within days, and where same-day reports from both partners were crossed. All variables were person-mean centered, so that their values reflected daily deviations from each respondent's mean values. Hence, this model assessed whether daily deviations from each respondent's average sexual difficulty was associated with changes in sexual satisfaction, in both themselves and their partners. Finally, entries where critical data was missing were removed using listwise deletion (10 entries).

Results

Sample Characteristics

The 70 participants (35 couples) individually completed a total of 2120 diary entries. This corresponds to an average of 30.7 diary entries per participant (89.9% of the participants completed 30 or more entries, and all completed 28 or more entries). Of these, 645 (324 for men, 321 for women) entries were made on days during which sexual activity had taken place. This corresponds to an average per participant of 9.3 sexual activity days (SD=5.5). Entries between partners were matched 91% of the time;

the remaining entries were either missing for one partner (7%), or partners disagreed on whether sex had occurred (1.9%).

Participants were on average 25.6 years old (SD: 3.2 years); 97.1% were White/Non Hispanic, 1.5% were Hispanic, and 1.5% (1 participant) reported to be of "other ethnicity". Average duration of their relationship with their spouse at the time of the study was 5.4 years (SD: 3.4 years). These sociodemographic characteristics were not significantly correlated with the dependent variable, daily sexual satisfaction. Descriptive statistics for the variables used in this study are reported in Table 1. In particular, participants reported responses from 4 "happy" to 7 "perfect" on a 7-point Likert scale 71.7% of the time when asked about their overall sexual satisfaction.

Averaging values across diary entries on sex days showed that women reported sexual difficulties in the range of 2 ("a little") to 5 ("extremely") in at least one area 67% of the time, and men, 32% of the time. In this sample, difficulties with subjective arousal were the most frequently reported sexual difficulty. Difficulties with subjective and physiological sexual arousal were twice as frequent for women than for men, and genito-pelvic pain, three times as frequent. The majority of these sexual difficulties were of low- to mid-level intensity (see Table 2). In this sample, participant's sexual frequency was not significantly associated with the average level of sexual difficulty they reported (difficult subjective arousal, $p=.661>0.05$; with physical arousal, $p=.773>0.05$; sexual pain, $p=.355>0.05$).

Table 1. Descriptive statistics for key variables

	Mean	Std. Deviation	Skewness	Kurtosis
Difficulty with subjective arousal	1.29	0.701	2.883	8.831
Difficulty with physiological arousal	1.28	0.688	2.869	8.27
Genito-pelvic pain	1.18	0.453	3.047	12.758
Sexual behavior	3.97	1.051	-0.912	0.123
Sexual satisfaction	3.74	1.261	-0.159	-0.277

Table 2. Sexual difficulties reported in the participants' daily diaries

Sexual difficulty	% reported	
	Men	Women
Low mental/subjective sexual arousal	12.2	27.6
Low physical sexual arousal	11.3	24.2
Genito-pelvic Pain	8.4	23

Note. A sexual difficulty was considered to be reported when the entry was between 2 ("a little") and 4 ("extremely") on a 5-point Likert scale.

Model fit

Direct (actor, partner) and indirect (mediation) effects were assessed using APIMeM (see Figure 1). This model converged without error and with an acceptable model fit (RMSEA: .000< .08; SRMR (Within): 0.030<0.08; TLI=1.050>1.000).

Associations between sexual difficulties and sexual satisfaction

Greater difficulties with subjective sexual arousal were significantly associated with lower levels of sexual satisfaction for both men (β= –.415; 95% CI=[–.557, -.272]; p<0.01) and women (β= –.257; 95% CI=[-.355, -.160]; p<0.01). Greater difficulties with

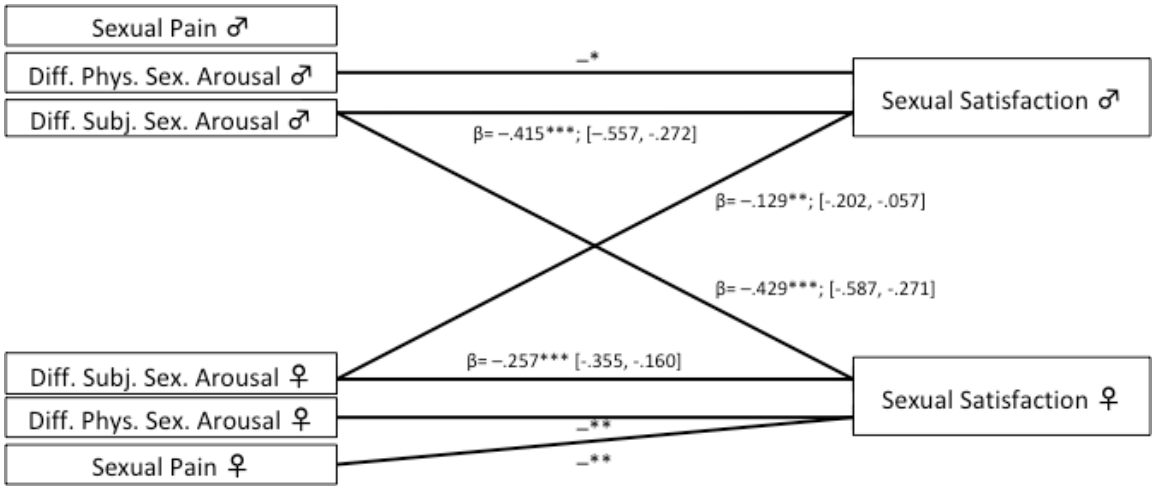
physiological sexual arousal were significantly associated with lower levels of sexual satisfaction for both men (β= –.201; 95% CI=[–.337, -066]; p<0.05) and women (β= –.194; 95% CI=[-.276, -.113]; p<0.01). Greater genito-pelvic pain was significantly associated with lower levels of sexual satisfaction for women (β= –.306; 95% CI=[–.446, -.165]; p<0.01) but not men (p>0.05).

Men's difficulties with subjective sexual arousal were significantly associated with their partner's lower levels of sexual satisfaction (β= –.429; 95%= [-.587, -.271]; p<0.01). Similarly, women's difficulties with subjective sexual arousal were significantly associated with their partner's lower levels of sexual satisfaction (β= –.129; 95% CI=[-.202, -.057]; p.<0.01). Partner effects were not significant for difficulties with physiological arousal or genito-pelvic pain for either sex.

Mediating role of range of sexual behaviors

A broader range of sexual behaviors during the couple's sexual activity was significantly associated with greater sexual satisfaction for both men (β= .289; 95% CI=[.209, .369]; p<0.01) and women (β= .388; 95% CI=[.248, .528]; p<0.01). Greater difficulties with subjective sexual arousal were significantly associated with a more restricted range of sexual behaviors for both men (β= –.157; 95% CI=[–.232, -.081]; p<.0.01) and women (β= –.074; 95% CI=[-.125, -.024]; p.<0.05). Difficulties with physiological sexual arousal and genito-pelvic pain were not significantly associated with the range of sexual behaviors for either sex (see Figure 1).

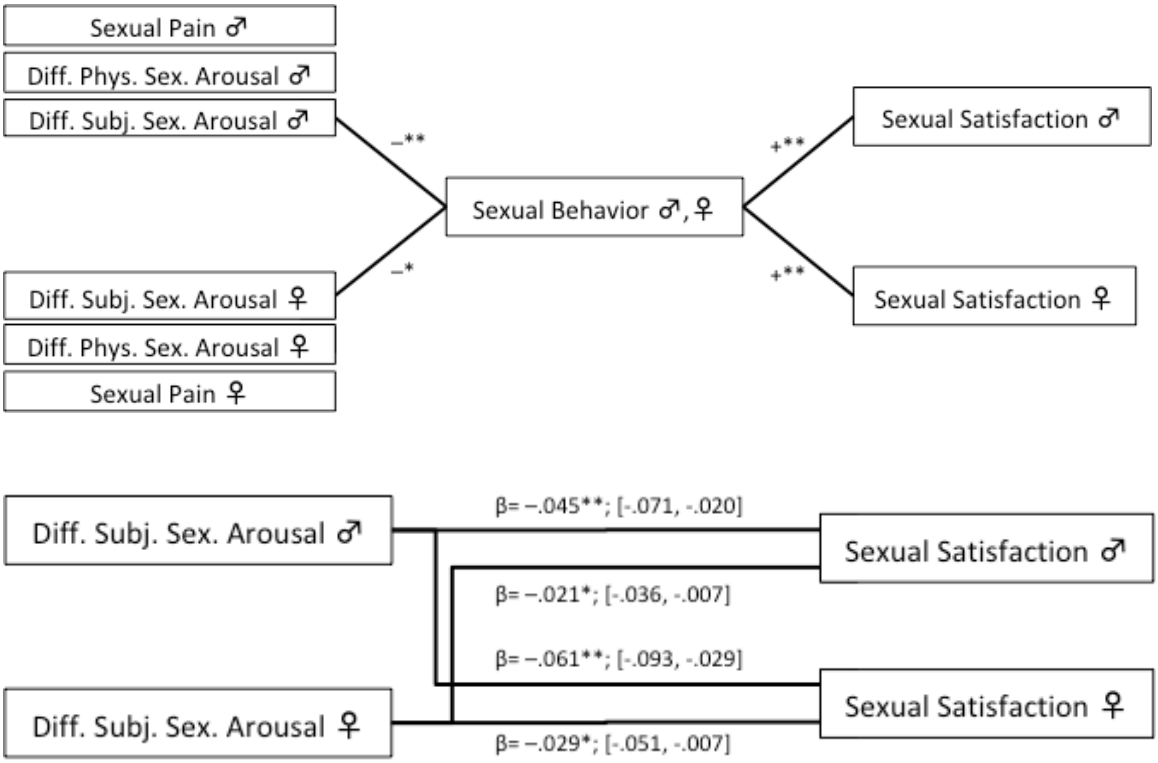
Figure 4. Sexual difficulties and sexual satisfaction: Main (actor and partner) effects



*Main (actor and partner) effects between sexual difficulties (subjective sexual arousal, physiological sexual arousal, sexual pain) and sexual satisfaction for men (♂) and women (♀). Direction of parameter estimates are represented by sign(+/–), and significance as stars (*p<.05; **p<.01; ***p<0.001). Parameter values are represented for associations with subjective sexual arousal. Confidence intervals (95% CI) noted in square brackets. Covariance relations are not represented for clarity.*

A reduced range of the couple's sexual behaviors was found to mediate the (actor) association between greater difficulties with subjective sexual arousal and lower sexual satisfaction for both men (a*b = –.045; 95% CI=[-.071, -.020]; p<0.05) and women (a*b = –.029; 95% CI=[0.051, -.007]; p<0.05). Similarly, reductions in the range of sexual behaviors mediated the (partner) association between men's greater difficulties with subjective arousal and their partner's lower sexual satisfaction (a*b = –.061; 95% CI=[0.093, -.029]; p<0.05), and women's greater difficulties with subjective arousal and their partner's lower sexual satisfaction (a*b = –.021; 95% CI=[-.036, -.007]; p<0.05). Interactions between these indirect effects were tested and found to be non-significant (p>0.05) (see Figure 2).

Figure 5. Sexual difficulties and sexual satisfaction: Indirect (mediation) effects



*Top: Significant associations between sexual difficulties and the couple's sexual behavior, and between sexual behavior and sexual satisfaction. Bottom: Significant indirect effects (mediation) between difficulties in subjective sexual arousal and sexual satisfaction for men (♂) and women (♀), via the couples' sexual behavior. Direction of parameter estimates are represented by signs (+/−) and significance as stars (*p<.05; **p<.01; ***p<0.01). Confidence intervals (95% CI) noted in square brackets.*

Discussion

This study assessed event-level associations between couples' everyday, subclinical sexual difficulties – specifically, low subjective sexual arousal, low physiological sexual arousal and genito-pelvic pain – the couples' range of sexual behaviors, and their sexual satisfaction. Despite the relatively high overall levels of sexual satisfaction in this sample, which may result from the fact that it was composed of young newlyweds, sexual difficulties were frequently reported. These frequencies were consistent with those observed elsewhere, as

were the gender differences in the reports (Frank et al., 1978; Laumann et al., 1999). These sexual difficulties were subclinical in that they would not be diagnosed as a sexual disorder in any of the participants, based on the DSM-5's criteria for persistence (75%-100% of the time) and intensity ("marked") of symptoms (American Psychiatric Association, 2013). In this sample, sexual frequency was not significantly associated with the average level of sexual difficulty. On days of sexual activity, men and women's difficulties with subjective sexual arousal were associated with their own lower sexual satisfaction, and with that of their partners' (*actor* and *partner* effects). These associations were mediated by the range of the couple's sexual behaviors, such that lower subjective arousal was associated with a more restricted range of sexual behaviors, which in turn was associated with lower sexual satisfaction. Men and women's physiological arousal difficulties, and women's genito-pelvic pain, were each associated with their own lower sexual satisfaction. No partner effects were observed for these sexual difficulties, and they were not mediated by range of sexual behaviors.

The associations observed in the present study between participants' sexual difficulties and their own lower sexual satisfaction are consistent with reported associations between clinical levels of sexual dysfunction and decreased sexual satisfaction (Bergeron, Likes, & Steben, 2014; L. Brotto et al., 2016; Sanchez-Fuentes et al., 2014). The fact that sexual frequency was not significantly associated with the average level of sexual difficulty suggests that, although participants' sexual difficulties affected their sexual satisfaction, they did not lead to avoiding sex altogether.

Results suggest that in the population under study, sexual difficulties are a proximal precursor of lower sexual satisfaction, and that this effect is observable even for lower levels

of symptom intensity and at the level of individual sexual activity. Sexual difficulties are salient, negative experiences during sexual interactions with a partner, and this may detract from the ability to attend to more positive physical and emotional cues, resulting in lower sexual satisfaction. The absence of a significant association in this sample between men's reports of genito-pelvic pain and lower sexual satisfaction, contrary to expectations, may be due to their lower incidence and intensity, leading to a "floor effect" in the results.

The significant, positive associations found between respondents' own sexual difficulties and their partner's lower sexual satisfaction are consistent with expectations. It is possible that lower subjective arousal in one partner may lead the other to feel less desirable, thus contributing to his/her lower sexual satisfaction. The lower arousal partner may also be less involved emotionally and be less engaged in the sexual interaction, which may negatively affect the other partner's sexual satisfaction. This interpretation is consistent with the clinical literature that cites difficulties with subjective arousal as central to couples' sexuality (Hall, 2010; McCarthy & Wald, 2012), and with recent empirical studies that suggest that the relational context – including the partner's mood and behavior – affects men and women's sexual experience and ultimately, their sexual satisfaction (L. A. Brotto et al., 2016; Marieke Dewitte, 2014; Marieke Dewitte, Van Lankveld, Vandenberghe, & Loeys, 2015; Dunn, Croft, & Hackett, 2000). The observation that associations between other sexual difficulties (physiological sexual arousal, genito-pelvic pain) and the partner's sexual satisfaction were not significant is also consistent with this interpretation. Low subjective sexual arousal (and more generally, sexual desire) is highly comorbid with other sexual difficulties (Meana, 2010; Meana & Steiner, 2014), and thus may dominate the associations with sexual satisfaction in the present results.

That the range of the couples' sexual behaviors mediated all the associations between difficulties with subjective arousal and lower sexual satisfaction is to our knowledge a novel result. The fact that – of the sexual difficulties studied here – low subjective sexual arousal had the only significant association with a more restricted range of sexual activities is consistent with the hypothesis that subjective arousal prompts and facilitates sexual behavior. Frameworks such as the Dual Control Model (Janssen & Bancroft, 2007) would posit that aversive cues such as sexual difficulties would have an inhibitory effect on sexual arousal during sexual activity. Arguably, this in turn would lead to a more restricted range of sexual behavior. In support of this hypothesis, a number of authors have reported associations between sexual desire more generally and the range of sexual behavior (Hall, 2010; McCarthy & Wald, 2012): This finding is also consistent with survey-based studies that link a greater range in sexual behaviors with higher sexual satisfaction (Fisher et al., 2015; Gillespie, 2016). Sexual behavior is shared between partners during sexual activity, which may explain why restrictions in sexual behaviors were associated with lower sexual satisfaction for both partners.

Furthermore, although individuals can and do engage in consensual sexual activity in the absence of sexual desire (Impett & Peplau, 2003; Vannier & O'Sullivan, 2010), the clinical literature suggests that individuals experiencing difficulties with subjective arousal or sexual desire tend to "just get on with it", and engage in less varied sexual behavior (Althof, 2016; Basson, 2016). Therefore, less varied sexual behavior may also have resulted in lower subjective sexual arousal in this sample. The empirical literature on the subject, though scarce, is consistent with this view. For example, in a daily diary study of young women, sexual interest was a significant predictor of a range of sexual behaviors, including oral sex, and

vaginal and anal penetrative sex (Fortenberry & Hensel, 2011). Relatedly, engaging in sexual activity for motives of pleasure was associated with a greater range of behaviors (Browning et al., 2000).

One of this study's limitations was that it focused on subjective sexual arousal but did not include a more general measure of sexual desire, as experienced during sexual activity. As many authors have observed (Levine, 2003; Sarin, Amsel, & Binik, 2013), definitions of sexual desire vary from one study to another, and may refer to different constructs altogether. Using a more multi-factorial measure may have been more reflective of participants' felt experience of low sexual interest. Further, the single-item measure of sexual satisfaction used here focused on participants' sexual satisfaction in relation to their sexual activity on that day, rather than the participants' sexual satisfaction in the relationship – the latter being a more common measure (Byers, 1999). More generally, single-item measures, although often preferred in daily diary studies to keep completion times short, may oversimplify complex constructs such as sexual satisfaction, and their reliability and validity are difficult to demonstrate (Bergkvist & Rossiter, 2007). Finally, the study focused on a relatively small sample of mixed-sex, newly married couples and had not pre-registered its hypotheses; this may limit the generalizability of its results. Future research in this area should seek to replicate this study's results with more representative samples of participants.

Conclusions

Studies of dyadic, event-level sexual phenomena are rare, which is an important gap when one considers the fundamentally relational nature of sexuality. The present findings contribute to filling this gap by highlighting how for the couples under study,

sexual difficulties interfered with same-day sexual satisfaction and how, for subjective arousal, this interference was reflected in the couples' more restricted range of sexual behaviors.

Our results are limited in scope, and must be interpreted with care. Nevertheless, the partner effects observed here add to a growing body of dyadic daily diary studies that highlight the importance of daily partner interactions in couples' sexuality. Clinically, results support the relevance of sex and couple therapy interventions, namely in the treatment of sexual arousal/desire difficulties, and suggest that therapists would benefit from systematically considering the couple's dynamics. Furthermore, the finding showing that sexual behavior (in this case, the range of sexual behavior) plays a mediating role in sexual difficulties underscores the importance of including therapeutic strategies that target the types as well as the range of sexual activities that couples engage in when working sexual difficulties, specifically, sexual arousal/desire problems.

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References

Althof, S. E. (2016). Low sexual desire in men *Handbook of clinical sexuality for mental health professionals* (pp. 286-326). New York, USA: Routledge.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed ed.). Washington, DC: American Psychiatric Association.

Atlantis, E., & Sullivan, T. (2012). Bidirectional association between depression and sexual dysfunction: a systematic review and meta-analysis. *Journal of Sexual Medicine, 9*(6), 1497-1507.

Avis, N. E., Colvin, A., Karlamangla, A. S., Crawford, S., Hess, R., Waetjen, L. E., Brooks, M., Tepper, P. G., & Greendale, G. A. (2017). Change in sexual functioning over the menopausal transition: results from the Study of Women's Health Across the Nation. *Menopause, 24*(4), 379-390.

Basson, R. (2016). Clinical challenges of sexual desire in younger women. In S. B. Levine (Ed.), *Handbook of clinical sexuality for mental health professionals* (pp. 143-188). New York, USA: Routledge.

Bergeron, S., Corsini-Munt, S., Aerts, L., Rancourt, K., & Rosen, N. O. (2015). Female sexual pain disorders: A review of the literature on etiology and treatment. *Current Sexual Health Reports, 7*(3), 159-169.

Bergeron, S., Likes, W. M., & Steben, M. (2014). Psychosexual aspects of vulvovaginal pain. *Best Pract Res Clin Obstet Gynaecol, 28*(7), 991-999.

Bergkvist, L., & Rossiter, J. R. (2007). The predictive validity of multiple-item versus single-item measures of the same constructs. *Journal of Marketing Research, 44*(2), 175-184.

Brotto, L., Atallah, S., Johnson-Agbakwu, C., Rosenbaum, T., Abdo, C., Byers, E. S., Graham, C., Nobre, P., & Wylie, K. (2016). Psychological and interpersonal dimensions of sexual function and dysfunction. *Journal of Sexual Medicine, 13*(4), 538-571.

Brotto, L. A., Atallah, S., Johnson-Agbakwu, C., Rosenbaum, T., Abdo, C., Byers, S. E., Graham, C. A., Nobre, P., & Wylie, K. (2016). Psychological and interpersonal dimensions of sexual function and dysfunction. *Journal of Sexual Medicine, 13*, 538-571.

Browning, J. R., Hatfield, E., Kessler, D., & Levine, T. (2000). Sexual motives, gender and sexual behaviour. *Archives of Sexual Behaviour, 29*(2), 135-153.

Byers, E. S. (1999). The interpersonal exchange model of sexual satisfaction: Implications for sex therapy with couples. *Canadian Journal of Counselling, 33*(2), 95-111.

Cherner, R. A., & Reissing, E. D. (2013). A comparative study of sexual function, behaviour, and cognitions of women with lifelong vaginismus. *Archives of Sexual Behaviour, 42*(8), 1605-1614.

Cook, W. L., & Kenny, D. (2005). The actor-partner interdependence model: A model of bidirectional effects in developmental studies. *International Journal of Behavioural Development, 29*(2), 101-109.

Cribbie, R. A. (2017). Multiplicity control, school uniforms, and other perplexing debates. *Canadian Journal of Behavioural Science / Revue canadienne des sciences du comportement, 49*(3), 159-165.

Davison, T. E., & McCabe, M. P. (2005). Relationships between men's and women's body image and their psychological, social, and sexual functioning. *Sex Roles, 52*(7-8), 463-475.

Derogatis, L. R., Clayton, A. H., Goldstein, A., Lewis-D'Agostino, D., Wunderlich, G., & Cotton, D. (2011). eDiary and Female Sexual Distress Scale((c)) in evaluating

distress in hypoactive sexual desire disorder (HSDD). *Journal of Sexual Research, 48*(6), 565-572.

Dewitte, M. (2014). On the interpersonal dynamics of sexuality. *Journal of Sex & Marital Therapy, 40*(3), 209-232.

Dewitte, M., & Mayer, A. (2018). Exploring the Link Between Daily Relationship Quality, Sexual Desire, and Sexual Activity in Couples. *Arch Sex Behav, 47*(6), 1675-1686.

Dewitte, M., Van Lankveld, J., Vandenberghe, S., & Loeys, T. (2015). Sex in its daily relational context. *Journal of Sexual Medicine, 12*(12), 2436-2450.

Dunn, K. M., Croft, P. R., & Hackett, G. I. (2000). Satisfaction in the sex life of a general population sample. *Journal of Sex and Marital Therapy, 26*(2), 141-151.

Farmer, M. A., & Meston, C. M. (2007). Predictors of genital pain in young women. *Archives of Sexual Behaviour, 36*(6), 831-843.

Fisher, W. A., Donahue, K. L., Long, J. S., Heiman, J. R., Rosen, R. C., & Sand, M. S. (2015). Individual and partner correlates of sexual satisfaction and relationship happiness in midlife couples: dyadic analysis of the international survey of relationships. *Archives of Sexual Behaviour, 44*(6), 1609-1620.

Fisher, W. A., Rosen, R. C., Eardley, I., Sand, M., & Goldstein, I. (2005). Sexual experience of female partners of men with erectile dysfunction: the female experience of men's attitudes to life events and sexuality (FEMALES) study. *Journal of Sexual Medicine, 2*(5), 675-684.

Fortenberry, J. D., & Hensel, D. J. (2011). The association of sexual interest and sexual behaviours among adolescent women: A daily diary perspective. *Hormones and Behaviour, 59*(5), 739-744.

Frank, E., Anderson, C., & Rubinstein, D. (1978). Frequency of sexual dysfunction in "normal" couples. *The New England Journal of Medicine, 299*(3), 111-115.

Gadassi, R., Bar-Nahum, L. E., Newhouse, S., Anderson, R., Heiman, J. R., Rafaeli, E., & Janssen, E. (2016). Perceived partner responsiveness mediates the association between sexual and marital satisfaction: A daily diary study in newlywed couples. *Archives of Sexual Behaviour 45*(1), 109-120.

Gallinsky, A. M. (2012). Sexual touching and difficulties with sexual arousal and orgasm among U.S. older adults. *Archives of Sexual Behaviour, 41*, 875-890.

Gefen, D., Straub, D. W., & Boudreau, M.-C. (2000). Structural equation modeling and regression: Guidelines for research practice. *Communications of AIS, 4*(7), 2-76.

Gillespie, B. J. (2016). Correlates of sex frequency and sexual satisfaction among partnered older adults. *Journal of Sex & Marital Therapy*, 1-21.

Hall, K. (2010). The canary in the coal mine: Reviving sexual desire in long-term relationships *Treating sexual desire disorders: A clinical casebook* (pp. 98-134): The Guilford Press.

Heiman, J. R., Long, J. S., Smith, S. N., Fisher, W. A., Sand, M. S., & Rosen, R. C. (2011). Sexual satisfaction and relationship happiness in midlife and older couples in five countries. *Archives of Sexual Behaviour, 40*(4), 741-753.

Impett, E. A., & Peplau, L. A. (2003). Sexual compliance: Gender, motivational, and relationship perspectives. *Journal of Sex Research, 40*(1), 87-100.

Impett, E. A., Strachman, A., Finkel, E. J., & Gable, S. L. (2008). Maintaining sexual desire in intimate relationships: The importance of approach goals. *Journal of Personality and Social Psychology, 94*(5), 808-823.

Janssen, E., & Bancroft, J. (2007). The dual control model. In E. Janssen (Ed.), *The Psychophysiology of Sex*: Indiana University Press.

Kline, R. B. (2012). Assumptions in structural equation modeling. In R. H. Hoyle (Ed.), *Handbook of structural equation modeling* (pp. 111-126). New York, USA: Guilford Press.

Laumann, E. O., Paik, A., Glasser, D. B., Kang, J. H., Wang, T., Levinson, B., Moreira, E. D., Jr., Nicolosi, A., & Gingell, C. (2006). A cross-national study of subjective sexual well-being among older women and men: findings from the Global Study of Sexual Attitudes and Behaviours. *Archives of Sexual Behaviour, 35*(2), 145-161.

Laumann, E. O., Paik, A., & Rosen, R. C. (1999). Sexual dysfunction in the United States. Prevalence and predictors. *JAMA, 281*(6), 537-544.

Levine, S. B. (2003). The nature of sexual desire: A clinician's perspective. *Archives of Sexual Behaviour, 32*(3), 279-285.

McCabe, M. P., Althof, S. E., Assalian, P., Chevret-Measson, M., Leiblum, S. R., Simonelli, C., & Wylie, K. (2010). Psychological and interpersonal dimensions of sexual function and dysfunction. *Journal of Sexual Medicine, 7*(1 Pt 2), 327-336.

McCarthy, B. W., & Wald, L. M. (2012). Sexual desire and satisfaction: The balance between individual and couple factors. *Sexual and Relationship Therapy, 27*(4), 310-321.

Meana, M. (2010). Elucidating women's (hetero)sexual desire: definitional challenges and content expansion. *Journal Sex Research, 47*(2), 104-122.

Meana, M., & Steiner, E. T. (2014). Hidden disorder / hidden desire: Presentations of low sexual desire in men. In Y. M. Binik & K. S. Hall (Eds.), *Principles and Practice of Sex Therapy* (3 ed.). New York, USA: Guilford Press.

Muise, A., Giang, E., & Impett, E. A. (2014). Post sex affectionate exchanges promote sexual and relationship satisfaction. *Archives of Sexual Behaviour, 43*(7), 1391-1402.

Muise, A., Impett, E. A., & Desmarais, S. (2012). Getting in on versus getting it over with: Sexual motivation, desire and satisfaction in intimate bonds. *Personality and Social Psychology Bulletin, 39*(10), 1320-1332.

Muthén, L. K., & Muthén, B. O. (2002). How to Use a Monte Carlo Study to Decide on Sample Size and Determine Power. *Structural Equation Modeling: A Multidisciplinary Journal, 9*(4), 599-620.

Muthén, L. K., & Muthén, B. O. (2015). *Mplus user's guide. Seventh edition*. Los Angeles, CA: Muthén & Muthén.

Rosen, N. O., Muise, A., Bergeron, S., Delisle, I., & Baxter, M.-L. (2015). Daily associations between partner responses and sexual and relationship satisfaction in couples coping with provoked vestibulodynia. *Journal of Sexual Medicine, 12*(4), 1028-1039.

Sanchez-Fuentes, M. d. M., Santos-Iglesias, P., & Sierra, J. C. (2014). A systematic review of sexual satisfaction. *International Journal of Clinical and Health Psychology, 14*, 67-75.

Sarin, S., Amsel, R. M., & Binik, Y. M. (2013). Disentangling desire and arousal: A classificatory conundrum. *Archives of Sexual Behaviour, 42*(6), 1079-1100.

Smith, A. M., Patrick, K., Heywood, W., Pitts, M. K., Richters, J., Shelley, J. M., Simpson, J. M., & Ryall, R. (2012). Body mass index, sexual difficulties and sexual satisfaction among people in regular heterosexual relationships: A population-based study. *Intern Med J, 42*(6), 641-651.

Smith, K. B., & Pukall, C. F. (2014). Sexual function, relationship adjustment, and the relational impact of pain in male partners of women with provoked vulvar pain. *Journal of Sexual Medicine, 11*, 1283–1293.

Trudel, G., & Goldfarb, M. R. (2010). Marital and sexual functioning and dysfunctioning, depression and anxiety. *Sexologies, 19*(3), 137-142.

Vannier, S. A., & O'Sullivan, L. F. (2010). Sex without desire: Characteristics of occasions of sexual compliance in young adults' committed relationships. *Journal of Sex Research, 47*(5), 429-439.

Zhang, D., & Willson, V. L. (2006). Comparing Empirical Power of Multilevel Structural Equation Models and Hierarchical Linear Models: Understanding Cross-Level Interactions. *Structural Equation Modeling: A Multidisciplinary Journal, 13*(4), 615-630.

Article 3: Sexual Desire Discrepancy and Sexual Distress

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RUNNING HEAD: Sexual Desire Discrepancy Predicts Sexual Distress

TITLE: Discrepancy in Dyadic Sexual Desire Predicts Sexual Distress Over Time in an Inclusive Sample of Committed Couples: A Daily Diary and Longitudinal Study

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Abstract

In long-term relationships, Sexual Desire Discrepancy (SDD) occurs frequently between partners. For many, this discrepancy is persistent and significant, and a source of significant distress. However, the dynamics of SDD in couples and specifically, its implications for partner sexual distress have received scant empirical attention. This study examined the associations between SDD and sexual distress from one day to the next and over a 12-month span, in a diverse community sample of 229 committed couples. Two datasets were collected: A 35-day daily diary and a 12-month longitudinal survey. In both, dyadic sexual desire and sexual distress were measured, and SDD was calculated as the absolute value of the difference in sexual desire between partners. Directional associations between SDD at one time point and sexual distress at the next time point were assessed using multilevel, 2-pane autoregressive cross-lagged models, controlling for within-variable changes, dependencies between partners, and partner age. Results were consistent with the study's hypotheses: Couples' SDD on one day predicted sexual distress on the next day. Similarly, SDD at baseline predicted sexual distress 12 months later. The reverse associations (i.e., sexual distress predicting SDD) were non-significant. The associations' directionality and the fact that they remained significant over days and months are consistent with the proposal that SDD is a precursor of sexual distress. The present study provides support for dyadic conceptualizations of sexual desire. Clinically, findings support therapeutic approaches that address issues with sexual desire and sexual distress by focusing not on the individual, but on the couple.

Keywords: Sexual desire, sexual desire discrepancy, sexual distress, dyadic daily diary study, longitudinal study

Discrepancy in Dyadic Sexual Desire Predicts Sexual Distress Over Time in an Inclusive Sample of Committed Couples: A Daily Diary and Longitudinal Study

Sex occurs most frequently in the context of committed relationships (Lindau et al., 2007), and is an important contributor to each partner's health and wellbeing (Heiman et al., 2011; McNulty et al., 2016; Scott & Sprecher, 2000; Sprecher, 2002). Sadly, committed couples often report sex to be unsatisfying, or even a source of distress (Byers, 2005; Dunn et al., 2000; Jasso, 1985; Klusman, 2002; Laumann et al., 1996). Among the sexual issues most frequently reported by couples is *sexual desire discrepancy* (SDD), that is, differences in sexual desire between partners (Dewitte et al., 2020). Such discrepancies occur frequently in long-term relationships (Herbenick et al., 2014). However, for some, these may be persistent and significant, and therefore come to be perceived as a sexual difficulty in its own right. Indeed, SDD is recognized by clinicians as one of the most frequent motives for seeking sex and couple therapy, one of the most challenging issues to treat, and a source of considerable distress for many couples (Dewitte et al., 2020; Kleinplatz et al., 2017; McCarthy & Oppliger, 2019; McCarthy & Ross, 2018). It is thus surprising that the repercussions of SDD in committed couples have received little empirical attention to date (Mark, 2015).

Despite the paucity of available data, there are good reasons to think that SDD may be strongly associated with *sexual distress* (i.e., the negative affect and thoughts attributed to one's sexuality; (Derogatis et al., 2002). For example, SDD has been linked to lower sexual satisfaction (Mark, 2015), which in turn is negatively associated to sexual distress (Stephenson & Meston, 2010). Similarly, the observation that women with low

sexual desire (e.g., sexual arousal/interest disorder, hypoactive sexual desire disorder) tend to report greater sexual distress when they are in a relationship than when they are single suggests that relational factors such as SDD may be associated with their sexual distress (Hendrickx et al., 2016; Meana, 2010).

Elucidating the putative association between SDD and sexual distress may be of considerable value, both conceptually and clinically. Indeed, according to general population surveys in the US, as many as 22% to 25% of women report clinically significant levels of sexual distress (Bancroft et al., 2003a; Shifren et al., 2008). Since our current knowledge of SDD derives in large part from clinical impressions, there is limited empirical understanding of how it relates to variability and persistence in sexual distress over time.

There is evidence that sexual distress is strongly associated with relational factors (Burri & Spector, 2011; Dennerstein et al., 2008; Hendrickx et al., 2016), and authors such as Dewitte (2014) have advocated for a greater dyadic focus in sex research, and recently, dyadic models of sexuality have been proposed, including the *Interpersonal Emotion Regulation Model (IERM)* of women's sexual dysfunction. According to the IERM, couples coping with sexual problems tend to engage in less optimal emotion co-regulation strategies, leading both partners to experience poorer sexual outcomes such as sexual distress. For example, in the case of couples struggling with sexual desire issues, lower-desire partners may avoid touching the other partner for fear that they would try to initiate sex, leading to fewer occasions for intimacy in the couple (McCarthy & Farr, 2012). Over time, such repeated experiences could lead to persistent patterns of

ill-adapted behaviors in couples (e.g., sexual avoidance), resulting in greater sexual distress in both partners. Specifically, one would expect that in couples' everyday experiences, daily changes in SDD (i.e., greater than the couples' average level) should precede, and therefore predict, changes in sexual distress. Similarly, one would expect that over longer periods, a greater discrepancy in sexual desire between partners would also predict higher sexual distress. The present study examined whether in committed couples, greater discrepancy in sexual desire predicted greater sexual distress, both proximally (from one day to another), and more distally (over a 12-month span).

Sexual Desire and Sexual Desire Discrepancy (SDD)

Sexual desire has been defined generally as an interest in sexual activity (Spector et al., 1996), and is understood to be a multi-factorial construct with biological, emotional and cognitive components (Levine, 2002). Although research to date has often focused on sexual desire as an intra-individual phenomenon, there is increasing evidence that in committed couples, sexual desire is strongly associated with relational factors (Brotto et al., 2016; Hogue et al., 2019; Mark et al., 2019; Meana, 2010; Raposo et al., 2019). Hence, there are strong grounds for studying the *interpersonal* or dyadic aspects of sexual desire in committed couples.

SDD is a dyadic aspect of sexual desire, defined here as the *difference in sexual desire between partners in a couple* (Mark, 2015). Sexual desire is known to vary (Ridley et al., 2006). Differences in sexual desire between partners should therefore not be unexpected. Indeed, Vowels et al. (2018), based on spectral and cross-spectral analysis of daily diary data collected over 30 days from 133 mixed-sex couples, reported that

although variations in sexual desire are generally synchronous between partners (i.e., low or negligible SDD), patterns of larger SDD were also observed. However frequent, SDD does appear to be an issue for many couples – all the more, if one includes couples consulting therapists for one partner's low-sexual desire (McCarthy & Farr, 2012; McCarthy & Oppliger, 2019; McCarthy & Ross, 2018). Indeed, Herbenick et al. (2014), working with qualitative responses from 179 women in mixed-sex relationships, noted that women in long-term relationships found SDD to be a problem. However, for many of the women surveyed, SDD remained an unresolved issue in their relationship.

Although SDD has been discussed in the clinical literature for over four decades (Zilbergeld & Ellison, 1980), the first empirical studies of this issue were published significantly later (Davies et al., 1999), and remain rare. Much of the work to date has focused on the associations between SDD and sexual satisfaction and/or relationship satisfaction. In a cross-sectional survey of 72 mixed-sex dating couples, Davies et al. (1999) reported that SDD was associated with lower sexual and relationship satisfaction, with sexual satisfaction fully mediating the association between SDD and relationship satisfaction. Similar results were later obtained for gay and heterosexual men (Pereira et al., 2019), women in same-sex relationships (Bridges & Horne, 2007), and for both partners in a sample of 255 mixed-sex new parents (Rosen et al., 2017). Further, in a 30-day diary study of 87 mixed-sex couples, greater SDD was associated in the women partners with poorer quality of sexual experience on the same day (Mark, 2014). Although one would intuitively expect an association to exist between SDD and sexual distress, no studies have to our knowledge tested the associations between the two.

Despite being sparse and recent, research on SDD has already used more than one operational definition, making comparisons between studies difficult (Mark, 2015). One early approach is intra-individual, and measures SDD by asking respondents to evaluate the difference in sexual desire between themselves and their partner (Bridges & Horne, 2007; Davies et al., 1999; Pereira et al., 2019; Sutherland et al., 2015). This measure is based on the participant's perception of their partner, and therefore likely suffers from bias. Indeed, in studies of close relationships, it is well-known that guessing one's partner's feelings or thoughts is subject to (an often positive) skew, and influenced by confounding factors such as relationship quality, self-perception, and mood (Gagné & Lydon, 2004). To limit this bias, a second approach is to measure the couple's SDD directly, by subtracting one partner's sexual desire score from the other partner's (Mark, 2012; Reece, 1987; Rosen et al., 2017; Sutherland et al., 2015; Willoughby et al., 2014). This yields a signed value (e.g., positive for the higher-desire partner and negative for the lower-desire partner), which may be appropriate in *differentiated* couples, where partners can be reliably differentiated by a criteria such as gender (e.g., mixed-sex couples), and where a consistent and significant direction in SDD is expected (e.g., between men and women). However, such measures may by the same token also emphasize the difference between partners and make it difficult to identify phenomena associated solely to the magnitude of SDD, regardless of the direction. Further, a signed measure may not be appropriate for undifferentiated (e.g., gender/sex diverse and nonclinical) samples of couples, which are symmetrical by construction. Finally, a signed measure may be less relevant to clinical approaches that focus on the couple as a whole rather than on one of the partners (McCarthy & Oppliger, 2019). As a result, some studies

– including the present study– have taken the approach of measuring SDD as the *absolute value* of the difference between the two partner's self-reported sexual desire (Mark et al., 2014). This approach disregards the direction of the difference altogether and allows research to focus on effects associated solely to the magnitude of the discrepancy.

In sum, most studies on SDD have used cross-sectional approaches and focused on intra-individual or signed measures. Further, the SDD literature has largely excluded same-gender/sex couples, non-heterosexual participants, trans men and women, and participants that identify outside of the gender binary (e.g., genderfluid, non-binary). In fact, only two studies to date have examined SDD in sexual minority couples or individuals (Bridges & Horne, 2007; Pereira et al., 2019) and none have included gender minority individuals in their samples. As a result, our understanding of SDD's evolution from day to day and over time is very limited, particularly in diverse populations of couples (Dewitte et al., 2020).

Sexual Distress

Sexual distress includes negative affect such as guilt, frustration, anger, feelings of inadequacy and inferiority, and intrusive thoughts such as regrets and worries attributed to one's sexuality (Derogatis et al., 2002). Sexual distress is associated with both individual (Rosen et al., 2009) and relational factors (Blumenstock & Papp, 2017), and decreases with age and relationship duration (Hendrickx et al., 2015; Rosen et al., 2009). Sexual distress is related to but distinct from low sexual satisfaction (Velten & Margraf, 2017). For example, the two variables have been shown to evolve differently over time,

associate differently with relational and sexual functioning variables, and respond differently to treatment (Stephenson & Meston, 2010).

Sexual distress is a necessary criterion in the diagnosis of both female and male sexual disorders (American Psychiatric Association, 2013). It is therefore surprising that the association between sexual function and sexual distress is not strong, particularly for low sexual desire (Meana, 2010; Shifren et al., 2008; Witting et al., 2008). Dewitte (2014) has suggested that in couples, partner interactions may determine whether someone with sexual difficulties experiences sexual distress, an outcome also predicted by relational models such as the IERM (Rosen & Bergeron, 2019). Hence, discrepancy in sexual desire between partners may be a source of sexual distress (Meana, 2010), and converging lines of evidence exist to support this hypothesis. For instance, in women reporting low sexual desire, the strongest predictor of sexual distress was having a current partner (Rosen et al., 2009). Similarly, Bancroft et al. (2003b) reported that in a sample of women in mixed-sex couples, the quality of the relationship and of the participant's wellbeing during sex were stronger predictors of sexual distress than indicators of sexual function (e.g., arousal, vaginal lubrication, orgasm). Taken together, these findings suggest that SDD may be significantly associated with sexual distress. However, no study to date has examined this hypothesis, either at the daily level, or over longer spans of time.

Study Goals and Hypotheses

The goal of the present research was to examine the associations between SDD and sexual distress. The IERM suggests that both proximal and distal factors lead to greater sexual distress. Accordingly, this study worked with two time-based datasets collected from the same sample of committed couples. To study proximal associations between SDD and sexual distress, an online daily diary approach was chosen. This method provides a good compromise between practicality and ecological validity, minimizing recall bias and interference to everyday activity, such that many researchers consider daily diaries a "gold standard" in accuracy (Graham et al., 2003). The second, a 12-month longitudinal survey, allowed more distal associations to be observed.

It was expected that in both datasets, couples where the difference in sexual desire between partners was greater (i.e., greater magnitude of SDD) would report greater sexual distress. Further, the direction of associations over time was examined, and it was expected that in both datasets, values of SDD at one time point would predict values of sexual distress at a later time, but not vice-versa. It was expected that these results would hold even after controlling for age, which is a variable that has shown to be associated with sexual distress (Hendrickx et al., 2015). It was also hypothesized that there would be same-day associations between SDD and sexual distress.

Further, one might expect that the couples' average sexual desire would moderate the putative associations between DSD and sexual distress. Arguably, in low-desire couples, sexual desire discrepancies may have a greater effect, and be perceived as more of an issue, than in high-desire couples. The present study investigated whether such an

effect would be observable, with the hypothesis that putative associations between DSD and sexual distress would be of greater magnitude for couples with lower sexual desire.

Finally, there are indications that gender and orientation may play a role in associations between SDS and predictors of sexual well-being. For example, in heterosexual couples, higher SDS was associated to lower sexual satisfaction in men but not women, after controlling for relationship satisfaction (Mark & Murray, 2012). Relatedly, problematic SDS was reported in studies of women in same-sex couples (Bridges & Horne, 2007), and in bisexual women in mixed-sex couples (Mark et al., 2018). Hence, studying whether either partner's gender had a moderating effect on the associations between SDS and sexual distress appeared warranted. While a full exploration of gender and sexual orientation effects on associations between SDD and sexual distress was beyond its scope, the present study investigated the moderating effects of participant's gender, that of their partner, and the possible interaction between the two. Given the paucity of available results in the literature, no hypothesis was made for these analyses, which remained exploratory.

Method

Working with the same sample of participants, two datasets were collected: A 35-day daily diary and a 12-month longitudinal survey.

Participants

A community sample of committed couples was recruited between March 2017 and February 2018 by advertising over social media and using printed ads. Particular attention was paid to recruiting a diverse sample, and some of the advertisements were specifically targeted toward the LGBT+ community. Couples were contacted by telephone and screened for eligibility. Where possible, both partners were included in this initial contact, but in was considered acceptable for a single partner to speak for the couple during the initial screening. Inclusion criteria included having lived together for at least one year, being sexually active (at least once a month in the past 3 months), being 18 years of age or older, and speaking and reading English or French. Couples were excluded if one or both of the partners was pregnant or was lactating, or had a condition that they reported significantly affected their sexuality, including serious mental or physical illness (e.g., recent cardiavoscular events). The decision to exclude couples was taken by the research team on a case-by-case basis.

Of the 519 couples initially interested in participating in the study, 170 couples could not be reached for the telephone screening or did not agree to complete it, 68 couples were ineligible or did not agree to participate after screening, and 43 couples agreed during the screening but did not respond to the invitation to complete the first online survey. Thus, a total of 238 couples were enrolled into the study. Of these, eight

couples were removed from the baseline survey due to failed attention checks or because they dropped out, and one asked that their data be removed from the study. As a result, the baseline sample contained completed records from 229 couples (458 matched participants).

Sample Characteristics

Participants at Baseline. At baseline, 271 of the 458 matched participants self-reported their sex assigned at birth as female, 185 as male, and two as intersex. Participants were aged 18 to 70 years (M = 30.4 years, SD = 8.4 years). Participants were on average 30.4 years of age (SD: 8.4 years). Participants reported 16.71 years of schooling on average (SD = 2.84), and 61.0% reported an average annual personal income of less than $40,000 CAD ($n$ = 265). Seventy-five percent of the participants reported being born in Canada, 13% in the United States, 7% in Europe, 2% in Asia, 2% in Latin or South America, and 1% in Africa.

Participants self-defined their gender as: man (33.6%), woman (45.0%), trans man (1.1%), trans woman (0.2%), non-binary or gender fluid (3.9%), and agender (2.2%). Participants self-defined their sexual orientation as heterosexual (54.8%), bisexual (10.7%), gay/lesbian (18.6%), queer (9.2%), pansexual (4.1%), uncertain/confused (.9%), asexual (.2%) or "other" (1.5%). Participants reported having been in a relationship with their current partner on average 5.9 years (SD = 5.05 years). Most couples reported being unmarried (71.4%), and most were without children (77.9%); those with children had between one and five children. Fifty-nine percent of the couples identified as mixed (man-woman) gender, 27% as same (man-man, woman-

woman) gender, and 14% included at least one participant not identifying along the gender binary.

Daily Diary. Of the 229 couples having completed the baseline survey, 11 couples dropped out before starting the daily diary or completed less than three diary days, and one couple was removed due to an error in data collection. Thus, the daily diary sample was composed of 217 couples and 13,134 daily diary entries (an 86% completion rate).

Longitudinal Survey. Of the 229 couples who completed the baseline survey, 193 couples were enrolled in the longitudinal survey's 12-month follow-up, 36 couples having dropped out in the intervening period. Five further couples did not complete this second survey. Hence, the final data sample contained 229 couples having completed $T_{0,}$ of which 188 couples had completed both T_0 and T_1. Participants having completed only T_0 did not differ significantly from those having completed both T_0 and T_1 in age, gender, orientation, sexual desire or sexual distress (one-way ANOVA, $p > 0.5$).

Procedure

This procedure was approved by the ethics committees of both universities participating in the study. After independently providing their informed consent online, each participant completed an online *longitudinal survey* which included self-report questionnaires at baseline and at 12-months. The baseline questionnaire included three attention-testing questions, of which the respondents needed to answer at least two correctly to remain in the study. Immediately after the couples had completed their baseline questionnaires, they were then asked to complete an online 35-day *daily diary*

survey: Participants were asked to complete their diaries individually everyday between 6 p.m. and 6 a.m., ideally at the same time every day, and at the same time as (but independent from) their partner. A research assistant contacted each participant weekly by telephone to answer any questions they may have about the survey, and to resolve any issue (e.g., technical) they encountered. This protocol was intended to encourage high completion rates.

This protocol was intended to encourage high completion rates. For the longitudinal survey, couples were compensated $20 per completed questionnaire, a maximum of $60 per couple. For the daily diary survey, couples were compensated up to $100 in total ($50 each), in proportion to the number of diaries completed by each partner, see Table 2 for details. Compensation was in the form of gift cards for a well-known online store.

Part 1: Daily Diary Data

Measures

Sociodemographic

Participant age was assessed as a potential covariate in this part of the study. This variable was measured at baseline with a single item question.

Daily Measures

Sexual Desire. Respondent's daily sexual desire was measured using 4 items adapted from the dyadic sexual desire subscale of the Sexual Desire Inventory-2 (SDI-2; Spector et al., 1996), see Table 3. Abridged measures are frequently used in daily diary studies, where completion time is important for participant retention (Wittenborn et al., 2013). Composite scores for this adapted scale ranged from 0 to 28, with higher scores indicating higher sexual desire. In the present sample, the Cronbach's α for this abridged measure was .93.

Sexual Desire Discrepancy (SDD). Sexual desire discrepancy was calculated in this study as the absolute value of the difference between partners' sexual desire scores, using the above 4-item scale. This absolute value approach has been used previously (Mark et al., 2014) and was preferred here to other operational definitions (e.g., a signed subtraction of the two partners' self-reports of sexual desire (Mark, 2012; Reece, 1987; Sutherland et al., 2015; Willoughby et al., 2014). SDD scores ranged from 0 to 28, with higher scores indicating greater discrepancy between the partners' reported sexual desire. Formal reliability (see Data Analytic Strategy, below) for this measure was .75.

Sexual Distress. Participants' sexual distress was measured using a 3-item abridged form of the Female Sexual Distress Scale-Revised used in Part (FSDS-R; Derogatis et al., 2002; Santos-Iglesias et al., 2018), see Table 4. Composite scores for this abridged scale range from 0 to 12, with higher scores indicating higher sexual distress. This abridged scale has also been used previously in dyadic daily diary studies (Muise et al., 2018), with good internal consistency. In the present sample, Cronbach's α was .90.

Low- and High-Desire Couples. To investigate whether the couples' sexual desire moderated analysis results, couples were differentiated by their average sexual desire. Firstly, the average sexual desire of each couple was calculated, using each partner's response to the baseline questionnaire's sexual desire measure (SDI-2). Couples were then identified as being low- or high-desire couples, depending on whether this value was respectively lower or greater than the sample's median. This new binary variable was named Lower than Median Desire Couple (LMDC).

Participant and Partner Gender. The study's baseline survey included socio-demographic data, including questions about participants' gender and orientation, see Table 5 and Table 6. Following recommendations by Bauer et al. (2017) and Broussard et al. (2017), these items were not obligatory, and participants could provide their own categories to supplement or instead of the categories suggested. The resulting large number of categories and correspondingly small number of participants in each category, rendered these variables difficult to use in statistical models. Instead, this study defined a simplified three-value gender variable (man, woman, genderfluid/non-binary), whose value was calculated from the original, see Table 7. Given the small number of

participants identifying as genderfluid/non-binary in this sample, the study further focused only on participants identifying as men or women (this included trans-identified participants), resulting in a binary variable.

Data Analytic Strategy

Univariate statistics and reliability tests were obtained using SPSS (IBM SPSS Statistics, v. 21.0). Note that reliability testing for SDD requires careful consideration. Indeed, as a difference measure, SDD neither assumes nor requires that the variables being compared be strongly correlated, and in fact, difference measures are in general more reliable when this correlation is low (Feldt, 1995; Rogosa & Willett, 1983). As a result, reliability tests such as Cronbach's α, which assess the degree of internal consistency of the items composing the scale, are not generally appropriate for difference scores such as those computed to measure SDD. A more appropriate reliability test for difference scores is as follows (Feldt, 1995):

$$r_{1\text{-}2} = [½ (r_1 + r_2) - \rho_{1,2}] / (1 - \rho_{1,2}) \quad (1)$$

…where $r_{1\text{-}2}$ is the reliability of the difference measure; r_1 and r_2 the reliability of each component score; and $\rho_{1,2}$ the correlation between the component scores. This reliability test was used in the present study.

Directional associations between SDD and sexual distress were assessed using 2-pane autoregressive cross-lagged models (Hamaker et al., 2009; Selig & Little, 2012). These models test the associations between variables from one time point to another, controlling for within-variable changes. Associations between SDD on one day and sexual

distress on the next day were controlled for same-day associations between the two variables.

Following Laurenceau and Bolger (2012), daily diary variables were person-mean centered, and therefore represented deviations from the respondents' mean values. Person-centered measures of SDD and sexual distress were not significantly correlated with participants' age in this sample ($p > .05$) and were not included as covariates in the final model.

Data dependencies between partners were controlled by using two-level (couple, partner) Structural Equation Modelling (SEM; Hox, 2002). As couples were undifferentiated, in that the partners could not be reliably differentiated (Laurenceau & Bolger, 2012), symmetrical paths were constrained to be equal. To control for possible modelling biases resulting from these symmetry constraints, two analysis were performed. Firstly, the symmetry of the 3D surface defined by both partners' sexual desire and SDS was tested using Response Surface Analysis (RSA), for both daily diary and longitudinal data, and the Slope of the Lines of Incongruence (LoIN) was then calculated for both response surfaces. Tests were performed via Structural Equation Modelling (SEM), (Hox & Bechger, 1998), and followed recommendations by Shanock et al. (2010). These models converged normally, and to acceptable fit. Results confirmed that for both datasets, responses surfaces are symmetrical (i.e., LoIN was non-significant, with $p > .05$), and therefore, that symmetry constraints were appropriate. Secondly, the study's results were compared with those from models which differentiated the partners on the basis of higher and lower average sexual desire. By construction, the DSD measure

used in this study assigns the same value for both partners in the couple, regardless of whose desire is higher. Therefore, differentiating the couples on this basis should not significantly affect the analysis results, and differences observed between differentiated and undifferentiated models should be indicative of modelling bias. On the strength of this reasoning, the study's analyses were thus re-executed for datasets datasets, using the same data analytic strategy as before (multilevel, 2-pane autoregressive cross-lagged SEMs), but differentiating partners in the couple on the basis of average sexual desire. Results obtained for these differentiated couples were similar to the results obtained originally for undifferentiated couples. Hence, the models used in this study did not present significant modelling biases due to the assumption that the sample's couples were undifferentiated.

Possible moderating effects of couple desire were investigated by re-executing the multi-level cross-lag model, and introducing LMDC as a between-level, binary moderator. Moderation tests were performed following recommendations by (Preacher et al., 2016; Vaillancourt-Morel et al., 2020).

The study also controlled for moderating effects of the participant's gender, their partner's gender, as well as possible interactions between the two. This was done by re-executing the multi-level cross-lag model, including the gender variables and the interaction variables as between-level binary moderators. Moderation tests were performed following recommendations by (Preacher et al., 2016; Vaillancourt-Morel et al., 2020).

Finally, missing data such as these were handled directly by the Maximum Likelihood (ML) estimation technique used in the SEM analyses. Indeed, as ML estimation has been shown to be robust to conditions where data are Missing At Random (MAR); no imputation was required in this analysis (Allison, 2003). Note that seven percent of the diary entries and 13% of the longitudinal dataset's time-2 (12-month) entries had missing data for one of the partners.

SEM analyses were performed in MPlus v7 (Muthén & Muthén, 2015). Model fit and parameter significance were assessed according to the following guidelines: Overall model fit was considered acceptable when Root Mean Square Error of Approximation (RMSEA) < .08, within Standardized Root Mean Square Residual (SRMSR) < .08, Tucker-Lewis Index (TLI) > 0.9, and individual standardized residuals (σ) were small (Gefen et al., 2000; West et al., 2012). Parameter estimates were considered significant when their p-value was < .05. As MPlus does not support bootstrapping for multilevel models, these were calculated using the Delta method (Muthén & Muthén, 2015).

Results

Descriptive Statistics

In this sample, Sexual Desire's average value was 10.931, with a standard deviation of 6.156. Sexual Distress's average was 0.9163, with a standard deviation of 1.921. SDD's average was 5.390, with a standard deviation of 4.552. SDD and sexual distress scores were left-skewed, with the majority being lower than the score's theoretical half-way point.

Covariates

Participants' age was not associated with their daily measures of sexual distress ($p > .05$) in this sample. On the same day, SDD at d_0 was significantly and positively associated with sexual distress at d_0 ($b = -.012$; $p \leq .001$; *95% CI* = [.006, .014]).

SDD Predicting Next-Day Sexual Distress

Associations between variations in SDD on one day and variations in sexual distress on the next day were modeled in a two-level (couple, day), two-panel cross-lagged SEM, controlling for age and same-day associations between the variables. The model converged normally and to acceptable fit (*RMSEA* = .013; *SRMS [Within]* = .007; *CFI* = .998). Deviations from average SDD on one day were positively and significantly associated with deviations from average in individual sexual distress on the next day ($b = .009$; $p = .004$; *95% CI* = [.004, .014]), see also Figure 6. Hence, higher dyadic SDD on one day was on average followed by significantly higher sexual distress for both partners on the next day. The converse associations, between individual sexual distress on one day and SDD on the following day, were not significant ($p > .05$).

Moderating Effect of Couple Desire

The study's analyses were re-executed using the same data analytic strategy as before (multilevel, 2-pane autoregressive cross-lagged SEMs), and using LMDC as a between-level, binary moderator. The slope of the association between DSD and sexual desire was observed to be higher for LDMC couples (i.e., couples whose average sexual desire was lower than the sample median) than for the other couples ($b = .024$; $p = .034$;

95% CI = [.005, .043]). Hence, for a given value of DSD, partners of low-desire couples reported on average more sexual distress than desire-couples on the following day.

Moderating Effect of Participant and Partner Gender

The study's analyses were re-executed using the same data analytic strategy as before (multilevel, 2-pane autoregressive cross-lagged SEMs), and using participant gender and partner gender as between-level, binary moderators. Moderation effects for participant's gender, their partner's gender, and interactions between the two variables, were observed to be non-significant ($p > 0.5$).

Part 2: Longitudinal Data

Measures

Sociodemographic

Participant age was assessed as a potential covariate in this part of the study. This variable was measured at baseline with a single item question.

Longitudinal Measures

Sexual Desire. The Dyadic Subscale of Sexual Desire Inventory-2 (SDI-2, (Spector et al., 1996) was used as a measure of sexual desire in Part 2. SDI-2 is a widely used measure of sexual desire, and has demonstrated excellent psychometric properties in other studies. The scale factors into a 9-item "dyadic" sexual desire subscale (sexual desire for a partner or attractive other person) and a 4-item "solo" sexual desire subscale (desire for masturbation). The present study used the former, this measure being more relevant in the context of sexual desire in committed couples. Composite scores for this subscale range from 0 to 81, with higher scores indicating higher sexual desire. Note that Cronbach's α is not a valid measure of SDI-2's reliability, as this scale is multi-factor scale and therefore not tau-equivalent (Tavakol & Dennick, 2011).

Sexual Desire Discrepancy (SDD). Sexual desire discrepancy was calculated as the absolute value of the difference between partners' SDI-2 scores (dyadic subscale). Composite scores range from 0 to 109, with higher scores indicating higher discrepancy between the partners' reported sexual desire. Formal reliability (see above Data Analytic Strategy section in Part 1 for details) for this measure was .82.

Sexual Distress. The Female Sexual Distress Scale-Revised was used as a measure of sexual distress. This scale was originally proposed for women (Derogatis et al., 2008; Derogatis et al., 2002) and was subsequently validated for men (Santos-Iglesias et al., 2018). The items on the scale load onto a single factor regardless of gender and degree of sexual function (Santos-Iglesias et al., 2018). Composite scores for this scale range from 0 to 56, with higher scores indicating higher sexual distress. In the present dataset, Cronbach's α for this measure was .92.

Low- and High-Desire Couples. The binary variable Lower than Median Desire Couple (LMDC) used in Part 1 was also used in this analysis.

Participant and Partner Gender. The gender variables used in Part 1 was also used in this analysis.

Data Analytic Strategy

The data analytic strategy in this part was analogous to the strategy used in Part 1, with Part 2's longitudinal measures replacing Part 1's daily measures. In particular, missing data were handled directly using Maximum Likelihood (ML) estimation. In Part 2, variables were not person-mean centered, and therefore represented deviations from the sample's mean values.

Results

Descriptive Statistics

Means and standard deviations of variables of interest are presented in Table 8. SDD and sexual distress scores were left-skewed, with the majority being inferior to the score's theoretical half-way point. In particular, 67.1% of participants reported sexual distress scores below the clinical cutoff score of 15.

Covariates

Participant age was significantly and negatively associated with sexual distress at T_0 (b = -.067; p = .028; *95% CI* = [-.117, -.017]). SDD at T_0 was significantly and positively associated with sexual distress at T_0 (b = -.312; p < .001; *95% CI* = [.202, .422]).

SDD Predicting Sexual Distress Over 12 Months

Associations between SDD at baseline (T_0) and sexual distress 12 months later (T_1) were modeled in a two-level (couple, participant), two-panel cross-lagged SEM controlling for age and associations between the variables at baseline. The model converged normally and to acceptable fit (*RMSEA* = .067; *SRMS [Within]* = .069; *CFI* = .959). Associations between SDD at T_0 and individual sexual distress at T_1 were significant and positive (b = .228; $p \leq .001$; *95% CI* = [.126, .329]), see also Figure 7. Hence, higher dyadic SDD at T_0 was on average followed by significantly higher sexual distress for both partners 12 months later. The reverse association, between individual sexual distress at T_0 and SDD at T_1, was not significant (p > .05).

Moderating Effect of Couple Desire

The study's analyses were re-executed using the same data analytic strategy as before (multilevel, 2-pane autoregressive cross-lagged SEMs), and using LMDC as a between-level, binary moderator. LMDC was not found to significantly moderate the association between DSD at baseline and each partner's sexual distress 12 months later ($p > 0.5$).

Moderating Effect of Participant and Partner Gender

The study's analyses were re-executed using the same data analytic strategy as before (multilevel, 2-pane autoregressive cross-lagged SEMs), and using participant gender and partner gender as between-level, binary moderators. Moderation effects for participant's gender, their partner's gender, and interactions between the two variables, were observed to be non-significant ($p > 0.5$).

Discussion

Based on the proposal from both clinical and research literatures that in long-term relationships, greater SDD may lead to greater sexual distress in both partners, this study examined the associations between SDD and sexual distress at the daily level and over time. Two datasets were collected from the same inclusive sample of committed couples: a 35-day daily diary and a 12-month longitudinal survey. Results obtained were consistent with the study's hypotheses. In Part 1, a couples' higher-than-average SDD on one day predicted higher-than-average sexual distress on the next day. Similarly, in Part 2's longitudinal data, higher SDD at baseline predicted higher sexual distress 12 months later. The reverse associations (i.e., sexual distress at one time point predicting SDD at the next) were non-significant in both the daily diary and longitudinal studies.

Less adaptive patterns of interaction between partners have long been reported in emotion research (Butler & Randall, 2012; Dixon-Gordon et al., 2015; Karney & Bradbury, 1995; Zaki & Williams, 2013). More recently, proposals such as the Interpersonal Emotion Regulation Model (IERM) of women's sexual dysfunction (Rosen & Bergeron, 2019) have also been supporting the hypothesis that a couple's sexual difficulties may lead to less optimal emotional co-regulation, resulting in lower individual and relational wellbeing. The IERM suggests that proximal and distal factors reciprocally influence the couples' emotion co-regulation strategies, which in turn affect individual outcomes such as sexual distress. Applied to SDD, this model suggests that proximal factors such as daily increases in SDD could lead the couple to engage in less adaptive dyadic emotion co-regulation strategies such as avoidance or conflict instead of

more adaptive strategies such as greater communication (Herbenick et al., 2014). These less adaptive strategies would limit the couple's ability to regulate their sexual distress.

Findings from Part 1 indicated that daily changes in a couples' SDD predicted next-day changes in sexual distress. This result suggests that on days when the difference in sexual desire between partners is greater, couples may interact in ways that would promote higher-than-average sexual distress the next day. For example, the lower-desire partner may react negatively to their higher-desire partner's signs of sexual interest. Should this be the case, it is likely that such reactions would increase the sexual distress in the higher-desire partner, since the negative psychological impact of sexual rejection is well-known (Dobson et al., 2020; Ford & Collins, 2013), particularly when this rejection is perceived as hostile (Kim et al., in press). This may also result in greater guilt and sexual distress for the lower-desire partner, given that low sexual desire has been associated with higher sexual guilt (Woo et al., 2011). Similarly, other scenarios, such as the low-desire partner engaging in sexual activity to avoid disappointing their partner, have also been associated with lower individual and relational wellbeing in both partners (Muise et al., 2012) and may result in both partners experiencing increased sexual distress. Finally, negative sexual interactions surrounding SDD may compound over time (e.g., leading to more frequent conflicts; (Willoughby et al., 2014), further increasing both partners' sexual distress. In this way, daily variations in SDD may affect the couples' everyday interactions and lead to increases in sexual distress that remain observable on the following day. The observation that associations between SDD and

sexual distress are greater in lower-desire couples than in higher-desire couples is consistent with this scenario.

Part 2 showed that SDD at baseline predicted sexual distress 12 months later. To our knowledge, there are no other studies examining the impact of SDD over long periods of time. However, this result is consistent with the existing clinical literature, which reports sexual desire issues such as SDD to be persistent and difficult to address (McCarthy & Oppliger, 2019; McCarthy & Ross, 2018). Furthermore, the observation that the associations between SDD and sexual distress remain significant over both days and months suggests that the everyday impacts of SDD on the couples' interactions may result in longer-term effects. The IERM is also helpful in interpreting this second result, as it proposes that distal factors (here, SDD as measured longitudinally over 12 months) also affect the couples' ability to cope effectively.

Finally, this study's third result, that sexual distress did not predict SDD, argues against possible alternative hypotheses. Indeed, various inverse scenarios could be imagined whereby sexual distress could be responsible for greater SDD in the couple – for example, that one partner's sexual distress may lead to their lower sexual desire whilst the other partner remains relatively unaffected, thereby resulting in greater SDD in the couple. This is a plausible scenario, given that in committed couples, sexual desire is known to be sensitive to individual factors such as mood and affect (Mark & Lassio, 2018). However, the observation that sexual distress does not significantly predict SDD over time suggests that such alternative interpretations may not reflect the experience of individuals in long-term relationships.

Hence, the directions of the associations observed in this study are consistent with the hypothesis that SDD plays a causal role in sexual distress. More generally, these results support IERM's proposal that sexual issues such as SDD may impact the partner's interaction, and eventually, affect the well-being of both partners. However, this study's correlational design cannot exclude the possibility of an unknown common third factor simultaneously responsible for the increases in both SDD and sexual distress.

This research is novel in many respects. Firstly, this study provided the first empirical investigation into an area of great clinical importance (namely the associations between SDD and sexual distress). Further, the results reported here stem from both a daily diary study and a longitudinal survey on the same sample of participants, which is helpful if we intend to better understand the bridge between proximal, everyday interactions between partners and the more distal, longer-term phenomena that shape the couples' sexual relationship over time. From a methodological standpoint, these designs allowed us to extend prior research by examining the directionality of associations between SDD and sexual distress. Finally, samples that are inclusive of sexual and gender minority couples remain rare in sex research. Although testing for effects of gender and sexual orientation on associations between SDD and sexual distress was beyond the scope of the present study, the inclusive sample used here may have yielded results that are more representative of the general population.

Study limitations include the use of online questionnaires. Although generally reported as an advantage by the participants, it is recognized that such an approach may have biased the sample towards e.g., younger couples. Similarly, including in the study's

inclusion criteria a requirement that couples be sexually active may have biased the study towards participants with a greater-than-average sexual activity (Velten & Margraf, 2017). Another possible bias in this study is that repeated measurements during the daily diary survey may lead to measurement reactivity in some participants – although the effects of such biases have been reported to be modest (Barta et al., 2012). Further, this research used abridged measures of sexual desire and sexual distress in the daily diary study. Although diary studies require questionnaires to be short to minimize attrition and maximize completion rates, such abridged measures warrant rigorous validation in future work. Furthermore, SDD is by nature a difference score, and whilst the variable's reliability was verified in the present study, the psychometric properties of this measure should be validated more rigorously. Indeed, despite being widely used in the social sciences (Thomas & Zumbo, 2011), difference scores have been criticized, firstly on the basis that one cannot assume their validity simply because the variables they compare have themselves been validated (Cronbach & Furby, 1970), and secondly because they may overly simplify the phenomena under study (Edwards, 2001; Griffin et al., 1999). The analyses performed in this study were limited to two points of data, and thus could not identify patterns in SDD's variation over time; it is recognized that this would be an interesting avenue of future research. Finally, this study did not study in depth the possible effects of gender or orientation, nor investigated whether the associations observed varied across other lines.

Despite these limitations, the present study sheds light on a poorly researched yet important area, namely sexual desire discrepancy in committed couples. Clinically, these

results are aligned with recent recommendations for addressing SDD in sexually distressed couples (Dewitte et al., 2020), which emphasize the importance of focusing on the couple and its dynamics, rather than focusing on and potentially pathologizing one of the partners. Furthermore, these results suggest that targeting SDD directly (e.g., by helping couples better synchronize their sexual desire, or by examining whether SDD is indicative of an underlying relationship issue), may be more effective than attempting to minimize the partners' sexual distress.

References

Allison, P. D. (2003). Missing data techniques for structural equation modeling. *Journal of Abnormal Psychology, 112*(4), 545-557. https://doi.org/10.1037/0021-843X.112.4.545

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed ed.). American Psychiatric Association. https://doi.org/10.1176/appi.books.9780890425596

Bancroft, J., Loftus, J., & Long, J. S. (2003a). Distress about sex: A national survey of women in heterosexal relationships. *Archives of Sexual Behavior, 32*(3), 193-208. https://doi.org/10.1023/A:1023420431760

Bancroft, J., Loftus, J., & Long, J. S. (2003b). Distress about sex: A national survey of women in heterosexual relationships. *Archives of Sexual Behavior, 32*(3), 193-208. https://doi.org/10.1023/A:1023420431760

Barta, W. D., Tennen, H., & Litt, M. D. (2012). Measurement reactivity in diary research. In M. R. Mehl & T. S. Conner (Eds.), *Handbook of research methods for studying daily life* (pp. 108-123). The Guilford Press.

Bauer, G. R., Braimoh, J., Scheim, A. I., & Dharma, C. (2017). Transgender-inclusive measures of sex/gender for population surveys: Mixed-methods evaluation and recommendations. *PLoS ONE, 12*(5), e0178043. https://doi.org/10.1371/journal.pone.0178043

Blumenstock, S. M., & Papp, L. M. (2017). Sexual distress and marital quality of newlyweds: An investigation of sociodemographic moderators. *Family Relations, 66*(5), 794-808. https://doi.org/10.1111/fare.12285

Bridges, S. K., & Horne, S. G. (2007). Sexual satisfaction and desire discrepancy in same sex women's relationships. *Journal of Sex & Marital Therapy, 33*(1), 41-53. https://doi.org/10.1080/00926230600998466

Brotto, L., Atallah, S., Johnson-Agbakwu, C., Rosenbaum, T., Abdo, C., Byers, E. S., Graham, C., Nobre, P., & Wylie, K. (2016). Psychological and interpersonal dimensions of sexual function and dysfunction. *Journal of Sexual Medicine, 13*(4), 538-571. https://doi.org/10.1016/j.jsxm.2016.01.019

Broussard, K. A., Warner, R. H., & Pope, A. R. D. (2017). Too many boxes, or not enough? Preferences for how we ask about gender in cisgender, lgb, and gender-diverse samples. *Sex Roles, 78*(9-10), 606-624. https://doi.org/10.1007/s11199-017-0823-2

Burri, A., & Spector, T. (2011). Recent and lifelong sexual dysfunction in a female uk population sample: Prevalence and risk factors. *Journal of Sexual Medicine, 8*(9), 2420-2430. http://www.ncbi.nlm.nih.gov/pubmed/21676186

Butler, E. A., & Randall, A. K. (2012). Emotional coregulation in close relationships. *Emotion Review, 5*(2), 202-210. https://doi.org/10.1177/1754073912451630

Byers, E. S. (2005). Relationship satisfaction and sexual satisfaction: A longitudinal study of individuals in long-term relationships. *Journal of Sex Research, 42*(2), 113-118. https://doi.org/10.1080/00224490509552264

Cronbach, L. J., & Furby, L. (1970). How we should measure "change" – or should we? *Psychological Bulletin, 74*(1), 68-80. https://doi.org/10.1037/h0029382

Davies, S., Katz, J., & Jackson, J. L. (1999). Sexual desire discrepancies: Effects on sexual and relationship satisfaction in heterosexual dating couples. *Archives of Sexual Behavior 28*(6), 553-567. https://doi.org/10.1023/A:1018721417683

Dennerstein, L., Guthrie, J. R., Hayes, R. D., DeRogatis, L. R., & Lehert, P. (2008). Sexual function, dysfunction, and sexual distress in a prospective, population-based sample of mid-aged, australian-born women. *Journal of Sexual Medicine, 5*(10), 2291-2299. https://doi.org/10.1111/j.1743-6109.2008.00936.x

Derogatis, L. R., Clayton, A., Lewis-D'Agostino, D., Wunderlich, G., & Fu, Y. (2008). Validation of the female sexual distress scale-revised for assessing distress in women with hypoactive sexual desire disorder. *Journal of Sexual Medicine, 5*(2), 357-364. https://doi.org/10.1111/j.1743-6109.2007.00672.x

Derogatis, L. R., Rosen, R., Leiblum, S., Burnett, A., & Heiman, J. (2002). The female sexual distress scale (fsds): Initial validation of a standardized scale for assessment of sexually related personal distress in women. *Journal of Sex & Marital Therapy, 28*(4), 317-330. https://doi.org/10.1080/00926230290001448

Dewitte, M. (2014). On the interpersonal dynamics of sexuality. *Journal of Sex & Marital Therapy, 40*(3), 209-232. https://doi.org/10.1080/0092623X.2012.710181

Dewitte, M., Carvalho, J., Corona, G., Limoncin, E., Pascoal, P., Reisman, Y., & Stulhofer, A. (2020). Sexual desire discrepancy: A position statement of the european society for sexual medicine. *Journal of Sexual Medicine, 8*(2), 121-131. https://doi.org/10.1016/j.esxm.2020.02.008

Dixon-Gordon, K. L., Bernecker, S. L., & Christensen, K. (2015). Recent innovations in the field of interpersonal emotion regulation. *Current Opinion in Psychology, 3*, 36-42. https://doi.org/10.1016/j.copsyc.2015.02.001

Dobson, K., Zhu, J., Balzarini, R. N., & Campbell, L. (2020). Responses to sexual advances and satisfaction in romantic relationships: Is yes good and no bad? *Social Psychological and Personality Science, 1*(11), 1-11. https://doi.org/10.1177/1948550619888884

Dunn, K. M., Croft, P. R., & Hackett, G. I. (2000). Satisfaction in the sex life of a general population sample. *Journal of Sex and Marital Therapy, 26*(2), 141-151. https://doi.org/10.1080/009262300278542

Edwards, J. R. (2001). Ten difference score myths. *Organizational Research Methods, 4*(3), 265-287. https://doi.org/10.1177/109442810143005

Feldt, L. S. (1995). Estimation of the reliability of differences under revised reliabilities of component scores. *Journal of Educational Measurement, 32*(3), 295-301. https://doi.org/10.1111/j.1745-3984.1995.tb00468.x

Ford, M. B., & Collins, N. L. (2013). Self-esteem moderates the effects of daily rejection on health and well-being. *Self and Identity, 12*(1), 16-38. https://doi.org/10.1080/15298868.2011.625647

Gagné, F. M., & Lydon, J. E. (2004). Bias and accuracy in close relationships: An integrative review. *Personality and Social Psychology Review, 8*(4), 322-338. https://doi.org/10.1207/s15327957pspr0804_1

Gefen, D., Straub, D. W., & Boudreau, M.-C. (2000). Structural equation modeling and regression: Guidelines for research practice. *Communications of AIS, 4*(7), 2-76. https://doi.org/10.17705/1CAIS.00407

Graham, C. A., Catania, J. A., Brand, R., Duong, T., & Canchola, J. A. (2003). Recalling sexual behavior: A methodological analysis of memory recall bias via interview using the diary as the gold standard. *Journal of Sexual Research, 40*(4), 325-332. https://doi.org/10.1080/00224490209552198

Griffin, D., Murray, S., & Gonzalez, R. (1999). Difference score correlations in relationship research: A conceptual primer. *Personal Relationships, 6*, 505-518. https://doi.org/10.1111/j.1475-6811.1999.tb00206.x

Hamaker, E. L., Zhang, Z., & van der Maas, H. L. J. (2009). Using threshold autoregressive models to study dyadic interactions. *Psychometrika, 74*(4), 727-745. https://doi.org/10.1007/s11336-009-9113-4

Heiman, J. R., Long, J. S., Smith, S. N., Fisher, W. A., Sand, M. S., & Rosen, R. C. (2011). Sexual satisfaction and relationship happiness in midlife and older couples in five countries. *Archives of Sexual Behavior, 40*(4), 741-753. https://doi.org/10.1007/s10508-010-9703-3

Hendrickx, L., Gijs, L., & Enzlin, P. (2015). Age-related prevalence rates of sexual difficulties, sexual dysfunctions, and sexual distress in heterosexual women: Results from an online survey in flanders. *Journal of Sexual Medicine, 12*(2), 424-435. https://doi.org/10.1111/jsm.12725

Hendrickx, L., Gijs, L., Janssen, E., & Enzlin, P. (2016). Predictors of sexual distress in women with desire and arousal difficulties: Distinguishing between personal, partner, and interpersonal distress. *Journal of Sexual Medicine, 13*(11), 1662-1675. https://doi.org/10.1016/j.jsxm.2016.09.016

Herbenick, D., Mullinax, M., & Mark, K. P. (2014). Sexual desire discrepancy as a feature, not a bug, of long-term relationships: Women's self-reported strategies for modulating sexual desire. *Journal of Sexual Medicine, 11*(9), 2196-2206. https://doi.org/10.1111/jsm.12625

Hogue, J. V., Rosen, N. O., Bockaj, A., Impett, E. A., & Muise, A. (2019). Sexual communal motivation in couples coping with low sexual interest/arousal: Associations with sexual well-being and sexual goals. *PLoS ONE, 14*(7), e0219768. https://doi.org/10.1371/journal.pone.0219768

Hox, J. J. (2002). *Multilevel analysis, techniques and applications*. https://doi.org/10.4324/9781410604118

Hox, J. J., & Bechger, T. M. (1998). An introduction to structural equation modeling. *Family Science Review, 11*, 354-373.

Jasso, G. (1985). Marital coital frequency and the passage of time: Estimating the separate effects of spouses' ages and marital duration, birth and marriage cohorts, and period influences. *American Sociological Review, 50*(2), 224-241. https://doi.org/10.2307/2095411

Karney, B. R., & Bradbury, T. N. (1995). The longitudinal course of marital quality and stability: A review of theory, method and research. *Psychological Bulletin, 118*(1), 3-34. https://doi.org/10.1037/0033-2909.118.1.3

Kim, J. J., Muise, A., Sakaluk, J. K., Rosen, N. O., & Impett, E. A. (in press). When tonight is not the night: Sexual rejection behaviors and satisfaction in romantic relationships. *Personality and Social Psychology Bulletin*.

Kleinplatz, P. J., Paradis, N., Charest, M., Lawless, S., Neufeld, M., Neufeld, R., Pratt, D., Menard, A. D., Buduru, B., & Rosen, L. (2017). From sexual desire discrepancies to

desirable sex: Creating the optimal connection. *Journal of Sex and Marital Therapy*, 1-12. https://doi.org/10.1080/0092623X.2017.1405309

Klusman, D. (2002). Sexual motivation and the duration of partnership. *Archives of Sexual Behavior, 31*(3), 275-287. https://doi.org/10.1023/A:1015205020769

Laumann, E. O., Gagnon, J. H., Michael, R. T., & Michaels, S. (1996). National health and social life survey, 1992. *Inter-university Consortium for Political and Social Research*. https://doi.org/10.3886/ICPSR06647

Laurenceau, J.-P., & Bolger, N. (2012). Analyzing diary and intensive longitudinal data from dyads. In *Handbook of research methods for studying daily life* (pp. 407-422).

Levine, S. B. (2002). Reexploring the concept of sexual desire. *Journal of Sex & Marital Therapy, 28*(1), 39-51. https://doi.org/10.1080/009262302317251007

Lindau, S. T., Schumm, L. P., Laumann, E. O., Levinson, W., O'Muircheartaigh, C. A., & Waite, L. J. (2007). A study of sexuality and health among older adults in the united states. *The New England Journal of Medicine, 357*, 762-774. https://doi.org/10.1056/NEJMoa067423

Mark, K. P. (2012). The relative impact of individual sexual desire and couple desire discrepancy on satisfaction in heterosexual couples. *Sexual and Relationship Therapy, 27*(2), 133-146. https://doi.org/10.1080/14681994.2012.678825

Mark, K. P. (2014). The impact of daily sexual desire and daily sexual desire discrepancy on the quality of the sexual experience in couples. *Canadian Journal of Human Sexuality, 23*(1), 27-33. https://doi.org/10.3138/cjhs.23.1.A2

Mark, K. P. (2015). Sexual desire discrepancy. *Current Sexual Health Reports, 7*(3), 198-202. https://doi.org/10.1007/s11930-015-0057-7

Mark, K. P., Bunting, A., & Moore, S. (2018). Sexual desire and modulation of desire discrepancy in a sample of bisexual women in long-term relationships with men. *The Journal of Sexual Medicine, 15*(6), S111-S112. https://doi.org/10.1016/j.jsxm.2018.03.046

Mark, K. P., Herbenick, D., Fortenberry, J. D., Sanders, S., & Reece, M. (2014). A psychometric comparison of three scales and a single-item measure to assess sexual satisfaction. *Journal of Sexual Research, 51*(2), 159-169. https://doi.org/10.1080/00224499.2013.816261

Mark, K. P., & Lassio, J. A. (2018). Maintaining sexual desire in long-term relationships: A systematic review and conceptual model. *Journal of Sex Research, 55*(4-5), 563-581. https://doi.org/10.1080/00224499.2018.1437592

Mark, K. P., Leistner, C. E., & Dai, M. (2019). Daily sexual desire and its impact on next-day desire and behavior in mixed sex couples. *Archives of Sexual Behavior*. https://doi.org/10.1007/s10508-018-1320-6

Mark, K. P., & Murray, S. H. (2012). Gender differences in desire discrepancy as a predictor of sexual and relationship satisfaction in a college sample of heterosexual romantic relationships. *Journal of Sex & Marital Therapy, 38*(2), 198-215. https://doi.org/10.1080/0092623X.2011.606877

McCarthy, B. W., & Farr, E. (2012). Strategies and techniques to maintain sexual desire. *Journal of Contemporary Psychotherapy, 42*(4), 227-233. https://doi.org/10.1007/s10879-012-9207-7

McCarthy, B. W., & Oppliger, T. R. (2019). Treatment of desire discrepancy: One clinician's approach. *Journal of Sex and Marital Therapy*, 1-9. https://doi.org/10.1080/0092623X.2019.1594475

McCarthy, B. W., & Ross, L. W. (2018). Maintaining sexual desire and satisfaction in securely bonded couples. *The Family Journal, 26*(2), 217-222. https://doi.org/10.1177/1066480718775732

McNulty, J. K., Wenner, C. A., & Fisher, T. D. (2016). Longitudinal associations among relationship satisfaction, sexual satisfaction, and frequency of sex in early marriage. *Archives of Sexual Behavior, 45*(1), 85-97. https://doi.org/10.1007/s10508-014-0444-6

Meana, M. (2010). Elucidating women's (hetero)sexual desire: Definitional challenges and content expansion. *Journal of Sex Research, 47*(2), 104-122. https://doi.org/10.1080/00224490903402546

Muise, A., Bergeron, S., Impett, E. A., Delisle, I., & Rosen, N. O. (2018). Communal motivation in couples coping with vulvodynia: Sexual distress mediates associations with pain, depression, and anxiety. *Journal of Psychosomatic Research, 106*, 34-40. https://doi.org/10.1016/j.jpsychores.2018.01.006

Muise, A., Impett, E. A., & Desmarais, S. (2012). Getting in on versus getting it over with: Sexual motivation, desire and satisfaction in intimate bonds. *Personality and Social Psychology Bulletin, 39*(10), 1320-1332. https://doi.org/10.1177/0146167213490963

Muthén, L. K., & Muthén, B. O. (2015). *Mplus user's guide. Seventh edition*. Muthén & Muthén.

Pereira, T. J., Machado, P. P. P., & Peixoto, M. M. (2019). Sexual and relationship satisfaction: The role of perceived (non)problematic sexual desire discrepancy in gay and heterosexual men. *Journal of Sex and Marital Therapy, 45*(2), 103-113. https://doi.org/10.1080/0092623X.2018.1488323

Preacher, K. J., Zhang, Z., & Zyphur, M. J. (2016). Multilevel structural equation models for assessing moderation within and across levels of analysis. *Psychological Methods, 21*(2), 189-205. https://doi.org/10.1037/met0000052

Raposo, S., Rosen, N. O., & Muise, A. (2019). Self-expansion is associated with greater relationship and sexual well-being for couples coping with low sexual desire. *Journal of Social and Personal Relationships, 37*(2), 602-623. https://doi.org/10.1177/0265407519875217

Reece, R. (1987). Causes and treatments of sexual desire discrepancies in male couples. *Journal of Homosexuality, 14*(1-2), 157-172. https://doi.org/10.1300/J082v14n01_12

Ridley, C. A., Cate, R. M., Collins, D. M., Reesing, A. L., Lucero, A. A., Gilson, M. S., & Almeida, D. M. (2006). The ebb and flow of marital lust: A relational approach. *The Journal of Sex Research, 43*(2), 144-153. https://doi.org/10.1080/00224490609552309

Rogosa, D. R., & Willett, J. B. (1983). Demonstrating the reliability of the difference score in the measurement of change. *Journal of Educational Measurement, 20*(4), 335-343. https://doi.org/10.1111/j.1745-3984.1983.tb00211.x

Rosen, N. O., Bailey, K., & Muise, A. (2017). Degree and direction of sexual desire discrepancy are linked to sexual and relationship satisfaction in couples transitioning to parenthood. *Journal of Sex Resarch*, 1-12. https://doi.org/10.1080/00224499.2017.1321732

Rosen, N. O., & Bergeron, S. (2019). Genito-pelvic pain through a dyadic lens: Moving toward an interpersonal emotion regulation model of women's sexual dysfunction. *Journal of Sexual Research, 56*(4-5), 440-461. https://doi.org/10.1080/00224499.2018.1513987

Rosen, R. C., Shifren, J. L., Monz, B. U., Odom, D. M., Russo, P. A., & Johannes, C. B. (2009). Correlates of sexually related personal distress in women with low sexual desire.

Journal of Sexual Medicine, 6(6), 1549-1560. https://doi.org/10.1111/j.1743-6109.2009.01252.x

Santos-Iglesias, P., Mohamed, B., Danko, A., & Walker, L. M. (2018). Psychometric validation of the female sexual distress scale in male samples. *Archives of Sexual Behavior*. https://doi.org/10.1007/s10508-018-1146-2

Scott, C., F., & Sprecher, S. (2000). Sexuality in marriage, dating and other relationships: A decade review. *Journal of Marriage and Family, 62*, 999-1017. https://doi.org/10.1111/j.1741-3737.2000.00999.x

Selig, J. P., & Little, T. D. (2012). Autoregressive and cross-lagged panel analysis for longitudinal data. In B. Laursen, T. D. Little, & N. A. Card (Eds.), *Handbook of developmental research methods* (pp. 265-278). The Guilford Press.

Shanock, L. R., Baran, B. E., Gentry, W. A., Pattison, S. C., & Heggestad, E. D. (2010). Polynomial regression with response surface analysis: A powerful approach for examining moderation and overcoming limitations of difference scores. *Journal of Business and Psychology, 25*(4), 543-554. https://doi.org/10.1007/s10869-010-9183-4

Shifren, J. L., Monz, B. U., Russo, P. A., Segreti, A., & Johannes, C. B. (2008). Sexual problems and distress in united states women: Prevalence and correlates. *Obstetrics & Gynecolology, 112*, 970-978. https://doi.org/10.1097/AOG.0b013e3181898cdb

Spector, I. P., Carey, M. P., & Steinberg, L. (1996). The sexual desire inventory: Development, factor structure, and evidence of reliability. *Journal of Sex & Marital Therapy, 22*(3), 175-190. https://doi.org/10.1080/00926239608414655

Sprecher, S. (2002). Sexual satisfaction in premarital relationships: Associations with satisfaction, love, commitment, and stability. *Journal of Sex Research, 39*(3), 190-196. https://doi.org/10.1080/00224490209552141

Stephenson, K. R., & Meston, C. M. (2010). Differentiating components of sexual well-being in women: Are sexual satisfaction and sexual distress independent constructs? *Journal of Sexual Medicine, 7*(7), 2458-2468. https://doi.org/10.1111/j.1743-6109.2010.01836.x

Sutherland, S. E., Rehman, U. S., Fallis, E. E., & Goodnight, J. A. (2015). Understanding the phenomenon of sexual desire discrepancy in couples. *Canadian Journal of Human Sexuality, 24*(2), 141-150. https://doi.org/10.3138/cjhs.242.A3

Tavakol, M., & Dennick, R. (2011). Making sense of cronbach's alpha. *International Journal of Medical Education, 2*, 53-55. https://doi.org/10.5116/ijme.4dfb.8dfd

Thomas, D. R., & Zumbo, B. D. (2011). Difference scores from the point of view of reliability and repeated-measures anova. *Educational and Psychological Measurement, 72*(1), 37-43. https://doi.org/10.1177/0013164411409929

Vaillancourt-Morel, M.-P., Rosen, N. O., Willoughby, B. J., Leonhardt, N. D., & Bergeron, S. (2020). Pornography use and romantic relationships: A dyadic daily diary

study. *Journal of Social and Personal Relationships, 37*(10-11), 2802-2821. https://doi.org/10.1177/0265407520940048

Velten, J., & Margraf, J. (2017). Satisfaction guaranteed? How individual, partner, and relationship factors impact sexual satisfaction within partnerships. *PLoS ONE, 12*(2), e0172855. https://doi.org/10.1371/journal.pone.0172855

Vowels, M. J., Mark, K. P., Vowels, L. M., & Wood, N. D. (2018). Using spectral and cross-spectral analysis to identify patterns and synchrony in couples' sexual desire. *PLoS ONE, 13*(10), e0205330. https://doi.org/10.1371/journal.pone.0205330

West, S. G., Taylor, A. B., & Wu, W. (2012). Model fit and model selection in structural equation modeling. In R. H. Hoyle (Ed.), *Handbook of structural equation modeling* (pp. 209-231). Guilford Press.

Willoughby, B. J., Farero, A. M., & Busby, D. M. (2014). Exploring the effects of sexual desire discrepancy among married couples. *Archives of Sexual Behavior, 43*(3), 551-562. https://doi.org/10.1007/s10508-013-0181-2

Wittenborn, A. K., Dolbin-MacNab, M. L., & Keiley, M. K. (2013). Dyadic research in marriage and family therapy: Methodological considerations. *Journal of Marital and Family Therapy, 39*(1), 5-16. https://doi.org/10.1111/j.1752-0606.2012.00306.x

Witting, K., Santtila, P., Varjonen, M., Jern, P., Johansson, A., von der Pahlen, B., & Sandnabba, K. (2008). Female sexual dysfunction, sexual distress, and compatibility with

partner. *Journal of Sexual Medicine, 5*(11), 2587-2599. https://doi.org/10.1111/j.1743-6109.2008.00984.x

Woo, J. S., Brotto, L. A., & Gorzalka, B. B. (2011). The role of sex guilt in the relationship between culture and women's sexual desire. *Archives of Sexual Behavior, 40*(2), 385-394. https://doi.org/10.1007/s10508-010-9609-0

Zaki, J., & Williams, W. C. (2013). Interpersonal emotion regulation. *Emotion, 13*(5), 803-810. https://doi.org/10.1037/a0033839

Zilbergeld, B., & Ellison, C. R. (1980). Desire discrepancies and arousal problems in sex therapy. In S. R. Leiblum & L. A. Pervin (Eds.), *Principles and practice of sex therapy*. Guilford Press.

Figures and Tables

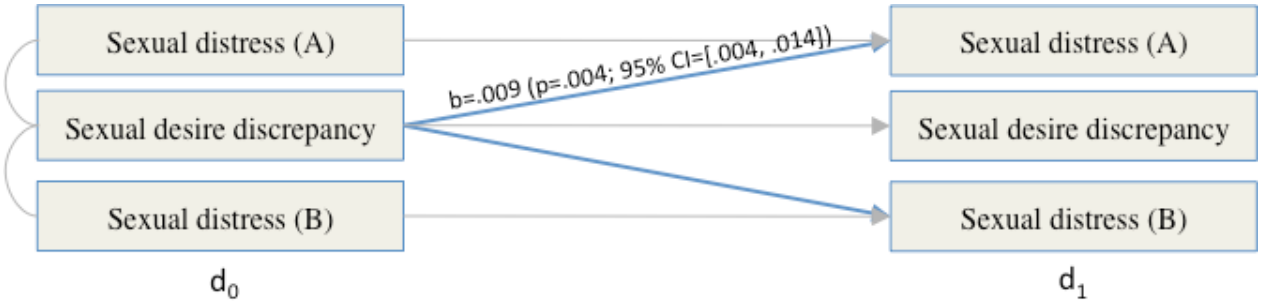
Table 2

Compensation for each partner, in proportion to the number of diaries completed.

Compensation, per partner	Number of diaries
$50	at least 30 each
$42	26-29 each
$37	23-25 each
$32	18-22 each
$20	less than 18 each

Figure 6

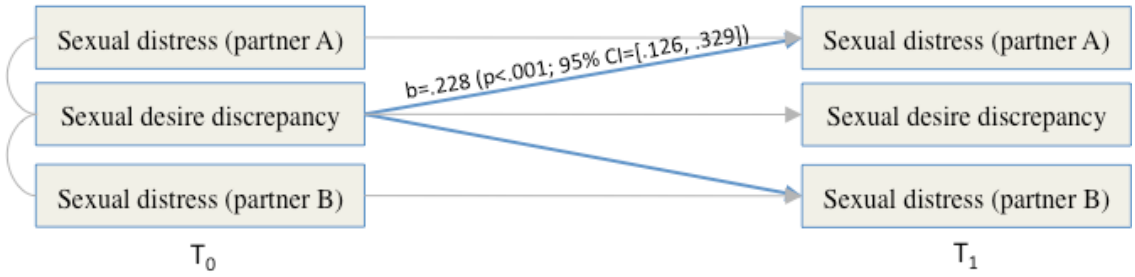
Associations Between the Couples' SDD and each Partner's Sexual Distress on One Day (d_0), and the Next Day (d_1).



Note: Light arrows represent autocorrelations between variables from one time point to another, light curved lines represent same-day associations between SDD and sexual distress at d_0, both of which were controlled for in this model. Dark arrows represent the significant associations observed between SDD on one day and sexual distress on the other, constrained to be symmetrical. The converse associations, between each partner's sexual distress on one day and the couples' SDD on the other, were not significant.

Figure 7

Associations between the couples' SDD and each partner's sexual distress at T_0, and 12 months later, at T_1.



Note: Light arrows represent autocorrelations between variables from one time point to another, and light curved lines represent associations between SDD and sexual distress at T_0, both of which were controlled for in this model. Dark arrows represent the significant associations observed between SDD on one day and sexual distress on the other, constrained to be symmetrical. The converse associations, between each partner's sexual distress on one day and the couples' SDD on the other, were not significant.

Table 3

4-item Abridged Sexual Desire Scale

1. "How often did you have sexual thoughts today?"
2. "How often did you feel sexual desire today?"
3. "How often did you feel sexual desire for your partner today?"
4. "Did you initiate or express interest in sexual activity with your partner today?"

Note. Items used a 7-point Likert scale, with responses ranging from 1 (“not at all”) to 7 (“a lot”).

Table 4

3-item abridged sexual distress scale

1. "How often did you feel distressed about your sex life."
2. "How often did you feel: - 2. Inferior because of sexual problems."
3. "How often did you feel: - 3. Worried about sex."

Note. Items used a 5-point Likert scale, with responses ranging from 0 (“never”) to 7 (“always”).

Table 5

Question and possible responses to the demographic variable gender

What is the gender with which you most identify?

1- Man
2- Woman
3- Trans-identify as man
4- Trans-identify as woman
5- Agender
6- Other (specify if you wish)

Other answers included: “genderqueer”, “genderfluid” and “non-binary”

Table 6

Question and possible responses to the demographic variable orientation

How do you define your sexual orientation ?

1- Heteroseuxal
2- Bisexual
3- Homosexual (lesbian, gay)
4- Queer
5- Pansexual (gender does not matter)
6- Asexual (no sexual attraction)
7- Uncertain or confused
8- Click to write choice

Note. Other answers included: “demisexual”, “homoflexible”

Table 7

Observed frequencies for three-value gender variable.

Gender	Frequency
Man	184
Woman	238
Genderfluid, genderqueer, non-binary	36
Total	458

Table 8

Means and Standard Deviations for 4-Week Retrospective Measures at Baseline (T_0) and 12 Months Later (T_1)

	Dyadic Sexual Desire	SDD	Sexual Distress
Baseline (T_0)	44.01 (10.19)	16.46 (13.76)	12.276 (10.33)
12-month (T_1)	40.85 (11.77)	17.72 (14.99)	11.0836 (9.89)

Note. Standard deviations are presented in parentheses. SDD: Sexual Desire Discrepancy

PART V: GENERAL DISCUSSION

This section summarizes the results of this doctoral research and its implications. The limitations of the present doctoral work are also discussed, and avenues for future research are suggested.

Summary of Research Results

Despite the central role they play in sexuality, sexual desire and sexual behaviour remain poorly understood in committed couples – particularly in how they interact between partners and associate dyadically with other fundamental constructs such as sexual satisfaction, sexual distress, and relationship intimacy. Beyond the conceptual implications of such a gap, the paucity of empirical results in this area contributes to the distance between science and clinical practice, and negatively impacts the quality of care offered to the many couples who seek help for sexual desire issues – the most common complaint in sex therapy.

The objective of this doctoral research was to help address this gap by studying sexual desire within a relational perspective. Consistent with models such as the Interpersonal Emotional Regulation Model (IERM) of Women's Sexual Dysfunction (Hofmann, 2014; Rosen & Bergeron, 2019; Zaki & Williams, 2013), our research was based on the assumption that each partner's wellbeing was influenced by that of the other partner, and that this influence was mediated in part by the couples' sexual behaviour. Much of this work was performed at a granular level, at the level of individual sexual events or from one day to the next. On the assumption that more distal associations would mirror those observed at a granular level, we also examined associations over a 12-month time span.

This section summarizes the three studies that composed this doctoral thesis.

First Article: Sexual Motives, Behaviour and Outcomes

This first study involved a sample of 35 mixed-sex newlywed couples, and tested the hypotheses that, on days when a couple reported sexual activity, self-directed sexual approach (SA) motives in either partner would be associated with greater sexual satisfaction (actor and partner effects), and that other-directed SA motives in either partner would be associated with a greater sense of intimacy, operationalized as Perceived Partner Responsiveness (PPR). It was further hypothesized that sexual behaviour would mediate these associations, with genital sexual behaviour mediating associations between self-directed SA motives and sexual satisfaction, and affectionate sexual behaviour mediating the associations between other-directed SA motive and PPR.

The analysis was performed using multilevel Actor Partner Interdependence Mediation Models (APIMeM) on differentiated (man, woman) dyads (Ledermann et al., 2011). Results showed significant positive associations between self-directed SA motives and greater sexual satisfaction on the same day for both partners (actor effects), and between men's greater self-directed SA motives and their female partner's greater sexual satisfaction (partner effects). All of these associations were mediated by genitally-focused sexual behaviour (oral sex and penile-vaginal penetration). Participants reporting self-directed SA motives also reported more genital sexual behaviour on the same day, and this was in turn associated with greater sexual satisfaction. For women, self-directed SA motives were also associated with their own PPR and that of their partner (actor and partner effects). Hence, women's reports of self-directed SA motives

were also associated with greater same-day PPR from themselves and from their partner. With regards to other-directed SA motives, associations in this sample were significant only for men. Other-directed SA motives in men were associated with greater PPR from themselves and from their partner (actor and partner effects). None of the associations with PPR were mediated by affectionate or genital sexual behaviour.

These results are generally in line with the study's hypotheses, and with findings from other studies on sexual motives. In particular, the intra-individual (actor) association between self-directed SA motives and sexual satisfaction was also reported by Muise et al. (2012). The observed (partner) association between men's self-directed SA motive and women's sexual satisfaction is to our knowledge novel, and consistent with the suggestion that a greater sense of self-agency in either partner would be sexually satisfying to the other. Note that the partner association between women's self-directed SA motive and men's sexual satisfaction was positive but not significant, a result which may be due to the relatively small sample size.

That genital sexual behaviour played a mediating role in both actor and partner associations between self-directed SA motives and sexual satisfaction is also a novel result. One explanation for this result is that men's desire to please themselves leads to an increase in genital sexual behaviour during sexual activity (here, vaginal intercourse and oral sex). These behaviours, being associated with sexual arousal and a higher likelihood of orgasm in both partners, may result in their greater sexual satisfaction. The mediating role of genital sexual behaviour also provides an explanation for the gendered partner effect observed for sexual satisfaction, whereby only men's self-directed SA

motives resulted in greater sexual satisfaction in their female partners. In mixed-sex couples, sexual activity such as vaginal penetration and oral sex is more frequently initiated by men than women (Clark, 1989; DeLamater, 1987). Given that genital behaviour is associated with greater sexual arousal and a higher likelihood of orgasm, it may result in greater sexual satisfaction for both partners.

The associations between men's other-directed SA motives and greater PPR are also in line with the study's hypotheses, and intra-individual (actor) associations between other-directed SA motives and relationship well-being have been reported elsewhere (Impett et al., 2013). It is possible that men's greater focus on their partner during sexual activity may result in a greater feeling of intimacy in both partners, and a greater chance of orgasm in women. Alternatively, it is also plausible that on days when men feel greater intimacy with their partner, they may be more open to, and perceptive of their partner's needs, and thereby report more other-directed SA motives.

Contrary to hypotheses, we observed that for women, self-directed (and not other-directed) SA motives were associated with their PPR and that of their partners. It is possible that in this sample of sexually satisfied newlywed couples, women who were self-motivated disclosed their sexual needs more clearly and assertively, and were received more positively by their male partners. Under such conditions, the Responsiveness Model (Reis et al., 2004) suggests that feelings of intimacy would increase in both partners; and would explain the observed association between women's self-directed SA motives and PPR. The same Responsiveness Model may be used in interpreting the gender differences observed in the associations between sexual motives

and PPR. Indeed, we should expect that expressing more vulnerable forms of disclosure would lead to a greater sense of intimacy. This would be the case for less gender-stereotyped sexual motives (for men, relational; for women, a greater focus on self-pleasure) (Browning et al., 2000; Impett et al., 2005). The fact that sexual behaviour mediated associations with sexual satisfaction but not with PPR reinforces the proposal that sexual desire and intimacy result from distinct processes (Diamond, 2004). It is possible that the couple interactions that mediate the associations between SA motives and PPR are non-sexual, or that they were not captured by the daily diary measures.

This study is limited by its small and homogeneous sample, and by its focus on one aspect of sexual desire, that is sexual approach motives. Nonetheless, it provides novel results in an important but rarely studied area of sex research, namely, the everyday evolution of sexuality in non-clinical, committed couples.

Second Article: Sexual Difficulties, Sexual Behaviour and Sexual Satisfaction

This study involved the same Kinsey sample of 35 couples as Study 1. It tested the hypothesis that, on days when a couple reported sexual activity, sub-clinical sexual difficulties experienced by either partner – specifically, low subjective sexual arousal (an aspect of sexual desire), low physiological sexual arousal and genito-pelvic pain – would be associated with lower sexual satisfaction in both partners (actor and partner effects). Furthermore, it was hypothesized that sexual behaviour would be one mediator of these associations, with greater reported sexual difficulties being associated with a more restricted range of sexual behaviours during sexual activity, and that this would be associated with lower sexual satisfaction.

Findings showed that although the couples reported on average high levels of sexual satisfaction, sexual difficulties were frequently reported on days of sexual activity. For all the couples in the sample, the frequency and intensity of these sexual difficulties were insufficient to meet DSM-5 criteria for sexual disorders (American Psychiatric Association, 2013), and were not associated with lower sexual frequency. The hypothesized associations were then tested using Actor Partner Interdependence Mediation Models (APIMeM) on differentiated (man, woman) dyads (Ledermann et al., 2011). Results showed significant positive associations between lower subjective sexual arousal and lower sexual satisfaction on the same day for both partners (actor effects), and between one partner's lower subjective sexual arousal and their partner's lower sexual satisfaction (partner effects). All of these associations were mediated by genital sexual behaviour. Participants reporting lower subjective sexual arousal also reported a more restricted range of sexual behaviours on the same day, and this was in turn associated with lower sexual satisfaction. Other sexual difficulties also showed an intra-individual association with lower sexual satisfaction (actor effects); these were not mediated by the range of sexual behaviour.

The observed event-level associations between non-clinical sexual difficulties and lower sexual satisfaction are novel, and consistent with studies where more significant, clinical levels of sexual dysfunction were associated with decreased sexual satisfaction (Bergeron et al., 2014; Brotto et al., 2016; Sanchez-Fuentes et al., 2014). The presence of sexual difficulties may detract both partners from attending to the more positive physical and emotional cues of sexual interactions, and lead to lower sexual satisfaction.

The fact that, of all the difficulties studied here, only subjective sexual arousal showed partner effects, supports the hypothesis that subjective sexual arousal (as well as sexual desire more generally) is a central aspect of couples' sexuality (Levine, 2003). It is possible that lower subjective sexual arousal in one partner leads the other to feel less desirable and less engaged, and ultimately, less satisfied sexually on that day. In this way, low subjective sexual arousal may act together with the range of sexual activity to mediate the partner effects associated with sexual difficulties. Alternatively, the strength of this partner effect may overshadow that of other comorbid sexual difficulties. Both these interpretations are consistent with the Dual Control Model (Janssen & Bancroft, 2007), as other sexual difficulties would arguably be experienced as aversive cues, and would therefore inhibit subjective sexual arousal during sexual activity; this inhibition would arguably lead to less varied sexual behaviour.

That the range of sexual behaviour was a mediator in these associations is also novel, and supports the proposal that subjective sexual arousal facilitates sexual behaviour. This result is consistent with reports that lower sexual desire in general is associated with reductions in the range of sexual behaviour (Hall, 2010; McCarthy & Wald, 2012). Similarly, in a daily diary study of young women, sexual interest was a significant predictor of a range of sexual behaviours, including oral sex, as well as vaginal and anal penetrative sex (Fortenberry & Hensel, 2011). Furthermore, a greater range of sexual behaviours has been associated with higher sexual satisfaction (Fisher et al., 2015; Gillespie, 2016).

Studies of dyadic, event-level sexual phenomena are rare, which is an important gap when one considers the fundamentally relational nature of sexuality. Despite limitations, the results of this study help fill this gap, and suggest how the cumulative effect of difficulties and behaviours between partners during individual sexual events may serve as proximal causes of larger-scale dissatisfaction and dysfunction.

Third Article: Dyadic Sexual Desire Discrepancy and Sexual Distress

This final study was comprised of an inclusive sample of 229 committed couples, and collected two sets of data, a 35-day daily diary and a 12-month longitudinal survey. The objective was to examine the extent to which, in committed couples, dyadic sexual desire discrepancy (SDD, i.e., the magnitude of the difference in dyadic sexual desire between partners) predicted each partner's sexual distress. Controlling for participant age and for pre-existing associations between variables, it was expected that SDD would predict sexual distress proximally, from one day to the next, and distally, over 12 months. It was further expected that the converse association would not hold, namely that sexual distress would not predict SDD.

Study findings were consistent with hypotheses. In the daily diary dataset, greater than average SDD on one day predicted greater than average sexual distress on the next. Similarly, in the longitudinal dataset, SDD predicted sexual distress over a 12-month time span. The opposite-direction associations, whereby sexual distress at one time point predicted values of SDD at a subsequent time, were not significant in either dataset. These results support conceptual frameworks such as the Interpersonal Emotion Regulation Model (IERM) of Women's Sexual Dysfunction (Rosen & Bergeron, 2019).

Although initially proposed in the context of couples dealing with women's Genito-Pelvic Pain/Penetration Disorder (GPPPD), the IERM generalizes readily to other sexual difficulties, notably to sexual desire issues such as SDD. The model proposes that proximal and distal factors reciprocally influence the couples' emotional regulation strategies, which in turn affect individual outcomes such as sexual distress. Hence, this model helps to create a consistent picture from the proximal, day-to-day results obtained from the daily diary dataset and the more distal results obtained from the 12-month longitudinal dataset. Specifically, results suggest that on days where a couple's SDD was higher, partners would interact in ways which would tend to increase each partner's sexual distress, and that this effect would be observable on the following day. For example, the lower-desire partner may react negatively to the higher-desire partner's signs of sexual interest, increasing the sexual distress in both partners. Such a scenario is plausible, given the observation that sexual rejection was associated with negative affect in the initiator (Ford & Collins, 2013), and that individuals with lower sexual desire tend to report greater sexual guilt (Muise et al., 2016; Woo et al., 2011). It was further argued that, should negative scenarios such as this one occur repeatedly in the couple, their effect might compound over time, leading to a durable increase in couple conflicts and sexual distress. Through such a process, the proximal association between daily variations in SDD and sexual distress would come to be reflected in more stable associations over longer periods of time. Indeed, SDD has been reported in the clinical literature to be persistent and difficult to address (McCarthy & Oppliger, 2019; McCarthy & Ross, 2018).

The fact that sexual distress did not predict SDD either proximally or distally would argue against alternative interpretations, for example whereby the sexual distress in one or both partners leads to an increased SDD in the couple by further depressing the lower-desire partner's libido. Finally, the study results' robustness to the effects of age and relationship duration suggest that although sexual distress decreases on average with age (Hendrickx et al., 2015; Shifren et al., 2008), discrepancies in sexual desire between partners may continue to remain significant issues as the couple evolves, beyond the effects of age and relationship duration.

This study is novel for many reasons. Firstly, dyadic studies remain rare in sex research, particularly in inclusive samples of committed couples. This is an important gap, as evidenced by the growing number of partner effects reported by recent research (Dewitte et al., 2020; Impett et al., 2005; Rosen et al., 2015b). Further, few studies explore the daily evolution of sexual desire and its associations over time. The present work helped to address this gap, and supports conceptual frameworks that suggest how such daily interactions relate to more stable associations. These contributions may also be of interest to clinicians, as they support existing practices which focus on everyday interactions – particularly those related to discrepancies in partners' sexual desire – when addressing complaints of sexual distress in committed couples.

Implications and Directions for Future Research

Overall, findings from all three studies of this doctoral research consistently support the view that in committed couples, everyday variations in each partner's sexual desire are associated with indicators of sexual wellbeing such as sexual satisfaction and sexual distress, and that these associations are mediated by the couple's interactions, including variations in their sexual behaviour. Furthermore, the third study begins to establish a direction and span to these associations, by suggesting that issues with sexual desire discrepancy are predictive of sexual distress from one day to the next, and that these daily, proximal associations are mirrored by more distal associations spanning a year or more.

Within this very general framework, the following section discusses some of the more specific implications suggested by our work, and suggests directions for future research.

Sexual Desire, Motives and Behaviour: Differentiating the Processes at Play During Sex

One important implication of this thesis is that findings support the suggestion that different processes are simultaneously occurring when a couple engages in sexual activity. The idea that a couple has sex for many reasons is far from new. For example, Meston and Buss (2007) collated 237 different motives for having sex from a cross-sectional survey of college students, and observed that these motives factored into groups, named physical, emotional, insecurity (i.e., self-enhancement) and goal attainment (i.e., instrumental). The authors also note that the survey respondents

endorsed multiple motives simultaneously, an observation we also see at an event-level in our own studies.

Of the multiple reasons to have sex, one distinction that appears fundamental is the difference between a desire for sexual gratification and for relational intimacy. Indeed, as suggested by different authors (Diamond, 2004), sex and love appear to be governed by interrelated but distinct processes, to be related to different evolutionary goals (i.e., mating and pair bonding), and to correspond to identifiably distinct neural substrates (Panksepp, 2011). Work on *communal motivation* by Muise and Impett (2015) is also consistent with this differentiated model, as it suggests that sex performed for the other can also lead to greater individual and relational wellbeing – with the important caveat that one should not give to the point of self-neglect. The present work supports these proposals, and shows that in committed couples, differences in sexual approach (SA) motives and in sexual behaviour may reflect the mix of processes at play in a given sexual activity.

Differentiating Self- and Other-Sexual Motives. The distinction made in our first study, between self- and other- SA motives, has proven productive in this sense. Indeed, previous work had shown that SA motives in general were associated both with greater sexual satisfaction and relational intimacy (Gable & Impett, 2012; Impett et al., 2005; Impett et al., 2008b). Distinguishing between self- and other- SA motives allowed us to observe that these two motives associate differently with each outcome, consistent with the proposal that sexuality and intimacy arise from two distinct but interrelated processes.

Differentiating Sexual Behaviour. Related to this work on sexual motives is the distinction made between genital and affective behaviours during sexual activity. Despite this difference being intuitive, we are aware of no study that has contrasted these two types of behaviours at the level of individual sexual activity in committed couples. Indeed, while genitally focused sexual behaviours (manual, oral sex, penile-vaginal penetration) have often been studied, it has generally been via cross-sectional surveys with younger populations, and often with a focus on risky behaviour (Ingledew & Ferguson, 2007; Maisto & Simons, 2016). Similarly, affective behaviours such as touching, caressing or kissing, although studied in the context of romantic relationships (Gulledge et al., 2007; Gulledge et al., 2004), have to our knowledge only rarely been studied at the event-level during sexual activity. Results of Study 1 suggest that contrasting both types of behaviour is important: firstly, these sexual behaviours were observed to factor naturally in our dataset, into two statistically distinct groups. Secondly, each group was associated differentially with sexual outcomes – this supports the proposal that more than one process is at play during couples' sexual interactions.

In sum, these differentiated results imply that in committed couples, sexual activity serves many motives simultaneously, both individual (such as self-gratification) and relational (such as the promotion of intimacy and relationship maintenance), and that these purposes are reflected by differentiated sets of behaviour. This work also supports clinical proposals such as the Good-Enough-Sex model (McCarthy & Metz, 2008), that emphasize the importance for couples of allowing their sexuality to meet multiple needs.

Avenues of Future Research. In our opinion, the proposal that sexual behaviour both mirrors and mediates different processes during sexual activity warrants further research. An important question in this area, with both conceptual and clinical implications, is whether the associations with sexual behaviour observed here *are causal*. If so, one would expect that, for instance, a greater focus on genital sexual behaviour would *lead* to greater sexual satisfaction, and not the contrary, that is that in some couples, greater sexual satisfaction may lead to a greater desire for genital sexual pleasure and orgasm.

Another question that takes on a particular importance in gender-diverse couples is whether sexual behaviours factor in the same way across different gender identities. Arguably, individual sexual behaviours may have different meanings for different couples. For example, anal penetration (penile, digital or with a sex toy) may occur regardless of the participants' gender, but its frequency – and arguably, its meaning – varies between men-men, women-women and mixed-gender couples (Nichols, 2004; Ritter et al., 2018; Scott et al., 2018; Sewell et al., 2017). Despite this variation, it may be that groups of sexual behaviour can be found which, although composed of different items, may be comparable in function and association between couple types. This is an important question, because in the absence of such comparability, gender-inclusive studies of sexual behaviour remain difficult.

Sexual Desire, Difficulties and Behaviour: The Importance of Everyday Sexual Difficulties

One of the novel aspects of our work is the focus in Studies 2 and 3 on couples' everyday, subclinical sexual difficulties. Previous studies have reported the

pervasiveness of subclinical sexual difficulties in the general population, where the intensity or persistence of the symptoms do not warrant a clinical diagnosis (Frank et al., 1978; Laumann et al., 1999). Sexual difficulties are frequently reported by the committed couples of Studies 2 and 3 – even when the partners report being sexually satisfied overall. The association between subclinical sexual difficulties and lower sexual satisfaction observed in Study 2, although unsurprising, had not to our knowledge been confirmed at the level of individual sexual activity. Similarly, event-level partner effects between one partner's lower subjective sexual arousal and the other's sexual dissatisfaction had not to our knowledge been reported elsewhere. These observations may have implications for the understanding of both subclinical sexual difficulties and clinically significant disorders.

Do event-level difficulties lead to clinically significant disorders? One implication of our results is that issues with sexual desire appear to play a pivotal role in the associations between a couple's sexual difficulties and each partners' sexual dissatisfaction and sexual distress. Indeed, Study 2 showed how low subjective sexual arousal was strongly correlated (comorbid) with other sexual difficulties such as difficult arousal or genito-pelvic pain, and how, when included in the same model, the effects of sexual difficulties on sexual satisfaction were dominated by those of low subjective sexual arousal. Further, the fact that low subjective sexual arousal is associated at the event level with sexual dissatisfaction suggests that sexual difficulties may be salient events for the partners even when of lower intensity. Given their frequency, one might expect that the cumulative effect of such salient experiences would lead to an increase in

their persistence and severity, eventually placing the couple at risk for developing clinically significant disorders. This idea finds support in Study 3's results, where the associations between sexual difficulties and sexual distress observed at a daily level are mirrored over a more distal 12-month span. Clinically, this finding supports therapeutic approaches such as couple cognitive behaviour therapy (C-CBT), which focus on the couples' everyday behaviour and emotions when treating sexual complaints (Corsini-Munt et al., 2014; de Carufel & Trudel, 2006).

Sexual behaviour mediates the associations with both positive and negative experiences. In both Study 1 and Study 2, sexual behaviour was shown to mediate between intra-individual variables in both partners. Interestingly, both studies worked with the same population. In contrast to the first study on sexual approach motives and its more positive focus, Study 2 focused on what happens when sex is not "all right". The fact that in Study 2, low subjective sexual arousal was associated with a lower variety (range) in sexual behaviours at the event level suggests that partners experiencing difficulties may have just been "getting on" with sex (Muise et al., 2012), and that neither partner was fully satisfied with this strategy. The observation that in couples, different choices of sexual behaviour (i.e., *sexual strategies*) associate differently with outcomes such as sexual satisfaction has also been reported in cross-sectional and event-level studies of behaviour (Gillespie, 2016; Heiman et al., 2011; Muise et al., 2014; Sanchez-Fuentes et al., 2014). Studies 1 and 2 support and extend this picture, suggesting a spectrum where on the positive end, couples who engage in a greater and more differentiated range of sexual behaviours report higher sexual and relational outcomes,

and on the other, couples with sexual difficulties restrict their sexual range and experience poorer outcomes. This picture is consistent with conceptual frameworks such as the IERM (Rosen & Bergeron, 2019), which posit that the presence of sexual difficulties may lead the couple to select less adaptive coping strategies, leading to poorer individual and relational outcomes.

Avenues of Future Research. Findings from the present thesis have raised the question of whether everyday sub-clinical sexual difficulties play a causal role in the genesis and maintenance of clinically significant sexual disorders in committed couples. Intuitively, one might expect that this is so, namely that the cumulative effect of a couples' salient negative experiences would lead to more severe and pervasive ill-adapted patterns. This question, although potentially of considerable clinical importance, runs into the difficulty conducting experiments in sex research capable of testing causal hypotheses. Continuing to exploit the temporal nature of some study designs may be a practical next step in this research. For example, establishing a more direct link between an individual's responses to daily diary studies and the same individual's outcome trajectories in longer-term longitudinal studies may be helpful in bridging results obtained from event-level, daily diary studies and longer-term cross-sectional or longitudinal studies.

Relatedly, looking beyond the cross-lagged analyses performed in our third Study, it may prove productive to study the impact of individual events such as sexual difficulties, on longer-term trajectories of outcomes such as sexual satisfaction and sexual distress. For example, by associating daily and longer-term trajectories on a

couple-by-couple basis, one would expect that couples with reports of more intense and frequent event-level sexual difficulties would have a higher likelihood of reporting clinically significant sexual disorders over the long term.

Sexual Desire, Sexual Desire Discrepancy and Sexual Distress: The Importance of Partner Interactions

Throughout this doctoral research, partner interactions were shown to have significant effects on both individual and relational outcomes. Indeed, all three studies observed that sexual desire involves actor and partner effects, such that each partner's state influences the other's. Further, the cross-lagged analyses of Study 3 suggest that the effects of such interactions are persistent – certainly, for periods of 24 hours, and perhaps far longer, over periods of 12 months. These results are consistent with recent research on emotional regulation (Butler & Randall, 2012; Dixon-Gordon et al., 2015; Hoffman et al., 2015; Niven, 2017; Rosen & Bergeron, 2019; Zaki & Williams, 2013), and more specifically, with proposals from Dewitte (2014) that sexual desire plays a regulatory role in the couple.

Such results also emphasize the clinical importance, in issues of sexual desire, of considering the committed couple as a unit. This minimizes the risk of "pathologizing" one of the partners, missing relational causes of the complaint such as conflict, and adopting treatment approaches that may be less effective or durable as a result (McCarthy & Thestrup, 2008a, 2008b).

Avenues of Future Research. Clearly, the dyadic variables studied here, namely dyadic sexual behaviour and discrepancy in sexual desire, cannot exist outside of the context of the couple interactions. That both of these poorly studied variables readily and productively associate with fundamental outcomes for couples, such as sexual satisfaction, sexual distress and relational intimacy, underscores the importance of their inclusion in future sex research.

Although working with self-reports of sexual behaviour and of individual and relational outcomes has proven productive in studying models of interaction such as the IERM, the data remain indirect and subject to recall and presentation bias (Graham et al., 2003), and more direct measures of partner interactions would be helpful. Out of the bedroom, this would suggest that observational studies of couples interacting could provide data that could be associated with indicators such as sexual desire, sexual desire discrepancy and self-reported sexual behaviour collected for previous days. Within the bedroom, hybrid qualitative-quantitative interviews of each partner's experience of sexual activity may help identify common behavioural strategies, and lead to the development of more targeted measures of the couple's sexual interactions.

Sexual Desire, Sexual Desire Discrepancy and Sexual Distress: Working with Time

Finally, models such as the IERM have a causal implication, namely, that partner interactions, in the form of emotional co-regulation, affect outcomes such as sexual satisfaction, sexual distress and relational intimacy. This implication cannot be tested directly in correlational studies such as ours. However, by exploiting the temporal dimension of its datasets, Study 3 does take a step in this direction. Indeed, the study's

main result, that the association between sexual desire discrepancy and sexual distress is directional, supports the IERM's proposal whilst arguing against alternative explanations.

In sum, results from these three studies contribute to a conceptual framework that furthers our understanding of the dynamics of everyday variations in sexual desire and sexual behaviour in the committed couple, one based on everyday partner interactions. This is important, because it suggests how the accumulated effects of everyday partner interactions can give rise to the longer-term trajectories and associations between more stable variables reported more generally in the field of sexuality and observed clinically. In particular, these results emphasize how the couple's overall sexual and relationship wellbeing is related both proximally and distally to everyday variations in sexual desire and in sexual behaviour between partners.

Principal Contributions

This research has taken a relational perspective in its study of sexual desire in committed couples, and in so doing, extended the scope of existing theoretical frameworks. The work also contributed methodologically, yielding recommendations for study designs and analytical tools, as working with gender-diverse couples, event-level studies and dyadic analyses remain relatively new in sex research. The studies themselves yielded a number of results, many of them novel contributions to the body of empirical knowledge in sex research, Finally, it is hoped that this research will be of use to the clinical community. These different contributions are outlined here.

Theoretical Contributions

Our doctoral research was based on a conceptualization of sexual desire in committed couples as a multifactorial construct, best understood in a biopsychosocial framework, where relational factors play a major role. Sex research increasingly focuses on relational perspectives of sexual desire. Consistent with this, the present studies highlighted the importance of considering the motives, affective states and behaviours of both partners.

Firstly, our work with sexual motives supported refining the approach-avoid framework (Gable & Impett, 2012; Impett et al., 2005) to differentiate between sexual approach motives that focus on oneself from those that focus on the other. This poorly-studied distinction between self- and other- sexual approach motives was initially identified by Cooper et al. (2011), who also noted that self- and other- motives did not factor well on the "avoid" side of the spectrum; this gives rise to a three-factor

framework for sexual motives (see Figure 8). Our work supports Cooper et al. (2011) proposed framework, by showing that self- and other- sexual approach motives are differentially associated with outcomes and show different gender effects. Furthermore, this work makes a strong case for distinguishing between the various processes that underpin sexual activity, in particular, sexual desire and romantic love, as suggested by (Diamond, 2004).

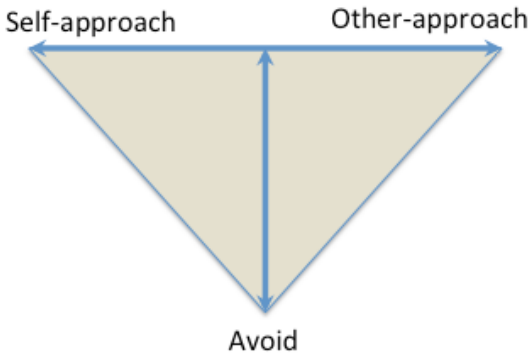


Figure 8. Three-factor framework for sexual motives

Secondly, our work with subjective sexual arousal brings empirical support to the Dual Control model (Bancroft et al., 2009). This model posits that subjective sexual arousal is driven by both inhibitory and excitatory processes, a view also held by authors such as Toates (2009). Our results suggest that the Dual Control applies to event-level, sub-clinical sexual difficulties, and highlights the pivotal role of subjective sexual arousal in these difficulties' associations with sexual dissatisfaction.

An important novel conceptual contribution of our work is to suggest that event-level variations in couples' shared sexual behaviour mediate the daily associations between sexual desire and individual and relational outcomes in both partners (see

Figure 9). Although intuitive and consistent both with our own results and that of other authors (Browning et al., 2000; Fisher et al., 2015; Muise et al., 2014), we are unaware of this model having been proposed elsewhere.

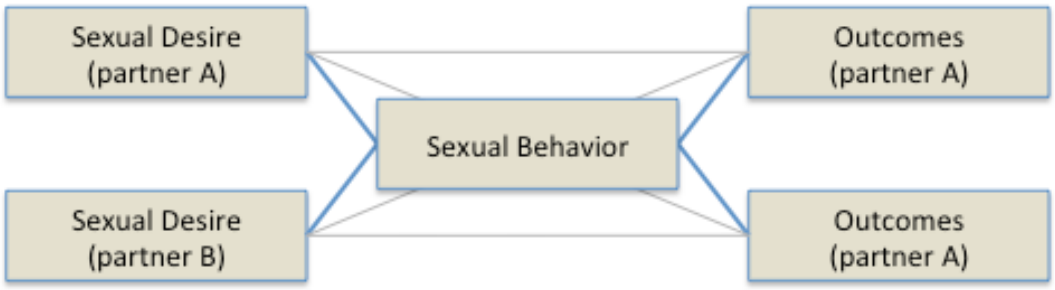


Figure 9. A couple's' shared sexual behaviour mediates the associations between sexual desire and individual and relational outcomes

Finally, this thesis provides empirical support for a dynamic perspective of couple interactions, where rapid (daily, or event-level) variations in sexual desire associate with dynamic variations in outcomes. That similar patterns exist at a daily or event-level and over greater spans of time (e.g., 12 months) also supports the idea that proximal events such as difficulties with sexual desire compound over time and lead to more lasting schemas of behaviour. Both of these observations are consistent with proposals that conceptualize sexuality within the wider scope of the couple's interactive emotional regulation processes (Dewitte, 2014). The Interpersonal Emotional Regulation Model (IERM) of Women's Sexual Dysfunction (Rosen & Bergeron, 2019) proposes that when dealing with sexual issues, couples may adopt less adaptive strategies for regulating their emotions (e.g., avoidance, emotional outbursts), leading to poorer outcomes. The model further suggests that couples' choice of emotional regulation strategy is influenced by

both proximal (e.g., partner motives and affect) and distal (e.g., perceived intimacy, attachment style) factors. Although initially proposed in the context of Genito-Pelvic Pain/Penetration Disorder, the results from our three studies can readily be interpreted in this manner, suggesting that IERM may be generalized to apply to couples experiencing sexual desire difficulties.

Methodological Contributions

Our field of this research remains relatively new, and poses difficult methodological problems: Few studies in sex research have examined dyadic, event-level, time-based phenomena, particularly in general population samples of participants. Ready-made solutions were often unavailable for issues such as the recruitment and collection of dyadic diary and longitudinal data in committed couples, the measurement of sexual phenomena in gender- and orientation-diverse couples, and the subsequent analysis of the resulting inter-dependent data. It was therefore necessary to extend or adapt techniques from other fields, and to apply and integrate some of the more sophisticated statistical techniques. As a result, a number of methodological contributions may be identified in this body of work.

Firstly, working with matched partners has led to the development of protocols that address particularities of such samples regarding issues of consent, confidentiality and retention during the data collection phase (Wittenborn et al., 2013). For example, during the data collection phase, it was recognized that participants in daily diaries would require particular attention, as measures repeated with such frequency are significantly impacted by lapses in participation. The protocols previously developed in

our laboratory were extended for this study and proved effective in obtaining high rates of participation during the diary period and low drop-out rates. The practice of assigning each couple to an investigator, and to contacting both participants weekly was felt to be an important contributor of this success.

Furthermore, Study 3 worked with a diverse sample of couples. Although this diversity covered many dimensions, including geographical, cultural, and ethnic, the study's decision to over-sample LGBT+ participants was by far the most methodologically significant. This has resulted in a number of developments, which researchers interested in diverse studies may find useful. One of these was highlighting the limits of scales designed for heterosexual populations when attempting to capture the experience of members of the LGBT+ community. One important example was measuring the variables "sex assigned at birth" and self-identified "gender" from participants in a manner that was both acceptable to LGBT+ participants and understandable to the cis community. In this, the recommendations by Bauer et al. (2017), which focus on transgender measures of sex and gender, were found to be particularly relevant. This work resulted in adjustments in both the language and the measures used.

Most studies in sex research to date have used intra-individual variables such as self-reported sexual satisfaction, and very few "purely dyadic" variables have been studied. These variables are important, as they allow us to study phenomena such as discrepancies and asynchronies, which only exist at the level of the dyad. The present work was novel in its work with two such dyadic measures, sexual behaviour and sexual

desire discrepancy. Work with sexual behaviour, made dyadic by matching reports between partners, gave rise to a first factor analysis which differentiated affective from sexual-genital behaviour. This initial checklist measure was then extended in the third study, in particular by including less frequent sexual activities (Browning et al., 2000). Although not reported above, this extended measure shows a three-factor structure, including affective, sexual-genital and exceptional-anal behaviours. The work with sexual desire discrepancy was challenging, as very few studies in sex research had previously used difference scores. This has led to innovations such as applying reliability tests generally developed for difference scores (Feldt, 1995) rather than Cronbach's alpha, and contrasting the use of fine-grained tools such as Response Surface Analysis (RSA, (Schönbrodt et al., 2018)) with the larger-grained but more complex models used in the study.

Finally, many of the analytical tools used in these studies were relatively new, and required adapting. One particularly important aspect of this work was the decision to use multi-level Structural Equation Models (SEM; Hox & Bechger, 1998) to account for dependencies between partners and between repeated (e.g., daily) measures. Although SEMs have been used for decades, many of the practical aspects of their use remain less well-known, particularly in sex research. As a result, the present research considered practical issues such as the degree of sensitivity of such models to smaller sample sizes, the applicability of family-wise corrections, their approach to missing data, and the appropriate choice of various fit statistics. Further, the appropriate modeling of couples in dyadic analyses also raises a number of tricky questions. In particular, we have

worked with both differentiated (mixed-sex) and undifferentiated couples, whereby each give rise to different types of models. Indeed, in community samples, the presence of same-sex/gender couples in the sample made it necessary to consider partners to be non-distinguishable, with attendant data modeling implications (Laurenceau & Bolger, 2012; Nezlek, 2012). Within this context, we have worked with both mediation and moderation in multi-level Actor-Partner Interdependence Models (Cook & Kenny, 2005). Similarly, analyzing associations which span over two or more time points requires controlling for data dependencies such as autocorrelations (i.e., within-variable associations over time; Hamaker et al., 2009; Selig & Little, 2012). It is believed that the resulting modeling recommendations, outlined in this document, will be of use to future sex researchers.

To our knowledge, our study is the first to report results of dyadic studies of both daily and longitudinal data collected from a common sample of couples. Similarly, we are unaware of cross-lag analyses that have worked with undifferentiated couples.

Overall, our research contributes to a small but growing body of work focusing on daily and longitudinal data from inclusive samples of matched partners, and it is hoped the methodological lessons learned during this work can be of use for future research.

Clinical Contributions

Recent clinical publications have recommended addressing sexual desire issues through therapies that include both partners rather than to focus on a single individual (McCarthy & Ross, 2018), and that consider the overall quality of the couples' sexuality

rather than focusing on quantitative outcomes such as the frequency of sexual activity (Kleinplatz et al., 2017; Leiblum, 2010).

Much of this work's contribution to clinicians can be considered an encouragement to pursue therapeutic approaches in this direction. Indeed, all three studies underscore the importance in committed couples of both partners' interactions in their association with outcomes such as sexual satisfaction, intimacy and sexual distress.

More specifically, the *role* that sex plays in the couple, and in particular, the motives that incite each partner to have sex, have been observed to associate differentially with outcomes such as sexual satisfaction and perceived intimacy. This work, consistent with much of the literature on sexual motives (Impett et al., 2008b; Muise et al., 2013), suggests that this theme of sexual motivation may be of therapeutic value, and in the least, should be covered during the couples' initial evaluation.

Similarly, the detail of the *event-level behaviour* the couple engages in during sexual activity has been shown to be relevant by the present research. For example, given their association with sexual satisfaction and perceived intimacy, it may be useful to clarify whether a couple engages in sexual-genital and affective behaviours when they are having sex. The range of different sexual behaviours may also have therapeutic value, a more restricted range having been associated with lower sexual satisfaction. Importantly, less varied sexual behaviour has been associated with lower subjective sexual arousal, and may also have diagnostic value. Note that as this study measured

person-centered values, what has been shown to be relevant are changes from the couples' average range and not absolute values.

In committed couples, this work has shown that sexual desire was associated not only with positive outcomes such as sexual satisfaction and perceived intimacy, but also – in the case of sexual desire discrepancy – with negative outcomes such as sexual distress. Since a couple's sexual desire discrepancy predicts sexual distress on a day-to-day basis, there may be value in asking couples to become aware of such asynchronies, and to notice whether their emotional co-regulating (coping) strategies are less effective on those days. Conversely, since sexual distress does not predict differences in sexual desire, a therapeutic focus on reducing sexual distress may not have a long-term effect in helping the couples resolve their sexual desire issues.

Taken together, findings of the three studies in the present thesis support the proposal that therapy should emphasize the couple's ability to work as an "effective sexual team" (McCarthy & Ross, 2018).

Principal Limitations

The first two of our studies suffered from similar limitations, particularly in the sample and from the methodology used. Firstly, the small (35 couples) and homogeneous (young, primarily white, mixed-sex, newlywed couples) sample may not be representative of all committed couples. As a result, although power analyses confirmed the acceptability of results in both studies, care should be taken in generalizing them to other populations of couples. Further, these studies focused on aspects of sexual desire (sexual approach motives and subjective sexual arousal, respectively), and results may therefore not extend to more general, multi-factorial measures of sexual desire. Similarly, constructs such as sexual satisfaction and perceived partner responsiveness were measured using abridged or single-item measures, an approach frequently used in daily diary designs to minimize completion times and maximize participant retention (Gunthert & Wenze, 2012). However, these abridged measures may oversimplify the construct, and the reliability and validity of single-item measures in particular are difficult to demonstrate (Bergkvist & Rossiter, 2007).

Although our third and final study addressed many of these limitations, it also remains limited. Care was taken into collecting a diverse sample of the general population. However, it is likely that the study's inclusion criteria, requiring committed partners to have lived together for a minimal duration of 12 months and yet to remain sexually active, may have biased the sample. Indeed, it is widely known that sexual frequency decreases with relationship duration – particularly after the second year

(James, 1981; Jasso, 1985; McNulty et al., 2016). Moreover, a sex-positive bias has been observed in participants of sex research (Catania et al., 1990).

The third study's methodology can also be improved upon. In particular, although our measure of sexual desire discrepancy (SDD) has already been used elsewhere (Mark, 2014), and although it's reliability was tested in this study's two datasets, the measure used here remains relatively new. Furthermore, SDD is a measure of the difference between two variables, here, each partner's sexual desire. Despite being widely used in the social sciences (Thomas & Zumbo, 2011), such difference measures have often criticized, firstly because one cannot assume their validity simply on the basis that the variables they compare have themselves been validated (Cronbach & Furby, 1970), and secondly because they may overly simplify the phenomena under study (Edwards, 2001; Griffin et al., 1999). Hence, a more rigorous study of this variable's psychometric properties is warranted in future research.

Finally, all of the study designs reported here are correlational, and their results should therefore not be interpreted causally. This is true also in our third study, where although a direction in time was observed in the association between SDD and sexual distress, one cannot deduce that SDD is a causal factor in sexual distress.

Conclusion

Remaining careful not to over-generalize, the present research has highlighted that sexual difficulties such as low sexual desire are associated with restrictions in sexual behaviour and sexual dissatisfaction, and how asynchronies between partners such as sexual desire discrepancy are associated with sexual distress. Conversely, our results show how positive interactions during sex, such as self- and other-approach motives and genital and affective behaviours, are associated with greater sexual satisfaction and intimacy. It is hoped that such observations can be of use to clinicians working with sexual desire issues, for instance, by supporting the use of therapies that work with the couple and focus on everyday interactions between partners.

More generally, the gap between research and clinical understandings of sexual desire in couples remains very wide. Given the paucity of existing studies in this area, our current knowledge of this important phenomenon derives in a large part from clinical impressions, and today's treatment approaches for couples consulting with sexual desire issues are rarely empirically informed. The recent appearance in sex research of conceptual frameworks and analytical tools that focus on partner interactions invites us to address this gap. It is hoped that through this work we can better support couples struggling with sexual desire issues.

REFERENCES

Alcaro, A., & Panksepp, J. (2011). The seeking mind: Primal neuro-affective substrates for appetitive incentive states and their pathological dynamics in addictions and depression. *Neuroscience & Biobehavoral Review, 35*(9), 1805-1820. https://doi.org/10.1016/j.neubiorev.2011.03.002

Allison, P. D. (2003). Missing data techniques for structural equation modeling. *Journal of Abnormal Psychology, 112*(4), 545-557. https://doi.org/10.1037/0021-843X.112.4.545

Althof, S. E. (2016). Low sexual desire in men. In *Handbook of clinical sexuality for mental health professionals* (pp. 286-326). Routledge.

American Psychiatric Association. (1980). *Diagnostic and statistical manual of mental disorders* (III ed.). American Psychiatric Association.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed ed.). American Psychiatric Association. https://doi.org/10.1176/appi.books.9780890425596

Anastasiadis, A. G., Davis, A. R., Ghafar, M. A., Burchardt, M., & Shabsigh, R. (2002). The epidemiology and definition of female sexual disorders. *World Journal of Urology, 20*(2), 74-78. https://doi.org/10.1007/s00345-002-0272-5

Angel, K. (2010). The history of 'female sexual dysfunction' as a mental disorder in the 20th century. *Current Opinion in Psychiatry, 23*(6), 536-541. https://doi.org/10.1097/YCO.0b013e32833db7a1

Arnup, K. (2001). *Close personal relationships between adults: 100 years of marriage in canada*.

Aubin, S., & Heiman, J. R. (2004). Sexual dysfunction from a relationship perspective. In *The handbook of sexuality in close relationships* (pp. 487-528). Psychology Press.

Avis, N. E., Colvin, A., Karlamangla, A. S., Crawford, S., Hess, R., Waetjen, L. E., Brooks, M., Tepper, P. G., & Greendale, G. A. (2017). Change in sexual functioning over the menopausal transition: Results from the study of women's health across the nation. *Menopause, 24*(4), 379-390. https://doi.org/10.1097/GME.0000000000000770

Bancroft, J., Graham, C. A., Janssen, E., & Sanders, S. A. (2009). The dual control model: Current status and future directions. *Journal of Sex Research, 46*(2-3), 121-142. https://doi.org/10.1080/00224490902747222

Bancroft, J., Loftus, J., & Long, J. S. (2003a). Distress about sex: A national survey of women in heterosexal relationships. *Archives of Sexual Behavior, 32*(3), 193-208. https://doi.org/10.1023/A:1023420431760

Bancroft, J., Loftus, J., & Long, J. S. (2003b). Distress about sex: A national survey of women in heterosexual relationships. *Archives of Sexual Behavior, 32*(3), 193-208. https://doi.org/10.1023/A:1023420431760

Barta, W. D., Tennen, H., & Litt, M. D. (2012). Measurement reactivity in diary research. In M. R. Mehl & T. S. Conner (Eds.), *Handbook of research methods for studying daily life* (pp. 108-123). The Guilford Press.

Basson, R. (2000). The female sexual response: A different model. *Journal of Sex & Marital Therapy, 26*(1), 51-65. https://doi.org/10.1080/009262300278641

Basson, R. (2001a). Human sex-response cycles. *Journal of Sex & Marital Therapy, 27*(1), 33-43. https://doi.org/10.1080/00926230152035831

Basson, R. (2001b). Using a different model for female sexual response to address women's problematic low sexual desire. *Journal of Sex & Marital Therapy, 27*(5), 395-403. https://doi.org/10.1080/713846827

Basson, R. (2002). A model of women's sexual arousal. *Journal of Sex & Marital Therapy, 28*(1), 1-10. https://doi.org/10.1080/009262302317250963

Basson, R., Leiblum, S. R., Brotto, L. A., DeRogatis, L. R., Fourcroy, J. L., Fugl-Meyer, K. S., Graziottin, A., Heiman, J. R., Laan, E., Meston, C. M., van Lankveld, J., & Weijmar-Schultz, W. (2003). Definitions of women's sexual dysfunction reconsidered: Advocating expansion and revision. *Journal of Psychosomatic Obstetrics & Gynecology 24*(4), 221-229. https://doi.org/10.3109/01674820309074686

Bauer, D. J. (2003). Estimating multilevel linear models as structural equation models. *Journal of Education and Behavioral Statistics, 28*(2), 135-167. https://doi.org/10.3102/10769986028002135

Bauer, G. R., Braimoh, J., Scheim, A. I., & Dharma, C. (2017). Transgender-inclusive measures of sex/gender for population surveys: Mixed-methods evaluation and recommendations. *PLoS ONE, 12*(5), e0178043. https://doi.org/10.1371/journal.pone.0178043

Baumeister, R. F. (2000). Gender differences in erotic plasticity: The female sex drive as socially flexible and responsive. *Psychological Bulletin, 126*(3), 347-374. https://doi.org/10.1037/0033-2909.126.3.347

Baumeister, R. F., Catanese, K. R., & Vohs, K. D. (2001). Is there a gender difference in strength of sex drive? Theoretical views, conceptual distinctions, and a review of relevant evidence. *Personality and Social Psychology Review, 5*(3), 242-273. https://doi.org/10.1207/S15327957PSPR0503_5

Bentler, B. M., & Chou, C.-P. (1986). Practical issues in structural modelling. *Sociological Methods & Research, 16*(1), 78-117. https://doi.org/10.1177/0049124187016001004

Bergeron, S., Benazon, N., Jodoin, M., & Brousseau, M. (2008). Sexualité et dysfonction sexuelle. In J. Wright, Y. Lussier, & S. Sabourin (Eds.), *Manuel clinique des psychothérapies de couple* (pp. 361-396). Presses de l'université du Québec.

Bergeron, S., Likes, W. M., & Steben, M. (2014). Psychosexual aspects of vulvovaginal pain. *Best Practices in Research and Clinical Obstetrics and Gynaecology, 28*(7), 991-999. https://doi.org/10.1016/j.bpobgyn.2014.07.007

Bergkvist, L., & Rossiter, J. R. (2007). The predictive validity of multiple-item versus single-item measures of the same constructs. *Journal of Marketing Research, 44*(2), 175-184. https://doi.org/10.1509/jmkr.44.2.175

Berkowitz, E. (2012). *Sex and punishment: Four thousand years of judging desire*. Counterpoint Press.

Berkowitz, E. (2015). *The boundaries of desire. A century of bad laws, good sex and changing identities*. Counterpoint Press.

Bernhardt, B. C., & Singer, T. (2012). The neural basis of empathy. *Annual Review of Neuroscience, 35*, 1-23. https://doi.org/10.1146/annurev-neuro-062111-150536

Berridge, K. C. (2004). Motivation concepts in behavioral neuroscience. *Physiology & Behavior, 81*(2), 179-209. https://doi.org/10.1016/j.physbeh.2004.02.004

Berridge, K. C., & Kringelbach, M. L. (2013). Neuroscience of affect: Brain mechanisms of pleasure and displeasure. *Current Opinion in Neurobiology, 23*(3), 294-303. https://doi.org/10.1016/j.conb.2013.01.017

Berridge, K. C., & Kringelbach, M. L. (2015). Pleasure systems in the brain. *Neuron, 86*(3), 646-664. https://doi.org/10.1016/j.neuron.2015.02.018

Bindra, D. (1974). A motivational view of learning, performance, and behavior modification. *Psychological Review, 81*(3), 199. https://doi.org/10.1037/h0036330

Birnbaum, G. E. (2018). The fragile spell of desire: A functional perspective on changes in sexual desire across relationship development. *Personality and Social Psychology Review, 22*(2), 101-127. https://doi.org/10.1177/1088868317715350

Birnbaum, G. E., Reis, H., Mizrahi, M., Kanat-Maymon, Y., Sass, O., & Granovski-Milner, C. (2016). Intimately connected: The importance of partner responsiveness for experiencing sexual desire. *Journal of Personality and Social Psychology, 111*(4), 530-546. https://doi.org/10.1037/pspi0000069

Blair, K. L., & Pukall, C. F. (2014). Can less be more? Comparing duration vs. Frequency of sexual encounters in same-sex and mixed-sex relationships. *Canadian Journal of Human Sexuality, 23*(2), 123-136. https://doi.org/10.3138/cjhs.2393

Blumenstock, S. M., & Papp, L. M. (2017). Sexual distress and marital quality of newlyweds: An investigation of sociodemographic moderators. *Family Relations, 66*(5), 794-808. https://doi.org/10.1111/fare.12285

Bolger, N., Davis, A., & Rafaeli, E. (2003). Diary methods: Capturing life as it is lived. *Annual Review of Psychology, 54*, 579-616. https://doi.org/10.1146/annurev.psych.54.101601.145030

Bolger, N., Stadler, G., & Laurenceau, J.-P. (2012). Power analysis for intensive longitudinal studies. In *Handbook of research methods for studying daily life* (pp. 285-301). Guilford Press.

Both, S., Everaerd, W., & Laan, E. (2007a). Desire emerges from excitement. A psychophysiological perspective on sexual motivation. In E. Janssen (Ed.), *The psychophysiology of sex*. Indiana University Press.

Both, S., Everaerd, W., Laan, E., & Janssen, E. (2007b). Desire emerges from excitement: A psychophysiological perspective on sexual motivation. In E. Janssen (Ed.), *The psychophysiology of sex* (pp. 327-339). Indiana University Press.

Bradford, A., & Meston, C. M. (2006). The impact of anxiety on sexual arousal in women. *Behaviour Research and Therapy, 44*(8), 1067-1077. https://doi.org/10.1016/j.brat.2005.08.006

Brezsnyak, M., & Whisman, M. A. (2004). Sexual desire and relationship functioning: The effects of marital satisfaction and power. *Journal of Sex & Marital Therapy, 30*(3), 199-217. https://doi.org/10.1080/00926230490262393

Bridges, S. K., & Horne, S. G. (2007). Sexual satisfaction and desire discrepancy in same sex women's relationships. *Journal of Sex & Marital Therapy, 33*(1), 41-53. https://doi.org/10.1080/00926230600998466

Brotto, L., Atallah, S., Johnson-Agbakwu, C., Rosenbaum, T., Abdo, C., Byers, E. S., Graham, C., Nobre, P., & Wylie, K. (2016). Psychological and interpersonal dimensions of

sexual function and dysfunction. *Journal of Sexual Medicine, 13*(4), 538-571. https://doi.org/10.1016/j.jsxm.2016.01.019

Brotto, L. A. (2010a). The dsm diagnostic criteria for hypoactive sexual desire disorder in men. *Journal of Sexual Medicine, 7*(6), 2015-2030. https://doi.org/10.1111/j.1743-6109.2010.01860.x

Brotto, L. A. (2010b). The dsm diagnostic criteria for hypoactive sexual desire disorder in women. *Archives of Sexual Behavior, 39*(2), 221-239. https://doi.org/10.1007/s10508-009-9543-1

Brotto, L. A., Bitzer, J., Laan, E., Leiblum, S. R., & Luria, M. (2010). Women's sexual desire and arousal disorders. *Journal of Sexual Medicine, 7*(1 Pt 2), 586-614. https://doi.org/10.1111/j.1743-6109.2009.01630.x

Brotto, L. A., Heiman, J. R., & Tolman, D. L. (2009). Narratives of desire in mid-age women with and without arousal difficulties. *Journal of Sex Research, 46*(5), 387-398. https://doi.org/10.1080/00224490902792624

Brotto, L. A., Petkau, A. J., Labrie, F., & Basson, R. (2011). Predictors of sexual desire disorders in women. *Journal of Sexual Medicine, 8*(3), 742-753. https://doi.org/10.1111/j.1743-6109.2010.02146.x

Broussard, K. A., Warner, R. H., & Pope, A. R. D. (2017). Too many boxes, or not enough? Preferences for how we ask about gender in cisgender, lgb, and gender-diverse samples. *Sex Roles, 78*(9-10), 606-624. https://doi.org/10.1007/s11199-017-0823-2

Browning, J. R., Hatfield, E., Kessler, D., & Levine, T. (2000). Sexual motives, gender and sexual behavior. *Archives of Sexual Behavior, 29*(2), 135-153. https://doi.org/10.1023/A:1001903705153

Burri, A., Rahman, Q., & Spector, T. (2011). Genetic and environmental risk factors for sexual distress and its association with female sexual dysfunction. *Psychological Medicine, 41*(11), 2435-2445. https://doi.org/10.1017/S0033291711000493

Burri, A., & Spector, T. (2011). Recent and lifelong sexual dysfunction in a female uk population sample: Prevalence and risk factors. *Journal of Sexual Medicine, 8*(9), 2420-2430. http://www.ncbi.nlm.nih.gov/pubmed/21676186

Butler, E. A. (2015). Interpersonal affect dynamics: It takes two (and time) to tango. *Emotion Review, 7*(4), 336-341. https://doi.org/10.1177/1754073915590622

Butler, E. A. (2017). Emotions are temporal interpersonal systems. *Curr Opin Psychol, 17*, 129-134. https://doi.org/10.1016/j.copsyc.2017.07.005

Butler, E. A., & Randall, A. K. (2012). Emotional coregulation in close relationships. *Emotion Review, 5*(2), 202-210. https://doi.org/10.1177/1754073912451630

Byers, E. S. (2005). Relationship satisfaction and sexual satisfaction: A longitudinal study of individuals in long-term relationships. *Journal of Sex Research, 42*(2), 113-118. https://doi.org/10.1080/00224490509552264

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Cartagena-Ramos, D., Fuentealba-Torres, M., Rebustini, F., Leite, A., Alvarenga, W. A., Arcencio, R. A., Dantas, R. A. S., & Nascimento, L. C. (2018). Systematic review of the psychometric properties of instruments to measure sexual desire. *BMC*

Medical Reseach Methodology, 18(1), 109. https://doi.org/10.1186/s12874-018-0570-2

Carver, C. S., Sutton, S. K., & Sheier, M. F. (2000). Action, emotion and personality: Emerging conceptual integration. *Personality and Social Psychology Bulletin, 26*(6), 741-751. https://doi.org/10.1177/0146167200268008

Catania, J. A., Gibson, D. R., Chitwood, D. D., & Coates, T. J. (1990). Methodoloigcal problems in aids behavioral resedarch: Influences, measurement error and participation bias in studies of sexual behavior. *Psychological Bulletin, 108*, 339-362. https://doi.org/10.1037/0033-2909.108.3.339

Chivers, M. L. (2016). The rainbow becomes a spectrum. *Archives of Sexual Behavior, 45*(3), 491-493. https://doi.org/10.1007/s10508-016-0711-9

Chivers, M. L., Seto, M. C., & Blanchard, R. (2007). Gender and sexual orientation differences in sexual response to sexual activities versus gender of actors in sexual films. *Journal of Personal and Social Psychology, 93*(6), 1108-1121. https://doi.org/10.1037/0022-3514.93.6.1108

Chivers, M. L., Seto, M. C., Lalumiere, M. L., Laan, E., & Grimbos, T. (2010). Agreement of self-reported and genital measures of sexual arousal in men and women: A meta-analysis. *Archives of Sexual Behavior, 39*(1), 5-56. https://doi.org/10.1007/s10508-009-9556-9

Clark, R. (1989). Gender differences in receptivity to sexual offers. *Journal of Psychology & Human Sexuality, 2*(1), 39-55. https://doi.org/10.1300/J056v02n01_04

Clement, U. (2002). Sex in long-term relationships: A systemic approach to sexual desire problems. *Archives of Sexual Behavior, 31*(3), 241-246. https://doi.org/10.1023/A:1015296718952

Cohen, J. N., & Byers, E. S. (2014). Beyond lesbian bed death: Enhancing our understanding of the sexuality of sexual-minority women in relationships. *Journal of Sexual Medicine, 51*(8), 893-903. https://doi.org/10.1080/00224499.2013.795924

Connor, M. K., Maserejian, N. N., De Rogatis, L., Meston, C. M., Gerstenberger, E. P., & Rosen, R. C. (2011). Sexual desire, distress, and associated factors in premenopausal women: Preliminary findings from the hypoactive sexual desire disorder registry for women. *Journal of Sex & Marital Therapy, 37*(3), 176-189. https://doi.org/10.1080/0092623X.2011.560533

Cook, W. L., & Kenny, D. (2005). The actor-partner interdependence model: A model of bidirectional effects in developmental studies. *International Journal of Behavioral Development, 29*(2), 101-109. https://doi.org/10.1080/01650250444000405

Cooper, M. L., Barber, L. L., Zhaoyang, R., & Talley, A. E. (2011). Motivational pursuits in the context of human sexual relationships. *Journal of Personality, 79*(6), 1333-1368. https://doi.org/10.1111/j.1467-6494.2010.00713.x

Cooper, M. L., Shapiro, C. M., & Powers, A. M. (1998). Motivations for sex and risky sexual behavior among adolescents and adults: A functional perspective. *Journal of Personality and Social Psychology, 75*(6), 1528-1558. https://doi.org/10.1037/0022-3514.75.6.1528

Cordaro, D. T., Sun, R., Keltner, D., Kamble, S., Huddar, N., & McNeil, G. (2018). Universals and cultural variations in 22 emotional expressions across five cultures. *Emotion, 18*(1), 75-93. https://doi.org/10.1037/emo0000302

Corona, G., Petrone, L., Mannucci, E., Ricca, V., G., B., Giommi, R., Forti, G., & Maggi, M. (2005). The impotent couple: Low desire. *International journal of andrology, 28 (Suppl. 2)*(46-52). https://doi.org/10.1111/j.1365-2605.2005.00594.x

Corsini-Munt, S., Bergeron, S., Rosen, N. O., Mayrand, M. H., & Delisle, I. (2014). Feasibility and preliminary effectiveness of a novel cognitive-behavioral couple therapy for provoked vestibulodynia: A pilot study. *Journal of Sexual Medicine, 11*(10), 2515-2527. https://doi.org/10.1111/jsm.12646

Coyne, J. C., Rohrbaugh, M. J., Shoham, V., Sonnega, J. S., Nicklas, J. M., & Cranford, J. A. (2001). Prognostic importance of marital quality for survival of congestive heart failure. *American Journal of Cardiology, 88*, 526-529. https://doi.org/10.1016/S0002-9149(01)01731-3

Cribbie, R. A. (2007). Multiplicity control in structural equation modeling. *Structural Equation Modeling: A Multidisciplinary Journal, 14*(1), 98-112. https://doi.org/10.1080/10705510709336738

Cronbach, L. J., & Furby, L. (1970). How we should measure "change" – or should we? *Psychological Bulletin, 74*(1), 68-80. https://doi.org/10.1037/h0029382

Curran, P. J. (2003). Have multilevel models been structural equation models all along? *Multivariate Behavioral Research, 38*(4), 529-569. https://doi.org/10.1207/s15327906mbr3804_5

Davies, S., Katz, J., & Jackson, J. L. (1999). Sexual desire discrepancies: Effects on sexual and relationship satisfaction in heterosexual dating couples. *Archives of Sexual Behavior 28*(6), 553-567. https://doi.org/10.1023/A:1018721417683

Dawson, S. J., & Chivers, M. L. (2014). Gender differences and similarities in sexual desire. *Current Sexual Health Reports, 6*(4), 211-219. https://doi.org/10.1007/s11930-014-0027-5

de Carufel, F., & Trudel, G. (2006). Effects of a new functional-sexological treatment for premature ejaculation. *Journal of Sex & Marital Therapy, 32*(2), 97-114. https://doi.org/10.1080/00926230500442292

Decety, J. (2011). Dissecting the neural mechanisms mediating empathy. *Emotion Review, 3*(1), 92-108. https://doi.org/10.1177/1754073910374662

Deckers, L. (2018). *Motivation: Biological, psychological and environmental*. Rootledge. https://doi.org/10.4324/9781315178615

Deeks, E. D. (2015). Flibanserin: First global approval. *Drugs, 75*(15), 1815-1822. https://doi.org/10.1007/s40265-015-0474-y

DeLamater, J. (1987). Gender differences in sexual scenarios. In K. Kelley (Ed.), *Females, males and sexuality: Theories and research* (pp. 127-140). SUNY Press.

Dennerstein, L., Guthrie, J. R., Hayes, R. D., DeRogatis, L. R., & Lehert, P. (2008). Sexual function, dysfunction, and sexual distress in a prospective, population-based sample of mid-aged, australian-born women. *Journal of Sexual Medicine, 5*(10), 2291-2299. https://doi.org/10.1111/j.1743-6109.2008.00936.x

Derogatis, L. R., Clayton, A., Lewis-D'Agostino, D., Wunderlich, G., & Fu, Y. (2008). Validation of the female sexual distress scale-revised for assessing distress in

women with hypoactive sexual desire disorder. *Journal of Sexual Medicine, 5*(2), 357-364. https://doi.org/10.1111/j.1743-6109.2007.00672.x

Derogatis, L. R., Clayton, A. H., Goldstein, A., Lewis-D'Agostino, D., Wunderlich, G., & Cotton, D. (2011). Ediary and female sexual distress scale((c)) in evaluating distress in hypoactive sexual desire disorder (hsdd). *Journal of Sexual Research, 48*(6), 565-572. https://doi.org/10.1080/00224499.2010.524321

Derogatis, L. R., Rosen, R., Leiblum, S., Burnett, A., & Heiman, J. (2002). The female sexual distress scale (fsds): Initial validation of a standardized scale for assessment of sexually related personal distress in women. *Journal of Sex & Marital Therapy, 28*(4), 317-330. https://doi.org/10.1080/00926230290001448

Dewitte, M. (2014). On the interpersonal dynamics of sexuality. *Journal of Sex & Marital Therapy, 40*(3), 209-232. https://doi.org/10.1080/0092623X.2012.710181

Dewitte, M., Carvalho, J., Corona, G., Limoncin, E., Pascoal, P., Reisman, Y., & Stulhofer, A. (2020). Sexual desire discrepancy: A position statement of the european society for sexual medicine. *Journal of Sexual Medicine, 8*(2), 121-131. https://doi.org/10.1016/j.esxm.2020.02.008

Diamond, L. M. (2004). Emerging perspectives on distinctions between romantic love and sexual desire. *Current Directions in Psychological Science, 13*(3), 116-119. https://doi.org/10.1111/j.0963-7214.2004.00287.x

Dixon-Gordon, K. L., Bernecker, S. L., & Christensen, K. (2015). Recent innovations in the field of interpersonal emotion regulation. *Current Opinion in Psychology, 3*, 36-42. https://doi.org/10.1016/j.copsyc.2015.02.001

Dobson, K., Zhu, J., Balzarini, R. N., & Campbell, L. (2020). Responses to sexual advances and satisfaction in romantic relationships: Is yes good and no bad? *Social Psychological and Personality Science, 1*(11), 1-11. https://doi.org/10.1177/1948550619888884

Dunn, K. M., Croft, P. R., & Hackett, G. I. (2000). Satisfaction in the sex life of a general population sample. *Journal of Sex and Marital Therapy, 26*(2), 141-151. https://doi.org/10.1080/009262300278542

Edwards, J. R. (2001). Ten difference score myths. *Organizational Research Methods, 4*(3), 265-287. https://doi.org/10.1177/109442810143005

Edwards, J. R. (2002). Alternatives to difference scores. Polynomial regression analysis and response surface methodology. In F. Drasgow & M. W. Schmitt (Eds.), *Advances in measurement and data analysis* (pp. 350-400). Jossey-Bass. https://doi.org/10.1037/e576892011-020

Ein-Dor, T., & Hirschberger, G. (2012). Sexual healing: Daily diary evidence that sex relieves stress for men and women in satisfying relationships. *Journal of Social and Personal Relationships, 29*(1), 126-139. https://doi.org/10.1177/0265407511431185

Elliot, A. J., & Covington, M. V. (2001). Approach and avoidance motivation. *Educational Psychology Review, 13*(2), 73-92. https://doi.org/10.1023/A:1009009018235

Elliot, A. J., Gable, S. L., & Mapes, R. R. (2006). Approach and avoidance motivation in the social domain. *Personality and Social Psychology Bulletin, 32*(3), 378-391. https://doi.org/10.1177/0146167205282153

Eng, P. M., Kawachi, I., Fitzmaurice, G., & Rimm, E. B. (2005). Effects of marital transitions on changes in dietary and other health behaviours in us male health professionals. *Journal of Epidemiology and Community Health, 59*(1), 56-62. https://doi.org/10.1136/jech.2004.020073

Engel, G. L. (1977). The need for a new medical model: A challenge for biomedicine. *Science, 196*(4286), 129-136. https://doi.org/10.1126/science.847460

Erens, B., Mitchell, K. R., Gibson, L., Datta, J., Lewis, R., Field, N., & Wellings, K. (2019). Health status, sexual activity and satisfaction among older people in britain: A mixed methods study. *PLoS ONE, 14*(3), e0213835. https://doi.org/10.1371/journal.pone.0213835

Everaerd, W., Both, S., & Laan, E. (2006). The experience of sexual emotions. *Annual Review of Sex Research, 17*(1), 183-199. https://doi.org/10.1080/10532528.2006.10559842

Feldt, L. S. (1995). Estimation of the reliability of differences under revised reliabilities of component scores. *Journal of Educational Measurement, 32*(3), 295-301. https://doi.org/10.1111/j.1745-3984.1995.tb00468.x

Fisher, W. A., Donahue, K. L., Long, J. S., Heiman, J. R., Rosen, R. C., & Sand, M. S. (2015). Individual and partner correlates of sexual satisfaction and relationship happiness in midlife couples: Dyadic analysis of the international survey of relationships. *Archives of Sexual Behavior, 44*(6), 1609-1620. https://doi.org/10.1007/s10508-014-0426-8

Fonteille, V., & Stoléru, S. (2011). The cerebral correlates of sexual desire: Functional neuroimaging approach. *Sexologies, 20*(3), 142-148. https://doi.org/10.1016/j.sexol.2010.03.011

Ford, M. B., & Collins, N. L. (2013). Self-esteem moderates the effects of daily rejection on health and well-being. *Self and Identity, 12*(1), 16-38. https://doi.org/10.1080/15298868.2011.625647

Fortenberry, J. D., & Hensel, D. J. (2011). The association of sexual interest and sexual behaviors among adolescent women: A daily diary perspective. *Hormones and behavior, 59*(5), 739-744. https://doi.org/10.1016/j.yhbeh.2011.03.003

Frank, E., Anderson, C., & Rubinstein, D. (1978). Frequency of sexual dysfunction in "normal" couples. *The New England Journal of Medicine, 299*(3), 111-115. https://doi.org/10.1056/NEJM197807202990302

Fraser, G. (2018). Evaluating inclusive gender identity measures for use in quantitative psychological research. *Psychology & Sexuality, 9*(4), 343-357. https://doi.org/10.1080/19419899.2018.1497693

Frazier, P. A., Tix, A. P., & Barron, K. E. (2004). Testing moderator and mediator effects in counseling psychology research. *Journal of Counselling Psychology, 51*(1), 115-134. https://doi.org/10.1037/0022-0167.51.1.115

Freud, S. (1905). Three essays on the theory of sexuality. In S. Freud & J. Strachey (Eds.), *The standard edition of the complete psychological works of sigmund freud* (Vol. VII (1901-1905)).

Gable, S. L. (2006). Approach and avoidance social motives and goals. *Journal of Personality, 74*(1), 175-222. https://doi.org/10.1111/j.1467-6494.2005.00373.x

Gable, S. L., & Impett, E. A. (2012). Approach and avoidance motives and close relationships. *Social and Personality Psychology Compass, 6*(1), 95-108. https://doi.org/10.1111/j.1751-9004.2011.00405.x

Gager, C. T., Yabiku, S. T., & Linver, M. R. (2015). Conflict or divorce? Does parental conflict and/or divorce increase the likelihood of adult children's cohabiting and marital dissolution? *Marriage & Family Review, 52*(3), 243-261. https://doi.org/10.1080/01494929.2015.1095267

Gagné, F. M., & Lydon, J. E. (2004). Bias and accuracy in close relationships: An integrative review. *Personality and Social Psychology Review, 8*(4), 322-338. https://doi.org/10.1207/s15327957pspr0804_1

Gefen, D., Straub, D. W., & Boudreau, M.-C. (2000). Structural equation modeling and regression: Guidelines for research practice. *Communications of AIS, 4*(7), 2-76. https://doi.org/10.17705/1CAIS.00407

Giles, J. (2008). Sex hormones and sexual desire. *Journal for the Theory of Social Behavior, 38*(1), 45-66. https://doi.org/10.1111/j.1468-5914.2008.00356.x

Gillespie, B. J. (2016). Correlates of sex frequency and sexual satisfaction among partnered older adults. *Journal of Sex & Marital Therapy*, 1-21. https://doi.org/10.1080/0092623X.2016.1176608

Gillmore, M. R., Leigh, B. C., Hoppe, M. J., & Morrison, D. M. (2010). Comparison of daily and retrospective reports of vaginal sex in heterosexual men and women. *Journal of Sexual Research, 47*(4), 279-284. https://doi.org/10.1080/00224490903050584

Goldey, K. L., & van Anders, S. M. (2014). Sexual modulation of testosterone: Insights for humans from across species. *Adaptive Human Behavior and Physiology, 1*(2), 93-123. https://doi.org/10.1007/s40750-014-0005-1

Gonzaga, G. C., Turner, R. A., Keltner, D., Campos, B., & Altemus, M. (2006). Romantic love and sexual desire in close relationships. *Emotion, 6*(2), 163-179. https://doi.org/10.1037/1528-3542.6.2.163

Gottman, J. M., & Levenson, R. W. (2000). The timing of divorce: Predicting when a couple will divorce over a 14‐year period. *Journal of Marriage and Family, 62*(3), 737-745. https://doi.org/10.1111/j.1741-3737.2000.00737.x

Gottman, J. M., & Notarium, C. I. (2000). Decade review: Observing marital interaction. *Journal of Marriage and Family, 62*, 927-947. https://doi.org/10.1111/j.1741-3737.2000.00927.x

Graham, C. A., Catania, J. A., Brand, R., Duong, T., & Canchola, J. A. (2003). Recalling sexual behavior: A methodological analysis of memory recall bias via interview using the diary as the gold standard. *Journal of Sexual Research, 40*(4), 325-332. https://doi.org/10.1080/00224490209552198

Gray, J. A. (1987). *The psychology of fear and stress*. Cambridge University Press.

Griffin, D., Murray, S., & Gonzalez, R. (1999). Difference score correlations in relationship research: A conceptual primer. *Personal Relationships, 6*, 505-518. https://doi.org/10.1111/j.1475-6811.1999.tb00206.x

Gulledge, A. K., Hill, M., Lister, Z., & Sallion, C. (2007). Non-erotic physical affection: It's good for you. In L. L'Abate (Ed.), *Low-cost approaches to promote physical and*

mental health (pp. 371-384). Springer. https://doi.org/10.1007/0-387-36899-X_18

Gulledge, A. K., Stahmann, R. F., & Colwich, M. W. (2004). Seven types of nonsexual romantic physical affection among brigham young university students. *Psychological Reports, 95*, 609-614. https://doi.org/10.2466/PR0.95.6.609-614

Gunthert, K. C., & Wenze, S. J. (2012). Daily diary methods. In M. Csikszentmihalyi (Ed.), *Handbook of research methods for studying daily life* (pp. 144-159). Guildford Press.

Hall, K. (2010). The canary in the coal mine: Reviving sexual desire in long-term relationships. In *Treating sexual desire disorders: A clinical casebook* (pp. 98-134). The Guilford Press.

Hamaker, E. L., Zhang, Z., & van der Maas, H. L. J. (2009). Using threshold autoregressive models to study dyadic interactions. *Psychometrika, 74*(4), 727-745. https://doi.org/10.1007/s11336-009-9113-4

Hayes, R. D. (2008). Assessing female sexual dysfunction in epidemiological studies: Why is it necessary to measure both low sexual function and sexually-related distress? *Sexual Health, 5*, 215-218. https://doi.org/10.1071/SH08016

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Heiman, J. R., Long, J. S., Smith, S. N., Fisher, W. A., Sand, M. S., & Rosen, R. C. (2011). Sexual satisfaction and relationship happiness in midlife and older couples in five countries. *Archives of Sexual Behavior, 40*(4), 741-753. https://doi.org/10.1007/s10508-010-9703-3

Hendrickx, L., Gijs, L., & Enzlin, P. (2015). Age-related prevalence rates of sexual difficulties, sexual dysfunctions, and sexual distress in heterosexual women: Results from an online survey in flanders. *Journal of Sexual Medicine, 12*(2), 424-435. https://doi.org/10.1111/jsm.12725

Hendrickx, L., Gijs, L., Janssen, E., & Enzlin, P. (2016). Predictors of sexual distress in women with desire and arousal difficulties: Distinguishing between personal, partner, and interpersonal distress. *Journal of Sexual Medicine, 13*(11), 1662-1675. https://doi.org/10.1016/j.jsxm.2016.09.016

Herbenick, D., Mullinax, M., & Mark, K. P. (2014). Sexual desire discrepancy as a feature, not a bug, of long-term relationships: Women's self-reported strategies for modulating sexual desire. *Journal of Sexual Medicine, 11*(9), 2196-2206. https://doi.org/10.1111/jsm.12625

Hoffman, W., Kotabe, H. P., Vhos, K. D., & Baumeister, R. F. (2015). Desire and desire regulation. In W. Hofmann & L. F. Nordgren (Eds.), *The psychology of desire* (pp. 61-81). The Guilford Press.

Hoffmann, H. (2007). The role of classical conditioning in sexual arousal. In E. Janssen (Ed.), *The psychophysiology of sex*. Indiana Univeristy Press.

Hofmann, S. G. (2014). Interpersonal emotion regulation model of mood and anxiety disorders. *Cognitive Therapy and Research, 38*(5), 483-492. https://doi.org/10.1007/s10608-014-9620-1

Hogue, J. V., Rosen, N. O., Bockaj, A., Impett, E. A., & Muise, A. (2019). Sexual communal motivation in couples coping with low sexual interest/arousal: Associations with

sexual well-being and sexual goals. *PLoS ONE, 14*(7), e0219768. https://doi.org/10.1371/journal.pone.0219768

Holmberg, D., & Blair, K. L. (2009). Sexual desire, communication, satisfaction, and preferences of men and women in same-sex versus mixed-sex relationships. *Journal of Sexual Medicine, 46*(1), 57-66. https://doi.org/10.1080/00224490802645294

Hoppe, M. J., Morrison, D. M., Gillmore, M. R., Beadnell, B., Higa, D. H., & Leigh, B. C. (2008). Agreement of daily diary and retrospective measures of condom use. *Journal of AIDS and Behavior, 12*(1), 113-117. https://doi.org/10.1007/s10461-007-9240-9

Hox, J. J. (2002). *Multilevel analysis, techniques and applications*. https://doi.org/10.4324/9781410604118

Hox, J. J., & Bechger, T. M. (1998). An introduction to structural equation modeling. *Family Science Review, 11*, 354-373.

Hox, J. J., & Stoel, R. D. (2005). Multilevel and sem approaches to growth curve modeling. In B. S. Everitt & D. C. Howell (Eds.), *Encyclopeida of statistics in behavioral science* (Vol. 3, pp. 1296-1305). John Wiley & Sons.

Hull, C. L. (1954). *Principles of behavior*. Appleton-Century-Crofts.

Hurlbert, D. F., & Apt, C. (1993). Female sexuality: A comparative study between women in homosexual and heterosexual relationships. *Journal of Sex & Marital Therapy, 19*(4), 315-327. https://doi.org/10.1080/00926239308404375

Hurlbert, D. F., Apt, C., Hurlbert, M. K., & Pierce, A. P. (2000). Sexual compatibility and the sexual desire-motivation relation in females with hypoactive sexual desire disorder. *Behavior Modification*(July), 325-347.

Hyde, J. S., Bigler, R. S., Joel, D., Tate, C. C., & van Anders, S. M. (2019). The future of sex and gender in psychology: Five challenges to the gender binary. *American Psychologist, 74*(2), 171-193. https://doi.org/10.1037/amp0000307

Impett, E. A., Gordon, A. M., Kogan, A., Oveis, C., Gable, S. L., & Keltner, D. (2010). Moving toward more perfect unions: Daily and long-term consequences of approach and avoidance goals in romantic relationships. *Journal of Personality and Social Psychology, 99*(6), 948-963. https://doi.org/10.1037/a0020271

Impett, E. A., Gordon, A. M., & Strachman, A. (2008a). Attachment and daily sexual goals: A study of dating couples. *Personal Relationships, 15*, 375-390. https://doi.org/10.1111/j.1475-6811.2008.00204.x

Impett, E. A., Javam, L., Le, B. M., Asyabi-Eshghi, B., & Kogan, A. (2013). The joys of genuine giving: Approach and avoidance sacrifice motivation and authenticity. *Personal Relationships, 20*(4), 740-754. https://doi.org/10.1111/pere.12012

Impett, E. A., Muise, A., & Peragine, D. (2014). Sexuality in the context of relationships. In *Apa handbook of sexuality and psychology, vol. 1: Person-based approaches* (pp. 269-315). American Psychological Association. https://doi.org/10.1037/14193-010

Impett, E. A., Peplau, L. A., & Gable, S. L. (2005). Approach and avoidance sexual motives: Implications for personal and interpersonal well-being. *Personal Relationships, 12*, 465-482. https://doi.org/10.1111/j.1475-6811.2005.00126.x

Impett, E. A., Strachman, A., Finkel, E. J., & Gable, S. L. (2008b). Maintaining sexual desire in intimate relationships: The importance of approach goals. *Journal of Personality and Social Psychology, 94*(5), 808-823. https://doi.org/10.1037/0022-3514.94.5.808

Impett, E. A., & Tolman, D. L. (2006). Late adolescent girls' sexual experiences and sexual satisfaction. *Journal of Adolescent Research, 21*(6), 628-646. https://doi.org/10.1177/0743558406293964

Ingledew, D. K., & Ferguson, E. (2007). Personality and riskier sexual behaviour: Motivational mediators. *Psychology & Health, 22*(3), 291-315. https://doi.org/10.1080/14768320600941004

James, W. H. (1981). The honeymoon effect on marital coitus. *Journal of Sex Research, 17*(2), 114-123. https://doi.org/10.1080/00224498109551106

Janssen, E., & Bancroft, J. (2007). The dual control model. In E. Janssen (Ed.), *The psychophysiology of sex*. Indiana University Press.

Janssen, E., Everaerd, W., Spiering, M., & Janssen, J. (2000). Automatic processes and the appraisal of sexual stimuli: Toward an information processing model of sexual arousal. *Journal of Sex Research, 37*(1), 8-23. https://doi.org/10.1080/00224490009552016

Janssen, E., Vorst, H., Finn, P., & Bancroft, J. (2002). The sexual inhibition (sis) and sexual excitation (ses) scales: I. Measuring sexual inhibition and excitation proneness in men. *Journal of Sex Research, 39*(2), 114-126. https://doi.org/10.1080/00224490209552130

Jaspers, L., Feys, F., Bramer, W. M., Franco, O. H., Leusink, P., & Laan, E. T. (2016). Efficacy and safety of flibanserin for the treatment of hypoactive sexual desire disorder in women: A systematic review and meta-analysis. *JAMA Intern Med, 176*(4), 453-462. https://doi.org/10.1001/jamainternmed.2015.8565

Jasso, G. (1985). Marital coital frequency and the passage of time: Estimating the separate effects of spouses' ages and marital duration, birth and marriage cohorts, and period influences. *American Sociological Review, 50*(2), 224-241. https://doi.org/10.2307/2095411

Jern, P., Santtila, P., Johansson, A., Varjonen, M., Witting, K., Algars, M., Alanko, K., von der Pahlen, B., & Sandnabba, K. (2008). Indicators of premature ejaculation and their associations with sexual distress in a population-based sample of young twins and their siblings. *Journal of Sexual Medicine, 5*(9), 2191-2201. https://doi.org/10.1111/j.1743-6109.2008.00863.x

Joannides, P., & Gross, D. (2018). *Guide to getting it on!* Goofy Foot Press.

Jodouin, J.-F., Bergeron, S., Desjardins, F., & Janssen, E. (2018a). Sexual behavior mediates the relationship between sexual motives and sexual outcomes: A daily diary study. *Archives of Sexual Behavior, 1*(12), 11. https://doi.org/10.1007/s10508-018-1259-7

Jodouin, J.-F., Bergeron, S., & Janssen, E. (2018b). The mediating role of sexual behavior in event-level associations between sexual difficulties and sexual satisfaction in newlywed mixed-sex couples. *Journal of Sexual Medicine, 15*(10), 1384-1392. https://doi.org/10.1016/j.jsxm.2018.08.010

Johns, G. (1981). Difference score measures of organizational behavior variables: A critique. *Organizational behavior and human performance, 27*(3), 443-463. https://doi.org/10.1016/0030-5073(81)90033-7

Johnson, N. J., Backlund, E., Sorlie, P. D., & Loveless, C. A. (2000). Marital status and mortality: The national longitudinal mortality study. *Annals of epidemiology, 10*(4), 224-238. https://doi.org/10.1016/S1047-2797(99)00052-6

Kaplan, H. S. (1977). Hypoactive sexual desire. *Journal of Sex & Marital Therapy, 3*(1), 3-9. https://doi.org/10.1080/00926237708405343

Karney, B. R., & Bradbury, T. N. (1995). The longitudinal course of marital quality and stability: A review of theory, method and research. *Psychological Bulletin, 118*(1), 3-34. https://doi.org/10.1037/0033-2909.118.1.3

Katz, M., DeRogatis, L. R., Ackerman, R., Hedges, P., Lesko, L., Garcia, M., Jr., Sand, M., & investigators, B. t. (2013). Efficacy of flibanserin in women with hypoactive sexual desire disorder: Results from the begonia trial. *Journal of Sexual Medicine, 10*(7), 1807-1815. https://doi.org/10.1111/jsm.12189

Keltner, D., & Haidt, J. (1999). Social functions of emotions at four levels of analysis. *Cognition & Emotion, 13*(5), 505-521. https://doi.org/10.1080/026999399379168

Kenny, D., Kashy, D. A., & Cook, W. L. (2006). *Dyadic data analysis*. Guilford Press.

Kenny, D. A. (2015). *Measuring model fit*. Retrieved 13 Jan 2018 from http://davidakenny.net/cm/fit.htm

Kenny, D. A., & Ledermann, T. (2010). Detecting, measuring, and testing dyadic patterns in the actor–partner interdependence model. *Journal of Family Psychology, 10*(24), 339-366. https://doi.org/10.1037/a0019651.supp

Ketlner, D., & Lerner, J. S. (2010). Emotion. In S. T. Fiske, D. T. Gilbert, & G. Lindzey (Eds.), *Handbook of social psychology* (pp. 317-352).

Kiecolt-Glaser, J. K., Loving, T. J., Stowell, J. R., Malarkey, W. B., Lemeshow, S., & Dickinson, S. L. (2005). Hostile marital interactions proinflammatory cytokine production, and wound healing. *Archives of General Psychiatry, 62*, 1377-1384. https://doi.org/10.1001/archpsyc.62.12.1377

Kim, J. J., Muise, A., Sakaluk, J. K., Rosen, N. O., & Impett, E. A. (in press). When tonight is not the night: Sexual rejection behaviors and satisfaction in romantic relationships. *Personality and Social Psychology Bulletin*.

Kingelbach, M. L., & Berridge, K. C. (2015). Motvation and pleasure in the brain. In W. Hofmann & L. F. Nordgren (Eds.), *The psychology of desire* (pp. 129-145). The Guilford Press.

Kinsey, A. C., Pomeroy, W. B., Martin, C. E., & Sloan, S. (1948). *Sexual behavior in the human male*. Indiana University Press.

Kleinplatz, P. J., Paradis, N., Charest, M., Lawless, S., Neufeld, M., Neufeld, R., Pratt, D., Menard, A. D., Buduru, B., & Rosen, L. (2017). From sexual desire discrepancies to desirable sex: Creating the optimal connection. *Journal of Sex and Marital Therapy*, 1-12. https://doi.org/10.1080/0092623X.2017.1405309

Kline, R. B. (2012). Assumptions in structural equation modeling. In R. H. Hoyle (Ed.), *Handbook of structural equation modeling* (pp. 111-126). Guilford Press.

Klusman, D. (2002). Sexual motivation and the duration of partnership. *Archives of Sexual Behavior, 31*(3), 275-287. https://doi.org/10.1023/A:1015205020769

Laan, E., & Both, S. (2008). What makes women experience desire? *Feminism & Psychology, 18*(4), 505-514. https://doi.org/10.1177/0959353508095533

Laumann, E. O., Gagnon, J. H., Michael, R. T., & Michaels, S. (1996). National health and social life survey, 1992. *Inter-university Consortium for Political and Social Research*. https://doi.org/10.3886/ICPSR06647

Laumann, E. O., Paik, A., & Rosen, R. C. (1999). Sexual dysfunction in the united states. Prevalence and predictors. *JAMA, 281*(6), 537-544. https://doi.org/10.1001/jama.281.6.537

Laurenceau, J.-P. (2000). *The interpersonal process model of intimacy in marriage: A daily-diary approach* ProQuest Information & Learning]. US.

Laurenceau, J.-P., Barrett, L. F., & Rovine, M. J. (2005). The interpersonal process model of intimacy in marriage: A daily-diary and multilevel modeling approach. *Journal of Family Psychology, 19*(2), 314-323. https://doi.org/10.1037/0893-3200.19.2.314

Laurenceau, J.-P., & Bolger, N. (2012). Analyzing diary and intensive longitudinal data from dyads. In *Handbook of research methods for studying daily life* (pp. 407-422).

Ledermann, T., & Macho, S. (2014). Analyzing change at the dyadic level: The common fate growth model. *Journal of Family Psychology, 28*(2), 204-213. https://doi.org/10.1037/a0036051.supp

Ledermann, T., Macho, S., & Kenny, D. A. (2011). Assessing mediation in dyadic data using the actor-partner interdependence model. *Structural Equation Modeling: A*

Multidisciplinary Journal, 18(4), 595-612. https://doi.org/10.1080/10705511.2011.607099

Lee, S., Cho, E., Grodstein, F., Kawachi, I., Hu, F. B., & Colditz, G. A. (2005). Effects of marital transitions on changes in dietary and other health behaviours in us women. *International Journal of Epidemiology, 34*(1), 69-78. https://doi.org/10.1093/ije/dyh258

Leiblum, S. R. (2010). Introduction and overview: Clinical perspectives on and treatment for sexual desire disorders. In S. R. Leiblum (Ed.), *Treating sexual desire disorders. A clinical casebook* (pp. 19-62). The Guilford Press.

Leiblum, S. R., & Rosen, R. C. (1988). *Sexual desire disorders*. Guilford Press.

Levin, R. J., & van Berlo, W. (2004). Sexual arousal and orgasm in subjects who experience forced or non-consensual sexual stimulation -- a review. *Journal of Clnical Forensic Medecine, 11*(2), 82-88. https://doi.org/10.1016/j.jcfm.2003.10.008

Levine, S. B. (2002). Reexploring the concept of sexual desire. *Journal of Sex & Marital Therapy, 28*(1), 39-51. https://doi.org/10.1080/009262302317251007

Levine, S. B. (2003). The nature of sexual desire: A clinician's perspective. *Archives of Sexual Behavior, 32*(3), 279-285. https://doi.org/10.1023/A:1023421819465

Lindau, S. T., Schumm, L. P., Laumann, E. O., Levinson, W., O'Muircheartaigh, C. A., & Waite, L. J. (2007). A study of sexuality and health among older adults in the united states. *The New England Journal of Medicine, 357*, 762-774. https://doi.org/10.1056/NEJMoa067423

Lopez, R. B., Wagner, D. D., & Heatherton, T. F. (2015). Neuroscience of desire regulation. In W. Hofmann & L. F. Nordgren (Eds.), *The psychology of desire* (pp. 146-160). Guilford Press.

Maisto, S. A., & Simons, J. S. (2016). Research on the effects of alcohol and sexual arousal on sexual risk in men who have sex with men: Implications for hiv prevention interventions. *Journal of AIDS and Behavior, 20 Suppl 1*, S158-172. https://doi.org/10.1007/s10461-015-1220-x

Mark, K. P. (2012). The relative impact of individual sexual desire and couple desire discrepancy on satisfaction in heterosexual couples. *Sexual and Relationship Therapy, 27*(2), 133-146. https://doi.org/10.1080/14681994.2012.678825

Mark, K. P. (2014). The impact of daily sexual desire and daily sexual desire discrepancy on the quality of the sexual experience in couples. *Canadian Journal of Human Sexuality, 23*(1), 27-33. https://doi.org/10.3138/cjhs.23.1.A2

Mark, K. P. (2015). Sexual desire discrepancy. *Current Sexual Health Reports, 7*(3), 198-202. https://doi.org/10.1007/s11930-015-0057-7

Mark, K. P., Bunting, A., & Moore, S. (2018). Sexual desire and modulation of desire discrepancy in a sample of bisexual women in long-term relationships with men. *The Journal of Sexual Medicine, 15*(6), S111-S112. https://doi.org/10.1016/j.jsxm.2018.03.046

Mark, K. P., Herbenick, D., Fortenberry, J. D., Sanders, S., & Reece, M. (2014). A psychometric comparison of three scales and a single-item measure to assess sexual satisfaction. *Journal of Sexual Research, 51*(2), 159-169. https://doi.org/10.1080/00224499.2013.816261

Mark, K. P., & Lassio, J. A. (2018). Maintaining sexual desire in long-term relationships: A systematic review and conceptual model. *Journal of Sex Research, 55*(4-5), 563-581. https://doi.org/10.1080/00224499.2018.1437592

Mark, K. P., & Lasslo, J. A. (2018). Maintaining sexual desire in long-term relationships: A systematic review and conceptual model. *Journal of Sexual Research, 55*(4-5), 563-581. https://doi.org/10.1080/00224499.2018.1437592

Mark, K. P., Leistner, C. E., & Dai, M. (2019). Daily sexual desire and its impact on next-day desire and behavior in mixed sex couples. *Archives of Sexual Behavior*. https://doi.org/10.1007/s10508-018-1320-6

Mark, K. P., & Murray, S. H. (2012). Gender differences in desire discrepancy as a predictor of sexual and relationship satisfaction in a college sample of heterosexual romantic relationships. *Journal of Sex & Marital Therapy, 38*(2), 198-215. https://doi.org/10.1080/0092623X.2011.606877

McAuliffe, T. L., DiFranceisco, W., & Reed, B. R. (2007). Effects of question format and collection mode on the accuracy of retrospective surveys of health risk behavior: A comparison with daily sexual activity diaries. *Health Psychology, 26*(1), 60-67. https://doi.org/10.1037/0278-6133.26.1.60

McCabe, M. P. (1997). Intimacy and quality of life among sexually dysfunctional men and women. *Journal of Sex & Marital Therapy, 23*(4), 276-290. https://doi.org/10.1080/00926239708403932

McCabe, M. P., Althof, S. E., Assalian, P., Chevret-Measson, M., Leiblum, S. R., Simonelli, C., & Wylie, K. (2010). Psychological and interpersonal dimensions of sexual function

and dysfunction. *Journal of Sexual Medicine, 7*(1 Pt 2), 327-336. https://doi.org/10.1111/j.1743-6109.2009.01618.x

McCallum, B., & Peterson, Z. D. (2012). Investigating the impact of inquiry mode on self-reported sexual behavior: Theoretical considerations and review of the literature. *Journal of Sexual Research, 49*(2-3), 212-226. https://doi.org/10.1080/00224499.2012.658923

McCarthy, B. W., & Farr, E. (2012). Strategies and techniques to maintain sexual desire. *Journal of Contemporary Psychotherapy, 42*(4), 227-233. https://doi.org/10.1007/s10879-012-9207-7

McCarthy, B. W., & Metz, M. E. (2008). The "good-enough sex" model: A case illustration. *Sexual and Relationship Therapy, 23*(3), 227-234. https://doi.org/10.1080/14681990802165919

McCarthy, B. W., & Oppliger, T. R. (2019). Treatment of desire discrepancy: One clinician's approach. *Journal of Sex and Marital Therapy*, 1-9. https://doi.org/10.1080/0092623X.2019.1594475

McCarthy, B. W., & Ross, L. W. (2018). Maintaining sexual desire and satisfaction in securely bonded couples. *The Family Journal, 26*(2), 217-222. https://doi.org/10.1177/1066480718775732

McCarthy, B. W., & Thestrup, M. (2008a). Couple therapy and the treatment of sexual dysfunction. In A. S. Gurman (Ed.), *Clinical handbook of couple therapy* (pp. 591-617). The Guilford Press.

McCarthy, B. W., & Thestrup, M. (2008b). Integrating sex therapy interventions with couple therapy. *Journal of Contemporary Psychotherapy, 38*(3), 139-149. https://doi.org/10.1007/s10879-008-9083-3

McCarthy, B. W., & Wald, L. M. (2012). Sexual desire and satisfaction: The balance between individual and couple factors. *Sexual and Relationship Therapy, 27*(4), 310-321. https://doi.org/10.1080/14681994.2012.738904

McDonald, J. H. (2009). *Handbook of biological statistics*. Sparky House Publishing.

McNulty, J. K., Wenner, C. A., & Fisher, T. D. (2016). Longitudinal associations among relationship satisfaction, sexual satisfaction, and frequency of sex in early marriage. *Archives of Sexual Behavior, 45*(1), 85-97. https://doi.org/10.1007/s10508-014-0444-6

Meana, M. (2010). Elucidating women's (hetero)sexual desire: Definitional challenges and content expansion. *Journal of Sex Research, 47*(2), 104-122. https://doi.org/10.1080/00224490903402546

Meana, M., & Steiner, E. T. (2014). Hidden disorder / hidden desire: Presentations of low sexual desire in men. In Y. M. Binik & K. S. Hall (Eds.), *Principles and practice of sex therapy* (3 ed.). Guilford Press.

Meston, C. M., & Bradford, A. (2007). Autonomic nervous system influences. The role of the sympathetic nervous system in female sexual arousal. In E. Janssen (Ed.), *The psychophysiology of sex*. Indiana University Press.

Meston, C. M., & Buss, D. M. (2007). Why humans have sex. *Archives of Sexual Behavior 36*(4), 477-507. https://doi.org/10.1007/s10508-007-9175-2

Milan, A. (2013). *Marital status: Overview, 2011* (Report on the Demographic Situation in Canada, Issue.

Morley, J. E., & Perry, H. M. (2003). Androgen treatment of male hypogonadism in older males. *The Journal of Steroid Biochemistry and Molecular Biology, 85*(2-5), 367-373. https://doi.org/10.1016/s0960-0760(03)00203-6

Muise, A. (2011). *Gettin'it on vs. Givin'it up: The association between sexual goals, interdependence and sexual desire in long-term relationships* University of Guelph].

Muise, A., Bergeron, S., Impett, E. A., Delisle, I., & Rosen, N. O. (2018). Communal motivation in couples coping with vulvodynia: Sexual distress mediates associations with pain, depression, and anxiety. *Journal of Psychosomatic Research, 106*, 34-40. https://doi.org/10.1016/j.jpsychores.2018.01.006

Muise, A., Giang, E., & Impett, E. A. (2014). Post sex affectionate exchanges promote sexual and relationship satisfaction. *Archives of Sexual Behavior, 43*(7), 1391-1402. https://doi.org/10.1007/s10508-014-0305-3

Muise, A., & Impett, E. A. (2015). Good, giving, and game: The relationship benefits of communal sexual motivation. *Social Psychological and Personality Science, 6*(2), 164-172. https://doi.org/10.1177/1948550614553641

Muise, A., Impett, E. A., & Desmarais, S. (2012). Getting in on versus getting it over with: Sexual motivation, desire and satisfaction in intimate bonds. *Personality and Social Psychology Bulletin, 39*(10), 1320-1332. https://doi.org/10.1177/0146167213490963

Muise, A., Impett, E. A., Kogan, A., & Desmarais, S. (2013). Keeping the spark alive: Being motivated to meet a partner's sexual needs sustains sexual desire in long-term

romantic relationships. *Social Psychological and Personality Science, 4*(3), 267-273. https://doi.org/10.1177/1948550612457185

Muise, A., Stanton, S. C. E., Kim, J. J., & Impett, E. A. (2016). Not in the mood? Men under-(not over-) perceive their partner's sexual desire in established intimate relationships. *Journal of Personality and Social Psychology, 110*(5), 725-742. https://doi.org/10.1037/pspi0000046

Muthén, L. K., & Muthén, B. O. (2015). *Mplus user's guide. Seventh edition*. Muthén & Muthén.

Nagoski, E. (2015). *Come as you are: The surprising new science that will transform your sex life*. Simon and Schuster.

Nezlek, J. B. (2012). Multilevel modeling analyses of diary-style data. In *Handbook of research methods for studying daily life* (pp. 357-383). Guilford Press.

Nichols, M. (2004). Lesbian sexuality/female sexuality: Rethinking 'lesbian bed death'. *Sexual and Relationship Therapy, 19*(4), 363-371. https://doi.org/10.1080/14681990412331298036

Niven, K. (2017). The four key characteristics of interpersonal emotion regulation. *Current Opinion in Psychology, 17*, 89-93. https://doi.org/10.1016/j.copsyc.2017.06.015

O'Sullivan, L. F., & Allgeier, E. R. (1998). Feigning sexual desire: Consenting to unwanted sexual activity in heterosexual dating relationships. *Journal of Sex Research, 35*(3), 234-243. https://doi.org/10.1080/00224499809551938

Olds, J., & Milner, P. (1954). Positive reinforcement produced by electrical stimulation of septal area and other regions of rat brain. *Journal of comparative and physiological psychology, 47*(6), 419. https://doi.org/10.1037/h0058775

Palmer, J. D., Udry, J. R., & Morris, N. M. (1982). Diurnal and weekly, but no lunar rhytms in human copulation. *Human Biology, 54*(1), 111-121.

Panksepp, J. (2011). The basic emotional circuits of mammalian brains: Do animals have affective lives? *Neuroscience & Biobehavoral Review, 35*(9), 1791-1804. https://doi.org/10.1016/j.neubiorev.2011.08.003

Peplau, L. A. (2003). Human sexuality: How do men and woment differ. *Current Directions in Psychological Science, 12*(2), 37-40. https://doi.org/10.1111/1467-8721.01221

Peplau, L. A., & Fingerhut, A. W. (2007). The close relationships of lesbians and gay men. *Annual Review of Psychology, 58*, 405-424. https://doi.org/10.1146/annurev.psych.58.110405.085701

Pereira, T. J., Machado, P. P. P., & Peixoto, M. M. (2019). Sexual and relationship satisfaction: The role of perceived (non)problematic sexual desire discrepancy in gay and heterosexual men. *Journal of Sex and Marital Therapy, 45*(2), 103-113. https://doi.org/10.1080/0092623X.2018.1488323

Perel, E. (2006). *Mating in captivity*. Harper Collins.

Peugh, J. L., DiLillo, D., & Panuzio, J. (2013). Analyzing mixed-dyadic data using structural equation models. *Structural Equation Modeling: A Multidisciplinary Journal, 20*(2), 314-337. https://doi.org/10.1080/10705511.2013.769395

Pfaus, J. G. (2007). Models of sexual motivation. In E. Janssen (Ed.), *The psychophysiology of sex*. Indiana University Press. https://doi.org/10.1111/j.1743-6109.2009.01309.x

Pfaus, J. G. (2009). Pathways of sexual desire. *Journal of Sexual Medicine, 6*(6), 1506-1533.

Pfaus, J. G., Kippin, T. E., Coria-Avila, G. A., Gelez, H., Afonso, V. M., Ismail, N., & Parada, M. (2012). Who, what, where, when (and maybe even why)? How the experience of sexual reward connects sexual desire, preference, and performance. *Archives of Sexual Behavior, 41*(1), 31-62. https://doi.org/10.1007/s10508-012-9935-5

Pfaus, J. G., & Scepkowski, L. A. (2005). The biologic basis for libido. *Current Sexual Health Reports, 2*(2), 95-100. https://doi.org/10.1007/s11930-005-0010-2

Preacher, K. J. (2011). Multilevel sem strategies for evaluating mediation in three-level data. *Multivariate Behavoral Research, 46*(4), 691-731. https://doi.org/10.1080/00273171.2011.589280

Preacher, K. J. (2015). Advances in mediation analysis: A survey and synthesis of new developments. *Annual Review of Psychology, 66*, 825-852. https://doi.org/10.1146/annurev-psych-010814-015258

Preacher, K. J., Rucker, D. D., & Hayes, A. F. (2007). Addressing moderated mediation hypotheses: Theory, methods, and prescriptions. *Multivariate Behavoral Research, 42*(1), 185-227. https://doi.org/10.1080/00273170701341316

Preacher, K. J., Zhang, Z., & Zyphur, M. J. (2016). Multilevel structural equation models for assessing moderation within and across levels of analysis. *Psychological Methods, 21*(2), 189-205. https://doi.org/10.1037/met0000052

Raposo, S., Rosen, N. O., & Muise, A. (2019). Self-expansion is associated with greater relationship and sexual well-being for couples coping with low sexual desire. *Journal of Social and Personal Relationships, 37*(2), 602-623. https://doi.org/10.1177/0265407519875217

Reece, R. (1987). Causes and treatments of sexual desire discrepancies in male couples. *Journal of Homosexuality, 14*(1-2), 157-172. https://doi.org/10.1300/J082v14n01_12

Regan, P. C. (2015). Sexual desire. Conceptualization, correlates and causes. In W. Hofmann & L. F. Nordgren (Eds.), *The psychology of desire* (pp. 347-368). The Guilford Press. https://doi.org/10.1002/9781118896877.wbiehs112

Regan, P. C., & Berscheid, E. (1996). Beliefs about the state, goals, and objects of sexual desire. *Journal of Sex & Marital Therapy, 22*(2), 110-120. https://doi.org/10.1080/00926239608404915

Reis, H. T., Clark, M. S., & Holmes, J. G. (2004). Perceived partner responsiveness as an organizing construct in the study of intimacy and closeness. In D. J. Mashek & A. Aron (Eds.), *Handbook of closeness and intimacy* (pp. 201-225). Psychology Press.

Reis, H. T., & Gable, S. L. (2015). Responsiveness. *Current Opinion in Psychology, 1*, 67-71. https://doi.org/10.1016/j.copsyc.2015.01.001

Reis, H. T., & Shaver, P. (1988). Intimacy as an interpersonal process. In S. Duck, D. F. Hay, S. E. Hobfoll, W. Ickes, & B. M. Montgomery (Eds.), *Handbook of personal relationships: Theory, research and interventions* (pp. 367-389). John Wiley & Sons.

Repetti, R. L., Reynolds, B. M., & Sears, M. S. (2015). Families under the microscope: Repeated sampling of perceptions, experiences, biology, and behavior. *Journal of Marriage and Family, 77*(1), 126-146. https://doi.org/10.1111/jomf.12143

Reynolds, B. M., Robles, T. F., & Repetti, R. L. (2016). Measurement reactivity and fatigue effects in daily diary research with families. *Dev Psychol, 52*(3), 442-456. https://doi.org/10.1037/dev0000081

Ridley, C. A., Cate, R. M., Collins, D. M., Reesing, A. L., Lucero, A. A., Gilson, M. S., & Almeida, D. M. (2006). The ebb and flow of marital lust: A relational approach. *The Journal of Sex Research, 43*(2), 144-153. https://doi.org/10.1080/00224490609552309

Ritter, L. J., Morris, H. R., & Knox, D. (2018). Who's getting the best sex? A comparison by sexual orientation. *Sexuality & Culture*. https://doi.org/10.1007/s12119-018-9538-y

Rizk, P. J., Kohn, T. P., Pastuszak, A. W., & Khera, M. (2017). Testosterone therapy improves erectile function and libido in hypogonadal men. *Current Opinion in Urology, 27*(6), 511-515. https://doi.org/10.1097/MOU.0000000000000442

Robles, T. F., & Kiecolt-Glaser, J. K. (2003). The physiology of marriage: Pathways to health. *Physiology & Behavior, 79*(3), 409-416. https://doi.org/10.1016/s0031-9384(03)00160-4

Rogosa, D. R., & Willett, J. B. (1983). Demonstrating the reliability of the difference score in the measurement of change. *Journal of Educational Measurement, 20*(4), 335-343. https://doi.org/10.1111/j.1745-3984.1983.tb00211.x

Rosen, N. O., Bailey, K., & Muise, A. (2017). Degree and direction of sexual desire discrepancy are linked to sexual and relationship satisfaction in couples

transitioning to parenthood. *Journal of Sex Resarch*, 1-12. https://doi.org/10.1080/00224499.2017.1321732

Rosen, N. O., & Bergeron, S. (2019). Genito-pelvic pain through a dyadic lens: Moving toward an interpersonal emotion regulation model of women's sexual dysfunction. *Journal of Sexual Research, 56*(4-5), 440-461. https://doi.org/10.1080/00224499.2018.1513987

Rosen, N. O., Bergeron, S., Sadikaj, G., Glowacka, M., Delisle, I., & Baxter, M.-L. (2014). Impact of male partner responses on sexual function in women with vulvodynia and their partners: A dyadic daily experience study. *Health Psychology, 33*(8), 823-831. https://doi.org/10.1037/a0034550

Rosen, N. O., Muise, A., Bergeron, S., Delisle, I., & Baxter, M.-L. (2015a). Daily associations between partner responses and sexual and relationship satisfaction in couples coping with provoked vestibulodynia. *Journal of Sexual Medicine, 12*(4), 1028-1039. https://doi.org/10.1111/jsm.12840

Rosen, N. O., Muise, A., Bergeron, S., Impett, E. A., & Boudreau, G. K. (2015b). Approach and avoidance sexual goals in couples with provoked vestibulodynia: Associations with sexual, relational, and psychological wellbeing. *Journal of Sexual Medicine, 12*(8), 1781-1790. https://doi.org/10.1111/jsm.12948

Rosen, R. C., Brown, C., Heiman, J., Leiblum, S. R., Meston, C., Shabsigh, R., Ferguson, D., & D'Agostino, R., Jr. (2000). The female sexual function index (fsfi): A multidimensional self-report instrument for the assessment of female sexual function. *Journal of Sex & Marital Therapy, 26*(2), 191-208. https://doi.org/10.1080/009262300278597

Rosen, R. C., Cappelleri, J. C., & Gendrano, N., , 3rd. (2002). The international index of erectile function (iief): A state-of-the-science review. *International Journal of Impotence Research, 14*(4), 226-244. https://doi.org/10.1038/sj.ijir.3900857

Rosen, R. C., Riley, A., Wagner, G., Osterloh, I. H., Kirkpatrick, J., & Mishra, A. (1997). The international index of erectile function (iief): A multidimensional scale for assessment of erectile dysfunction. *Urology, 49*, 822-830. https://doi.org/10.1016/S0090-4295(97)00238-0

Rosen, R. C., Shifren, J. L., Monz, B. U., Odom, D. M., Russo, P. A., & Johannes, C. B. (2009). Correlates of sexually related personal distress in women with low sexual desire. *Journal of Sexual Medicine, 6*(6), 1549-1560. https://doi.org/10.1111/j.1743-6109.2009.01252.x

Rubin, H., & Campbell, L. (2012). Day-to-day changes in intimacy predict heightened relationship passion, sexual occurrence, and sexual satisfaction. *Social Psychological and Personality Science, 3*(2), 224-231. https://doi.org/10.1177/1948550611416520

Rust, J., Golombok, S., & Collier, J. (1988). Marital problems and sexual dysfunction: How are they related ? *British Journal of Psychiatry, 152*, 629-631. https://doi.org/10.1192/bjp.152.5.629

Sanchez-Fuentes, M. d. M., Santos-Iglesias, P., & Sierra, J. C. (2014). A systematic review of sexual satisfaction. *International Journal of Clinical and Health Psychology, 14*, 67-75. https://doi.org/10.1016/S1697-2600(14)70038-9

Santos-Iglesias, P., Mohamed, B., Danko, A., & Walker, L. M. (2018). Psychometric validation of the female sexual distress scale in male samples. *Archives of Sexual Behavior*. https://doi.org/10.1007/s10508-018-1146-2

Sarin, S., Amsel, R. M., & Binik, Y. M. (2013). Disentangling desire and arousal: A classificatory conundrum. *Archives of Sexual Behavior, 42*(6), 1079-1100. https://doi.org/10.1007/s10508-013-0100-6

Schoebi, D., & Randall, A. K. (2015). Emotional dynamics in intimate relationships. *Emotion Review, 7*(4), 342-348. https://doi.org/10.1177/1754073915590620

Schönbrodt, F. D., Humberg, S., Nestler, S., & Carlson, E. (2018). Testing similarity effects with dyadic response surface analysis. *European Journal of Personality, 32*(6), 627-641. https://doi.org/10.1002/per.2169

Scott, C., F., & Sprecher, S. (2000). Sexuality in marriage, dating and other relationships: A decade review. *Journal of Marriage and Family, 62*, 999-1017. https://doi.org/10.1111/j.1741-3737.2000.00999.x

Scott, S. B., Ritchie, L., Knopp, K., Rhoades, G. K., & Markman, H. J. (2018). Sexuality within female same-gender couples: Definitions of sex, sexual frequency norms, and factors associated with sexual satisfaction. *Archives of Sexual Behavior, 47*(3), 681-692. https://doi.org/10.1007/s10508-017-1077-3

Selig, J. P., & Little, T. D. (2012). Autoregressive and cross-lagged panel analysis for longitudinal data. In B. Laursen, T. D. Little, & N. A. Card (Eds.), *Handbook of developmental research methods* (pp. 265-278). The Guilford Press.

Sewell, K. K., McGarrity, L. A., & Strassberg, D. S. (2017). Sexual behavior, definitions of sex, and the role of self-partner context among lesbian, gay, and bisexual adults.

Journal of Sexual Medicine, 54(7), 825-831. https://doi.org/10.1080/00224499.2016.1249331

Shahbandeh, M. (2018). *Size of the sexual wellness market worldwide from 2017 to 2022*. Statista. www.statista.com/statistics/428953/global-sexual-wellness-market-size/

Shanock, L. R., Baran, B. E., Gentry, W. A., Pattison, S. C., & Heggestad, E. D. (2010). Polynomial regression with response surface analysis: A powerful approach for examining moderation and overcoming limitations of difference scores. *Journal of Business and Psychology, 25*(4), 543-554. https://doi.org/10.1007/s10869-010-9183-4

Shifren, J. L., Braunstein, G. D., Simon, J. A., Casson, P. R., Buster, J. E., Redmond, G. P., E., B. R., Ginsburg, E. S., Rosen, R. C., Leiblum, S. R., & Caramelli, K. E. (2000). Transdermal testosterone treatment in women with impaired sexual function after oophorectomy. *New England Journal of Medicine, 34*(10), 682-688. https://doi.org/10.1056/NEJM200009073431002

Shifren, J. L., Monz, B. U., Russo, P. A., Segreti, A., & Johannes, C. B. (2008). Sexual problems and distress in united states women: Prevalence and correlates. *Obstetrics & Gynecolology, 112*, 970-978. https://doi.org/10.1097/AOG.0b013e3181898cdb

Singer, B., & Toates, F. M. (1987). Sexual motivation. *Journal of Sex Research, 23*(4), 481-501. https://doi.org/10.1080/00224498709551386

Smith, E. R., & Mackie, D. M. (2015). Dynamics of group-based emotions: Insights from intergroup emotions theory. *Emotion Review, 7*(4), 349-354. https://doi.org/10.1177/1754073915590614

Spector, I. P., Carey, M. P., & Steinberg, L. (1996). The sexual desire inventory: Development, factor structure, and evidence of reliability. *Journal of Sex & Marital Therapy, 22*(3), 175-190. https://doi.org/10.1080/00926239608414655

Sprecher, S. (2002). Sexual satisfaction in premarital relationships: Associations with satisfaction, love, commitment, and stability. *Journal of Sex Research, 39*(3), 190-196. https://doi.org/10.1080/00224490209552141

Stephenson, K. R., & Meston, C. M. (2010). Differentiating components of sexual well-being in women: Are sexual satisfaction and sexual distress independent constructs? *Journal of Sexual Medicine, 7*(7), 2458-2468. https://doi.org/10.1111/j.1743-6109.2010.01836.x

Stulhofer, A., Bergeron, S., & Jurin, T. (2016). Is high sexual desire a risk for women's relationship and sexual well-being? *Journal of Sexual Research, 53*(7), 882-891. https://doi.org/10.1080/00224499.2015.1084984

Sutherland, S. E., Rehman, U. S., Fallis, E. E., & Goodnight, J. A. (2015). Understanding the phenomenon of sexual desire discrepancy in couples. *Canadian Journal of Human Sexuality, 24*(2), 141-150. https://doi.org/10.3138/cjhs.242.A3

Tartari, M. (2015). Divorce and the cognitive achievement of children. *International Economic Review, 56*(2), 597-645. https://doi.org/10.1111/iere.12116

Tavakol, M., & Dennick, R. (2011). Making sense of cronbach's alpha. *International Journal of Medical Education, 2*, 53-55. https://doi.org/10.5116/ijme.4dfb.8dfd

Ter Kuile, M. M., Vigeveno, D., & Laan, E. (2007). Preliminary evidence that acute and chronic daily psychological stress affect sexual arousal in sexually functional women. *Behaviour Research and Therapy, 45*(9), 2078-2089. https://doi.org/10.1016/j.brat.2007.03.006

Thomas, D. R., & Zumbo, B. D. (2011). Difference scores from the point of view of reliability and repeated-measures anova. *Educational and Psychological Measurement, 72*(1), 37-43. https://doi.org/10.1177/0013164411409929

Tiefer, L. (2004). *Sex is not a natural act & other essays*. Westview Press.

Tiefer, L., Hall, M., & Tavris, C. (2002). Beyond dysfunction: A new view of women's sexual problems. *Journal of Sex Marital Therapy, 28 Suppl 1*, 225-232. https://doi.org/10.1080/00926230252851357

Toates, F. (2004). Cognition, motivation, emotion and action: A dynamic and vulnerable interdependence. *Applied Animal Behaviour Science, 86*(3-4), 173-204. https://doi.org/10.1016/j.applanim.2004.02.010

Toates, F. (2009). An integrative theoretical framework for understanding sexual motivation, arousal, and behavior. *Journal of Sex Research, 46*(2-3), 168-193. https://doi.org/10.1080/00224490902747768

Toledano, R., & Pfaus, J. G. (2006). The sexual arousal and desire inventory (sadi): A multidimensional scale to assess subjective sexual arousal and desire. *Journal of Sexual Medicine, 3*(5), 853-877. https://doi.org/10.1111/j.1743-6109.2006.00293.x

Tolman, D. L., & Diamond, L. M. (2001). Desegregating sexuality research: Cultural and biological perspectives on gender and desire. *Annual Review of Sex Research, 12*(1), 33-74. https://doi.org/10.1080/10532528.2001.10559793

Trafimow, D. (2015). A defense against the alleged unreliability of difference scores. *Cogent Mathematics, 2*(1). https://doi.org/10.1080/23311835.2015.1064626

Trudel, G., & Goldfarb, M. R. (2010). Marital and sexual functioning and dysfunctioning, depression and anxiety. *Sexologies, 19*(3), 137-142. https://doi.org/10.1016/j.sexol.2009.12.009

Usami, S. (2014). A convenient method and numerical tables for sample size determination in longitudinal-experimental research using multilevel models. *Behavior Research Methods, 46*(4), 1207-1219. https://doi.org/10.3758/s13428-013-0432-0

Vaillancourt-Morel, M.-P., Rosen, N. O., Willoughby, B. J., Leonhardt, N. D., & Bergeron, S. (2020). Pornography use and romantic relationships: A dyadic daily diary study. *Journal of Social and Personal Relationships, 37*(10-11), 2802-2821. https://doi.org/10.1177/0265407520940048

Valverde, M. (2006). A new entity in the history of sexuality: The respectable same-sex couple. *Feminist Studies, 32*(1), 155-162. https://doi.org/10.2307/20459076

van Anders, S. M. (2012). Testosterone and sexual desire in healthy women and men. *Archives of Sexual Behavior, 41*(6), 1471-1484. https://doi.org/10.1007/s10508-012-9946-2

van Anders, S. M. (2015). Beyond sexual orientation: Integrating gender/sex and diverse sexualities via sexual configurations theory. *Archives of Sexual Behavior 44*(5), 1177-1213. https://doi.org/10.1007/s10508-015-0490-8

Velten, J., & Margraf, J. (2017). Satisfaction guaranteed? How individual, partner, and relationship factors impact sexual satisfaction within partnerships. *PLoS ONE, 12*(2), e0172855. https://doi.org/10.1371/journal.pone.0172855

Venkatesh, V., & Goyal, S. (2010). Expectation disconfirmation and technology adoption: Polynomial modeling and response surface analysis. *MIS Quarterly, 34*(2), 281-303. https://doi.org/10.2307/20721428

Vowels, M. J., Mark, K. P., Vowels, L. M., & Wood, N. D. (2018). Using spectral and cross-spectral analysis to identify patterns and synchrony in couples' sexual desire. *PLoS ONE, 13*(10), e0205330. https://doi.org/10.1371/journal.pone.0205330

West, S. G., Taylor, A. B., & Wu, W. (2012). Model fit and model selection in structural equation modeling. In R. H. Hoyle (Ed.), *Handbook of structural equation modeling* (pp. 209-231). Guilford Press.

Whitson, S., & El-Sheikh, M. (2003). Marital conflict and health. *Aggression and Violent Behavior, 8*(3), 283-312. https://doi.org/10.1016/s1359-1789(01)00067-2

Willoughby, B. J., Farero, A. M., & Busby, D. M. (2014). Exploring the effects of sexual desire discrepancy among married couples. *Archives of Sexual Behavior, 43*(3), 551-562. https://doi.org/10.1007/s10508-013-0181-2

Wittenborn, A. K., Dolbin-MacNab, M. L., & Keiley, M. K. (2013). Dyadic research in marriage and family therapy: Methodological considerations. *Journal of Marital*

and Family Therapy, 39(1), 5-16. https://doi.org/10.1111/j.1752-0606.2012.00306.x

Witting, K., Santtila, P., Varjonen, M., Jern, P., Johansson, A., von der Pahlen, B., & Sandnabba, K. (2008). Female sexual dysfunction, sexual distress, and compatibility with partner. *Journal of Sexual Medicine, 5*(11), 2587-2599. https://doi.org/10.1111/j.1743-6109.2008.00984.x

Woo, J. S., Brotto, L. A., & Gorzalka, B. B. (2011). The role of sex guilt in the relationship between culture and women's sexual desire. *Archives of Sexual Behavior, 40*(2), 385-394. https://doi.org/10.1007/s10508-010-9609-0

Zaki, J., & Williams, W. C. (2013). Interpersonal emotion regulation. *Emotion, 13*(5), 803-810. https://doi.org/10.1037/a0033839

Zhang, D., & Willson, V. L. (2006). Comparing empirical power of multilevel structural equation models and hierarchical linear models: Understanding cross-level interactions. *Structural Equation Modeling: A Multidisciplinary Journal, 13*(4), 615-630. https://doi.org/10.1207/s15328007sem1304_6

Zilbergeld, B., & Ellison, C. R. (1980). Desire discrepancies and arousal problems in sex therapy. In S. R. Leiblum & L. A. Pervin (Eds.), *Principles and practice of sex therapy*. Guilford Press.

Zion Market Research. (2018). *Global erectile dysfunction drugs market will reach usd 7.10 billion by 2024*. Global News Wire. www.globenewswire.com/news-release/2018/10/05/1617442/0/en/Global-Erectile-Dysfunction-Drugs-Market-Will-Reach-USD-7-10-Billion-by-2024-Zion-Market-Research.html