A latent variable approach to understanding the relationships between sexual dysfunctions and depressive and anxiety disorders

Miriam K. Forbes

BA Psych Hons

Department of Psychology, Macquarie University

This thesis is presented for the degree of a Doctor of Philosophy in Psychology.

July 2014

Table of Contents

Thesis Summary

Interest in the underlying structure of mental disorders has grown in recent years. Studies concur that the high rates of comorbidity between sexual dysfunctions and depressive and anxiety disorders are related to increased chronicity and severity, and poorer quality of life. However, the direction and nature of the relationships between the disorders remains unclear, and sexual dysfunctions have not been considered in the formulation of a nosological meta-structure. Accurate and empirically based models of these relationships are important precursors to effective diagnosis and treatment, but have not been considered in the literature to date. Thus, the aim of this thesis was to empirically evaluate theory-driven models of these relationships as a first step towards understanding their aetiology, course, and the most effective treatment response for clinicians. The relationships between depression, anxiety, and sexual problems were investigated using large samples and advanced statistical techniques, including structural equation modelling, latent profile analyses, and factor mixture analysis (FMA).

Five separate studies were conducted: The first examined a dimensional model of the relationships, which extended the established internalising spectrum to include sexual problems. The second investigated the measurement capabilities of popular sexual function measures —to evaluate their pertinence to latent structure models— and found them lacking for the measurement of sexual desire in particular. The third compared a dimensional model with a categorical framework model to determine which conceptualisation was more appropriate for the relationships between the disorders, and found a dimensional model provided the best fit for the majority of men and women. The fourth allowed for simultaneous dimensional and categorical components in a structural model by using FMA. The models of best fit implied that that the relationships between the disorders should be recognised in our nosological systems, but separate diagnostic groups can also be maintained. The final study was a preliminary examination of the interrelationships between the latent variables over

time, and found relationships consistent with a shared underlying factor that drives change in the disorders over time.

Taken together, these studies advance our understanding of the relationships between these highly comorbid disorders that can have a severe impact on quality of life. Understanding these relationships is a prerequisite for effective diagnosis and treatment, and is crucial to having valid nosological systems. This body of work contributes to the literature by (i) extending our knowledge about the nature of the relationships between depression, anxiety, and sexual problems; (ii) developing preliminary structural models of these relationships that are suited to the nature of psychopathology and to our nosological systems; and (iii) by providing specific recommendations about ways these models can be incorporated into our nosology.

Statement of Candidate

I certify that the work in this thesis entitled "A latent variable approach to understanding the relationships between sexual dysfunctions and depressive and anxiety disorders" has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree to any other university or institution other than Macquarie University. I also certify that the thesis is an original piece of research and it has been written by me. In addition, I certify that all information sources and literature used are indicated in the thesis.

Each of the empirical chapters lists multiple authors. I, Miriam Forbes, am the primary author of each chapter. Associate Professor Andrew Baillie and Doctor Carolyn Schniering are my PhD supervisors, and their contributions to each empirical paper are as follows:

Chapter Two: As the primary author, I was responsible for the study conception and design, data collection and analysis, interpretation of the results, and preparation of the manuscript for publication. Dr Carolyn Schniering provided guidance throughout these processes and provided extensive feedback on the manuscript. Dr Alan Taylor (not listed as a co-author) was a statistical consultant for the structural equation modelling.

Chapter Three: As the primary author, I was responsible for the study conception and design, data analysis, interpretation of the results, and preparation of the manuscript for publication. A/Prof Andrew Baillie and Dr Carolyn Schniering provided extensive feedback on the manuscript

Chapter Four: As the primary author, I was responsible for the study conception and design, data analysis, interpretation of the results, and preparation of the manuscript for publication. A/Prof Andrew Baillie suggested the statistical approach, provided guidance on the application and interpretation of latent profile analyses, and provided extensive feedback on the manuscript. Dr Carolyn Schniering provided guidance throughout the initial study design and data collection, and provided feedback on the manuscript.

Chapter Five: As the primary author, I was responsible for the study conception and design, data collection and analysis, interpretation of the results, and preparation of the manuscript for publication. A/Prof Andrew Baillie provided guidance throughout all of these processes, particularly with reference to the most appropriate statistical approaches, and gave feedback on the manuscript. Dr Carolyn Schniering provided feedback on the manuscript.

Chapter Six: As the primary author, I was responsible for the study conception and design, data analysis, interpretation of the results, and preparation of the manuscript for publication. A/Prof Andrew Baillie provided guidance throughout these processes and gave feedback on the manuscript. Dr Carolyn Schniering also provided feedback on the manuscript.

A/Prof Andrew Baillie and I spent countless hours discussing the ideas in Chapters One and Seven, and A/Prof Baillie also provided conceptual and editorial feedback on these chapters. Owen Forbes proofread all seven chapters, and Prof Greg Forbes proofread Chapters One and Seven.

The research in this thesis was approved by the Macquarie University Human Ethics Committee, reference number: 5201000105 on 3/3/2010, and reference number: 5201100390 on 18/5/2011.

Miriam Forbes Date

Student ID: 40740358

Acknowledgements

It took a village: Andrew, Carolyn, Pearse, Dad, Mum, Owen, Mabs, John, my Pod buddies, and all of my other family and friends. Your support, encouragement, and friendship made this a terrific journey. Thank you.

Chapter One

General Introduction

General Introduction

This thesis demonstrates that sexual dysfunctions share a common underlying factor with depression and anxiety disorders akin to internalising psychopathology. Positive sexual relationships and intimacy are fundamentally important parts of human experience that represent a valuable area for investigation, and yet have somehow become the shrinking violets of mainstream psychopathology research. Symptoms of sexual dysfunction[1] are highly prevalent (e.g., Laumann, Paik & Rosen, 1999; Mercer et al., 2003); within Australia, two thirds of the population aged over sixteen are sexually active and over half of these people experience sexual problems (de Visser, Smith, Rissel, Richters & Grulich, 2003; Harrison, 2009; Najman, Dunne, Boyle, Cook & Purdie, 2003), which are associated with marked personal distress and decreased quality of life (Blumentals, Gomez-Caminero, Brown, Vannappagari & Russo, 2004; Dunn, Croft & Hackett, 1998; Kontula & Haavio-Mannila, 2009; Matic & McCabe, 2007; McCabe, 1997; Moreira, Glasser, King, Duarte & Gingell, 2008; Nobre, Pinto-Gouveia & Gomes, 2006; Richters, Grulich, de Visser, Smith & Rissel, 2003; Shabsigh, Zakaria, Anastasiades & Seidman, 2001). Mental health is the best predictor of sexually related distress (Bancroft et al., 2003b), and the experience of combined depression, anxiety, and sexual problems can have a profound negative impact on an already compromised quality of life (e.g., Michael & O'Keane, 2000).

Depressive and anxiety disorders have long been known to have high rates of co-occurrence with sexual dysfunctions (Derogatis, Meyer & King, 1981; Kaplan, 1979; Wolpe, 1958) and these findings have been consistently replicated across demographic groups and cultures (see Laurent & Simons, 2009 for a review). More specifically, major depressive

---

[1] Symptoms of sexual dysfunction are referred to as sexual problems throughout this thesis, as distress associated with the symptoms has not been measured, and no diagnosis has been made (Bancroft, Loftus & Long, 2003b; Lutfey, Link, Rosen, Wiegel & McKinlay, 2009). Where diagnosable disorders are referred to, the term "sexual dysfunctions" is used. This footnote has been removed from subsequent chapters.

disorder, generalised anxiety disorder (GAD), obsessive-compulsive disorder (OCD), and panic disorder have been found to be associated with sexual desire, arousal, and orgasmic disorders for men and women, as well as with sexual pain disorders for women (e.g., Althof et al., 2005; Balon, 2006; Derogatis et al., 1981; Figueira, Possidente, Marques & Hayes, 2001; Kendurkar & Kaur, 2008; van Minnen & Kampman, 2000). Social anxiety has been found to have more specific relationships with orgasmic disorders (Figueira et al., 2001) but also with desire and pain disorders (Corretti & Baldi, 2007). These systematic patterns of co-occurrence are associated with increased chronicity and severity, and worse long-term outcomes for patients across all three diagnostic groups (Laurent & Simons, 2009; Michael & O'Keane, 2000; van Lankveld & Grotjohann, 2000). Despite this, we have a poor understanding of the relationships between depression, anxiety, and sexual problems; the disorders tend to be treated separately, and sexual dysfunctions often go undiagnosed and under-recognised in primary care (Mercer et al., 2003; Moreira et al., 2008; Read, King & Watson, 1997; Richters et al., 2003).

This thesis aims to advance our understanding of the nature of the interrelationships between these disorders. It consists of seven chapters, five of which are self-contained empirical papers. This first chapter introduces the context of the research, reviews the pre-existing findings on these relationships, and outlines the aims and structure of the program of research.

Comorbidity Among Mental Disorders in a Broad Psychopathology Framework

The concept of a "mental disorder" is not well defined (Aragona, 2009). In this thesis, mental disorders are conceptualised as syndromes indicated by groups of observable clinical symptoms and signs that commonly occur together. In this paradigm, the disorder itself is not observable; it is only measureable via the symptoms, which indicate the severity of the disorder on a continuous spectrum from 'normal' to 'abnormal'. As such, disorders are not conceptualised as present/absent on the basis of a threshold determined by polythetic

diagnostic criteria; this approach creates an artificial distinction between 'normal' and 'abnormal' function, and generates instability in diagnoses from the effect of small changes in presenting symptoms (Widiger & Trull, 2007). By conceptualising disorders as continuous, we can retain valuable information about symptom variation above and below the diagnostic threshold, and differentiate between severity levels (Krueger, Caspi, Moffit & Silva, 1998).

Since the release of the third edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-III), comorbidity[2] between mental disorders has been an ongoing difficulty for psychopathology research, as common mental disorders are significantly correlated and have consistently been found to systematically co-occur (i.e., co-occur more frequently than would be expected by chance; Kessler, Chiu, Demler & Walters, 2005; Kessler et al., 1994). To learn how we can best conceptualise and understand comorbidity, we need to understand how and why disorders covary by determining which statistical models offer the strongest explanation of empirical data that document comorbidity among disorders (Krueger & Markon, 2006). Neale and Kendler (1995) built on Klein and Riso's (1993) theoretical models of comorbidity to develop statistical models that account for the covariation of two disorders, such as the random multiformity model (i.e., having Disorder A generates symptoms of Disorder B, and vice versa), the correlated liabilities model (i.e., the risk factors for Disorders A and B are correlated), and the causal model (i.e., Disorder A is a risk factor for Disorder B). Krueger and Markon (2006) extended this research to explore multivariate models of comorbidity among groups of disorders; studies have consistently found results consonant with the associated liabilities models they describe, in which shared underlying factors

[2] Comorbidity was originally conceptualised as the co-existence of clinical disorders within an individual (Feinstein, 1970). Throughout this thesis, the term "comorbidity" is used to conceptualise the observed covariation of psychopathological syndromes in the population, despite the controversy surrounding the term (Goldberg, 2014; Lilienfeld, Waldman & Israel, 1994). The use of the term "comorbidity" encompasses the notions of observed covariation, systematic co-occurrence, multimorbidity and multivariate comorbidity (cf. Krueger & Markon, 2006).

account for comorbidity between disorders. In these models, comorbidity is no longer seen as a nuisance, but as an indicator of stable, underlying core psychological processes (Krueger, 1999). Accordingly, the high rates of comorbidity between common mental disorders have been reconceptualised as an artefact of diagnostic systems (i.e., the DSM, and the *International Classification of Diseases* [ICD]) that are imposing false categorical distinctions (Maj, 2005).

Models of Comorbidity Among Depressive and Anxiety Disorders

The comorbidity among depressive and anxiety disorders is a pertinent and well-documented example (see Mineka, Watson & Clark, 1998 for a systematic review). In their tripartite model, Clark and Watson (1991) accounted for the overlap between depression and anxiety through a general heritable neuroticism factor that is characterised by negative affect (see also Andrews, Morris-Yates, Holt & Henderson, 1990), and anxiety and depression are distinguished by the unique factors of 'physiological hyperarousal' (specific to anxiety) and 'low positive affect' (specific to depression). In their seminal paper, Krueger et al. (1998) expanded on this work to uncover two correlated spectra (also referred to as "liabilities," e.g., Eaton et al., 2013) that describe the structure of common mental disorders: Externalising psychopathology comprises substance use disorders and antisocial personality disorder, where maladjustment is expressed outwards; internalising psychopathology is characterised by negative affect, and explains the comorbidity among affective disorders, where maladjustment is expressed inwards. The internalising spectrum is split into 'Fear' and 'Distress' liabilities that differentiate between anxiety and depressive disorders respectively —with the exception of GAD, which is an indicator for Distress along with major depression and dysthymia.

In a statistical representation of this theoretical model, these dimensional spectra are invoked as higher-order latent factors that account for the shared variance among the disorders, and the distinctions between the disorders are also accounted for by including their unique variance (Krueger & Piasecki, 2002). This internalising-externalising (IE) structure

groups disorders according to actual empirical similarities and comorbidity levels, rather than through the focus on shared phenomenological features in the DSM (Krueger, Markon, Patrick & Iacono, 2005a). While the precise causes for disorders falling along this continuum are unclear, the structure is consistent with current genetic and personality research and has been replicated across genders, cultures, diagnostic time frames, various measurement levels, analytic approaches, and for clinical and community samples (Acton, Kunz, Wilson & Hall, 2004; Goldberg, Krueger, Andrews & Hobbs, 2009; Kendler, Prescott, Myers & Neale, 2003; Krueger, 1999; Krueger, Chentsova-Dutton, Markon, Goldberg & Ormel, 2003; Krueger & Finger, 2001; Watson, 2005). The dimensional IE spectrum model has also been validated in a meta-analytic comparison of different conceptualisations of comorbidity, and was found to have a superior fit compared to the DSM-IV classifications (Krueger & Markon, 2006). This finding provides support for the notion that the DSM-IV diagnostic categories may lack structural coherence (Watson, 2005), which is particularly concerning given the influence of the DSM structure on clinical research and practice.

The Structure of the DSM and the ICD

The DSM is popularly referred to as "psychiatry's bible." Since its diagnostic structure and criteria are reified by health professionals, teaching institutions, journals, and researchers (First, 2009), each new edition 'drives science' by prescribing the structure of teaching and learning about psychopathology (Clark, Watson & Reynolds, 1995, p. 123). The extent of this influence necessitates careful attention to the (lack of) methodological underpinnings of these classification systems (Acton & Zodda, 2005): In 1948, the World Health Organization (WHO) published the ICD-6, which for the first time included mental disorders as part of its broad nomenclature. A few years later the American Psychiatric Association (APA) published the first edition of the DSM, which described categories of mental disorders with a focus on clinical utility (APA, 2014). Stengel's (1959) comprehensive review of diagnostic issues emphasised the importance of explicit definitions of disorders as a means of promoting

reliable clinical diagnoses where the pathology and aetiology of disorders is unknown. This was eventually adopted in DSM-III's descriptive approach, which provided lists of diagnostic criteria and attempted to remain neutral with respect to aetiology. The developers of the DSM-IV and ICD-10 worked together to increase congruence between their two nosologies, with the goal of relying on firm empirical bases for change without disrupting clinical utility. Ultimately, the DSM-IV and ICD-10 are consensus statements that provide clinical and research utility through the precise definition of diagnoses, but their emphasis on the differences between disorders distracted subsequent research from the development of dimensional theories about shared underlying psychopathological processes (Acton & Zodda, 2005). However, as a result of the findings that dimensional spectrum models offer the best explanation of the broad structure of psychopathology, spectra of psychopathology have been incorporated into the DSM-5 to reflect the empirical relationships and similarities between larger groups of disorders (e.g., the Depressive Disorders and Anxiety Disorders chapters are adjacent). Similarly, the ICD-11 will use "multiple parenting" to recognise the empirical relationships between different disorders and diagnostic chapters, and to account for the phenomenological complexity of disorders (i.e., an entity may be in more than one branch; for example, Tuberculosis Meningitis is both an infection and a brain disease; WHO, 2014). While the DSM and ICD are also under the influence of competing social and political processes, the APA and WHO have made it clear that change will be made according to empirical evidence in future revisions (APA, 2013a; WHO, 2014), although it is unclear what empirical evidence will be considered necessary or sufficient for change.

Leading up to the release of the DSM-5, extensive research served to expand and explore dimensional models of psychopathology, and most Axis I and II disorders have been included in the IE model, including post traumatic stress disorder, OCD, bipolar disorders, eating disorders, schizophrenia, and personality disorders (Kotov et al., 2010; Krueger, 2005; Krueger et al., 1998; Markon, Krueger & Watson, 2005; Slade & Watson, 2006; Watson,

2005). However, sexual dysfunctions have not been considered in any examinations of the broad structure of psychopathology (e.g., Kendler, 2009; Krueger, Watson & Barlow, 2005b; Markon, 2010). The existing body of literature suggests that sexual dysfunctions may be a strong candidate for inclusion in the internalising spectrum with depressive and anxiety disorders. As a side note: because sexual dysfunctions do not fit neatly with the current conceptualisation of internalising psychopathology (i.e., disorders where maladjustment is directed inwards), their inclusion in the internalising spectrum would shift the boundaries of this latent construct. Correspondingly, the shared liability between the disorders is referred to as "akin to internalising psychopathology" in this thesis, as it is a subtly different construct from the traditional label of "internalising psychopathology".

The Associations between Depression, Anxiety, and Sexual Dysfunctions

Looking beyond the high comorbidity rates among sexual dysfunctions and depressive and anxiety disorders, there is a large body of literature regarding the strong multifaceted relationships in their shared cognitive and affective processes and characteristics. For example, sexual dysfunctions are characterised by the same sorts of unconditional beliefs (e.g., conservative, rigid and negative ideas about sex; Bach, Wincze & Barlow, 2007; Nobre & Pinto-Gouveia, 2006; Nobre & Pinto-Gouveia, 2008, 2009), maladaptive cognitive schemas (e.g., failure expectancies, incompetence self-schemas, perceived lack of control, hyper-vigilance; Nobre, 2009; Nobre & Pinto-Gouveia, 2008, 2009; Wiegel, Scepkowski & Barlow, 2007), and negative causal attributions (i.e., internal, global and stable attributions for negative sexual events; Nobre, 2009; Wiegel et al., 2007) that are found in depression and anxiety. Sexual dysfunctions also share the high level of negative affect that characterises internalising disorders, which is a general dimension of fear, anger sadness, guilt, worry, and disgust (Clark & Watson, 1991); high levels of these emotions have been found in men and women with sexual dysfunctions (Nobre, 2009; Peixoto & Nobre, 2012) and sexual dysfunctions are generally related to both temporary and recurrent negative affect (Wiegel et

al., 2007). Correspondingly, Oliveira and Nobre (2013) recently proposed that negative trait affect might act as a common vulnerability factor for depression, anxiety, and sexual problems in women. Furthermore —in the context of Clark and Watson's (1991) tripartite model— low positive affect (or anhedonia) has also been associated with sexual problems (Kalmbach, Ciesla, Janata & Kingsberg, 2012; Oliveira & Nobre, 2013; Wiegel et al., 2007), and anxious arousal has been linked specifically with more physiological sexual problems, such as lubrication and pain difficulties for women and erectile and orgasmic function for men (Kalmbach et al., 2012).

Depression, anxiety, and sexual dysfunctions have further overlap in their associated personality traits. For example, internalising spectrum disorders are related to neuroticism, which appears to confer a risk for internalising psychopathology (Krueger & Markon, 2006); sexual dysfunctions have also been associated with high levels of neuroticism, even after controlling for other psychopathology (Harris, Cherkas, Kato, Heiman & Spector, 2008; Quinta Gomes & Nobre, 2011). Further, neuroticism has been found to predict the overall frequency of negative sexual cognitions (Moyano & Sierra, 2013).

Finally, biological correlates have been found in dopaminergic neurophysiology, which increases desire and erectile function (Meston & Frohlich, 2000) and noradrenergic neurophysiology, which may explain the link between anxiety and spontaneous ejaculation (Redmond, Kosten & Reiser, 1983). Corretti and Baldi (2007) also suggested that the sympathetic dominance in the neurobiological expression of anxiety is negatively involved in arousal and orgasm, and may also interfere with desire. While a large body of literature has found high rates of comorbidity, as well as cognitive, affective, personality and neurobiological associations between the disorders, a smaller set of studies has found conflicting results.

Conflicting Studies

Some young men have been found to report increased desire during negative mood states (Bancroft et al., 2003a). Bancroft et al. (2003a) accounted for this finding with a "self-soothing" hypothesis that suggests these men are seeking intimacy, self-validation, and pleasure during negative mood states, which manifests as elevated desire. Nofzinger (1993) found a similar pattern for men experiencing atypical depressive episodes —who reported increased desire— whereas men experiencing anhedonic, endogenous or melancholic depression reported decreased desire. These two studies might be describing the same phenomenon: Given that atypical depression is more common in adolescence (APA, 2000), it could be the mood reactivity in atypical depression that is associated with increased sexual desire in young men. Specifically, mood reactivity in response to potential positive events may reinforce sexual approach behaviours in these young men. In other types of depression, the ongoing dysphoria and anhedonia may disrupt the process by which pleasurable behaviours are reinforced (Frohlich & Meston, 2002). These findings are important to consider, as they highlight the importance of nuanced analyses that do not presume the same interrelationships between groups (e.g., factor mixture analyses).

Some studies have also found anxiety to have a neutral or facilitative effect on sexual arousal for men and women. In their review of experimental studies on sexual dysfunctions and anxiety disorders, van den Hout and Barlow (2000) concluded that "there is no reason to believe that anxiety disorders are driven by sexual problems or that sexual problems are maintained by anxiety" (p. 241). However, these findings rely exclusively on experimental studies of state anxiety —which seems to have a facilitative effect through sympathetic activation— and the mislabeling of physiological anxious arousal as sexual arousal (i.e., excitation transfer) in sexually functional participants (Elliot & O'Donohue, 1997). While these studies' findings are valid and interesting, they do not contradict the premise of this thesis, which is focused on the broad overarching relationships between disorders and is not

concerned with transient state affect and anxiety. Interestingly, these same experimental studies consistently find distraction (i.e., a shared cognitive component of state and trait anxiety) to have a negative impact on sexual arousal —for both sexually functional and dysfunctional participants— as it increases the salience of non-erotic cues, preventing positive cognitive and emotional feedback and subsequent subjective arousal (Basson, 2002; Corretti & Baldi, 2007; Corretti, Pierucci, De Scisciolo & Nisita, 2006; Elliot & O'Donohue, 1997).

Taken together, the multifaceted relationships and high rates of comorbidity between depression, anxiety, and sexual dysfunctions may denote common aetiological bases. Combined with the lack of apparent causal relationships, Laurent and Simons (2009) suggested that sexual dysfunctions might be part of the internalising spectrum, alongside depressive and anxiety disorders. However, despite increased interest in the broad structure of psychopathology over the last fifteen years, there have been no studies on how sexual dysfunctions fit into this broad structure. Further —with the exception of recent studies by Oliviera and Nobre (2013), Peixoto and Nobre (2012), and Kalmbach et al. (2012)— there have been very few studies on the broad relationships between these groups of disorders; most psychopathology studies rely almost exclusively on cross-sectional and experimental designs that examine the relationships between pairs of disorders.

Understanding the Nature of the Broad Interrelationships

Given their strong negative impact when combined, and the disadvantages of not treating them together, more work is needed to understand the nature of the relationships between sexual dysfunctions and depressive and anxiety disorders. Defining the relationships between these disorders is a prerequisite for an understanding of the mechanisms and processes that foster comorbidity, which is necessary before interventions can be developed to prevent comorbidity (Kessler & Price, 1993). Elucidating the relationships between the disorders would also promote the development of an empirically based nosology, and would foster more sensitive diagnosis. For example, if the disorders share a latent liability, the presence of

depression or anxiety makes it easy to identify patients at risk for sexual dysfunction, and vice versa. The low levels of recognition and treatment in primary care settings (Dunn et al., 1998; Mercer et al., 2003; Moreira et al., 2008; Read et al., 1997; Richters et al., 2003) could thus be improved by formalising the need to screen for sexual problems, which could overcome some of the discomfort associated with initiating discussions about sexual dysfunction in primary care. The knock-on effect to the prevention of comorbidity might also pre-empt the exacerbation of primary disorders that is known to accompany onset of a secondary disorder (Kessler & Price, 1993).

In short, accurate models of these relationships are important precursors for the development of an empirically based nosology, sensitive diagnostic protocol, and efficacious treatment programs. In this context, this thesis addresses some fundamentally important research questions: Do sexual dysfunctions and depressive and anxiety disorders share an internalising liability? Are our nosological models accurate representations of the interrelationships between the disorders? Are there alternative empirically driven models that could improve our classification systems? Are there any evident causal relationships between the disorders that could explain their comorbidity? Despite the importance of these questions, they have not been considered in the literature to date. Thus, the aim of this program of research was to empirically evaluate theory-driven models of comorbidity to define the structural relationships between these disorders. The five empirical studies focus on the latent structure of the relationships between the disorders[3], and are consequently intrinsically linked with a number of methodological and statistical considerations.

---

[3] The studies in this thesis are the first to investigate the nature of the broad relationships between depression, anxiety, and sexual problems. As such, this is preliminary research that takes a latent variable approach, and is primarily focused on the structure of the relationships based on the observed covariation among the symptoms of the disorders, and these studies do not take into account the effects of extraneous variables that could also have a role in changing symptom levels (e.g., relationship quality, life stressors, SSRIs, see Althof et al., 2005; Figueira et al., 2001).

Methodological and Statistical Considerations

The key considerations for these studies included (i) how to conceptualise and measure disorders, (ii) deciding which type of samples to recruit and include in each study, and (iii) determining the assumptions and limitations of statistical analyses that were best suited to the research questions and theoretical models of interest. These issues were all intertwined. For example, I decided to measure self-reported symptoms of disorders (rather than using structured interviews or physiological measures) to enable the collection of the largest possible samples, given the time frame and resource constraints. The use of summed symptom scores allowed us to conceptualise the disorders as continuous in severity, which provides useful information above and below diagnostic thresholds —rather than relying on the somewhat arbitrary diagnostic thresholds of polythetic criteria for diagnosis (Caspi et al., 2013)— and led to our decision to test statistical models based on symptom covariation among the disorders.

The Samples

To date, there has been very little research on these disorders in non-clinical samples, as most studies begin with a base population of participants with diagnosed sexual dysfunctions or depressive or anxiety disorders (Laurent & Simons, 2009). Research that relies on clinical samples is vulnerable to Berkson's bias (Berkson, 1946), which states that comorbid cases are more common in clinical samples than the population at large, even if the probability of seeking help is independent of disorder severity. These high comorbidity rates are associated with elevated distress, and, importantly, with restricted range in symptom variation due to the nature of the exclusively high-symptom sample (see Edwards, 1976). The inclusion of a broad range of symptom levels is vital to understand the nature of the relationships that describe the covariation among disorders, so an investigation of these relationships in a diverse non-clinical sample would provide particularly useful information. The dimensional structure of psychopathology has been found to have high levels of similarity between clinical and non-

clinical samples (O'Connor, 2002). The extension of the IE structure in a sample of participants across a variety of symptom levels will thus give us important insights into the relationships between the disorders, and is potentially relevant to both epidemiological and clinical research.

Two large-scale convenience samples were recruited with the goal of representing a wide variety of symptom levels and socio-demographic backgrounds. The first sample (used in Chapters 2 through 4) was a cross-sectional survey of self-reported symptom levels. The second sample (used in Chapters 5 and 6) had greater symptom variation, and provided responses for a longitudinal study that included six time points, which allowed for both concurrent and sequential comorbidity to be accounted for when evaluating the structure of comorbidity (cf. Caspi et al., 2013).

Statistical Analyses to Match Theoretical Models

The most important methodological considerations were the statistical analyses used to model the latent relationships: The theoretical models of the relationships between the disorders (i.e., dimensional and categorical models, or nosological models) are intertwined with the statistical methods that are used to examine and compare them. The analyses utilised include structural equation modelling (SEM), latent profile analyses (LPA), exploratory factor analyses, and factor mixture analyses (FMA). Each type of statistical modelling has its own set of assumptions, strengths and limitations that need to be balanced in the context of the research questions. The parsimony of the models is particularly important in a nosology context; parsimonious models are more likely to be population models, as they explain more observations with fewer assumptions (Krueger & Markon, 2006). However, it is also important to use nuanced analyses that can identify subgroups that do not share the relationships in the parsimonious models of best fit (e.g., FMA). While all of the models tested offer important and useful information in isolation, it is their interpretation as a body of

research that provides the most informative and robust characterisation of the nature of the underlying relationships between depression, anxiety, and sexual problems.

Thesis Structure

As already mentioned, this thesis is in the form of seven chapters, five of which are self-contained empirical papers. Chapter 2 examines whether a liability-spectrum model is an accurate representation of the relationships between the disorders. More specifically, it is an empirical evaluation of three alternative conceptualisations of these relationships. The first model was an expanded model of the internalising spectrum that included a sexual problems liability alongside Fear and Distress. The second model incorporated Laurent and Simons' (2009) interpretation of Clark and Watson's (1991) tripartite model through the inclusion of cross-loadings from Distress to desire and orgasm disorders, and from Fear to arousal and pain disorders. The third model was based on the DSM-IV-TR organisation of disorders into separate chapters. This cross-sectional study includes sexually active participants with complete responses, and uses SEM to compare the three models. The published version of this study is included in Appendix A with small editorial changes that are explained in detail in the final paragraph of this chapter.

Because there were some unexpected results for sexual problems in Chapter 2, the study in Chapter 3 is an investigation of the measurement properties of the sexual function measures utilised in the first sample, namely the Female Sexual Function Index (FSFI; Rosen et al., 2000) and the International Index of Erectile Function (IIEF; Rosen et al., 1997). The FSFI and IIEF were found to have flaws for the measurement of sexual desire in particular. This study was published with a commentary by some of the authors of the measures, and my response to that commentary. These manuscripts are all included in Appendix B.

Chapter 4 compares a dimensional spectrum conceptualisation of the relationships between the disorders with a categorical conceptualisation using SEM and LPA, respectively. This is a test of the assertion in Chapter 2 that sexual problems should be included in the

internalising spectrum. An extended model of the internalising spectrum was compared with a categorical model that represented the current nosological structure. This study used the same base sample as Chapter 1, but there were some differences in the observed variables, which were updated to reflect the findings from Chapter 3, and the broader literature.

Chapter 5 examines the relationships between the disorders by comparing dimensional, categorical, and hybrid models (FMAs) —which combine dimensional and categorical components. This approach overcomes the limitations of SEM and LPA in isolation, and results in models that are compatible with the new nosological meta-structure. This chapter utilises the second sample described above, and consequently provides more reliable and valid findings. The models of best fit for the samples who had engaged in intercourse (i.e., the participants without missing data) were then tested with the parameters held equal for the participants who had not engaged in intercourse, which was an important step for the findings to be relevant to nosological models.

Chapter 6 examines the structure of the relationships over time using longitudinal data from the second sample, and investigates the possible causal relationships between the disorders using SEM. All participants with a complete response at the first time point were included, and FIML was used to account for missing data. The data from waves four weeks apart were used in the primary analyses to maximise sample size, and the models of best fit were subsequently examined using data from waves one week and six months apart.

Chapter 7 is a general discussion that critically examines these five studies' findings together in the context of the literature, discusses the limitations of the body of research as a whole, and explores the broad implications and possible future directions.

Chapters 2 and 3 have been published, but all of the chapters have been edited to form a consistent body. For example, the reference list for each paper has been moved to the end of the thesis to form a single integrated reference list; the chapters are all presented in APA style; terms that refer to the same concepts, ideas and observed variables have been made

consistent between chapters; the terms "males" and "females" have been changed to men and women[4]; and Australian spelling has been used throughout. Where any other changes have been made —or comments have been added— a special footnote (denoted with a letter rather than a number) is included to denote this change. Chapters 2 through 6 are in the form of self-contained empirical papers, which necessitates some degree of overlap, but each chapter also introduces new ideas.

[4] This change was made to the published version of Chapter 2 to acknowledge that gender does not bear a binary meaning of male or female. In both samples, participants were given the option to provide any additional information about themselves that they thought relevant to the study, and in the second sample participants were given an "other" option for gender. No participants stated that they identified as intersex, transgender or pangender and so the terms "men" and "women" are used for participants who identified as "male" and "female", respectively

Chapter Two

Are sexual problems a form of internalising psychopathology? A structural equation modelling analysis

Miriam K. Forbes and Carolyn A. Schniering

This study has been published as: Forbes, M. K., & Schniering, C. A. (2013). Are sexual problems a form of internalizing psychopathology? A structural equation modeling analysis. *Archives of Sexual Behavior, 42*, 23-44. doi: 10.1007/s10508-012-9948-0.

The formatted publication is provided in Appendix A.

Abstract

Sexual dysfunctions, depression, and anxiety disorders have high rates of comorbidity. The aim of this study was to empirically evaluate an expanded model of the internalising spectrum (Krueger, 1999) that includes sexual problems, based on these patterns of comorbidity. Responses to an online survey from a sexually active community sample (n = 563) were analysed using structural equation modelling (SEM) to compare the fit of four alternative models for men and women. An expanded model of the internalising spectrum that included sexual problems was a good fit for the pattern of interrelationships in the female data. However, the weak relationships between the observed variables in the male data meant that none of the models provided an adequate fit for men. This study offers preliminary evidence for the utility of a model of the internalising spectrum that includes sexual problems for women, which could facilitate a better understanding of the role of common underlying psychopathological processes between disorders, and offers a first step towards effective diagnosis and treatment. Future research should focus on clinical and representative samples.

Introduction

The upcoming release of the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; American Psychiatric Association [APA], 2010) has generated a surge of interest in the structure of psychopathology. Recent structural modelling has focused on patterns of comorbidity among disorders being understood in terms of underlying dimensional spectra of psychopathology (e.g., internalising psychopathology; Krueger & Markon, 2006). While the internalising-externalising (IE) framework has been extended to include other spectra of psychopathology, and numerous disorders from Axes I and II of the DSM-IV-TR (e.g., Markon, 2010), sexual dysfunctions have not been incorporated in any analyses of the structure of mental disorders.

The IE Framework

Internalising psychopathology is characterised by negative affect and is used in the IE framework as a higher-order factor to explain the comorbidity among depressive and anxiety disorders (Krueger, 1999). The hierarchical model of the internalising spectrum is split into "Fear" and "Distress" (Watson, 2005; initially "Anxious-Misery") factors that roughly differentiate between anxiety and unipolar mood disorders, respectively. A notable exception to this pattern is generalised anxiety disorder (GAD), which is classified with depression as part of the unipolar mood disorders, rather than its DSM diagnostic chapter of Anxiety Disorders (for a discussion, see Watson, 2005). A recent meta-analysis demonstrated that this model provides a better fit to the data than the DSM-IV-TR classifications (Krueger & Markon, 2006). The externalising dimension comprises alcohol and drug dependence and antisocial personality disorder; that is, disorders wherein maladjustment is expressed outwards (Krueger, 1999).

The IE framework has proven to be versatile and robust across a variety of populations, cultures, indicators, and time frames of diagnoses (James & Taylor, 2008; Kendler et al., 2003; Krueger, 1999; Krueger et al., 2003; Krueger & Piasecki, 2002; Slade & Watson,

2006). Recently, the model has been extended to include numerous disorders and diagnostic categories from Axes I and II of the DSM-IV-TR (APA, 2000; Goldberg et al., 2009; James & Taylor, 2008; Kotov et al., 2010; Krueger et al., 2003; Markon, 2010; Slade & Watson, 2006; Watson, 2005). One diagnostic category that has consistently been overlooked as a candidate for inclusion is Sexual Dysfunctions, which are also characterised by negative affect (Rosen, 2000).

Sexual Problems

Sexual dysfunctions are strongly associated with negative mood, low self-esteem, poor interpersonal function, low quality of life, and poor mental health (Laumann et al., 1999; Lutfey et al., 2009; Rosen, 2000). A number of large-scale epidemiological surveys have reported prevalence rates of sexual problems of approximately 50% —both nationally and internationally (Dunn et al., 1998; Kontula & Haavio-Mannila, 2009; Laumann et al., 1999; Richters et al., 2003). Given the prevalence of sexual problems and their negative impact on individuals' lives, an increased level of research attention is warranted, compared to the relative neglect in current mainstream research. The comorbidity among sexual problems, depression, and anxiety disorders is poorly understood at a conceptual level, and may indicate the presence of a shared underlying psychopathological process (i.e., internalising psychopathology).

Relationships between Sexual Problems, Depression, and Anxiety Disorders

The comorbidity among sexual dysfunctions, depression, and anxiety disorders is not a recent discovery (Barlow, 1986; Derogatis et al., 1981; Wolpe, 1958). However, it has only recently begun to gain attention, with many studies finding an association between anxiety/depressive disorders and increased sexual problems in all phases of the sexual response cycle (Donahey & Carroll, 1993; Laumann et al., 1999; Lykins, Janssen & Graham, 2006; Trudel, Landry & Larose, 1997; van Lankveld & Grotjohann, 2000). In a recent review,

Laurent and Simons (2009) concluded that the relationship between poor mental health and sexual problems exists for men and women, and across cultures.

Research that has centred on depressive disorders has found that all sexual dysfunctions are more likely to occur in depressed patients (e.g., inhibited sexual desire: Balon, 2006; pain: Dunn, Croft & Hackett, 1999; inhibited arousal and orgasm: Graziottin, 1998; Michael & O'Keane, 2000), with a stronger effect in women (Angst, 1998; Lykins et al., 2006). Depression has been linked more specifically with desire disorders (Balon, 2006; Laurent & Simons, 2009) and erectile dysfunction (Derogatis et al., 1981; Rosen, 2000), with these relationships remaining after controlling for antidepressant use, age, and health (Laurent & Simons, 2009; van Lankveld & Grotjohann, 2000). GAD is also associated with sexual problems in all phases of the sexual response cycle (Laurent & Simons, 2009) whereas other anxiety disorders are not (Angst, 1998). In general, data on the relationship between depression symptoms and sexual problems are consistent and robust.

In contrast, studies on the effect of anxiety on sexual function have shown mixed results and the relationships remain unclear (Barlow, 1986; Elliot & O'Donohue, 1997). Specific anxiety disorders have been associated with multiple aspects of sexual dysfunction. For example, panic disorder is related to inhibited sexual desire and increased sexual aversion (Figueira et al., 2001).[a] In general, women with anxiety symptoms have been found to be at greater risk of developing sexual problems than women without anxiety symptoms (Dunn et al., 1999).

The comorbidity of sexual problems, depression, and anxiety disorders is particularly important because of their detrimental effect when combined. Comorbid depression and anxiety are related to poorer treatment outcomes and increased severity and chronicity (Kessler et al., 2005), and the presence of sexual dysfunction compounds this already

[a] Obsessive-compulsive disorder (OCD) was also mentioned here in the published manuscript, but as OCD is not an observed variable in this study, it has been removed.

compromised quality of life (Michael & O'Keane, 2000). Patients experiencing sexual problems have worse long-term outcomes if they also have a history of psychiatric illness, and rarely return to treatment if the problems are not treated in synchrony (van Lankveld & Grotjohann, 2000).

As well as high comorbidity rates and experimental associations, depression, anxiety, and sexual dysfunctions have been linked by overlapping descriptions of their development and maintenance in social learning theories, cognitive-behavioural theories, and psychodynamic theory (Laurent & Simons, 2009). In cognitive-behavioural theories specifically, the attributional style that characterises depression has been implicated in sexual function disorders, where internal, global, and stable attributions about negative sexual experiences foster sexual dysfunction (Nobre & Pinto-Gouveia, 2009). Correspondingly, cognitive-behavioural therapy for depression and anxiety has been found to decrease symptoms of sexual dysfunction (Hoyer, Uhmann, Rambow & Jacobi, 2009; ter Kuile, Both & van Lankveld, 2010).[b]

While studies generally concur that anxiety and mood disorders are associated with sexual problems, the direction and nature of the relationship remains unclear. Some studies suggest depression, anxiety disorders, and sexual problems coincide with one another (e.g., van Lankveld & Grotjohann, 2000) or that depression and anxiety are risk factors for developing sexual problems (e.g., Strand, Wise, Fagan & Schmidt, 2002). Other studies suggest that sexual dysfunction is likely to create vulnerability to anxiety and depression symptoms (e.g., Donahey & Carroll, 1993). It is difficult to compare these conflicting results across studies due to the use of different definitions and measures, and methods of mood and anxiety induction (for a review, see Elliot & O'Donohue, 1997). In their review, Laurent and Simons

[b] The discussion of shared treatment response of sexual problems to SSRIs has been removed, as SSRIs have only been found to have a positive effect on premature ejaculation, and tend to have a strong negative impact on other aspects of sexuality (Figueira et al., 2001).

(2009) concluded that the relationship among sexual dysfunction, anxiety, and unipolar mood disorders is "multi-factorial, complex and often bidirectional…with symptoms often manifesting at the same time" (p. 575).

Without a clear causal relationship, the combination of shared cognitive and affective characteristics, treatment response, *and* high comorbidity rates suggest a common aetiological basis that could be accounted for by a shared underlying dimension of psychopathology. Since sexual dysfunctions also share the high negative affect that characterises internalising psychopathology (Rosen, 2000), Laurent and Simons (2009) suggested that there is a strong case for the inclusion of sexual dysfunctions as a part of the internalising spectrum, with anxiety and unipolar mood disorders. Despite its potential impact, this idea has not been tested to date.

The Present Study

The aim of this study was to empirically evaluate the adequacy of a new conceptualisation of the internalising spectrum that classifies sexual problems along with unipolar mood disorders and anxiety disorders. The fit of four alternative models were compared separately for men and women to allow for different manifestations of sexual problems between genders (Basson, 2003; Lutfey et al., 2009).

Figure 1 depicts the four models that were tested. The primary hypothesised model (Model 1) is a hierarchical model of the internalising spectrum (based on Krueger, 1999) that includes a third latent factor, Sexual Problems. The shared underlying psychopathological processes of depression, anxiety disorders, and sexual problems are represented by the higher-order Internalising Spectrum. Model 2 depicts an alternative conceptualisation of the hierarchical three-factor model: Laurent and Simons (2009) suggested that the lack of pleasure seeking in depression (analogous to Distress) may denote a more specific relationship with orgasm and desire disorders and that the physiological arousal aspects of

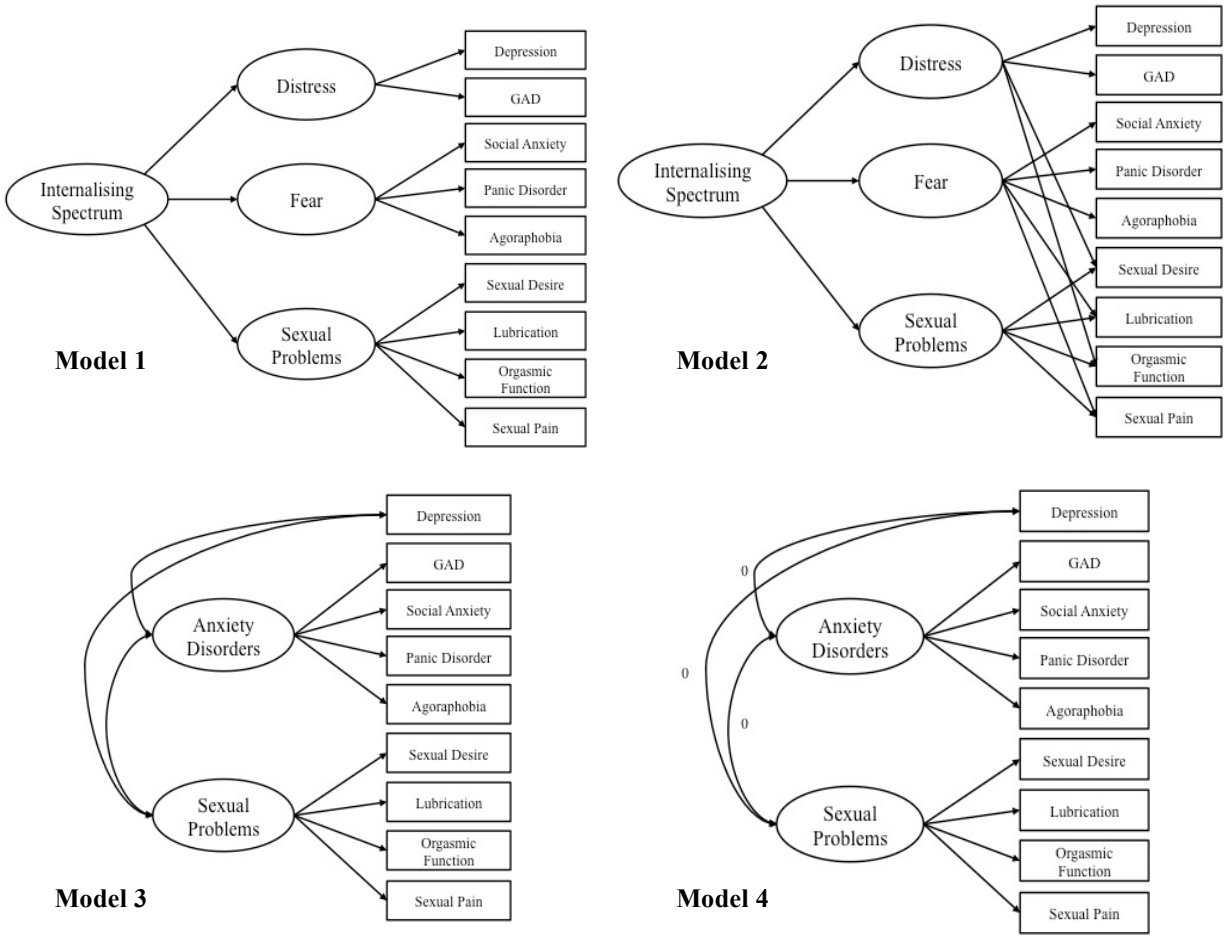

Figure 1. The four models to be tested for women. The models for men do not include sexual pain, and have erectile function in the place of lubrication. Model 1 is a hierarchical model of the internalising spectrum that includes a sexual problems factor, Model 2 is based on concepts suggested by Laurent and Simons (2009), and Models 3 and 4 are based on the DSM-IV-TR structure.

anxiety disorders (cf. Fear) may indicate a liability to the sexual pain and arousal disorders.[c] Accordingly, cross-loadings are added from Fear to pain (for women) and arousal, and from Distress to orgasm and desire. Two three-factor models based on the DSM-IV-TR structure (APA, 2000) were also tested for comparison; the three factors were tested as related (Model 3; see Widiger & Trull, 2007) and distinct (Model 4; see Krueger & Piasecki, 2002). We hypothesised that a model that included sexual problems as part of the internalising spectrum

[c] While this paper was in press, another study was published that investigated Laurent and Simons' (2009) recommendations in the context of Clark and Watson's (1991) tripartite model. Kalmbach et al. (2012) found specificity for anxious arousal (Fear) with lubrication and pain for women, and with erectile function and orgasmic function for men; and found anhedonia (Distress) to be related to all female sexual dysfunctions, and to cognitive arousal and orgasmic function for men.

(Model 1 or Model 2) would provide a good fit for the data and would provide a superior fit to the alternative models (Model 3 or Model 4).

Method

Participants

A total of 563 sexually active adults from the general Australian population were included in the study, after the exclusion of sexually inactive participants and incomplete responses. Participants were required to be a minimum of 18 years old to avoid the need for parental consent for younger adolescents, which would preclude anonymity for those participants. Of the included sample, 60% was female (n = 336) and the median age group was 25-34 years (n = 185). While participants came from a range of socio-demographic backgrounds, most were under 45 years old (84%, n = 471), had no children (76%, n = 430), had a university degree (68%, n = 385), worked full time (54%, n = 302), and/or lived with a partner (45%, n = 251). A higher percentage of males were working full time, and a lower percentage lived with a partner or held a university degree, compared to females.

Sexually inactive participants (25%, n = 202) were excluded from analyses because the presence, frequency, and severity of sexual problems could not be assessed, so the hypothesised relationships in each model could not be tested. Incomplete responses (6%, n = 45) were also excluded for this reason. Chi-square significance tests were used to compare the demographic characteristics of included and excluded responses, using adjusted standardised residuals (ASR) with an absolute value > 2 to determine which levels of these categorical variables differed systematically between groups (Field, 2009). Participants who reported no sexual activity were less likely to be male or in a relationship. The incomplete responses showed few significant differences, with no clear patterns of difference emerging.

Measures

All participants completed self-report measures that assessed demographic variables, depression, GAD, social anxiety, panic and agoraphobia, and sexual problems, as follows.

Demographic Variables

Participants were asked standard questions about their gender, age, relationship and employment status, number of children, and level of education. These factors were measured as potential covariates for the models.

Depression

The Depression scale from the 21-item version of the Depression Anxiety Stress Scales (DASS-21; Lovibond & Lovibond, 1995) measures the severity of depressive symptoms, as experienced in the past week. The 4-point Likert severity scale ranges from "Did not apply to me at all" (0) to "Applied to me very much, or most of the time" (3). The DASS-21 has been established as having adequate psychometric properties on a par with the full-length DASS and research findings suggest that the depression scale is reliable (internal consistency of $\alpha = 0.82$) and has high convergent and discriminant validity (Henry & Crawford, 2005).

GAD

The Brief Measure for Assessing Generalized Anxiety Disorder (GAD-7; Spitzer, Kroenke, Williams & Lowe, 2006) is a 7-item anxiety scale that measures GAD symptoms. The frequency of symptoms over the past two weeks was measured on a 4-point Likert scale ranging from "Not at all" (0) to "Nearly every day" (3). The measure has very good reliability (internal consistency $\alpha = 0.92$ and a test-retest Spearman coefficient of 0.83) and strong construct and criterion validity.

Social Anxiety

The Social Phobia Inventory (SPIN; Connor et al., 2000) consists of 17 items and is the only self-report measure of social anxiety that measures a spectrum of fear, avoidance, and physiological symptoms. The degree of distress generated by the symptoms was measured on a 5-point scale ranging from "Not at all" (0) to "Extremely" (4). It has a good test-retest Spearman correlation coefficient of 0.89, excellent internal consistency ($\alpha = 0.94$) and good construct validity.

Agoraphobia and Panic Disorder

The Agoraphobic Cognitions and Body Sensations Questionnaires (ACQ and BSQ; Chambless, Caputo, Bright & Gallagher, 1984) are among the most widely used and researched measures of agoraphobia and panic disorder. The frequency of thoughts about negative consequences of anxiety —and the amount of concern generated by sensations of autonomic arousal— was measured by the average response across 31 items on 5-point scales. They have moderate test-retest coefficients (0.86 for the ACQ and 0.67 for the BSQ), good internal consistency (0.80 for the ACQ and 0.87 for the BSQ), and high construct validity.

Sexual Problems

Women completed the Female Sexual Function Index (FSFI; Rosen et al., 2000), which briefly measures the six major dimensions of female sexual function (sexual desire, subjective arousal, lubrication, orgasmic function, sexual satisfaction, and sexual pain) as experienced over the past four weeks. The 19 multiple-choice items were scored with a 5- or 6- point scale. These domains display test-retest coefficients ranging from 0.79-0.86, with a minimum Cronbach's alpha value of 0.82, and good construct validity (Wiegel, Meston & Rosen, 2005).

Men completed the International Index of Erectile Function (IIEF; Rosen et al., 1997) which is a 15-item measure assessing five dimensions of male sexual functioning (erectile function, orgasmic function, sexual desire, intercourse satisfaction, and overall satisfaction). Each item was measured on a 5- or 6- point Likert scale that varies according to the format of the question. Psychometric studies have supported reliability and validity across the domains (i.e., internal consistency ranging from $\alpha = 0.73$ to $\alpha = 0.99$, and highly significant test-retest coefficients from 0.63 to 0.84; Rosen, Cappelleri & Gendrano, 2002).

Procedure

The anonymous online survey was advertised extensively through a wide range of community hubs. The study was approved by the Macquarie University Human Ethics

Committee, and participants were required to provide informed consent before they were able to access the survey.

Data Analysis

The data were analysed using the Predictive Analysis Software (PASW) Statistics Version 18.0 for Macintosh and Analysis of Moment Structures (Amos) Version 18 (Arbuckle, 2009). An alpha level of .05 was used to determine statistical significance of the bivariate relationships between observed variables, as the research questions were formulated *a priori*. The models were evaluated separately by gender.

Results

Descriptive Statistics

The means and standard deviations of the affective disorder and sexual problems variables were similar across genders, and were generally at normal levels.

Bivariate Correlations

Women

Table 1 presents bivariate correlations between the observed variables for men and women. All correlations within depressive and anxiety disorders were significant and in a positive direction for women, as were those within the sexual problems variables. Desire had very low Pearson correlation coefficients (r) with depression and anxiety disorder variables, ranging from $r = -.07$ with panic disorder to $r = .11$ (all ps $< .05$) with social anxiety. There were also non-significant correlations between sexual pain and panic disorder ($r = .08$) and orgasmic function and agoraphobia ($r = .08$). All other correlations were positive and significant.

Men

Correlations within the depression and anxiety variables were all positive and significant. Within the sexual problems variables, only erectile and orgasmic function had a moderate correlation ($r = .53$, $p < .01$). Correlations of the depression and anxiety disorder variables

with desire were all non-significant and orgasmic function only reached significance in its relationship with agoraphobia ($r = .19$, $p < .01$). Erectile function had generally low significant positive relationships with all anxiety variables, but not with depression ($r = .06$) (see Table 1).

Table 1

Bivariate Correlations for Untransformed Observed variables for Women (above the diagonal; n = 336) and Men (below the diagonal; n = 227)

	Dep	GAD	SA	PD	Ag	SD	Ar	Org	Pain
Depression (Dep)	-	.68**	.43**	.34**	.50**	.03	.27**	.22**	.13*
GAD	.74**	-	.50**	.47**	.60**	.07	.30**	.18**	.15**
Social Anxiety (SA)	.63**	.66**	-	.46**	.56**	.11*	.24**	17**	.19**
Panic Disorder (PD)	.26**	.34**	.42**	-	.62**	-.07	.16**	.15**	.08
Agoraphobia (Ag)	.61**	.69**	.67**	.47**	-	-.04	.17**	.08	.14*
Sexual Desire (SD)	.06	-.05	.00	-.08	-.07	-	.34**	.12*	.17**
Arousal Difficulties (Ar)	.06	.16*	.16*	.20**	.26**	.13*	-	.40**	.43**
Orgasmic Function (Org)	.04	.07	.07	.07	.19**	.11	.53**	-	.21**

Note. For men, Arousal Difficulties = erectile function. For women, Arousal Difficulties = lubrication. Pain is not applicable for men.

* $p < .05$; ** $p < .01$

Structural Equation Modelling

Sexual function items were scored so that higher scores indicated greater dysfunction, in line with all other measures. The DASS-21 depression subscale, the IIEF subscales of sexual desire, erectile function, and orgasmic function, and the FSFI subscales of sexual desire, lubrication, orgasmic function, and sexual pain were calculated according to the measures' scoring instructions, as were the total scores from the GAD-7, SPIN, ACQ, and BSQ. These thirteen scores formed the observed variables. The scores were then standardised, as the scales of the observed variables varied greatly. Due to the non-clinical sample that was used, the scores for some observed variables were skewed to low symptom levels. Observed variables that had skewness and/or kurtosis statistics with an absolute value > 2 were subjected to a $\log_{10}$ transformation, which successfully reduced all skew and kurtosis statistics to an acceptable level (Kline, 2004).

Analysis Decisions

The resultant continuous and normal data meant that SEM with maximum likelihood (ML) estimation was the most appropriate method to assess how well each of the

hypothesised models fit the existing patterns in the data, which were analysed in the form of covariance matrices. All models were identifiable and negative variances that were not significantly different from zero (at $\alpha = .05$) were set to .005 to preserve the confirmatory aspect of the factor model (Anderson & Gerbing, 1988), which implies that the variables are measured with minimal error.

Model Evaluation

Model fit should be evaluated by a variety of complementary fit indices (Jackson, Gillaspy & Purc-Stephenson, 2009). In this study, a mix of global, absolute, and incremental fit indices were used: the chi-square goodness-of-fit statistic (χ^2), the normed chi-square (χ^2/df), the Tucker-Lewis Index (TLI), the comparative fit index (CFI), the root mean square error of approximation (RMSEA), and the standardised root mean square residual (SRMR). Due to the high Type II error rate of the χ^2 statistic, other fit indices are often used to ascertain model fit (Hu & Bentler, 1999). Consequently, χ^2 significance tests are included in the goodness-of-fit tables, but were not referred to in the evaluation of model fit.

The χ^2/df is less prone to problems with sample size; a χ^2/df ratio between 1 and 3 suggests an adequate fit (Kline, 2005). Incremental fit indices compare each model to an independence model, where all variables are uncorrelated: The TLI is relatively unaffected by sample size and favours parsimonious models; both the CFI and TLI are sensitive to model misspecification, and values greater than .95 suggest an acceptable model fit for both indices (Hu & Bentler, 1999). Absolute fit indices measure how well an *a priori* model reproduces the sample data: SRMR is more sensitive to different types of misspecification than other goodness-of-fit indices, but is biased by sample size (Marsh, Hau & Wen, 2004); RMSEA is not dependent on sample size and compensates for model complexity (Jackson et al., 2009). Values less than .08 for SRMR and .06 for RMSEA (more liberally .08 (Schumacker & Lomax, 2004) suggest an adequate model fit (Hu & Bentler, 1999). The evaluation the models will be presented separately by gender.

Preliminary Analysis

A model that represented the basic internalising spectrum from the IE framework (see Krueger, 1999) was validated for each gender to establish that it was an appropriate foundation on which subsequent models could be based. This model examined the extent to which the data on depressive and anxiety disorders could be explained by two latent factors related to unipolar mood disorders and GAD (Distress), and other anxiety disorders (Fear). The latent factors were allowed to correlate, which conceptualised Fear and Distress as having shared features while still being distinct constructs. The model demonstrated a close fit to the data for both genders, with all model fit indices within the conservative ranges, and all path coefficients were positive and significant.

Model 1: Hierarchical Three-Factor Model

A third latent factor representing sexual dysfunctions (Sexual Problems) was added to the basic model to load onto a higher-order factor of the Internalising Spectrum, along with the Fear and Distress latent variables. This hierarchical model examined the extent to which a higher-order Internalising Spectrum could explain the intercorrelations among the observed variables that load onto Fear, Distress, and Sexual Problems.

Women. As shown in Table 2, the model provided a close fit to the data, with all fit indices within a conservative acceptable range. The regression weights were all positive and significant (see Figure 2).

Table 2

Goodness-of-Fit Indices for Each Model for Women (n = 336)

Model	χ^2	*df*	*p*	χ^2/df	TLI	CFI	RMSEA	SRMR
Model 1	40.151	25	.028*	1.606	.974	.981	.043	.0477
Model 2	35.015	22	.039*	1.592	.974	.984	.042	.0372
Model 3	112.310	25	<.0005**	4.492	.844	.892	.102	.0636
Model 4	256.510	29	<.0005**	8.845	.650	.718	.153	.1748

Note. df = degrees of freedom. TLI = Tucker-Lewis index. CFI = comparative fit index. RMSEA = root mean square error of approximation. SRMR = standardised root mean square residual.

* $p < .05$; ** $p < .01$

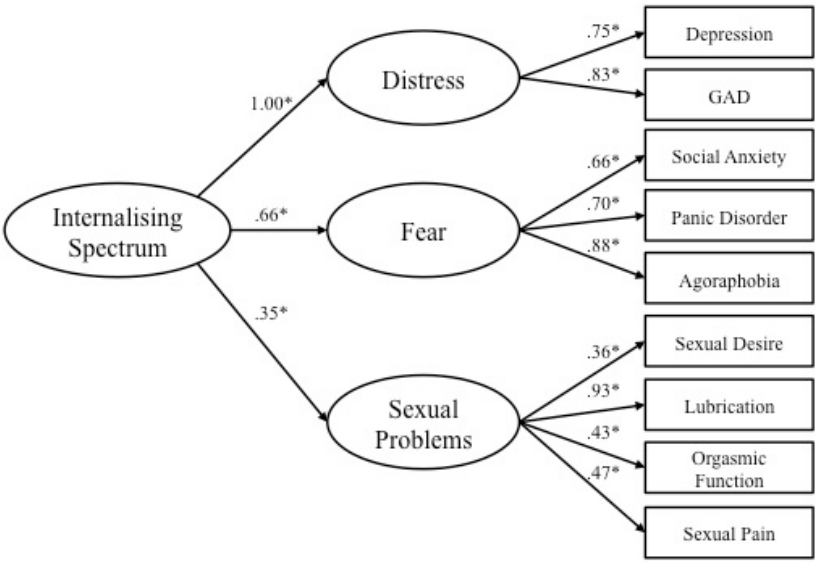

Figure 2. Model 1 for women with standardised regression weights (n = 336). The non-significant negative error variance of Distress (s^2 = -.061) was set to .005 to preserve the confirmatory aspect of the model.

** $p < .01$

Men. The TLI was unacceptable at .918, and the CFI was just under the acceptable cut off of .95, as shown in Table 3. Although a case could be made that the other fit indices indicated marginal fit, the loadings of the observed sexual problems variables onto the Sexual Problems latent variable were non-significant, as was the loading of Sexual Problems onto the Internalising Spectrum variable (see Figure 3). Taking into account these non-significant regression weights, Model 1 did not provide an adequate fit to the data for men.

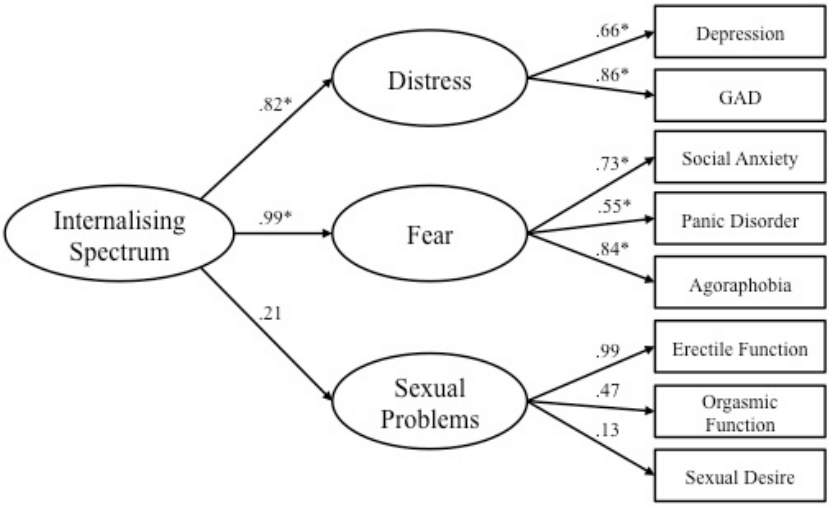

Figure 3. Model 1 for men with standardised regression weights (n = 227). The non-significant negative error variance of Erectile Function (s^2 = -.146) was set to .005 to preserve the confirmatory aspect of the model.

** $p < .01$

Table 3

Goodness-of-Fit Indices for Each Model for Men (n = 227)

Model	χ^2	*df*	*p*	χ^2/df	TLI	CFI	RMSEA	SRMR
Model 1	44.991	19	.001**	2.368	.918	.944	.078	.0584
Model 2	42.434	15	<.0005**	2.829	.891	.941	.090	.0517
Model 3	51.131	19	<.0005**	2.691	.899	.931	.087	.0568
Model 4	151.859	21	<.0005**	7.231	.627	.721	.166	.1631

Note. *df* = degrees of freedom. TLI = Tucker-Lewis index. CFI = comparative fit index. RMSEA = root mean square error of approximation. SRMR = standardised root mean square residual.

** $p < .01$

Model 2: Hierarchical Three-Factor Model with Cross-Loadings

Cross-loadings were added in Model 2 from the latent factor of Fear to the observed variables of sexual pain and lubrication for women —and to erectile function for men— and from Distress to the observed variables of sexual desire and orgasmic function. This model was based on Laurent and Simons' (2009) theorised relationships between depression, anxiety disorders, and sexual dysfunctions.

Women. The model fit indices shown in Table 2 indicate a close fit to the data. However, the regression weights of all of the cross-loadings were close to zero and non-significant, with a range from $\beta = -.07$ from Distress to sexual desire to $\beta = .11$ from Distress to orgasmic function. Evidently, the cross-loadings were not an accurate conceptualisation of the relationships between these variables in the present data.

Men. As shown in Table 3, the TLI, CFI, and RMSEA indicated that Model 2 provided an inadequate fit for the data for men. The only significant cross-loading was from Fear to erectile function ($\beta = .43$, $p < .05$) and only orgasmic function had a significant standardised loading onto Sexual Problems ($\beta = .53$, $p < .05$).

Models 3 and 4: Three Latent Factors

Models 3 and 4 examined the extent to which the data could be explained by three factors: latent variables of Anxiety Disorders and Sexual Dysfunctions, and the observed variable of depression (representing the diagnostic group of Unipolar Mood Disorders). Model 3 was a lenient model of the DSM-IV-TR structure, which allowed the three factors to correlate. It represented the factors as distinct while still having shared features (Widiger & Trull, 2007).

Model 4 was based on a more conservative conceptualisation of the DSM structure, representing the diagnostic categories as qualitatively distinct (Krueger & Piasecki, 2002).

Women. While all of the regression pathways were significant for Models 3 and 4, all model fit indices were outside an acceptable range for both models (see Table 2). Subsequently, Models 3 and 4 provided a poor fit to the data for women.

Men. As shown in Table 3, the model fit indices indicated an inadequate fit for both models, despite greater parsimony. Furthermore, none of the Sexual Dysfunction path coefficients reached significance in either model. Evidently, Models 3 and 4 provided the poorest fit to the data for both men and women.

Age Group Differences

Model fit could not be compared for different age groups, due to insufficient sample size for participants in the over 45 age group. Instead, factor score coefficients produced by Amos for each latent variable in Model 1 were applied to the transformed datasets. While no patterns of difference emerged between age groups for either gender, it is interesting to note that the standard deviation for Sexual Problems factor scores was almost four times smaller for men (s = .13) than for women (s = .50).

Discussion

The main aim of this study was to empirically evaluate the adequacy of a conceptualisation of the internalising spectrum that incorporates sexual dysfunctions. A model that included Sexual Problems as an additional latent variable in the internalising spectrum (Model 1) provided a good fit to the data for women. In contrast, neither of the new conceptualisations that included sexual problems (Models 1 and 2) provided an adequate fit to the data for men. However, Model 1 did provide a better fit to the data than the models based on the DSM-IV-TR framework (Models 3 and 4) for both gender groups. Model 1 also provided equivalence of fit across age groups for men and women, but due to the inadequacy of the model fit for the male sample, it did not provide equivalence of fit across genders. Due

to these gender differences, the results for women will be discussed first, followed by the results for men.

A hierarchical model of the internalising spectrum that included sexual problems along with anxiety and unipolar mood disorders (Model 1) provided an effective explanation of the pattern of interrelationships between variables in the data for women. It should be noted that while the liability between the Internalising Spectrum and Sexual Problems factors was lower than for Fear or Distress, this was to be expected due to the greater differentiation of Sexual Problems from the other factors at a measurement level; the shared symptoms between depressive and anxiety disorders inflated the correlations between the Fear and Distress factors, which are represented by the higher-order factor of the Internalising Spectrum (Laurent & Simons, 2009). Similarly, the broad range of path coefficients for the observed variables was consistent with the higher-order factor structure, as no two disorders have the same amount of variance accounted for by shared underlying processes (i.e., common variance; Kramer, Krueger & Hicks, 2008).

Importantly, the significant intercorrelations between observed variables that load onto different latent factors confirm the suitability of the higher-order structure of Model 1. For example, lubrication loads onto "Sexual Problems," and is significantly correlated with depression —which loads onto "Distress"— and also with agoraphobia —which loads onto "Fear." While the relationships within each group of observed variables were accounted for by their latent factor (e.g., the commonalities between the sexual problems were accounted for by the Sexual Problems factor), a higher-order factor was required to explain the more complex interrelationships between the observed variables that load onto different latent factors. Thus, Model 1 represents an empirically supported expansion of the IE framework that includes sexual dysfunctions.

The literature reviewed earlier describes a complicated relationship between the disorders, with problems in all phases of the sexual response cycle related to a mix of both depression

and anxiety disorders (e.g., Balon, 2006; Dunn et al., 1999; Figueira et al., 2001; Graziottin, 1998; Laurent & Simons, 2009; Michael & O'Keane, 2000; van Minnen & Kampman, 2000). The cross-loadings suggested by Laurent and Simons (2009) from Fear to sexual pain and arousal difficulties, and from Distress to sexual desire and orgasmic function, appear to have oversimplified this complex relationship. Due to their small and non-significant path coefficients, the addition of these cross-loadings in Model 2 did not contribute to an improved model fit, but decreased model parsimony. Thus, although Model 2 had adequate fit indices, the more parsimonious Model 1 provided a better fit to the data by using the Internalising Spectrum to account for the complex pattern of interrelationships.

In contrast to the consistent empirical evidence that reports a relationship between female sexual desire difficulties, depression, and anxiety disorders (e.g., Balon, 2006; Donahey & Carroll, 1993; Lykins et al., 2006; Trudel et al., 1997; van Lankveld & Grotjohann, 2000), desire had correlations close to zero with depression and all anxiety disorders in this study. It appears most likely that a significant relationship between desire, depression, and anxiety disorders was not observed here due to limitations in the measurement of female sexual desire problems. Basson (2003) has argued that the definition of sexual desire by the presence of sexual fantasy and an interest in having sex (i.e., spontaneous desire) is not suited to female desire. Instead, women's motivations for sex are diverse and often based on a desire for intimacy, not sexual satisfaction (Basson, 2000, 2003; Meston & Buss, 2007). Consequently, the definition of desire in the FSFI (i.e., "a feeling that includes wanting to have a sexual experience, feeling receptive to a partner's sexual initiation, and thinking about having sex"; Rosen et al., 2000) may not measure female desire accurately.

Two alternative conceptualisations based on the DSM-IV-TR structure were also tested; observed variables loaded onto one of three latent variables that corresponded to the DSM diagnostic categories. These factors were tested as correlated (Model 3) and separate (Model 4). The poor fit of the models for both genders was in line with the body of literature on the

limitations of the current structure of psychopathological classification (e.g., Krueger & Piasecki, 2002; Watson, 2005; Widiger & Sankis, 2000). Because it does not explicitly recognise the relationships between disorders, the structure of the DSM-IV-TR is incompatible with the high comorbidity rates that have been demonstrated for almost all Axis I disorders, which support the appropriateness of a higher-order factor structure (see Clark et al., 1995; Krueger & Piasecki, 2002). In summary, the higher-order Internalising Spectrum factor provided a good explanation of the pattern of interrelationships among depression, anxiety disorders, and sexual problems in the data for women across age groups, and was superior to all other models tested.

In contrast, all models that included a Sexual Problems factor demonstrated an inadequate fit for men. The inadequacy of these models was most likely due to the small and non-significant correlations in the data between the depression, anxiety, and sexual problems variables, which were incompatible with the models' representations of the relationships between variables. Specifically, the three-factor hierarchical model (Model 1) —which provided a close fit for the data for women— did not fit the data for men, with a number of possible explanations. Bancroft et al. (2003a) suggested that there is a complex relationship among depression, anxiety, and sexual problems in men that is often overlooked. Specifically, young men often experience increased arousal during negative mood states. Thus, the weak correlations in the data for men could have been the result of opposing positive and negative relationships from the younger and older samples, respectively. However, this is unlikely because there were no age group differences for the factors of Fear, Distress, and Sexual Problems. It seems more likely that the weak correlations and poor model fit were a result of an unrepresentative male sample. Narrow sampling of male sexual dysfunction symptoms was evident in the standard deviation for the Sexual Problems variable, which was four times smaller for men than for women. Such a restriction of range causes correlations to be lower than they would be if the range were not restricted (Edwards, 1976). There were additional

biases towards a mentally and sexually healthy sample in the large proportion of men that were married, and/or had tertiary education, which have been found to be protective factors for internalising disorders and sexual problems (Kessler et al., 2005; Laumann et al., 1999). This would further minimise the relationships among the disorders, as the severity of a disorder predicts its level of comorbidity with other disorders (Clark et al., 1995; Kessler et al., 2005). Thus, the weak relationships between the observed variables in this sample may underestimate the relationships in the true population.

Comorbidity between depression and anxiety is related to increased chronicity, poorer treatment outcomes, and greater psychopathology (Brown, Schulberg, Madonia, Shear & Houck, 1996; Gorman, 1997). When sexual dysfunctions are also present, quality of life is further reduced, long-term outcomes are worse, and patients are more likely to drop out of treatment (Michael & O'Keane, 2000; van Lankveld & Grotjohann, 2000). Without understanding the relationships between these disorders, it is not possible to treat and diagnose them effectively. Transdiagnostic evidence-based treatments have recently been developed that could be effective for whole spectra of diagnoses, including one for disorders that share high negative affect (i.e., "The Unified Protocol"; Boisseau, Farchione, Fairholme, Ellard & Barlow, 2010), which could be used to treat internalising psychopathology. If treatments that target shared underlying psychopathological processes prove to be effective, the identification of all members of a given spectrum should be a clear priority for future psychopathology research.

To date, sexual dysfunctions have been conspicuously absent from structural models of psychopathology, and their integration into mainstream research would represent a valuable opportunity for growth. This study provided preliminary empirical evidence that internalising psychopathology is a liability for sexual problems in women, and future efforts to model the structure of DSM-IV-TR disorders should consider testing models that include this concept.

Limitations of the Present Study

It is important to recognise the limitations in the current study. The use of a convenience sample from the general community resulted in low symptom levels that likely reduced the strength of the relationships between observed variables, due to their restricted range. The estimates of sexual problems variables were probably biased further towards lower symptom levels by the young sample (Lutfey et al., 2009) and by the exclusion of sexually inactive participants. The male sample —for which the primary hypothesised model did not provide an adequate fit due to the weak relationships between observed variables— likely had an additional bias of a narrow sample of sexual problems. This restricted the correlations between sexual problems, depression, and anxiety disorders and contributed to the inadequate model fit. Likewise, the broader sample of female sexual problems will have contributed to the stronger model fit for women. Due to these biases, the generalisability of the current findings was limited. It is likely that including a clinical sample with diagnosed disorders would have resulted in greater variability in symptoms, and consequently stronger relationships between the disorders. Future research would benefit from broader sampling in clinical populations and representative community samples, in which stronger relationships are likely to be found.

This study is the first of its kind to provide evidence that female sexual problems may be part of the internalising spectrum, alongside depressive and anxiety disorders. It is not yet clear whether the same model will be appropriate for men and women, or whether this model is the best conceptualisation of the relationships between these disorders. Future research in clinical and representative samples using diverse measurement methods is critical to refine theoretical and treatment models for individuals with comorbid sexual problems and internalising psychopathology.[d]

---

[d] This sentence was omitted in the published version of this study

Chapter Three

Critical flaws in the Female Sexual Function Index and the International Index of Erectile Function

Miriam K. Forbes, Andrew J. Baillie, and Carolyn A. Schniering

This study has been published as: Forbes, M. K., Baillie, A. J., & Schniering, C. A. (2014). Critical flaws in the Female Sexual Function Index and the International Index of Erectile Function. *Journal of Sex Research, 51*(5), 485-491. doi: 10.1080/00224499.2013.876607.

The published manuscript is presented in Appendix B, along with a commentary by some of the authors of the measures, and my response to that commentary.

Abstract

The Female Sexual Function Index (FSFI; Rosen et al., 2000) and International Index of Erectile Function (IIEF; Rosen et al., 1997) are two of the most widely used measures of sexual dysfunction. However, they have potential measurement and psychometric flaws that have not been addressed in the literature. This chapter examined the measurement capabilities of these measures. A convenience sample of 518 sexually active adults (65% women) drawn from the general community was included in the analyses. Both measures displayed critical theoretical and measurement problems for the assessment of sexual problems beyond sexual arousal, and for the sexual desire domains in particular. Based on these results, we encourage clinicians and researchers to think critically about whether the FSFI and IIEF are appropriate measures for their practice and research. In particular, these measures are inappropriate for use among individuals who are not currently sexually active, and research with a focus other than sexual arousal should consider supplementary measures of sexual function. The psychometric properties of these measures should be re-assessed in clinical samples, but the theoretical issues with the measures raised in this chapter are relevant across clinical and research contexts.

Introduction

Reliable and valid measures are essential for empirical research, for measurement of treatment change, and for diagnosis in clinical practice. While the Female Sexual Function Index (FSFI; Rosen et al., 2000) and the International Index of Erectile Function (IIEF; Rosen et al., 1997) are widely used measures of sexual function, careful inspection suggests that they may be flawed for research and clinical purposes, particularly for assessment of sexual desire. The measures have been criticised for their biased results for sexually inactive samples (Meyer-Bahlburg & Dolezal, 2007; Yule, Davison & Brotto, 2011), but there appear to be deeper theoretical and psychometric problems that have not yet been empirically investigated.

The FSFI (Rosen et al., 2000) is one of the most widely used measures of female sexual function, cited in over 1,500 articles. It is a 19-item self-report measure that gives scores on six domains of sexual function (sexual desire, subjective arousal, lubrication, orgasmic function, sexual satisfaction, and sexual pain) and a total score that can discriminate between women with and without female sexual dysfunction (FSD). The FSFI is purported to have been "developed as a brief, multidimensional self-report instrument for assessing key dimensions of sexual function in women" (Wiegel et al., 2005, p. 3), and it is widely used for this purpose. However, it was originally designed specifically to measure arousal disorders (Rosen et al., 2000), which raises questions around the validity of the measure for other domains of sexual function.

The measurement of sexual desire by the FSFI may be particularly problematic. There has been long-standing dissatisfaction with out-dated models of female sexual desire (see Carvalho, Vieira & Nobre, 2012 for a review). The FSFI draws on these models, defining desire as "a feeling that includes wanting to have a sexual experience, feeling receptive to a partner's sexual initiation, and thinking about having sex" (Bayer AG, Zonagen Inc. & Target Health Inc., 2013, p. 1). There is a body of research that supports an incentive motivation model of sexual response, which suggests that female sexual desire may often be triggered

(i.e., responsive) as opposed to spontaneous (Brotto, 2010). As such, the definition of sexual desire as an interest in having sex and the presence of sexual fantasy (i.e., spontaneous desire) may not be suited to female desire (Basson, 2000, 2001, 2003).

During the development of the FSFI, a desire factor was not delineated for the female sexual arousal disorder (FSAD) group, nor for the no-FSD control group (Rosen et al., 2000). Instead, the desire items loaded onto the subjective arousal factor, which is consistent with the body of research that finds significant overlap between female sexual desire and arousal (Brotto, 2010). Wiegel et al. (2005) found that there were no significant differences for desire scores between sexual dysfunction groups —including a diagnosed hypoactive sexual desire disorder (HSDD) group— which suggests that the desire domain may also have low criterion validity. In their review of the FSFI, Wiegel et al. (2005) conceded that the desire domain was the weakest on the scale. In light of these concerns, a systematic examination of the desire scale is important.

The measurement of female sexual arousal is also complex. In their meta-analysis, Chivers, Seto, Lalumière, Laan and Grimbos (2010) concluded that self-report measures of vaginal lubrication are not a reliable proxy for genital measures of arousal. Consequently, assessment of the DSM-IV-TR FSAD (APA, 2000) —based on an adequate lubrication-swelling response— is problematic when inferred from self-report data on the lubrication scale of the FSFI. Perhaps combining the subjective arousal and lubrication scales would be a good way to get a more accurate, composite measure of arousal to reflect the strong relationship between these constructs (Rellini, McCall, Randall & Meston, 2005); this idea requires empirical evaluation.

The IIEF (Rosen et al., 1997) is a 15-item measure of five domains of male sexual function, cited in over 2,700 articles. It also has problems for the measurement of non-erectile sexual dysfunction, especially for sexual desire. As with the FSFI, the IIEF was designed to measure arousal disorders; specifically, erectile dysfunction (ED) (Rosen et al., 1997). Again,

this raises the question of whether the IIEF is a reliable and valid measure for other domains of sexual function. For example, the orgasmic function items simply ask about frequency of ejaculation and the sensation of orgasm, and do not provide useful clinical information about premature or delayed ejaculation independent of ED.

In short, the FSFI and IIEF have clear measurement issues that require further investigation and analyses to determine their extent. While other researchers have focused on the problems with using the FSFI and IIEF in sexually inactive samples (Brotto, 2009; Meyer-Bahlburg & Dolezal, 2007; Yule et al., 2011), we focus on the conceptual and psychometric flaws, in particular for the desire subscales. Based on the literature and the formulation of the measures, it was hypothesised that the FSFI and IIEF would not provide adequate measurement of sexual problems beyond sexual arousal.

Method

Participants

The sample in the present study comprised a subset from a larger dataset (see Chapter 2). Chapter 2 described the full inventory of measures in detail. This chapter contributes new perspectives based on different research questions.

A total of 518 sexually active adults from the general Australian population were included in the study, from a larger sample of 810 participants. Participants who had not attempted intercourse in the past four weeks (30%, $n = 247$) were excluded from analyses due to known bias in the measures when sexually inactive participants are included (Meyer-Bahlburg & Dolezal, 2007; Yule et al., 2011). Incomplete responses (6%, $n = 45$) were also excluded to provide the best possible data set for the measures. Participants who reported no sexual activity were less likely to be male or in a relationship. Of the included sample, 65% were female ($n = 336$). For the purposes of the study, participants' ages were collected in age brackets; the median age group was 25-34 years ($n = 185$), and the age range was from 18 years to over 65. While participants came from a range of socio-demographic backgrounds, a

large proportion of participants were under 45 years old (83%, *n* = 431), had no children (75%, *n* = 390), had a university degree (69%, *n* = 359), worked full time (54%, *n* = 281), and/or lived with a partner (48%, *n* = 247). Compared with women, a higher percentage of men were working full time, and a lower percentage lived with a partner or held a university degree.

Measures

All participants completed self-report measures that assessed demographic variables, depression, generalised anxiety, social anxiety, panic disorder and agoraphobia, and sexual problems for the larger study. Only the sexual function measures are reported here.

FSFI

Women completed the FSFI (Rosen et al., 2000), which is commonly used to measure the six major dimensions of female sexual function (sexual desire, subjective arousal, lubrication, orgasmic function, sexual satisfaction, and sexual pain) as experienced over the past four weeks. The 19 multiple-choice items are answered on a 5- or 6- point Likert scale. Domain scores are calculated by summing the responses for the items on each domain, then scaling this total with a multiplier that constrains all domains to the same range. These domains display test-retest coefficients in the literature ranging from 0.79-0.86, with a minimum Cronbach's alpha value of 0.82 (Wiegel et al., 2005). A total score for the measure can be obtained by summing the individual domain scores.

IIEF

Men completed the IIEF (Rosen et al., 1997), which is a 15-item measure widely utilised to assess five dimensions of male sexual functioning (erectile function, orgasmic function, sexual desire, intercourse satisfaction, and overall satisfaction). Each item is measured on a 5- or 6- point Likert scale, and items are summed to produce individual scales for each domain of sexual function. Psychometric studies have suggested that the scales are reliable and valid

(i.e., internal consistency ranging from $\alpha = 0.73$ to $\alpha = 0.99$, and highly significant test-retest coefficients from 0.63 to 0.84; Rosen et al., 2002).

Due to an oversight, one of the overall satisfaction questions ("How satisfied have you been with your sexual relationship with your partner?") was not included in the questionnaire. However, this question, and the satisfaction domains more generally, were not a focus for this study, so this oversight does not have significant implications for the present analyses.

Procedure

The anonymous online survey was advertised extensively through a wide range of community hubs, such as public noticeboards, shopping centres, community and sports clubs, mailing lists of businesses and universities, and online forums. The advertisement for the study was titled "Sexuality and Negative Emotions" and briefly explained that the study would "take a new look at the relationship between sexuality and negative emotions." After an initial stage of recruitment, advertising was specifically targeted at under-represented groups, including participants over 35 years old and men. A wide range of symptom levels was sought by advertising on websites and online forums for individuals experiencing sexual dysfunction and emotional distress.

The study was approved by the Macquarie University Human Ethics Committee and participants were required to provide informed consent before they were able to access the survey. Each Internet protocol address was only permitted to submit one response to the survey to prevent duplicate responses, and reverse-scored items throughout the survey suggested that there were not any arbitrary responders. The items were scored according to instructions, and the data were analysed using the Predictive Analysis Software (PASW) Statistics Version 18.0 for Macintosh. Following descriptive statistical analyses, an exploratory factor analysis (EFA) of the sexual function measures was done to assess the basis for the subscales. A principal axis factoring approach was taken for the EFA to allow for

unique variance not accounted for by the factor structure, and varimax rotation was applied to the initial factor solution because the subscales were not expected to be orthogonal.

Results

The FSFI

Descriptive Statistics

Table 4 shows the descriptive statistics for: the FSFI subscales in the current sample, calculated according to instructions in Rosen et al. (2000), for the summed domain scores in the current sample, and for the control group in Rosen et al.

Table 4

Descriptive Statistics for the FSFI Domains Scaled According to Scoring Instructions, Summed, and for the Control Group in Rosen et al. (2000); Means (Standard Deviations)

Domain	Scaled according to scoring instructions $n = 336$	Summed domains $n = 336$	Rosen et al. (2000) control group summed domains $n = 130$
Sexual Desire	3.62 (1.11)	6.03 (1.85)	6.9 (1.89)
Subjective Arousal	4.72 (1.09)	15.74 (3.65)	16.8 (3.62)
Lubrication	5.21 (0.98)	17.37 (3.25)	18.6 (3.17)
Orgasmic Function	4.56 (1.46)	11.41 (3.65)	12.7 (3.16)
Sexual Pain	5.25 (1.05)	13.12 (2.62)	13.9 (2.79)
Sexual Satisfaction	4.59 (1.30)	11.48 (3.25)	12.8 (3.03)
Total Score	27.96 (4.80)	75.15 (12.93)	30.5 (5.29)[a]

Note. Higher scores denote lower symptom levels. The scaled domains all have a maximum score of six, whereas the summed domains are simply the summed totals of all items for a given domain.

[a] The *Total* score from Rosen et al. (2000) appears to be calculated based on the scaled domain scores.

On the scaled domains, the mean for sexual desire was a full point lower than the other domains, denoting higher levels of dysfunction. All summed scales had slightly lower means than the control norms presented in Rosen et al. (2000), but this was expected because that control sample excluded participants displaying any sexual problems. The diagnostic cut-point score of 5 for the desire domain (Gerstenberger et al., 2010) revealed that 40% of the sample met the criteria for a dysfunctional level of hypoactive desire, compared to 29% of the sample that met the FSFI FSD cut-off of 26.55 (Wiegel et al., 2005).

Correlations

The internal consistency and bivariate correlations for the domains are shown in Table 5. All relationships were positive and significant. The largest relationship was between the

subjective arousal and lubrication domains, and the smallest correlations were between desire and orgasmic function, and between desire and pain. The scales had good internal consistency, considering the short length of the scales. The lubrication and subjective arousal items combined had a Cronbach's alpha of .91.

Table 5

Bivariate Correlations for Scaled FSFI Domains, and Cronbach's Alpha for each Domain (n = 336)

Domain	Subjective Arousal α = .881	Lubrication α = .888	Orgasmic Function α = .926	Sexual Pain α = .890	Sexual Satisfaction α = .886
Desire	.54**	.34**	.12**	.17**	.21**
Subjective Arousal	-	.64**	.49**	.33**	.56**
Lubrication	-	-	.40**	.43**	.44**
Orgasmic Function	-	-	-	.21**	.38**
Sexual Pain	-	-	-	-	.30**

Note. Higher scores denote lower symptom levels. Desire α = .880, Total Scale α = .915

** $p < .01$

Table 6

Rotated Factor Matrix for FSFI Items (n = 336)

Item content	Desire and Subjective Arousal	Lubrication	Orgasmic Function	Sexual Satisfaction	Sexual Pain
Level of desire	**.864**	-	-	-	-
Frequency of desire	**.767**	-	-	-	-
Level of subjective arousal	**.668**	-	-	.324	-
Confidence about becoming aroused	**.558**	.329	-	.312	-
Frequency of subjective arousal	**.492**	.368	-	-	-
Satisfaction with subjective arousal	**.459**	.319	.398	.377	-
Frequency of maintaining lubrication	-	**.815**	-	-	-
Difficulty maintaining lubrication	-	**.791**	-	-	-
Frequency of lubrication	.322	**.724**	-	-	-
Difficulty becoming lubricated	.309	**.589**	-	-	.345
Difficulty reaching orgasm	-	-	**.867**	-	-
Frequency of reaching orgasm	-	-	**.865**	-	-
Satisfaction with reaching orgasm	-	-	**.852**	-	-
Satisfaction with sexual relationship	-	-	-	**.875**	-
Satisfaction with sex life overall	-	-	-	**.791**	-
Satisfaction with emotional closeness during sex	-	-	-	**.710**	-
Frequency of pain during sex	-	-	-	-	**.860**
Frequency of pain after sex	-	-	-	-	**.851**
Level of pain	-	-	-	-	**.774**

Note. Factor loadings >.3 are shown and factor loadings >.4 are bolded.

Exploratory Factor Analysis

Based on the original formation of the FSFI, five factors were expected *a priori*, the scree plot suggested five factors, and there were also five eigenvalues greater than 1. In the five-factor structure the desire items loaded onto a subjective arousal factor. The five factors were

clearly defined as: sexual desire and subjective arousal, lubrication, orgasmic function, sexual satisfaction, and sexual pain (see Table 6). There were no double-loadings > .4. This structure replicated the original factor structure in Rosen et al. (2000) and the structure in Wiegel et al. (2005).

The IIEF

Descriptive Statistics

The descriptive statistics for the IIEF subscales, and for the control group from in Rosen et al. (1997), are shown in Table 7. All domains had higher means than the Rosen et al. control sample, suggesting that our sample had lower symptom levels. Based on the criteria given in Rosen et al. (1997)[e] 66% of our sample met the criteria for dysfunctional levels of desire, compared with 6% for erectile dysfunction, and 21% for orgasmic dysfunction.

Table 7

Descriptive Statistics for the IIEF Domains, and for the Control Group in Rosen et al. (1997); Means (Standard Deviations)

Domain	IIEF Domains n = 182	Rosen et al. (1997) control group n = 109
Sexual Desire	7.84 (1.58)	7.0 (1.8)
Erectile Function	28.41 (2.61)	25.8 (7.6)
Orgasmic Function	9.24 (1.54)	8.8 (2.9)
Intercourse Satisfaction	11.87 (2.21)	10.6 (3.9)
Overall Satisfaction[a]	3.85 (1.05)[•]	8.6 (1.7)[a]
Total	61.21 (6.21)	-

Note. Higher scores denote lower symptom levels.

[a] Due to an oversight, one of the Overall Satisfaction items was not measured. The mean given for the sample in this study was based on only one item, whereas Rosen et al.'s mean was based on two items.

Correlations

The internal consistency and bivariate correlations for the domains are shown in Table 8. The largest relationship was between the two satisfaction domains. Notably, desire had very small, non-significant correlations with erectile function and orgasmic function. The scales had low to moderate internal consistency; the erectile function domain had the best internal consistency.

[e] The cut-off criteria used here have been misattributed to Rosen et al. (1997). An extensive

Table 8

Bivariate Correlations for IIEF Domains, and Cronbach's Alpha for each Domain (n = 182)

	Erectile Function α = .800	Orgasmic Function α = .654	Intercourse Satisfaction α = .420	Overall Satisfaction[a]
Sexual Desire	.09	.03	.28**	.14
Erectile Function	-	.46**	.47**	.41**
Orgasmic Function	-	-	.64**	.25**
Intercourse Satisfaction	-	-	-	.64**

Note. Desire α = .770, Total Scale α = .797.

[a] Cronbach's alpha for Overall Satisfaction could not be computed, as only one item for that domain was measured.

** $p < .01$

Table 9

Rotated Factor Matrix for IIEF Items (n = 182)

Item content	Erectile Function	Sexual Satisfaction	Desire and Intercourse Frequency	Orgasmic Function
Erections hard enough for penetration	**.792**	-	-	.309
Confidence in getting an erection	**.628**	-	-	-
Able to penetrate	**.622**	-	-	-
Frequency of maintaining erection	**.574**	-	-	-
Able to get an erection	**.555**	-	-	**.448**
Difficulty maintaining an erection	**.410**	.332	-	-
Frequency of intercourse satisfaction	-	**.686**	-	.391
Enjoyment of intercourse	-	**.677**	-	-
Satisfaction overall	-	**.540**	-	-
Level of desire	-	-	**.868**	-
Frequency of desire	-	-	**.691**	-
Frequency of intercourse	-	-	**.443**	-
Frequency of ejaculation	.355	-	-	**.705**
Frequency of orgasm	-	-	-	**.575**

Note. Factor loadings >.3 are shown and factor loadings >.4 are bolded.

Exploratory Factor Analysis

While five factors were expected *a priori*, there were four eigenvalues greater than one, and the scree plot suggested four factors. The factors were: erectile function, sexual satisfaction, sexual desire/number of times intercourse was attempted, and orgasmic function (see Table 9). The item "How often were you able to get an erection?" had the only double loading >.4, onto the orgasmic function scale. There were four factors, rather than the five expected *a priori*, in part because one of the overall satisfaction items was omitted. As a result, intercourse satisfaction and overall satisfaction loaded onto one factor. While a sexual desire factor was delineated, it was uncorrelated with erectile and orgasmic function (see Table 8). Furthermore, the desire items had almost zero correlations with all other IIEF items

(range from $r = -.030$, $p = .685$ to $r = .161$, $p = .030$), with the exception of the item that asked the number of times the participant had attempted intercourse in the past week ($r = .295$, $p < .001$, and $r = .353$, $p < .001$).

Discussion

These results show crucial problems for both measures, particularly in the measurement of sexual desire. For women, conceptual issues are the primary concern, supported by evident measurement issues. For men, the items appear to have good face validity but poor measurement.

Excepting desire, the FSFI appears at first impression to have strong measurement properties due to the simple factor structure and good internal consistency. However, sexual desire is not a rare phenomenon, so the fact that it is not delineated in the factor structure is a problem. The overlap between subjective arousal and desire is evident in the natural factor structure, which was ignored in the creation of a separate desire domain; the authors simply stated that "clinical consideration dictated separating the domain of desire/arousal" (Rosen et al., 2000, p. 198). It is probable that the inappropriate definition of desire used in the FSFI prevented the construct from being captured.[f] It also seems unlikely that the two brief questions about the level and frequency of desire experienced over the past four weeks could capture the complexity of the construct (i.e., they have low content validity). Before female sexual desire can be measured accurately and consistently, it is essential to clearly define what is meant by 'sexual desire problems' (Brotto, 2010; McCabe & Goldhammer, 2013); this has not been done in the FSFI.

[f] In their commentary on this paper (see Appendix B), Rosen, Revicki and Sand (2014) pointed out that part of the definition of desire (i.e., "feeling receptive to a partner's sexual initiation") is congruent with theories regarding the responsive nature of female sexual desire. This is discussed in greater depth in the response to the commentary (Forbes, 2014), which is presented in Appendix B.

Despite the evident conceptual problems with the FSFI desire domain, the diagnostic cut-point for dysfunctional levels of desire provided excellent specificity and sensitivity for the screening of HSDD in the samples in Gerstenberger et al. (2010). However, this cut-point is not pragmatic; it appears to grossly overestimate dysfunction, as experiencing desire over the past four weeks "about half the time" at a low level, or "less than half the time" at a moderate level, will both put a woman in the dysfunctional range of hypoactive desire (Gerstenberger et al., 2010). This is inconsistent with the DSM-IV-TR Criterion A for HSDD of chronically low or absent sexual fantasies or desire for sexual activity (APA, 2000, p. 539) and led to 40% of our community sample exceeding the cut-off for a dysfunctionally low level of desire. (We refer to DSM-IV criteria here, as those were the diagnostic criteria available when the FSFI was being developed.)

Distress caused by low sexual desire is also not measured in the FSFI, which means the symptoms measured do not necessarily denote dysfunction, as DSM-IV defined HSDD had a diagnostic criterion of significant distress or interpersonal difficulty (APA, 2000, p. 539). The problems with the desire scale likely arise in part due to the fact that the measure was developed to assess FSAD. Combined with the conceptual problems discussed earlier, it appears that the measurement of desire by the FSFI is neither reliable nor valid. Despite these problems, researchers have specifically recommended the FSFI as a measure for female sexual desire (Gerstenberger et al., 2010).

The measurement of arousal was also discussed earlier, and it appears that combining the subjective arousal and lubrication items to give a composite measure of arousal is appropriate at a measurement level: all arousal items had loadings >.3 on the lubrication scale, the constructs were highly correlated, and the combined items had high internal consistency. However, the theoretical implications would need to be considered in any studies that utilise a composite measure of arousal, as there is disagreement on the nature of the relationships between lubrication and subjective sexual arousal (e.g., Basson, 2001; Rellini et al., 2005)

There were also clear measurement problems for the IIEF that are evident in its original publication. The problems for the sexual desire subscale of the IIEF began with the fact that the measure was designed to measure ED, and was tested on an ED sample (Rosen et al., 1997). The weakest factor in the development of the IIEF was sexual desire, which did not demonstrate discriminant validity between clinical participants and controls (Rosen et al., 1997). Furthermore, the two questions about desire are too broad and vague to measure the complex construct of sexual desire (low content validity), and the desire domain displayed almost no relationship with other domains of sexual function in the present study (poor convergent validity). Combined with the over-sensitive cut-offs, which diagnosed 66% of our low symptom community sample with dysfunctional desire, the scale is apparently weak. The orgasmic function scale items also appear not to contribute any valuable information about premature or delayed ejaculation independent of ED, and so lack clinical utility.

Although the IIEF is widely used to measure five domains of male sexual function, there are some often-overlooked warnings in the original articles not to do so: The authors who developed the IIEF stated that the measure was "designed as an assessment measure for ED, and it is not intended for use as a primary measure of premature ejaculation or hypoactive sexual desire" (Rosen et al., 1997, p. 828). A follow-up review conceded that the measure "provides superficial assessment of domains of sexual functioning other than erection…[and] should only be used when assessing erectile function is the primary goal" (Rosen et al., 2002, p. 242). Taken together, these statements seem to imply that the Sexual Health Inventory for Men (Rosen, Cappelleri, Smith, Lipsky & Peña, 1999) —which consists of the five best items for measuring erectile function from the IIEF— should replace the IIEF in all future research, as the other items lack validity by the authors' own admission.

The primary limitation of this study was the lack of an alternative or convergent measure of sexual function to compare with the FSFI and IIEF. Furthermore, sexually related distress was not measured in the current sample, and this is a diagnostic criterion for sexual

dysfunctions in the DSM-IV-TR and DSM-5 (APA, 2000, 2013a). Consequently, sexual dysfunctions could only be discussed as a possible extension of the present findings, which were based on sexual problems (Lutfey et al., 2009). It is also important to acknowledge that one of the overall satisfaction items was not measured. It is possible that this missing item could have altered the results for the IIEF, but we do not feel that this oversight significantly impacted the interpretation of these results, as the focus of this study was on the desire, erectile and orgasmic function scales. Our male sample also had higher means on all domains compared with the control group in Rosen et al. (1997), which suggests that this was a low symptom sample. The female sample was larger and more diverse, so offered a good sample for these analyses. However, neither sample was representative of the general Australian population, and so the results are not necessarily generalisable. Clinical and representative samples would likely yield different results, but much of the critique of the measures was based on theory and substantive interpretation, so it is still important to consider the weaknesses of the measure in this light.

This study explored measurement capabilities of two popular sexual function measures: the FSFI and the IIEF. Despite the fact that these measures are widely used to assess various domains of sexual function, it is evident that they have marked limitations for measurement of sexual function beyond sexual arousal, in particular sexual desire. The critical flaws in the desire scales are particularly concerning because both measures are often used, and specifically recommended to be used, to measure sexual desire (e.g., Gerstenberger et al., 2010; Lewis et al., 2004; Nobre et al., 2006). We emphasise these flaws —despite the strengths of the FSFI and IIEF for assessing sexual arousal— to encourage researchers and clinicians to think critically about whether these measures are appropriate for their research questions on a case-by-case basis.

Chapter Four

Should sexual problems be included in the internalising spectrum? A comparison of dimensional and categorical models

Miriam K Forbes, Andrew J. Baillie, and Carolyn A. Schniering

Abstract

Preliminary research has suggested that sexual problems should be included in the internalising spectrum alongside depressive and anxiety disorders. This aim of this study was to empirically examine and compare an extended internalising spectrum model with a categorical framework model implied by the current nosological structure. Responses to an online survey from a community sample that had engaged in sexual intercourse in the past four weeks (n = 518) were analysed using structural equation modelling and latent profile analysis to compare the fit of six alternative models of the relationship between sexual problems, depressive and anxiety disorders, separately for men and women. The results for women were the primary focus, as the male sample was small, narrow, and had low symptom levels. The best model for women (n = 336) was a dimensional spectrum model that included sexual arousal, orgasm and pain difficulties in the internalising spectrum; the observed variable of female sexual desire was ultimately excluded from the analyses, due to flawed measurement. The results for men (n = 182) were less clear-cut: there were apparent categorical relationships for a small group (n = 8), and the spectrum model showed a good fit for 96% of the sample. These findings are consistent with a nosology that maintains discrete disorders and diagnostic chapters while recognising the relationships between them, as in the new structure of the DSM-5. As such, this study offers further evidence that there are dimensional relationships between sexual problems and depressive and anxiety disorders, which should be explicitly recognised in diagnostic systems, and recommends that future research should focus on better measurement and sampling for men in particular.

Introduction

When the *Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition* (DSM-IV) was published, Clark, Watson and Reynolds (1995) concluded that "it is time to halt the general call for dimensional systems and begin the hard work of developing specific dimensional proposals in targeted domains" (p. 147). This idea gained momentum in the lead up to the DSM-5. However, none of the attempts at modelling the broad dimensions of psychopathology (e.g., Kendler, 2009; Markon, 2010) have included sexual dysfunctions, and the high rates of co-occurrence between depression, anxiety, and sexual problems are not accounted for in the new DSM (American Psychiatric Association [APA], 2013a) or the current International Classification of Diseases (ICD; World Health Organization [WHO], 2008). The DSM-IV-TR (APA, 2000) had a categorical structure that emphasised the differences between disorders, which distracted research from the development of dimensional theories about the shared processes between them. One of the primary problems with the DSM-IV-TR arose from the systematic co-occurrence between disorders (i.e., comorbidity), and this could be accounted for by a shared underlying dimension (Krueger et al., 2005a).

It is stated in the DSM-IV-TR that "a categorical approach works best when all members of a diagnostic class are homogeneous, when there are class boundaries between classes, and when the different classes are mutually exclusive" (APA, 2000, p. xxxi). Ironically, none of these three conditions were satisfied in the DSM-IV-TR: There was heterogeneity both within and between diagnostic chapters (Widiger & Sankis, 2000; Widiger & Trull, 2007), and chapter boundaries were blurred by new diagnoses included to fill the gaps that were highlighted by the frequency of the 'not otherwise specified' diagnosis (e.g., mixed anxiety-depressive disorder; APA, 2000, p. 484), which impaired clinical utility (Andrews, Anderson, Slade & Sunderland, 2008). Furthermore, the high rates of comorbidity between diagnostic chapters (see Kessler et al., 2005) suggested that the categories were not mutually exclusive; a

categorical taxonomy imposes distinctions that do not exist in nature, and is incompatible with the nature of psychopathology (Krueger & Piasecki, 2002; Watson, 2005).

Dimensional models can overcome some of these problems, and have several advantages over the categorical approach. Firstly, heterogeneity within diagnostic chapters can be eliminated by a dimensional approach that transcends arbitrary categorical distinctions, and organises disorders according to shared underlying psychopathological processes (or "spectra"). Secondly, by restructuring the chapters, the confusion at their boundaries would no longer be an issue; a smaller number of spectra that accurately reflect relationships between disorders could be more easily understood and employed by clinicians (Acton & Zodda, 2005). Thirdly, patterns of comorbidity can be highlighted as reliable empirical observations —representing the underlying spectra between mental disorders (Vollebergh et al., 2001). This can facilitate the assessment and tracking of sub-threshold comorbid conditions that might otherwise not be assessed or noticed (Widiger & Samuel, 2005). In short, the use of a dimensional spectrum model to organise diagnoses according to comorbidity patterns would facilitate differential diagnosis and clinical utility, and eliminate many of the problems with a categorical model (Watson, 2005). Diagnostic labels can remain —enabling accurate communication— and research is consequently based on more informative data.

This idea sparked an ongoing debate surrounding the structure of psychopathology, and how to incorporate underlying spectra of psychopathology in a nosological meta-structure (see Kendler, 2009; Krueger et al., 2005b). As a result of much research and debate, some of the DSM-5 chapters have been re-ordered to signal how disorders relate to one another, based on symptom characteristics and underlying vulnerabilities (APA, 2013b). The ICD-11 will also account for the relationships between chapters of diagnoses through multiple parenting (WHO, 2014). This structure will encourage research on how disorders relate to each other both within and between diagnostic groupings, as chapters are sorted into broad categories,

some of which denote shared features within larger diagnostic groups (APA, 2013b). A prominent example of this is the depressive and anxiety disorders, which have been established as part of an internalising spectrum (e.g., Krueger, 1999), and are neighbours in the DSM-5 (APA, 2013b) and the ICD-11 Beta Draft (WHO, 2013).

Depressive and anxiety disorders also share a strong relationship with sexual dysfunctions, which is indicated by the high rates of comorbidity among the disorders between these diagnostic categories (see Laurent & Simons, 2009 for a review). For example, depression, generalised anxiety disorder (GAD), and panic disorder have been found to be associated with sexual desire, arousal and orgasmic disorders for men and women, and with sexual pain disorders for women (e.g., Althof et al., 2005; Balon, 2006; Derogatis et al., 1981; Figueira et al., 2001; Kendurkar & Kaur, 2008; van Minnen & Kampman, 2000). Social anxiety has been found to have more specific relationships with orgasmic disorders (Figueira et al., 2001) but also with desire and pain disorders (Corretti & Baldi, 2007). Specifically in the context of female sexual dysfunction, more research has been conducted focusing on desire and arousal, so the evidence for these relationships is more robust compared to the studies focusing on orgasm and pain disorders. The evidence for associations with depression is also more robust compared to associations with anxiety, as experimental studies that focus on state anxiety have found mixed results for the effects of anxious arousal for women (e.g., Bradford & Meston, 2006; Elliot & O'Donohue, 1997; Palace & Gorzalka, 1990). For men, most research focuses on erectile dysfunction, but relationships between depression and anxiety and all phases of the sexual response cycle have been found (Laurent & Simons, 2009). A smaller number of studies have found conflicting results for the relationships between sexual desire and depression, with some men reporting increased desire during negative mood states (e.g., Bancroft et al., 2003a; Nofzinger et al., 1993). Laurent and Simons (2009) provided an extensive review of the literature on these relationships and found that depressive and anxiety disorders are associated with all sexual dysfunctions for men and women, and across cultures.

Similar cognitive processes between the disorders have also been found. For example, the attributional style that characterises depression also fosters sexual dysfunction through internal, global and stable attributions about negative sexual experiences (Nobre & Pinto-Gouveia, 2009). Erroneous sexual beliefs and negative self-image are also vulnerability factors for sexual dysfunction (Nobre & Pinto-Gouveia, 2006), as they activate the schemas around negative automatic thoughts and emotions that perpetuate the cycle, and distract from erotic cues (Nobre & Pinto-Gouveia, 2003, 2009). Furthermore, the defining characteristics of internalising psychopathology (i.e., negative affect and neuroticism) have a role in sexual dysfunction (Laurent & Simons, 2009). Correspondingly, shared treatment response to cognitive-behavioural therapy has been found for depression, anxiety disorders and sexual problems (e.g., Hoyer et al., 2009), which effects change in the maladaptive cognitions and attributions in sexual dysfunctions (McCabe, 2001; Trudel et al., 2001).

Based on their review, Laurent and Simons (2009) suggested that the inclusion of sexual dysfunctions in the internalising spectrum would be consistent with the evidence to date, as the multifaceted associations between the disorders —combined with the lack of an apparent causal relationship— suggest that sexual problems share an underlying liability with depression and anxiety disorders. Understanding these relationships is crucial to effectively diagnose and treat comorbid disorders, as they have a particularly detrimental effect when combined (Michael & O'Keane, 2000; van Lankveld & Grotjohann, 2000). Nonetheless, sexual dysfunctions have been overlooked in the formulation of a nosological meta-structure. As a result, our current nosology does not adequately account for or highlight the evident relationships between these disorders.

Chapter 2 offered preliminary evidence for the utility of a dimensional spectrum model of the internalising spectrum that includes sexual problems for women (see Figure 4). This type of model understands comorbidity between disorders as a result of common, underlying core psychopathological processes; no longer a nuisance, but a “signal” that supports a

conceptualisation of DSM disorders as indicators of underlying latent factors (Krueger, 1999, p. 921). While there is heterogeneity across sexual dysfunctions and in theories regarding their underlying pathophysiology, a dimensional spectrum model accounts for their shared symptom characteristics and vulnerabilities through a higher-order internalising spectrum, as well as accounting for the unique aspects of the disorders within the spectrum by maintaining discrete diagnoses (Krueger et al., 2005a). Consequently, a dimensional spectrum model enables us to move forward from a descriptive categorical nosology to an *explanation* of the relationships between disorders.

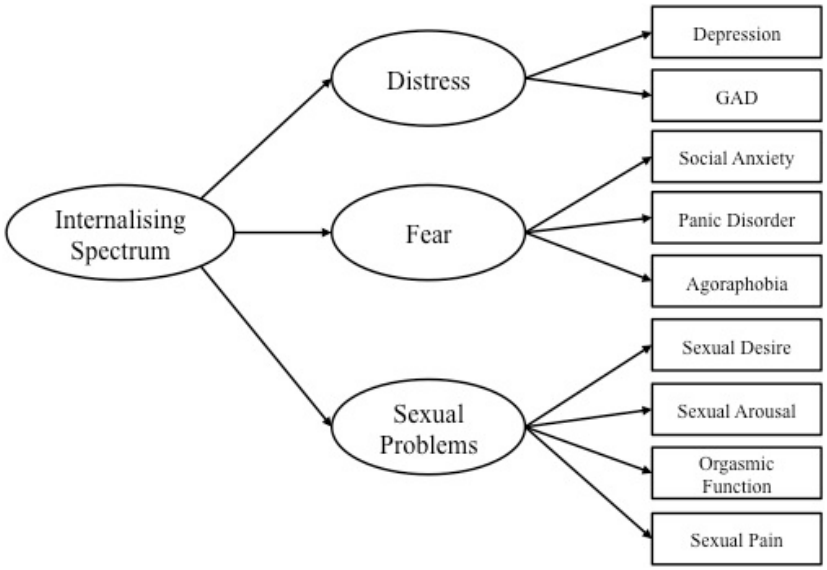

Figure 4. A dimensional spectrum model that fits well for women (see Chapter 2)

This dimensional model provided a superior fit to a model with three independent dimensions, but has not been compared with a true categorical model. In order to understand the nature of the relationships between these diagnostic categories, it is imperative to empirically compare dimensional and categorical conceptualisations. This comparison will help determine whether sexual problems are better classified together with depression and anxiety (to recognise the high rates of comorbidity and conceptual associations between them), or conceptualised as distinct categories (as implied in the DSM-5). Without comparing the models directly, conclusions regarding the nature of the relationships between these

disorders cannot be made. As such, the statistical methods used in this chapter are integral to effectively addressing this research question, so they are explained in some detail below.

The primary aim of the present study was to empirically examine a dimensional spectrum model and alternative categorical models of the relationships between depression, anxiety, and sexual problems for women. The available data for men are less robust, but preliminary exploratory analyses were conducted as a secondary aim. The continuous variables in this study made latent profile analysis (LPA) and structural equation modelling (SEM) the most appropriate statistical methods for comparing categorical and dimensional spectrum models. Individuals are grouped by symptom profiles in LPA; if the profiles are generally parallel, this suggests the profiles differ by symptom severity, and may indicate an underlying spectrum. A profile model indicating a categorical distinction between the groups of individuals would resemble a strong interaction effect in regression (e.g., a profile with high levels of depression and anxiety and low levels of sexual problems; and a profile with high levels of sexual problems and low levels of depression and anxiety). Structural equation modelling offers the best way to explain patterns using an underlying continuous dimension, or spectrum. Accordingly, a dimensional spectrum conceptualisation that includes sexual problems along with depression and anxiety (i.e., an SEM model) will be compared with categorical framework models that may separate these disorders (i.e., LPA models).

The LPA and SEM models will be compared within each gender using an information-theoretic approach. This approach emphasises minimising the amount of information required to express the data and the model —providing efficient and accurate representations of observed data, which are most useful for nosological models— and is appropriate for non-nested model comparisons (Krueger et al., 2005a). It is hypothesised that a model consistent with a dimensional spectrum conceptualisation of the relationships between these variables (i.e., an SEM model) will offer the best representation of the data for women, reflecting the multifaceted relationships between the disorders. Models for men will also be explored, and it

is hypothesised that a similar dimensional model will provide the closest fit. The hypothesised SEM models were based on Chapter 2.

Method

Participants

The sample in the present study comprised a subset from a larger dataset (see Chapter 2). This chapter contributes new perspectives based on different research questions and analyses, with a focus on the comparison of dimensional and categorical models. This sample was required to have engaged in penetrative intercourse in the last four weeks, and observed variables also differed from Chapter 2, as outlined in the Analysis section below.

A total of 518 sexually active adults from a convenience sample of the general Australian population were included in the analyses. Participants were required to be 18 years of age to participate in the study, and this was the only exclusion criterion. Participants who had not attempted intercourse in the past four weeks (31% of men with complete responses, $n = 81$; 20% of women with complete responses, $n = 82$) were excluded from analyses because the presence, frequency and severity of sexual problems in penetrative sex could not be assessed. Responses were considered to be incomplete if any item had missing information (16%, $n = 129$)[g], and these responses were excluded for the same reason. Participants who had not attempted intercourse were less likely to be male or in a relationship. Of the included sample, 65% was female ($n = 336$). For the purposes of the study, participants' ages were collected in age brackets; the median age group was 25-34 years ($n = 185$) with an age range from 18 years to over 65. While participants came from a range of socio-demographic backgrounds, a

[g] This differs from the number of incomplete responses in Chapters 2 and 3, which allowed for some missing items in the calculation of the sexual arousal, orgasmic function and sexual pain scales for participants who had not engaged in intercourse in the past four weeks. These participants were ultimately excluded from all analyses (i.e., they were also excluded in Chapters 2 and 3, but on the basis of their sexual inactivity, rather than as part of the "incomplete" group).

large proportion of participants were under 45 years old (83%, *n* = 431), had no children (75%, *n* = 390), had a university degree (69%, *n* = 359), worked full time (54%, *n* = 281), and/or lived with a partner (48%, *n* = 247). A higher percentage of men were working full time, and a lower percentage lived with a partner or held a university degree, compared to women.

Measures

All participants completed self-report measures that asked about the past four weeks and assessed demographic variables, depression, GAD, social anxiety, panic disorder and agoraphobia, and sexual problems as follows:

Depression

The Depression scale from the 21-item version of the Depression Anxiety Stress Scales (DASS-21; Lovibond & Lovibond, 1995) measures the severity of depressive symptoms on a four-point Likert scale. Research findings suggest that the depression scale is reliable and has high convergent and discriminant validity (Henry & Crawford, 2005). The norms for the DASS-21 (Lovibond & Lovibond, 1995) are presented in Table 10 to show the comparative symptom levels of the present sample.

GAD

The Brief Measure for Assessing Generalized Anxiety Disorder (GAD-7; Spitzer et al., 2006) is a 7-item anxiety scale that measures GAD symptoms on a four-point Likert scale. The measure has very good reliability (internal consistency $\alpha = 0.92$) and strong construct and criterion validity. The norms presented in Table 10 are from Lowe et al. (2008).

Social Anxiety

The Social Phobia Inventory (SPIN; Connor et al., 2000) consists of 17 items, and is the only self-report measure of social anxiety that measures a spectrum of fear, avoidance, and physiological symptoms. The degree of distress generated by the symptoms measured on a 5-

point scale. It has excellent internal consistency (α = 0.94) and good construct validity. The norms presented in Table 10 are from Connor et al. (2000).

Agoraphobia and Panic Disorder

The Agoraphobic Cognitions and Body Sensations Questionnaires (ACQ & BSQ; Chambless et al., 1984) are among the most widely used measures of agoraphobia and panic disorder. The frequency of thoughts about negative consequences of anxiety —and the amount of concern generated by sensations of autonomic arousal— is measured by the average response across 31 items on 5-point scales. They have good internal consistency (0.80 for the ACQ and 0.87 for the BSQ) and high construct validity. The norms presented in Table 10 are from Chambless et al. (1984).

Sexual Problems

Women completed the FSFI (Rosen et al., 2000), which is commonly used to measure the six major dimensions of female sexual function (sexual desire, subjective arousal, lubrication, orgasm, sexual satisfaction, and sexual pain). The 19 multiple-choice items are scored with a 5- or 6- point scale. These domains have been found to have a minimum Cronbach's alpha value of 0.82 (Wiegel et al., 2005). The norms presented in Table 10 are from Rosen et al. (2000).

Men completed the IIEF (Rosen et al., 1997), which is a 15-item measure widely utilised to assess five dimensions of male sexual functioning (erectile function, orgasmic function, sexual desire, intercourse satisfaction, and overall satisfaction). Each item is measured on a 5- or 6- point Likert scale. Psychometric studies have suggested that the scales are reliable and valid (i.e., internal consistency ranging from α = 0.73 to α = 0.99; Rosen et al., 2002). Due to an oversight, one of the overall satisfaction items was not assessed. However, that scale was not included in these analyses, so it will not impact the results of this study. The norms presented in Table 10 are from Rosen et al. (1997).

Procedure

The anonymous online survey was advertised extensively through a wide range of community hubs, such as public noticeboards, shopping centres, community and sports clubs, mailing lists of businesses and universities, and online forums. After an initial stage of recruitment, advertising was specifically targeted at under-represented groups, including participants over 35 years old and men. The study was approved by the Macquarie University Human Ethics Committee and participants were required to provide informed consent before they were able to access the survey. Each Internet protocol address was only permitted to submit one response to the survey to prevent duplicate responses, and reverse-scored items throughout the survey indicated that there were no arbitrary responders.

Analysis

The data were analysed using the Predictive Analysis Software (PASW) Statistics Version 18.0 for Macintosh and MPlus Version 6.1 (Muthén & Muthén, 2011). It is important to note that these analyses were not a direct comparison of the models for men and women, as different questions were used to assess sexual function for each gender.

Chapter 3 found theoretical and measurement flaws in the FSFI, which provided poor measurement of sexual desire in particular. For example, the FSFI uses an over-simplified circular definition of female sexual desire; relies on two brief and general questions about the level and frequency of desire; employs overly sensitive diagnostic cut-off scores; and the desire subscale is not delineated in the factor structure of the FSFI, which implies it is not being measured adequately. Consequently, the models were tested with and without female sexual desire. Furthermore, female subjective arousal and lubrication were combined to attain a more accurate, composite measure of arousal to reflect the strong relationship between these constructs (Rellini et al., 2005). The ACQ and BSQ measures of panic and agoraphobia were also combined to reflect the close relationship between these disorders. As a result of these decisions, the composite measures of ‘female sexual arousal’ and ‘panic and agoraphobia’,

along with the remaining scales, represented the ten observed variables. The final set of constructs analysed were: depression (internal consistency for women [α_w] = .88, internal consistency for men [α_m] = .90), GAD (α_w = .89, α_m = .89), social anxiety (α_w = .92, α_m = .92), panic and agoraphobia (α_w = .94, α_m = .92), as well as the sexual problem variables of female sexual arousal (α_w = .91), female orgasmic function (α_w = .93), female sexual pain (α_w = .89), male sexual desire (α_m = .77), erectile function (α_m = .78), and male orgasmic function (α_m = .65). Sexual function items were reverse-scored so that higher scores indicated higher levels of sexual problems, in line with all other measures. The scores were standardised, as the scales of the observed variables varied greatly. Scores for some observed variables were skewed to low symptom levels. Consequently, maximum likelihood estimation with robust standard errors (MLR) was used for all analyses.

To decide on which LPA model is the strongest, it is important to use a combination of statistical and substantive model checking. The Vuong-Lo-Mendell-Rubin (VLMR) Likelihood Ratio Test (LRT), Lo-Mendell-Rubin (LMR) LRT (Lo, Mendell & Rubin, 2001) and the Bootstrapped LRT (BLRT) are tests that provide a *p*-value that indicates whether a (*k*-1) class model can be rejected in favour of a *k*-class model. These statistical tests are used to determine the best number of symptom profiles to characterise the groups in the data. The first *k*-class model that has a non-significant *p*-value ($p > .05$) is rejected in favour of the previous (*k*-1) class model, which suggests that the (*k*-1) class model has the best profile enumeration. It is also important to assess the value and utility of the profiles (i.e., how informative the model is) and whether the profile sizes and proportions indicate over-extraction (i.e., are very small; Masyn, Henderson & Greenbaum, 2010); entropy is a measure of quality of class enumeration with values close to 1 being ideal (Masyn et al., 2010).

For the SEM, model fit should be evaluated by a variety of complementary fit indices (Jackson et al., 2009). In this study, a mix of global, absolute, and incremental fit indices were used. Due to the high Type II error rate of the chi-square goodness-of-fit statistic (χ^2), other fit

indices are often used to ascertain model fit (Hu & Bentler, 1999). The comparative fit index (CFI) and Tucker-Lewis Index (TLI) compare models to an independence model, where all variables are uncorrelated; they are both sensitive to model misspecification, and values greater than .95 suggest an acceptable model fit for both indices (Hu & Bentler, 1999). Absolute fit indices measure how well an *a priori* model reproduces the sample data: the standardised root mean square residual (SRMR) is more sensitive to different types of misspecification than other goodness-of-fit indices, but is biased by sample size; the root mean square error of approximation (RMSEA) is not dependent on sample size and compensates for model complexity (Jackson et al., 2009). Values less than .08 for SRMR and .06 for RMSEA suggest an adequate model fit (Hu & Bentler, 1999).

To compare LPA and SEM models, maximum likelihood-based indices such as Bayesian information criteria (BIC), Akaike's information criteria (AIC) and sample size adjusted BIC (ABIC) are used. For these statistical indicators, lower values indicate a better model (Masyn et al., 2010). Finally, coming from an information-theoretic approach, we are looking for stable, robust and parsimonious models. The BIC has been shown to be more reliable than the other criteria (Nylund, Asparouhov & Muthén, 2007) and favours parsimonious models, so it was used as our primary criterion to compare LPA and SEM models.

Results

Descriptive Statistics

Descriptive statistics for the sample are presented in Table 10. The sample means for depression, panic disorder and agoraphobia symptoms were similar to population norms. Higher levels of GAD symptoms and lower levels of social anxiety were present, compared to population norms. Independent samples *t*-tests showed that women had higher levels of social anxiety, panic and agoraphobia, compared to men. Women also had higher symptom levels compared to population norms for all sexual problems. In contrast, men had fewer symptoms than population norms on all sexual problems variables, as well as restricted variance.

Table 10

Descriptive Statistics for Demographics and Observed Variables for Whole Sample; Women and Men. Means (Standard Deviations) or N (%)

Variable (possible range of values)	*Whole Sample* (*n* = 518)	*Women* (*n* = 336)	*Men* (*n* = 182)	*Population Norms*
Age – Under 45 [a]	431 (83.2%)	285 (84.8%)	146 (80.2%)	-
Relationship – Living together	247 (47.7%)	168 (50.0%)	79 (43.4%)	-
Employment – Full time work	281 (54.3%)	162 (48.2%)	119 (65.4%)	-
Education – University degree	359 (69.3%)	252 (75.0%)	107 (58.8%)	-
Family – Does not have children	390 (75.3%)	256 (76.2%)	134 (73.6%)	-
Depression (0-42)	7.03 (7.90)	6.99 (7.58)	7.10 (8.48)	6.34 (6.97)
GAD (0-21)	4.44 (4.12)	4.68 (4.07)	3.99 (4.20)	2.95 (3.41)
Social Anxiety (0-68)	11.48 (10.78)	12.30 (10.92)*	9.98 (10.38)*	22.66 (15.02)
ACQ (1-5)	1.43 (0.47)	1.49 (0.50)*	1.31 (0.38)*	1.6 (0.46)
BSQ (1-5)	1.77 (0.70)	1.82 (0.72)*	1.69 (0.65)*	1.8 (0.59)
Female Sexual Desire [b] (2-10)	-	6.03 (1.85) [c]	-	6.9 (1.89)
Female Subjective Arousal [b] (0-20)	-	15.74 (3.65) [c]	-	16.8 (3.62)
Female Lubrication [b] (0-20)	-	17.37 (3.25) [c]	-	18.6 (3.17)
Female Orgasmic Function [b] (0-15)	-	11.41 (3.65) [c]	-	12.7 (3.16)
Female Sexual Pain [b] (0-15)	-	13.12 (2.62) [c]	-	13.9 (2.79)
Male Sexual Desire [b] (0-10)	-	-	7.84 (1.58)	7.0 (1.8)
Erectile Function [b] (0-30)	-	-	28.41 (2.61)	25.8 (7.6)
Male Orgasmic Function [b] (0-10)	-	-	9.24 (1.54)	8.8 (2.9)

Note. GAD = Generalised Anxiety Disorder, ACQ = Agoraphobic Cognitions Questionnaire, BSQ = Body Sensations Questionnaire. Variables shown are scored according to measures' instructions. Variables used in the analyses were scored for all scales so that higher scores denoted greater dysfunction, and scores were then standardised. The Female Sexual Desire scale was excluded from analyses, the Subjective Arousal and Lubrication scores were combined to provide a composite measure of arousal, and the ACQ and BSQ were also combined to form a composite Panic and Agoraphobia variable.

[a] Age was collected in age brackets, and the median age group was 25-34

[b] Lower scores denote higher levels of sexual dysfunction

[c] The mean scaled FSFI domain scores (with a possible range from 0-6) are as follows: Sexual Desire = 3.62, Subjective Arousal = 4.72, Lubrication = 5.21, Orgasmic Function = 4.56, Sexual Pain = 5.25

* Independent samples t-tests show that women have significantly higher scores than men on these scales ($p < .05$)

Latent Profile Analyses and Structural Equation Modelling

Women

In an attempt to retain sexual desire difficulties in the analyses, models that included desire as part of a 'female sexual interest and arousal' factor were compared to models that excluded desire. Models that included desire were, on average, 60 points higher (worse) on the BIC. When combined with the measurement and theoretical issues with the desire scale, it was judged that the observed variable of desire was not contributing to the models, but detracting from their validity, and this led us to exclude desire from further analyses. The fit indices and information criteria for the models that excluded desire are shown in Table 11.

Table 11

Fit indices and Information Criteria for Models for Women (n = 336)

Dimensional Model	LL	k	BIC	ABIC	AIC	CFI	TLI	RMSEA	SRMR
Internalising Spectrum	**-2975.61**	**24**	**6090.83**	**6014.70**	**5999.22**	**.99**	**.98**	**.036**	**.029**
Categorical Models	LL	k	BIC	ABIC	AIC	VLMR	LMR	BLRT	Entropy
One-class	-3333.84	14	6749.12	6704.71	6695.67	-	-	-	-
Two-class	-3109.87	22	6347.71	6277.92	6263.73	.025	.027	<.001	.92
Three-class	**-3014.37**	**30**	**6203.25**	**6108.09**	**6088.74**	**.023**	**.024**	**<.001**	**.90**
Four-class	-2945.74	38	6112.54	5992.00	5967.49	.238	.246	<.001	.91
Five-class	-2908.77	46	6085.13	5939.21	5909.54	.525	.530	<.001	.90

Note. LL = log likelihood, k = number of free parameters, BIC = Bayesian information criteria, ABIC = sample size adjusted BIC, AIC = Akaike's information criteria, CFI = comparative fit index, TLI = Tucker-Lewis index, RMSEA = root mean square error of approximation, SRMR = standardised root mean square residual, VLMR = Vuong-Lo-Mendell-Rubin likelihood ratio test (LRT) *p*-value, LMR = Lo-Mendell-Rubin LRT *p*-value, BLRT = Bootstrapped LRT *p*-value.

Dimensional Spectrum Model. The dimensional spectrum model provided an excellent fit to the data (see Table 11), and had a lower BIC than the strongest categorical framework (three-class) model. The near-perfect fit indices for the dimensional spectrum model, combined with the superior information criteria and the positive and significant loadings for all variables (see Figure 5) suggest that it offers the best explanation of the relationships in the data for women.

Categorical Framework Models. Table 11 shows the model fit indices for the categorical framework models examined for women. The BIC never reached a minimum, and the BLRT never reached significance, so the VLMR and LMR were used as the primary model

indicators. The VLMR and LMR first reached significance for the four-class model, indicating that the three-class model is best. Substantive interpretation for this model shows good class enumeration (entropy = .9), and three interpretable classes (see Figure 6). An asymptomatic class (Class 1) accounted for 69% of the sample, and a further 26% of the sample had a parallel profile with moderate symptom levels (Class 2). Five per cent of the sample displayed high levels of depression and anxiety symptoms, and moderate sexual problems (Class 3). Thus, the three-class model was chosen as the best LPA based on its strengths, and the significant VLMR and LMR for the four-class model.

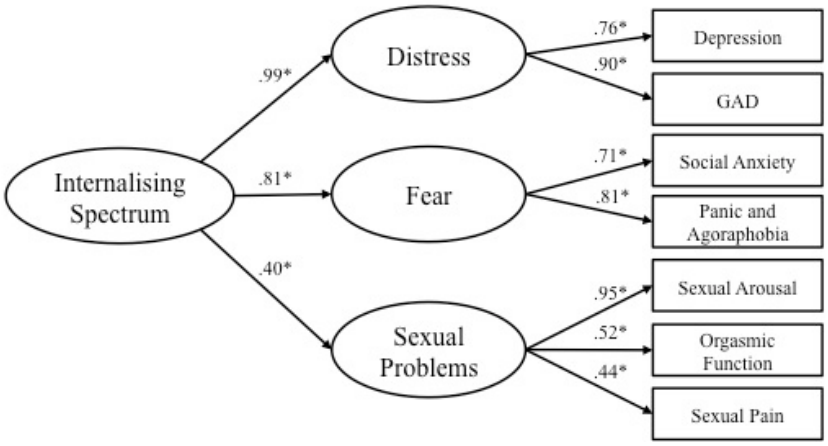

Figure 5. Dimensional spectrum model for women with standardised regression weights (*n* = 336).
**p < .01

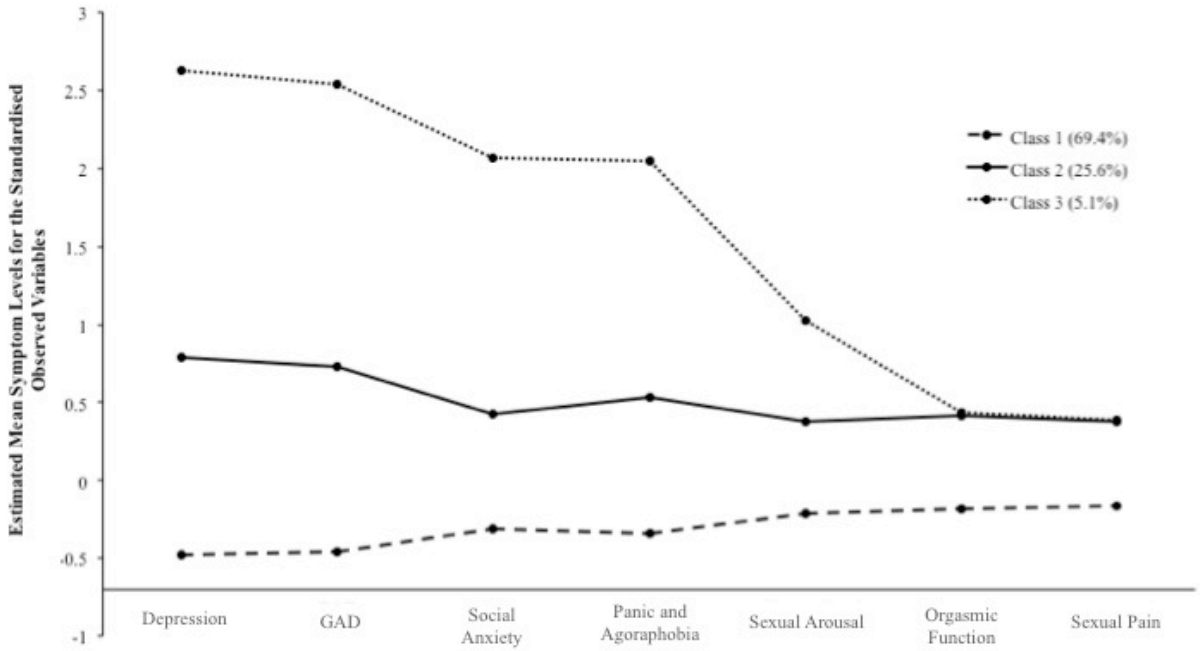

Figure 6. Estimated means for the three profiles from the best fitting LPA for women (*n* = 336).

Men

Models were tested with and without the IIEF desire scale. The inclusion of desire did not alter model selection or interpretation, so it was included in analyses to retain maximum information in the models. Table 12 shows the model fit indices and information criteria.

Table 12

Fit Indices and Information Criteria for Models for Men (n = 182)

Dimensional Model	LL	k	BIC	ABIC	AIC	CFI	TLI	RMSEA	SRMR
Internalising Spectrum	**-1603.74**	**22**	**3321.96**	**3252.29**	**3251.47**	**.97**	**.95**	**.063**	**.049**
Categorical Models	LL	k	BIC	ABIC	AIC	VLMR	LMR	BLRT	Entropy
One-class	-1781.68	14	3636.21	3591.87	3591.35	-	-	-	-
Two-class	**-1607.61**	**22**	**3329.70**	**3260.03**	**3259.22**	**<.001**	**<.001**	**<.001**	**.98**
Three-class	-1546.60	30	3249.33	3154.31	3153.21	.167	.174	<.001	.98
Four-class	-1502.52	38	3202.80	3082.45	3081.04	.130	.137	<.001	.96
Five-class	-1408.67	46	3200.72	3055.03	3053.33	.404	.416	<.001	.95

Note. LL = log likelihood, k = number of free parameters, BIC = Bayesian information criteria, ABIC = sample size adjusted BIC, AIC = Akaike's information criteria, CFI = comparative fit index, TLI = Tucker-Lewis index, RMSEA = root mean square error of approximation, SRMR = standardised root mean square residual, VLMR = Vuong-Lo-Mendell-Rubin likelihood ratio test *p*-value (LRT), LMR = Lo-Mendell-Rubin LRT *p*-value, BLRT = Bootstrapped LRT *p*-value.

Dimensional Spectrum Model. The fit indices for the dimensional model were acceptable (see Table 12). However, there were evident problems: The latent variable covariance matrix was not positive definite, so the non-significant negative error variances for erectile function and Fear variables were set at .005 to preserve the confirmatory aspect of the model (Anderson & Gerbing, 1988). The Sexual Problems latent variable also had a fairly small loading onto the Internalising Spectrum latent variable (see Figure 7), which suggests this model may not accurately capture the relationships between the observed variables. Sexual desire was a poor indicator for the model and had a small non-significant R^2.

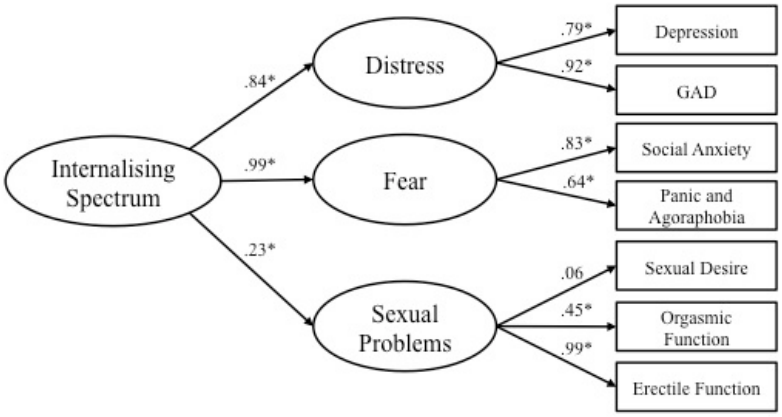

Figure 7. Dimensional spectrum model for men with standardised regression weights (n = 182). *p < .01

Categorical Framework Models. As with the categorical models for women, the BIC never reached a minimum and the BLRT never reached significance. The VLMR and LMR suggested a two-class model, and this model had equal entropy to the three-class model. The two-class model showed a large asymptomatic class (Class 1; 87%) and a smaller class with high mood and anxiety symptoms (Class 2; 13%). The profile patterns and class sizes in this model mirror the two-class model for women (see Figure 8). However, the substantive interpretation of the three-class model provides important information (see Figure 9). This model shows categorical distinctions between the symptomatic classes (low mood and high sexual problems except desire in Class 2; high mood and low sexual problems in Class 3), which sheds new light on the low loadings and correlations in the SEM, and suggests that there are categorical relationships present for a small group of men (n = 8).

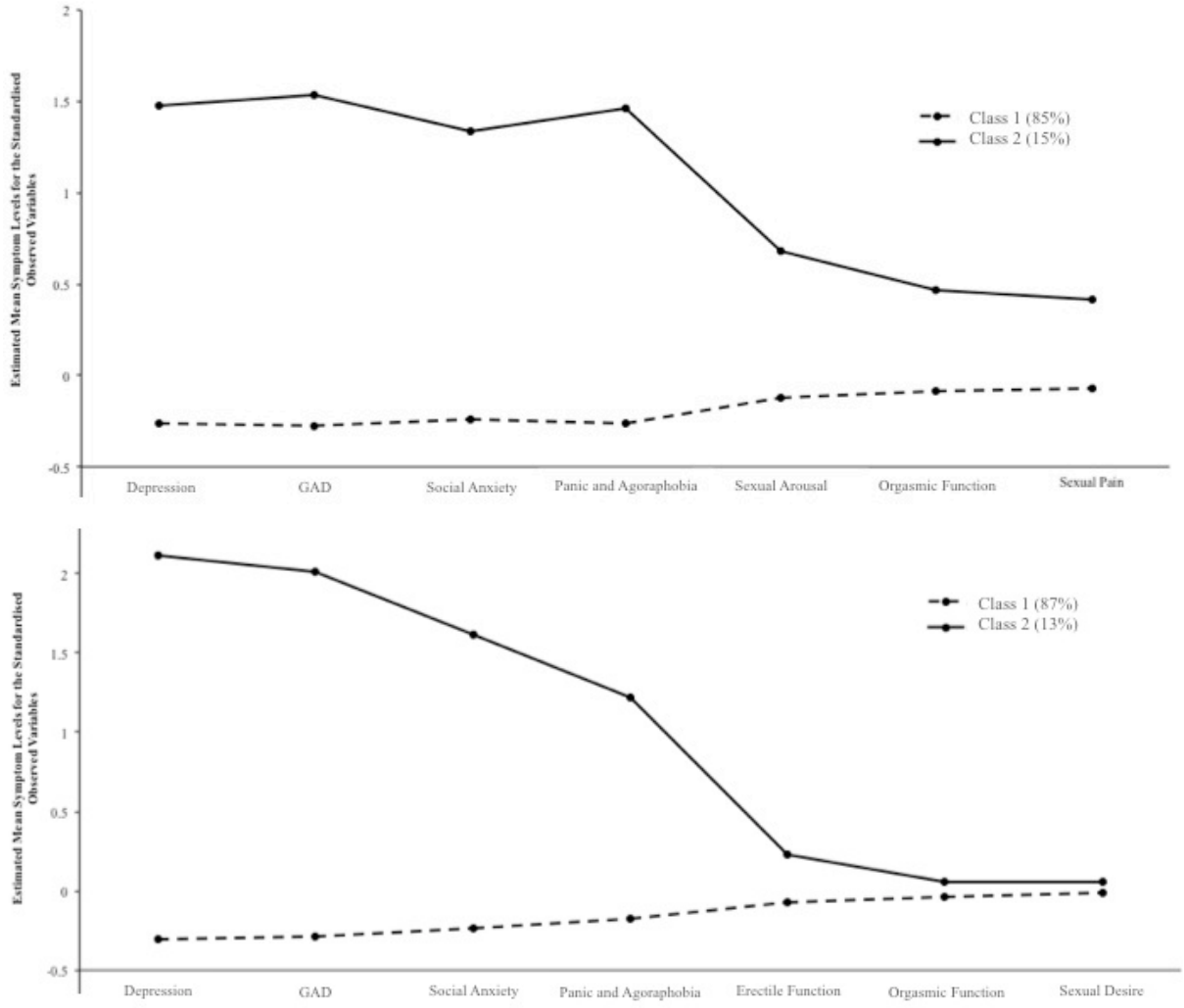

Figure 8. Estimated means for the two-class models for women (above) and men (below).

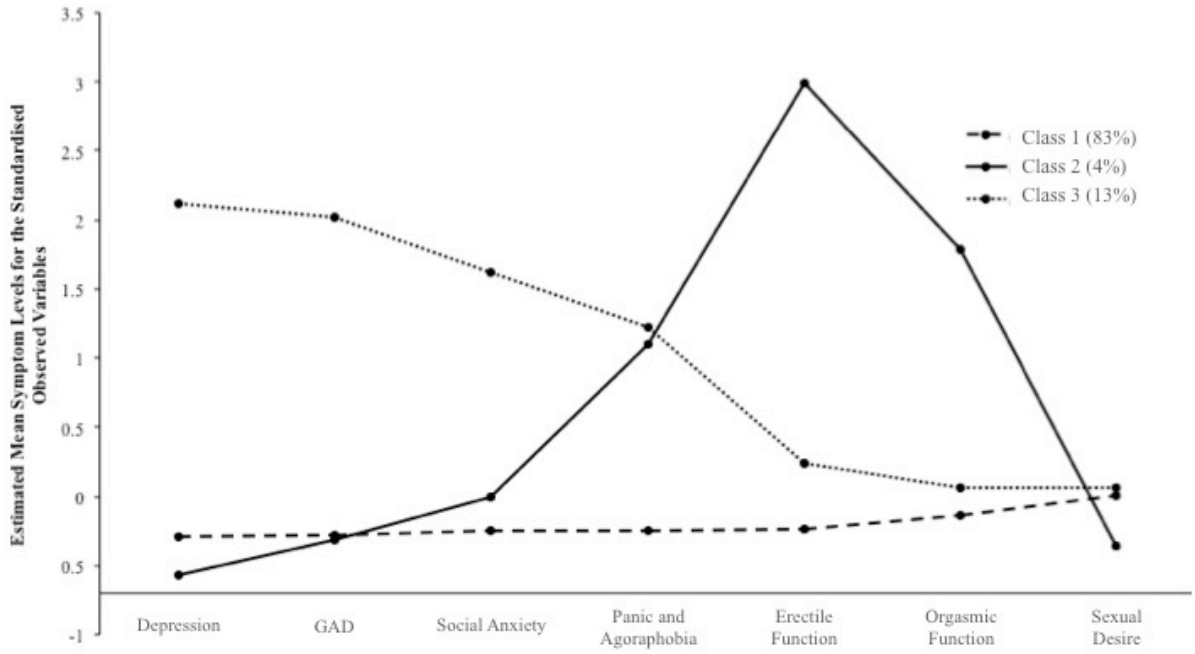

Figure 9. Estimated means for the three profiles from the three-class LPA for men (n = 182).

As a follow-up analysis, the dimensional spectrum model was re-analysed without this small group of men, and it provided a strong fit to the data. The Fear and erectile function variables still required their error variances to be fixed at .005, but the fit indices were excellent (CFI = 1.000, TLI = 1.012, RMSEA < .001, SRMR = .036), and the factor loadings all increased. Notably, the Sexual Problems loading onto the Internalising Spectrum increased to .38 (p = .001).

Discussion

This study is the first of its kind to empirically compare dimensional and categorical conceptualisations of the relationships between depression, anxiety, and sexual arousal, orgasm and pain difficulties for women. Specifically, a dimensional spectrum model (SEM) based on the internalising spectrum was compared with one- to five-class LPA models from the categorical framework. For women, the dimensional model provided an excellent fit to the data, and was better than any of the categorical models, as hypothesised. A secondary analysis was conducted on the available data for men; the dimensional model provided a good fit for most of the sample, but the substantive interpretation of the three-class model suggested that a small group of men have categorical distinctions between the disorders.

Before interpreting these analyses, it is important to note that LPA and SEM offer different perspectives on the same questions, not necessarily different answers. Individuals are classified into shared symptom profiles in LPA, compared with SEM, which describes the relationships between observed variables. In choosing the model that best explains the relationships in the data, we need to think not only about which model is more parsimonious, but also about which model helps us understand the relationships better. Furthermore, one model does not necessarily have to be chosen over the other; they can be interpreted together.

The Results for Women

For women, the dimensional model based on the internalising spectrum fit better than any of the categorical framework models. This dimensional finding is particularly significant because the data naturally tend toward finding a categorical model. For example, the female sample had symptom levels similar to population norms for most measures. Compared to a more diverse group that included a high symptom clinical sample, our community sample may naturally have lower levels of comorbidity due to the lesser severity of the symptoms and floor effects in the observed variables (Kessler et al., 2005). These factors decrease the chance of finding strong dimensional relationships, and it is likely that the dimensional model would be even stronger in a sample with more varied —and higher— symptom levels. Depression and anxiety symptoms would also be expected to naturally separate from sexual problems because different domains are being measured (i.e., emotional and physiological), and the depression and anxiety symptom questions tend to share similar question stem and response methods, which might further separate these domains from sexual problems. Thus, finding a dimensional spectrum model to be stronger than the categorical framework profile models implies that it is robust, because it is overcoming boundaries at a measurement level. Likewise, it was not surprising that the regression weight between ‘Sexual Problems’ and the higher-order ‘Internalising Spectrum’ was lower than for ‘Fear’ or ‘Distress’. This is most likely due to the greater differentiation of ‘Sexual Problems’ from the other factors at a

measurement level; the shared symptoms between depressive and anxiety disorders inflate the correlations between the 'Fear' and 'Distress' factors, which are represented by their loading onto the higher-order 'Internalising Spectrum' (Laurent & Simons, 2009). Consequently, the comparatively low loading of 'Sexual Problems' onto the 'Internalising Spectrum' does not necessarily denote a weaker underlying relationship. The range of the factor loadings for the observed variables is also consistent with the higher-order factor structure, as no two disorders have the same amount of variance accounted for by shared underlying processes (i.e., common variance).

The three-class model was selected as the best LPA. It had a large asymptomatic class and a parallel profile with moderate symptom levels that together accounted for 95% of the sample. The third profile had high levels of mood and anxiety symptoms, and moderate sexual problems. The fact that the profiles were parallel and flat for the majority of the disorders is consistent with the dimensional spectrum model; it implies that the two largest profiles differed primarily based on symptom severity, and that there were no categorical distinctions between disorder classes. Correspondingly, the comparative fit indices suggested that the internalising spectrum was the strongest model, and it was also independently characterised by excellent goodness-of-fit indices. This finding is consistent with the literature, and useful in understanding the relationships between the variables in the present data. All of the included female sexual problems were good indicators in the model, which is also consistent with existing research.

While the exclusion of desire is a limitation of this model, the literature gives an indication of the relationships that we might expect to see in future research: Studies have found a significant overlap between subjective arousal and sexual desire for women, as women find it difficult to differentiate between the two constructs, and the conceptual distinction between the constructs is unclear (see Brotto, 2010 for a review). Given that female sexual arousal was a strong indicator in the present analyses, we can infer that desire

might demonstrate similar relationships in future studies. However, it will be important to investigate this hypothesis in future research by using better measurement methods, as low sexual desire is the most commonly reported sexual problem (Laumann et al., 1999). Taken together, these results suggest that there is a shared underlying factor between depression, anxiety and sexual problems for women that is not represented in our current nosology.

The Results for Men

The male sample was smaller and showed restriction of range. This poses a number of difficulties for analysis, as the limited range in the variables restricts our ability to see robust relationships between the variables. Despite this, we decided to analyse this available data, as a preliminary exploratory analysis. In contrast to the results for women that clearly showed the spectrum model to be best, the results for men were not as clear. The fit indices for the spectrum model suggested that it fit well, but the variance of the Fear latent variable had to be restricted and the Sexual Problems factor had a small loading onto the Internalising Spectrum, which implied that the model did not adequately conceptualise the relationships between the variables. The sexual desire variable was also a poor indicator for all of the models, which may suggest male sexual functions independently of depression, anxiety, and other sexual problems. While many studies have found depression and anxiety to be related to decreased libido (see Laurent & Simons, 2009), a couple of studies have also found the opposite effect for small groups of young men, and men experiencing atypical depression (Bancroft et al., 2003a; and Nofzinger et al., 1993 respectively). The finding that desire did not fit into the model could be a result of opposing positive and negative relationships between depression and anxiety and male sexual desire. However, it also seems likely to be related to the poor measurement properties of the IIEF desire domain, which have been explored in detail elsewhere (see Chapter 3).

The two-class model was indicated as the best categorical model for men. This model mirrored the two-class model for women; it showed a large asymptomatic class, and a class

with high mood and anxiety symptoms, but low sexual problems. The strong separation between the disorder classes seems likely to have arisen due to the low and narrow sample of sexual problems. The group with high levels of sexual problems is consequently very small, and is not defined in the two-class model. In contrast, the depression and anxiety variables that distinguished between the profiles had a greater spread of symptom levels, so a symptomatic group based on these variables would be delineated more easily.

While the two-class model was the best model according to the selection rules, the substantive interpretation of the three-class model provided additional important information, as it displayed clear categorical distinctions for a small group of men. Follow-up analyses showed that the dimensional model provided a strong fit to the rest of the sample. It is important to be conscious of the sample limitations in interpreting this data, but taken at face value these results suggest that a dimensional spectrum model fits the data well for 96% of the men in our sample.

The dimensional spectrum model is similar to that tested in Chapter 2, but the results for the spectrum model in this study are different for a number of reasons. This was a sample of participants who had engaged in penetrative sexual intercourse in the past four weeks, so these analyses were conducted on a slightly different sample from Chapter 2, which required any form of sexual activity (e.g., masturbation or oral sex) in the past four weeks. This study also used different observed variables. For example, panic and agoraphobia were combined; as were the subjective and physiological female sexual arousal measures, which gave us a better picture of female sexual arousal; and sexual desire was ultimately removed from analyses for women due to flawed measurement. The main point of difference for this study was the combination of LPA and SEM, which enabled the empirical evaluation of dimensional *and* categorical relationships between these disorders. Due to these differences, there are interesting new results.

Limitations

Before exploring the implications of this study, it is important to recognise its limitations. The use of a convenience sample from the general community will have affected the results in a number of ways. Our sample tended towards healthy sexual function, as participants were required to have attempted intercourse in the past four weeks, and the sample was also young and well educated (Laumann et al., 1999). Consequently, the relationships found here will be weaker than if a clinical sample were included, as discussed earlier. In particular, it seems likely that a more diverse sample and better measurement for men would give better information on appropriate models. While we cannot rule out a biased sample, the female sample appears more robust than the male sample given its larger size, higher symptom means, and larger variance. Due to the samples used, the results presented here have limited generalisability to clinical and sexually inactive populations. Further, distress associated with sexual problems was not measured, so these findings cannot necessarily be applied to sexual dysfunctions. However, this study offers preliminary comparative analyses of dimensional and categorical models of the relationships between depression anxiety and sexual problems, and so offers an important step towards broader and more accurate nosological models. Finally, it became clear after we collected this data that the FSFI and IIEF measures of sexual function have marked limitations. While the removal of the sexual desire observed variable for women detracted from the coverage of the models tested, the temporary inclusion of the FSFI desire domain detracted from the models. The inclusion of desire in the models for men appears to have not contributed anything, as it was a poor indicator. The present dataset offers the best measurement of the variables of interest; none of the large-scale epidemiological datasets include sexual problems variables in sufficient depth to examine these models (e.g., Australian Bureau of Statistics, 2007; Smith, Pitts, Shelley, Richters & Ferris, 2007), so this dataset was used despite its shortcomings. Despite the limitations of this study, new and noteworthy results were found.

Implications

The results suggest that there are strong dimensional relationships between depression, anxiety, subjective and physiological arousal, orgasmic function and sexual pain for women. While a dimensional model was clearly a superior fit for women, neither a dimensional spectrum nor a categorical framework model was superior to the exclusion of the other for men. Interestingly, when four per cent of men were excluded from analyses, the dimensional model provided strong fit for the remaining 96%. These results are generally consistent with a nosology that recognises the relationships between diagnostic categories (i.e., spectra of psychopathology), as in the new structure of the DSM-5. Due to the narrow and low symptom male sample, implications are primarily drawn from the results for women.

The implications of the present study are mainly structural; understanding the nature of the relationships between these disorders is key to having valid nosological systems, and it is vital for our nosology to explicitly recognise known relationships between diagnostic categories to aid effective diagnosis and treatment. Due to the recent inclusion of spectra in DSM-5 (APA, 2013a), there is ongoing debate about the spectra of psychopathology and a valuable opportunity for change. This study provides empirical evidence that internalising psychopathology may be a liability for sexual dysfunctions, which is consistent with the evidence in the literature to date. Specifically, this study contributes to the literature by showing that the inclusion of a broad range of sexual problems in a model of the internalising spectrum provides a more accurate representation of the pattern of interrelationships than the current conceptualisation of psychopathology classification that implies sexual dysfunctions are categorically distinct from depressive and anxiety disorders. A secondary implication of these results is that models of the development and maintenance of sexual problems would be more accurate if emotional and psychosocial factors were considered (e.g., Basson, 2003; Basson, 2005) —potentially for women *and* men.

More broadly, some possible future clinical implications are of note. Comorbidity between depression and anxiety is related to increased chronicity, poorer treatment outcomes and greater psychopathology. When sexual dysfunctions are also present, quality of life is further reduced, long-term outcomes are worse, and patients are more likely to drop out of treatment (Michael & O'Keane, 2000; van Lankveld & Grotjohann, 2000). Implementing a conceptualisation of the internalising spectrum that includes sexual problems could pre-empt these detrimental effects of mixed disorder presentation by highlighting likely patterns of co-occurrence, facilitating early recognition and encouraging treatment of diagnosed and sub-threshold comorbid conditions in combination. It is also possible that a transdiagnostic treatment program that targets shared underlying psychopathological processes could be effective for concurrent treatment (e.g., 'The Unified Protocol'; Boisseau et al., 2010). Transdiagnostic programs are gaining momentum with the advancement towards a dimensional model of psychopathology, and have been used effectively to target common elements of internalising disorders in populations with comorbid symptom presentation (e.g., Ehrenreich, Buzzella & Barlow, 2007). Further research will be needed to understand if any shared underlying mechanisms between these disorders offer good targets for treatment, but the first step is to determine an accurate description of the nature of the structural relationships between disorders. The potential for these treatments to target underlying spectra of psychopathology adds to the list of reasons for the identification of a comprehensive and integrated dimensional model of psychopathology based on higher-order factors being a clear priority for future research.

Conclusions

This study offers an important step towards identifying the nature of the latent structure between a variety of sexual problems, and depressive and anxiety disorders. Due to the stronger female sample, the case for dimensional relationships between these disorders is stronger than the mixed results found in the male sample. It is not yet clear, however, whether

the same model will be appropriate for men and women. Further research is also needed to ascertain whether the small group of men with categorical distinctions was an idiosyncrasy of this sample or a signpost of relationships in the broader population, and also to test these models in sexually inactive and clinical populations. This study adds to the growing body of evidence suggesting that sexual problems should be integrated into the internalising spectrum, and that the DSM and ICD should explicitly recognise these known relationships between sexual dysfunctions and depressive and anxiety disorders. However, regardless of whether the relationships are recognised in our nosology, research on these disorders in conjunction with one another will provide a greater depth of understanding about the role of underlying psychopathological processes in the disorders' aetiology, course and treatment response.

Chapter Five

Where do sexual dysfunctions fit into the meta-structure of psychopathology? A factor mixture analysis

Miriam K. Forbes, Andrew J. Baillie, and Carolyn A. Schniering

Abstract

Sexual dysfunctions have not been included in research on the meta-structure of psychopathology, despite their high prevalence and impact on quality of life. Preliminary research has shown that they offer a strong candidate for inclusion in the internalising spectrum, alongside depressive and anxiety disorders. To overcome the oversimplification of the relationships to date, this study compared dimensional and categorical models with "hybrid" models (factor mixture analyses), which combine dimensional and categorical components simultaneously. Participants (n = 1000) were selectively recruited to include a range of symptom levels, and completed a series of self-report measures online. Symptoms of depression, anxiety, and sexual dysfunctions were analysed separately by gender and groups of differing sexual activity levels. For both men and women, a hybrid model fit best. A three-class, two-factor model fit best for women, and all three classes contained two related factors (anxiety/depression and sexual problems). For men, a two-class, two-factor model fit best, which showed strong dimensional relationships for a large majority of the men (88%). Taken together, these results are consistent with a nosology that explicitly recognises the relationships between the diagnostic chapters of Depressive and Anxiety Disorders and Sexual Dysfunctions, but still maintains discrete diagnoses, which is compatible with the structure of the DSM-5 and upcoming ICD-11.

Introduction

The present chapter comprehensively investigates theoretically driven models that include sexual dysfunctions in the meta-structure of psychopathology. It uses novel statistical methods that are central to addressing the research questions, so has a dual focus on both content (i.e., sexual dysfunctions and their relationships with internalising disorders) and process (i.e., the statistical methods).

Sexual Dysfunctions and Internalising Psychopathology

Sexual dysfunctions have been shown to be highly prevalent, and associated with marked personal distress and decreased quality of life (e.g., McCabe, 1997). In addition, they have exceptionally high rates of co-occurrence with depressive and anxiety disorders (see Laurent & Simons, 2009 for a review), and this comorbidity is related to increased chronicity and severity, resistance to treatment, and worse long-term outcomes for patients (e.g., Hoyer et al., 2009; Shabsigh et al., 1998; van Lankveld & Grotjohann, 2000). When the disorders are not treated together, patients tend to have negative treatment outcomes, drop out of treatment, and subsequently are likely not to seek help again (Shabsigh et al., 1998; van Lankveld & Grotjohann, 2000). Despite this, the disorders tend to be treated separately, and sexual dysfunctions often go undiagnosed and unrecognised in primary care (Moreira et al., 2008; Read et al., 1997).

This clinical separation is likely influenced by their separation in our nosology. The *Diagnostic and Statistical Manual of Mental Disorders – Fifth Edition* (DSM-5) and the *International Classification of Diseases – Eleventh Edition Beta Draft* (ICD-11) incorporate a dimensional meta-structure to group disorders according to actual empirical similarities and comorbidity, rather than according to shared phenomenological features, as in the DSM-IV (Krueger et al., 2005b). For example, depressive and anxiety disorders have been established as part of an internalising spectrum, which represents the commonalities between them (Krueger, 1999; Krueger et al., 1998), and this shared underlying factor is explicitly

represented in the meta-structure of the DSM-5: "Some symptom domains, such as depression and anxiety, involve multiple diagnostic categories and may reflect common underlying vulnerabilities for a larger group of disorders. In recognition of this reality, the disorders included in DSM-5 were reordered into a revised organizational structure meant to stimulate new clinical perspectives." (American Psychiatric Association [APA], 2013a, p. xli).

Sexual dysfunctions also have strong, multifaceted and bi-directional relationships with depressive and anxiety disorders that are consistent with a shared underlying factor of internalising psychopathology (see Laurent & Simons, 2009 for a review), and preliminary research has shown that a model that includes sexual problems in the internalising spectrum fits better than a model that separates the disorders (see Chapters 2 and 4). While the DSM-5 suggests that the new structure will encourage broad investigations within proposed chapters and across adjacent chapters (APA, 2013a, p. 13), the opposite is happening for the Sexual Dysfunctions chapter; it appears to have been overlooked in the formulation of a meta-structure and is consequently separated from Depressive Disorders and Anxiety Disorders by seven chapters. At least three of the indicators that were used to determine the meta-structure are relevant to depression, anxiety, and sexual problems: abnormalities of emotional or cognitive processing (Nobre & Pinto-Gouveia, 2003, 2006, 2009), high comorbidity (Laurent & Simons, 2009), and shared treatment response (e.g., Brotto, Basson & Luria, 2008; McCabe, 2001). It is not yet clear whether the other indicators (e.g., shared neural substrates, family traits, genetic risk factors and biomarkers) apply, but there is growing evidence to propose a shift in our nosology.

Low recognition rates of sexual problems in primary care could be improved if the relationships between these disorders were highlighted in our nosology, and the intensified effect of the combined disorders could be pre-empted if clinicians became more proactive in enquiring about sexual problems in depressed and anxious patients, and vice versa (Michael & O'Keane, 2000). As such, it is important to define the nature of the relationships between

these disorders to help understand aetiology, course and treatment response. These sorts of questions were prolific leading up to the release of the DSM-5, and primarily centred around whether the latent structures of disorders —and of psychopathology more broadly— were dimensional or categorical. The literature in this area is vast, and there are strong arguments on both sides of the debate.

Theoretical and Statistical Methods to Determine the Structure of Psychopathology

To briefly summarise, categorical models fulfil the needs of clinicians and insurance companies, as they classify and diagnose individuals (Andrews et al., 2008). One statistical method that has been used to test these categorical models is latent profile analysis (LPA; latent class analysis using continuous variables). LPA has been used to evaluate categorical conceptualisations of psychopathology by grouping individuals according to their observed symptom response patterns, and offer the best way to explain patterns of co-occurrence with respect to a number of mutually exclusive underlying classes (Krueger et al., 2005a). However, LPA does not allow for varying severity within or across categories, and relies on a conditional independence assumption (i.e., the assumption that disorders are completely unrelated to each other within each class; Masyn et al., 2010); neither of these rigid assumptions are compatible with what is known about the nature of psychopathology.

Dimensional models provide a good framework to understand the shared aspects of disorders, and recognise the relationships between them. This perspective is more suited to the nature of psychopathology, and explains the robust patterns of comorbidity between disorders, which are interpreted as indicators of stable, underlying core processes (Krueger & Markon, 2006). An example of a statistical method used to investigate the dimensional relationships between disorders is factor analysis (FA). FA allows for the unique and shared aspects of disorders, and is the best way to explain patterns with respect to underlying continuous dimensions (Widiger & Samuel, 2005). However, FAs rely on the assumptions that all individuals are from the same homogeneous population (i.e., share the same patterns

of relationships), and that individual differences arise purely from differences on an underlying factor, which are both unlikely to be true in the real world. They also do not provide a means for diagnosis. In short, neither statistical method alone suits both the nature of psychopathology and the needs of clinicians, and both rely on statistical assumptions that do not hold for psychopathology. As such, while these methods are helpful theoretically, they are flawed in their practical applications.

An ideal model for psychopathology would overcome the limitations of LPA and FA. That is, it would account for the relationships between disorders, account for the needs of clinicians, allow for variation of symptom severity within groups, and not rely on the assumptions of conditional independence or homogeneity of the population. Recently, a modelling technique has been developed that does just this, and has made the dimensional versus categorical debate redundant (Masyn et al., 2010). Factor mixture analyses (FMAs) — or "hybrid models"— simultaneously incorporate both dimensional *and* categorical components without relying on an *a priori* assumption about the underlying structure of the relationships as dimensional or categorical. Consequently, FMAs combine the strengths of both LPA and FA to offer a strong theoretical solution that is compatible with our nosology, and relax the rigid statistical assumptions of each model in isolation (Clark et al., 2013). This approach allows us to detect whether there are qualitatively different relationships for different groups of individuals. In short, a model that maintains separate diagnoses, but recognises the relationships between them meets the needs of clinicians and is an important step towards more effective diagnosis and pre-emptive transdiagnostic treatment. Accordingly, FMAs are the strongest and most informative statistical models for our nosological systems, and are compatible with the structure of the DSM-5 and ICD-11 Beta Draft (APA, 2013a; World Health Organization [WHO], 2013), which have adopted structural models that recognise spectra of psychopathology.

Application of these Methods to Sexual Dysfunctions, Depression and Anxiety

More specifically in the context of depression, anxiety, and sexual problems, preliminary research has empirically evaluated dimensional and categorical models and found both types of relationships, with particularly strong dimensional relationships for women (see Chapters 2 and 4). However, the models tested were limited by the assumptions of the LPA and FA methods, their utility in real contexts was not sufficient, and valuable information was lost in both models by forcing a single type of structure. Logically, both dimensional *and* categorical relationships would be present: there are clear relationships between the diagnostic groups, but there are also differences between the sexual and emotional domains, so it is likely that neither a forced dimensional or categorical structure would be ideal. Consequently, while the existing studies in this area were theoretically important, they were practically flawed. In this context, FMAs provide a uniquely helpful conceptualisation that is suited to investigate the nature of the relationships of interest.

The Present Study

The aim of the present study was to define a theoretically driven and empirically supported nosological model of the relationships between depression, anxiety, and sexual problems, with a focus on using innovative statistical techniques. As such, FMAs will be used to build on existing research. Clark et al. (2013) described five different broad types of FMA models (FMA-1 to FMA-5), each with different parameter restrictions. In practice, the more restrictive models (e.g., FMA-1 and FMA-2) often do not fit real data well (Clark et al., 2013). Accordingly, and for the sake of brevity, FMAs based on the less restrictive FMA-4[5]

[5] In this type of FMA, the means of the continuous disorder scores are allowed to vary across classes, as a variety of symptom severity levels are expected between groups. Factor loadings are held invariant across classes, which suggests that the disorders are being measured the same way across all classes; but factor variances and covariances and the factor covariance matrix are freely estimated in each class, which allows for a range of severity levels within and between classes. This will allow us to determine if there are categorically different groups in the sample, or if the same underlying structure is appropriate for all groups.

from Clark et al. will be compared with the FAs and LPAs of best fit. The primary analyses will focus on the responses from participants who engaged in intercourse in the past four weeks, as these responses provide complete information on the experience of sexual problems. The model of best fit for these participants will also be examined for the participants who had not engaged in intercourse in the past four weeks.

All analyses will be conducted separately for men and women to account for differences in male and female sexual response cycles: For men, a simple linear sexual response model has been found to fit well, which conceptualises desire, erection and orgasm as temporally distinct, consecutive phases (Masters & Johnson, 1970). For women, a circular sexual response model has been developed that takes into account motivations to be sexual and contextual elements, such as cultural and relationship factors (Basson, 2005). Desire and arousal overlap in the circular model of sexual response, and responsive desire is emphasised rather than spontaneous desire, where responsive desire is conceptualised as a lack of arousability to any number of stimuli, relational or otherwise (Basson, 2005; Meana, 2010). As such, the improved measurement of sexual desire, and subsequent inclusion in analyses in the present study, is likely to generate additional gender differences compared to Chapter 4, which did not include sexual desire. It is not clear how these gender differences will manifest, but the substantive interpretations will be compared between models.

This study will also overcome many of the limitations in the existing research on this topic: Chapters 2 and 4 had flawed measurement for sexual dysfunctions in particular. These studies also relied on a sample that excluded adolescents under 18, had a narrow sample of symptoms for men, and excluded participants who were not sexually active in the past four weeks, all of which limited the reliability and generalisability of the results. To overcome these limitations, this study utilised a data set with better criterion validity to the DSM and better measurement of sexual problems, included adolescents, recruited a sample of men with a broader range of symptoms, and included participants across all levels of sexual activity. In

order to improve the generalisability of the model of best fit, it will be examined for men and women with a variety of sexual activity levels from broad socio-demographic backgrounds. It will also have improved generalisability to clinical samples compared to earlier studies, due to the greater variety in symptom levels, and a greater proportion of participants with high symptom levels. Based on existing research, it is hypothesised that the models of best fit for women will tend to be dimensional in nature, and that the best fit for men will be hybrid models that incorporate dimensional and categorical components. More broadly, it is hypothesised that both genders will need dimensional components to adequately represent the relationships between disorders.

Method

To address these hypotheses, a wide range of respondents completed online self-report measures on symptoms of affective disorders and sexual dysfunctions. The present study used the first time point from a six time point longitudinal study.

Participants

Participants were recruited by responding to print and online advertisements, which were disseminated as widely as possible and specifically placed to recruit varying symptom levels for the disorders of interest (e.g., in The Happiness Institute newsletter and blog, local newspapers, the beyondblue website, and the Impotence Australia website, to name a few). Advertisements directed participants to a website (www.moodstressandsex.com) "to help us understand the relationship between mood, stress levels and sexuality over time" where the details of the study were provided. Participants self-selected into the study, and a total of 1000 adults from the general population were included in the analyses. Incomplete responses (n = 110, 11%) were excluded. Of the included sample, 72% were female (n = 721), 28% were male (n = 279), and the average age was 31.9 years (SD = 11.9). Participants who had engaged in intercourse in the past four weeks (the "intercourse group"; n = 707) were the

primary sample, as they provided complete information for all of the variables of interest. Models were also analysed for the "no intercourse group" (n = 293), as a comparison.

Measures

The measures for this study assessed symptoms of major depression, generalised anxiety disorder (GAD), social anxiety, obsessive-compulsive disorder (OCD), panic disorder, and sexual dysfunctions, as described below. These measures were all self-report Likert scales, chosen for their brevity and high criterion validity to DSM disorders.

Depression

The Patient Health Questionnaire (PHQ-9; Kroenke, Spitzer & Williams, 2001) is a 9-item measure of depression that incorporates DSM-IV depression diagnostic criteria with other leading major depressive symptoms, and has been shown to have good reliability (Lowe, Kroenke, Herzog & Grafe, 2004). Diagnostic validity of the PHQ-9 has also been established, and diagnostic cut-off scores with good sensitivity and specificity (88%) are available to differentiate the severity of symptom levels (Lowe et al., 2004).

GAD

The Brief Measure for Assessing Generalized Anxiety Disorder (GAD-7; Spitzer et al., 2006) is a 7-item measure of GAD with very good reliability (internal consistency $\alpha = 0.92$, test-retest coefficient of 0.83) and high construct validity. It also has established cut-off scores to ascertain the severity of GAD.

Social Anxiety

The Social Phobia Inventory (SPIN; Connor et al., 2000) consists of 17 items, and is the only self-report measure of social anxiety that measures a spectrum of fear, avoidance, and physiological symptoms. It has a good test-retest coefficient of 0.89, excellent internal consistency ($\alpha = 0.94$), good construct validity, and a threshold to establish the likely presence of social anxiety.

OCD

The Obsessive-Compulsive Inventory-Revised (OCI-R; Foa et al., 2002) is an 18-item self-report measure that measures six subscales (washing, checking, ordering, obsessing, hoarding, and neutralising) and gives a total score. It has been shown to have good internal consistency ($\alpha = .83$ to $\alpha = .90$), convergent validity, and test-retest reliability (Foa et al., 2002), and has a threshold score to determine the likely presence or absence of OCD.

Panic Disorder

The Panic Disorder Severity Scale - Self-Report (PDSS-SR; Shear et al., 1997) is a 7-item measure of panic disorder severity. The PDSS-SR has high internal consistency ($\alpha = .92$), and convergent and discriminant validity (Houck, Spiegel, Shear & Stat, 2002). The PDSS-SR also has good clinical and criterion validity, and existing clinical severity cut-off scores.

Sexual Problems

The Abbreviated Sexual Function Questionnaire (ASFQ; Williams, Abraham & Symonds, 2010) is a 20-item screening tool for female sexual dysfunction (FSD). We included the six domains with criterion validity to DSM disorders: sexual desire, arousal sensation, cognitive arousal, lubrication, orgasmic function and sexual pain. It has excellent criterion validity, and good reliability and construct validity.

The Female Sexual Distress Scale – Revised (FSDS-R; Derogatis, Clayton, Lewis-D'Agostino, Wunderlich & Fu, 2008) is a 13-item measure of for assessing sexually related distress in women, to be used in conjunction with the ASFQ for screening for sexual dysfunctions in the DSM-IV-TR. It has demonstrated good discriminant validity, high test-retest reliability, and a high degree of internal consistency ($\alpha = .88$), and has a cut-off score established to determine the presence of likely FSD.

The International Index of Erectile Function (IIEF; Rosen et al., 1997) was designed for —and tested on— sufferers of erectile dysfunction, and subsequently has outstanding psychometric properties only for the 6-item erectile function subscale (excellent discriminant

and construct validity, internal consistency α = .93, test-retest coefficient = .84). The other subscales (satisfaction, orgasmic function, sexual desire) are inadequate measures for the purposes of this study (see Chapter 3). Consequently, only the erectile function subscale was used in this study.

The Index of Premature Ejaculation (IPE; Althof et al., 2006) is a 10-item index of premature ejaculation (PE) that assesses changes in control over ejaculation, distress in men who experience PE, and general sexual satisfaction. The IPE has been shown to possess very good discriminant validity and good convergent validity. It has also shown good internal consistency (α = .70 to α = .86) and test-retest reliability.

The Sexual Desire Inventory (SDI; Spector, Carey & Steinberg, 1996) has 13 items, and was used to measure male dyadic and solitary sexual desire. It has been shown to have high internal consistency (α = .86; α = .96), and construct validity.

Procedure

Participants completed brief demographic information and the measures relevant to their gender, providing data on their levels depression, anxiety, and sexual dysfunction. The study was approved by the Macquarie University Human Ethics Committee, and respondents were required to provide informed consent and declare their age before they were able to access the study. Those under sixteen years of age were not able to access the survey, and this was the only exclusion criterion. At the completion of the survey, respondents were automatically entered into the draw for a prepaid $100 credit card.

Data Analysis

The data were scored and transformed —and descriptive statistics were computed— using SPSS Statistics Version 19.0 for Macintosh. The primary analyses were conducted with MPlus Version 6.1 (Muthén & Muthén, 2011). Sexual function items were reverse-scored so that higher scores indicated greater dysfunction, in line with all other measures. The scales of the observed variables varied greatly, and this is known to cause convergence problems in

complex models (Muthén & Muthén, 2011), so scores were standardised. Because of the general community sample used, some variables were positively skewed; consequently, variables were treated as censored from below to account for floor effects and non-normality. The PHQ-9, GAD-7, SPIN, OCI-R, PDSS-R, FSDS-R, IIEF-Erection, and SDI totals, as well as the sexual desire, arousal sensation, cognitive arousal, lubrication, orgasmic function and sexual pain subscales of the SFQ, and the sexual satisfaction, ejaculatory control and PE-related distress subscales of the IPE comprised our seventeen observed variables. A robust maximum likelihood estimator (MLR) was used, which treated disorders as continuous. Models were analysed separately for each gender, as the questions used to assess sexual problems differed between genders. The data from the groups that had engaged in intercourse in the past four weeks were the focus of the primary analyses because they had the full information for all variables of interest.

The recommendations of Clark et al. (2013), Masyn et al. (2010) and Muthén (2002) were used to determine which model provided the best fit to the data, using a combination of statistical and substantive model checking. LPA and exploratory FA (EFA) models need to be run before fitting an FMA. The Vuong-Lo-Mendell-Rubin (VLMR) Likelihood Ratio Test (LRT), Lo-Mendell-Rubin (LMR) LRT (Lo et al., 2001) and Bootstrapped LRT (BLRT) are tests to decide which LPA model provides the best number of symptom profiles to characterise the groups in the data. The LRTs provide *p*-values that indicate whether a (*k*-1) class model can be rejected in favour of a *k*-class model. The first model that has a non-significant *p*-value ($p > .05$) is rejected in favour of the previous model, which suggests that the (*k*-1) class model has the best profile enumeration. It is also important to assess the value and utility of the profiles (i.e., how informative the model is) and whether the profile sizes and proportions indicate over-extraction (i.e., are very small; Masyn et al., 2010); entropy is a measure of the degree to which classes are distinguishable, and precision with which individuals are placed in classes, with values close to 1 being ideal (Masyn et al., 2010). For

EFAs, an interpretable factor structure with high factor score determinacies (i.e., close to 1; FDs) indicates a strong model.

The best LPA is then the end point for increasing the number of classes in an FMA, and the EFA is the end point for increasing the number of factors. These models are then combined using an iterative approach, building up from one factor and one class, until the maximum number of factors and classes is reached. The resulting FMAs are compared using the same methods for choosing an LPA model. Once the best LPA, EFA, and FMA models have been picked, they can be compared using the Bayesian Information Criterion (BIC), which has been shown to be the most reliable comparison criterion (Nylund et al., 2007), and by checking the theoretical implications of the model. This study also included the Akaike's Information Criterion (AIC) and sample size adjusted BIC (ABIC), which have been shown to outperform the BIC for models with larger class separation (Lubke & Neale, 2006). It is also important that the classes have utility and value in their interpretation.

Participants in the "no intercourse" group could not provide responses for some of the sexual problems variables, and so could not be included in the primary analyses. In order to analyse the structure of the relationships in these groups, the model of best fit from the primary analyses was also examined in these samples: structural invariance was held based on the results of the primary analyses, but the means and variances of observed variables were allowed to be free, as we would not necessarily expect the same levels of symptoms between groups. We can interpret these models as having the same underlying latent variables because they have the same number of factors, and equal factor loadings and intercepts (Clark et al., 2013). Missingness for the "no intercourse groups" was dealt with using full information maximum likelihood (FIML). An information-theoretic approach was used to identify the best model for each group. This type of approach emphasises parsimony (i.e., efficient and accurate representations of observed data), which is ideal for nosological models (Krueger et al., 2005a).

[This page is left blank to adjust pagination of text in relation to tables and figures.]

Results

Descriptive Statistics

Participants Who Had Engaged in Intercourse in the Past Four Weeks

Descriptive statistics for demographics and observed variables are presented in Table 13. Observed variables tended to have high symptom rates for a community sample. Twenty-to-forty per cent of the "intercourse groups" reached the cut-offs for moderate or significant dysfunction across most disorders, with the exception of panic disorder, female sexual pain disorders, and erectile dysfunction (8.5% met the "severe" cut-off). Comparing men and women in the "intercourse groups", there were no significant differences in depression and anxiety symptom levels. The "intercourse groups" thus had a wide and adequate range of symptom levels that were optimal for testing the models of interest in the present study.

Intercourse Versus No Intercourse Groups

Independent samples *t*-tests and chi-square analyses showed that, compared with women in the "intercourse group", women who had not had intercourse (n = 195) in the past four weeks tended to have higher levels of depression, GAD, social anxiety, OCD, panic disorder, and sexually related distress; and lower levels of desire and cognitive arousal. They were also more likely to be single and not working. There were no differences between groups in arousal sensation, lubrication or orgasmic function, age, number of children, or education levels. This pattern seems to show that affective and cognitive symptoms were more severe for women who had not engaged in intercourse, as opposed to self-reported physiological symptoms of sexual dysfunction. It is also interesting to note that 60% of the "no intercourse" female sample exceeded the threshold for social anxiety. Men who had not engaged in intercourse in the past four weeks (n = 98) had significantly lower sexual satisfaction, and lower levels of desire than the intercourse group. Beyond these findings, there were no significant differences in any symptom levels. Men who had engaged in intercourse tended to

have higher levels of education, and were more likely to be in a relationship, compared with men who had not had intercourse in the past four weeks.

Table 13

Descriptive Statistics for Demographics and Observed Variables for Women and Men. Means (Standard Deviations) or N (% of respondents)

	Women		*Men*	
Variable (possible range)	*Intercourse in the past 4 weeks* (*n* = 526)	*No intercourse* (*n* = 195)	*Intercourse in the past 4 weeks* (*n* = 181)	*No intercourse* (*n* = 98)
Age	30.32 (10.47)	31.89 (12.28)	34.51 (13.26)	35.47 (13.94)
Relationship – Living together	285 (54.2%)	80 (41.0%)**	89 (49.2%)	34 (34.7%)**
Employment – Full Time Work	215 (40.9%)	77 (39.5%)**	122 (67.4%)	54 (55.1%)
Education – University Degree	347 (66.0%)	133 (68.2%)	106 (58.6%)	45 (45.9%)**
Family – No children	386 (73.4%)	138 (70.8%)	111 (61.3%)	65 (66.3%)
Depression (0-27)	7.16 (5.52)	9.14 (6.92)	7.13 (5.80)	8.04 (5.86)
Moderate to severe depression	153 (29.1%)	76 (39.0%)	51 (28.2%)	35 (35.71%)
GAD (0-21)	6.03 (4.84)	6.92 (5.48)**	6.17 (5.06)	6.09 (5.66)
Significant or Severe GAD	120 (22.8%)	55 (28.2%)	47 (26%)	25 (25.5%)
Social Anxiety (0-68)	14.45 (12.57)	17.44 (14.20)**	13.74 (13.41)	15.84 (13.18)
Over threshold for SA	156 (29.7%)	117 (60.0%)	50 (27.6%)	34 (34.7%)
Obsessive Compulsivity (0-72)	9.92 (10.04)	12.28 (12.14)**	10.91 (11.87)	10.48 (9.39)
Over threshold for OCD	118 (22.4%)	49 (25.1%)	34 (18.8%)	20 (20.4%)
Panic Disorder (0-4)	2.65 (4.32)	3.23 (5.00)**	2.45 (4.14)	3.11 (4.89)
Mild or Severe PD	88 (16.7%)	39 (20.0%)	25 (13.8%)	17 (17.3%)
Sexually Related Distress (0-52)	15.17 (13.10)	18.11 (13.92)**	-	-
Over cut-off for likely FSD	290 (55.1%)	127 (65.1%)	-	-
Sexual Desire (0-26)	13.72 (6.03)	21.40 (4.43)**	-	-
High Probability of HSDD	175 (33.3%)	152 (77.9%)	-	-
Arousal Sensation (0-16)	7.14 (4.20)	7.84 (3.58)	-	-
High Probability of FSAD	163 (31.0%)	18 (31.6%)	-	-
Lubrication (0-8)	3.25 (2.15)	3.58 (1.92)	-	-
High Probability of FSAD	157 (29.8%)	19 (33.3%)	-	-
Cognitive Arousal (0-8)	3.17 (2.19)	3.93 (2.31)**	-	-
High Probability of FSAD	146 (27.8%)	25 (43.9%)	-	-
Orgasmic Function (0-14)	5.85 (4.13)	6.05 (4.25)	-	-
High Probability of FSOD	186 (35.4%)	28 (37.3%)	-	-
Sexual Pain (0-13)	1.58 (2.33)	-	-	-
High Probability of Dyspareunia	26 (4.9%)	-	-	-
Erectile Function (0-24)	-	-	3.30 (4.73)	4.05(6.12)
Mild to severe ED	-	-	48 (25.4%)	17 (17.4%)
Sexual Satisfaction (0-100)	-	-	34.89 (30.16)	76.04 (25.89)**
Ejaculatory Control (0-100)	-	-	36.46 (32.06)	-
PE-Related Distress (0-100)	-	-	25.21 (29.33)	17.05 (25.39)
Desire (0-98)	-	-	32.68 (14.08)	38.74 (20.82)**

Note. **Independent samples *t*-test *p*-value < .01, compared within gender.

Higher scores indicate higher symptom levels. GAD = generalised anxiety disorder, OCD = obsessive-compulsive disorder, PD = panic disorder, FSD = female sexual dysfunction, HSDD = hypoactive sexual desire disorder, FSAD = female sexual arousal disorder, FSOD = female sexual orgasmic disorder, ED = erectile dysfunction, PE = premature ejaculation.

Women

Latent Profile Analysis

An LPA that fit one- through five-class models to the data was conducted to examine the fit of a categorical model.[6] The results can be seen in Table 14. The VLMR and LMR *p*-values first reached non-significance ($p > .05$) for the four-class model, which indicated that the three-class model was best. The BIC never reached a minimum, but was over 500 points lower for the three-class model, compared with the two-class model. The drop in the BIC to the four-class model was significantly less, at 200 points, which suggests that the 'elbow point' for the BIC was at the three-class model. Substantive interpretation for this model shows the best class enumeration for any of the LPA models (entropy = .9), and three interpretable classes. The first class (60%) had low symptom levels; the second class (23%) had low depression and anxiety symptoms and high sexual problems; and the third class (17%) showed high levels of depression and anxiety symptoms, and low sexual problems. Thus, the three-class model was chosen as the best LPA based on the significant VLMR and LMR *p*-values for the four-class model, and because there is a substantive interpretation for each of the three classes.

Exploratory Factor Analysis

An EFA was conducted to examine the fit of a dimensional model. The EFA tested models with one to four factors. While the two, three and four-factor models all had similar BICs, the four-factor structure did not have interpretable factors, and the three-factor structure had a factor defined only by sexually related distress. The two-factor EFA had the strongest factor structure and high FDs (see Table 14). This model shows a depression/anxiety factor, and a sexual problems factor (see Table 15), with an inter-correlation of $r = .33$ ($p < .001$),

[6] The BLRT *p*-values did not reach non-significance in any of the analyses, and so the *p*-values are not included in the tables (all *p*s < .0001). Models were selected according to the VLMR and LMR *p*-values, as well as the information criteria and substantive model interpretation (Nylund et al., 2007).

and had a lower BIC than even the strongest LPA (three-class) model. Since the two-factor model is parsimonious, fits well, and has an interpretable structure, it was chosen as the best factor analytic model for the data.

Table 14

Model Fit Indices for Latent Profile Analyses (LPAs), Exploratory Factor Analyses (EFAs), and Factor Mixture Analyses (FMAs) for Women who had Engaged in Intercourse in the Past Four Weeks (N = 526)

LPAs	LL	k	BIC	ABIC	AIC	VLMR	LMR	Entropy
1 class	-9045.06	24	18240.45	18164.26	18138.12	-	-	-
2 classes	-8039.89	37	16851.53	16734.08	16693.79	.000	.000	.897
3 classes	**-8018.15**	**50**	**16349.46**	**16190.75**	**16136.29**	**.021**	**.022**	**.904**
4 classes	-7870.03	63	16134.65	15934.68	15866.06	.598	.600	.896
5 classes	-7718.47	76	15912.96	15671.71	15588.94	.118	.119	.893
EFAs	LL	k	BIC	ABIC	AIC	FD			
						1	2	3	4
1 factor	-8153.65	36	16532.79	16418.52	16379.31	.947			
2 factors	**-7601.82**	**47**	**15498.03**	**15348.84**	**15297.65**	**.946**	**.953**		
3 factors	-7566.56	57	15490.13	15309.19	15247.11	.944	.953	.867	
4 factors	-7542.61	66	15498.61	15289.11	15217.22	.940	.894	.948	.861
FMAs	LL	k	BIC	ABIC	AIC	VLMR	LMR	Entropy	
1 class 1 factor	-8153.90	36	16533.28	16419.01	16379.80	-	-	-	
1 class 2 factors	-7652.97	37	15537.68	15420.23	15379.93	-	-	-	
2 classes 1 factor	-7700.59	50	15714.34	15555.63	15501.17	.000	.000	.909	
2 classes 2 factors	-7488.82	53	15309.60	15141.37	15083.64	.002	.002	.940	
3 classes 1 factor	-7558.50	64	15517.87	15314.71	15245.01	.135	.138	.864	
3 classes 2 factors	**-7354.29**	**71**	**15153.28**	**14927.91**	**14850.58**	**.000**	**.000**	**.956**	

Note. Models were run using maximum likelihood estimation with robust standard errors (MLR), and variables were treated as censored from below.

LL = log-likelihood, k = number of free parameters, BIC = Bayesian information criterion, ABIC = sample size adjusted BIC, AIC = Akaike's information criterion, VLMR = Vuong-Lo-Mendell-Rubin likelihood ratio test *p*-value, LMR = Lo-Mendell-Rubin likelihood ratio test *p*-value, FD = factor score determinacy.

Table 15

Quartimin Rotated Factor Matrix for Exploratory Factor Analysis (EFA), and Standardised Factor Loadings for Factor Mixture Analysis (FMA) Classes for Women who had Engaged in Intercourse in the Past Four Weeks (n = 526)

Disorder	EFA		FMA					
			Class 1		Class 2		Class 3	
	1	2	1	2	1	2	1	2
GAD	**.866**		**.743**		**.822**		**.904**	
Depression	**.831**		**.745**		**.824**		**.905**	
OCD	**.731**		**.610**		**.708**		**.827**	
Panic Disorder	**.675**		**.369**		**.458**		**.603**	
Social Anxiety	**.671**		**.610**		**.675**		**.802**	
Cognitive Arousal		**.920**		**.902**		**.914**		**.922**
Lubrication		**.785**		**.765**		**.788**		**.804**
Arousal Sensation		**.756**		**.766**		**.788**		**.804**
Sexual Desire		**.725**		**.701**		**.727**		**.746**
Orgasmic Function		**.584**		**.618**		**.646**		**.666**
Sexually Related Distress	.297	**.524**		**.592**		**.621**		**.641**
Sexual Pain	.208	.176		.137		.148		.156

Note. Significant factor loadings >.1 are shown and factor loadings >.3 are bolded. Standardised loadings are shown to take into account differences in factor variance across models in order to compare the loadings.

GAD = generalised anxiety disorder, OCD = obsessive-compulsive disorder.

Factor Mixture Analysis

The results of the LPAs and EFA suggested that FMAs with a maximum of three classes and two factors should be fit to the data. The two-factor structure was specified based on the EFA two-factor structure, so that depression and anxiety disorders loaded onto factor one, and sexual problems loaded onto factor two. For each set of models, the two-factor structure is clearly better than the one-factor structure, with BICs 400-500 points lower. None of the two-factor models had non-significant LRTs, so they were compared using the BIC. The three-class two-factor model has the lowest LL and BIC, and the best entropy (see Table 14). To allow this complex model to converge, we specified start values for the mean of class one and the variance for factor two, based on the final estimates given in the initial solution.

Figure 10 shows the symptom profiles for the three classes. The first and largest class, 77% of the sample, is the lowest line on the profile plot, with all disorders at similarly low symptom levels. Individuals in this class are likely not to report any high symptom levels. While this class is similar to the largest class in the three-class LPA, the size is different, which suggests they are not the same group. The second class, 18% of the sample, had a large estimated mean for panic disorder, and the third class, 5% of the sample, had elevated estimated means for sexual pain and sexually related distress.

Table 15 shows the factor structure within each class, compared with the original EFA factor structure. The factor structure is similar within each of the classes: there are moderate to strong highly significant factor loadings, sexual pain is a poor indicator, and the factors are correlated at $r = .3$ in each class (range from $r = .30$ to $r = .32$, all ps $< .001$). The mean symptom levels vary between each class, but the model suggests each class has the same underlying structure of relationships between symptoms, and a generally dimensional structure with two separate but related factors. Classes two and three each have progressively larger factor loadings, compared to class one. This suggests that the underlying factors have more influence in classes two and three, and that the within-class correlations among the

disorders are also slightly higher. While the factors have similar interpretations between classes, they are not equivalent, as the factor variances are non-invariant between classes. This FMA is consistent with a nosological model that maintains discrete diagnostic categories (e.g., panic disorder is required to describe the profile pattern for class two), while explicitly recognising the relationships between them.

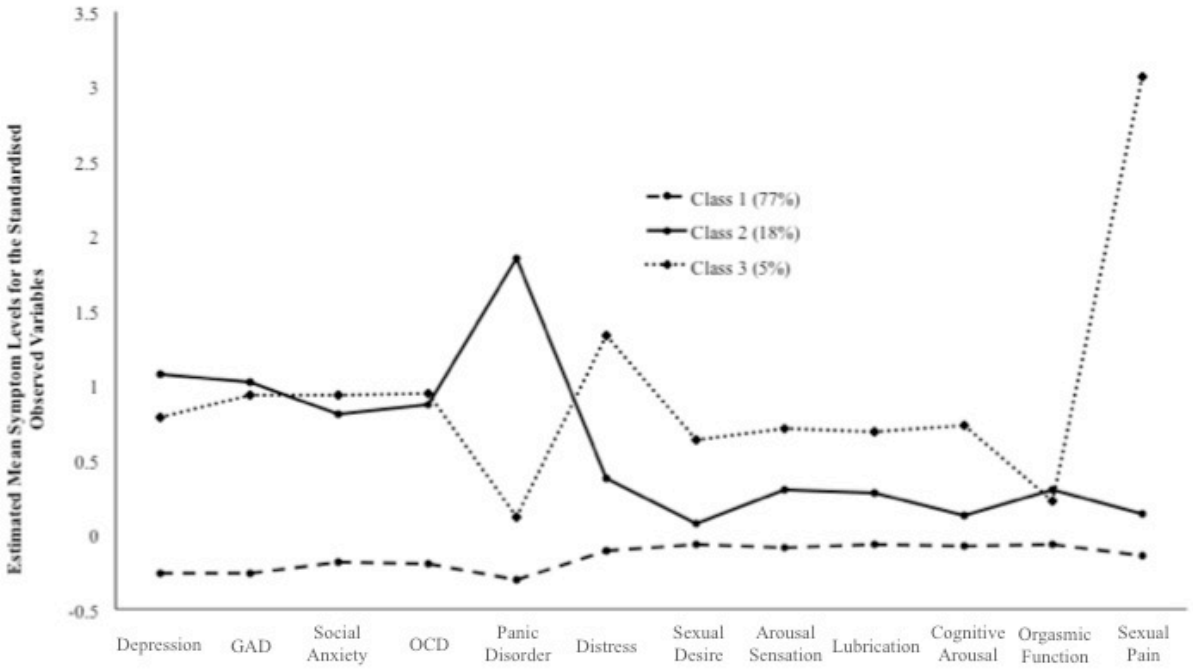

Figure 10. Estimated mean profiles for the three-class two-factor factor mixture analysis for women who had engaged in intercourse in the past four weeks (n = 526)

Note. GAD = generalised anxiety disorder, OCD = obsessive-compulsive disorder.

Comparing the three best models for women, the three-class two-factor FMA provided the best fit to the data (see Table 14). The BIC is 350 points lower for the FMA, compared with the EFA, suggesting that the assumption that participants are drawn from a homogeneous population has been violated, and that the classes are required to explain the relationships between the variables. However, the three-class LPA was the poorest fit to the data, and had a very different profile plot from the final FMA, which suggests that the rigid assumptions of the LPA were also not suited to the data. Due to the low BIC, and the substantive interpretation, the FMA was chosen as the best model to explain the data, as it combines the two important elements of dimensions and classes, both of which explain different aspects of the data.

Women Who Had Not Engaged in Intercourse.

The three-class two-factor FMA was also tested for the group of women who had not engaged in intercourse in the past four weeks (n = 195). Pain during intercourse could not be estimated for this group. As such, the FMA was estimated with depression, GAD, social anxiety, OCD, panic disorder, sexually related distress, desire, cognitive arousal, lubrication, arousal sensation, and orgasmic function. The arousal and orgasm variables were estimated based on women who had engaged in sexual activity without penetrative vaginal sex (e.g., masturbation, oral sex). The means for orgasmic function in class one, and for panic in class three were specified starting values to enable the model to converge, and the MCONVERGENCE criterion was changed to .01, because it was difficult to obtain high numerical precision (Muthén & Muthén, 2011). The model had entropy of .86, with VLMR and LMR p-values < .0001, so the model was not rejected. The estimated mean profile plots showed the first class, 77% of the sample, with low symptoms, but slightly elevated sexual problems; the second class, 18% of the sample, had moderate symptom levels across disorders, but low desire difficulties; and the third class, 5% of the sample, displayed elevated OCD and panic symptoms. These classes can be interpreted as having the same underlying latent variables as the intercourse group because they have the same number of factors, equal factor loadings, and equal means. This model suggests that the "no intercourse group" of women tended to have higher symptom levels, but the same factor and class structure were appropriate.

Men

Latent Profile Analysis

The latent profile analysis for men was conducted by fitting one- through five-class models to the data. The results can be seen in Table 16. The VLMR and LMR p-values first reached non-significance (p > .05) for the four-class model, which indicated that the three-class model was best. While the BIC never reached a minimum, the drops in the BIC reached

an elbow point at the three-class model, and the entropy was highest for this model. Class one was large, 60% of the sample, and comprised of asymptomatic participants; class two, 31% of the sample, had a similar profile pattern, with moderate symptom levels; and class three, 9% of the sample, had elevated mood and anxiety symptoms, with spikes at OCD and at PE-related distress. Due to the elbow point in the BIC, the high entropy, and the clear profile structure, the three-class model was chosen as the best LPA.

Table 16

Model Fit Indices for Latent Profile Analyses (LPAs), Exploratory Factor Analyses (EFAs), and Factor Mixture Analyses (FMAs) for Men who had Engaged in Intercourse in the Past Four Weeks (n = 181)

LPAs	LL	k	BIC	ABIC	AIC	VLMR	LMR	Entropy
1 class	-2503.70	20	5111.37	5048.03	5047.40	-	-	-
2 classes	-2206.09	31	4573.33	4475.15	4474.17	.002	.003	.918
3 classes	**-2114.80**	**42**	**4447.94**	**4314.92**	**4313.60**	**.040**	**.043**	**.937**
4 classes	-2064.34	53	4404.21	4236.35	4234.69	.317	.325	.911
5 classes	-2008.35	64	4349.40	4146.71	4144.70	.275	.280	.935
EFAs	LL	k	BIC	ABIC	AIC	FD			
						1	2	3	4
1 factor	-2144.37	30	4444.70	4349.69	4348.74	.958	-	-	-
2 factors	-2048.04	39	4298.81	4175.30	4174.07	.953	.973	-	-
3 factors	**-2023.38**	**47**	**4291.08**	**4142.23**	**4140.75**	**.942**	**.939**	**.984**	**-**
4 factors	-2013.97	54	4308.66	4137.64	4135.94	.940	.894	.948	.861
FMAs	LL	k	BIC	ABIC	AIC	VLMR	LMR	Entropy	
1 class 1 factor	-2144.33	30	4444.61	4349.60	4348.66	-	-	-	
1 class 2 factors	-2067.01	31	4295.17	4197.00	4196.02	-	-	-	
1 class 3 factors	-2052.25	33	4276.06	4171.54	4170.51	-	-	-	
2 classes 1 factor	-2035.82	42	4289.98	4156.96	4155.64	.031	.033	.914	
2 classes 2 factors	**-1996.19**	**45**	**4226.31**	**4083.79**	**4082.37**	**.024**	**.026**	**.978**	
2 classes 3 factors	-1973.64	49	4202.00	4046.82	4202.00	0.057	.058	.848	
3 classes 1 factor	-1983.67	54	4248.05	4077.03	4075.33	.331	.336	.951	
3 classes 2 factors	-1935.78	59	4178.28	3991.42	3989.57	.085	.088	.892	
3 classes 3 factors	-1918.47	67	4185.23	3973.04	3970.94	.239	.242	.872	

Note. Models were run using maximum likelihood estimation with robust standard errors (MLR), and variables were treated as censored from below.

LL = log-likelihood, k = number of free parameters, BIC = Bayesian information criterion, ABIC = sample size adjusted BIC, AIC = Akaike's information criterion, VLMR = Vuong-Lo-Mendell-Rubin likelihood ratio test *p*-value, LMR = Lo-Mendell-Rubin likelihood ratio test *p*-value, FD = factor score determinacy.

Exploratory Factor Analysis

The two-factor EFA showed the same structure as the EFA for women, with a stronger correlation of $r = .54$ ($p < .001$) between factors. However, the three-factor EFA model had the lowest (best) BIC of all the EFAs and LPAs (see Table 16), and a strong factor structure with good FDs. This model had a clear interpretable internalising model structure: a depression and GAD factor (i.e., Distress); a social anxiety, OCD and panic factor (i.e., Fear);

and a sexual problems factor (see Table 17). The Fear and Distress factors were strongly correlated with one another (r = .71, p < .001), and both were moderately correlated with the sexual problems factor (both rs = .45, p < .001). There were also two significant double-loadings, but desire was not a good indicator for any of the factors, including the sexual problems factor. Due to the low BIC, and strong interpretable factor structure, the three-factor EFA was chosen as best.

Table 17

Quartimin Rotated Factor Matrix for the Three-Factor Solution Exploratory Factor Analysis (EFA) for Men who had Engaged in Intercourse in the Past Four Weeks (n = 181)

Disorder	EFA		
	1	2	3
Depression	**.892**		
GAD	**.655**	.285	
Social Anxiety		**.733**	
OCD		**.843**	
Panic Disorder		**.426**	
Erectile Function			**.315**
Sexual Satisfaction	**.373**		**.499**
Ejaculatory Control			**.996**
PE-Related Distress	-.114	**.323**	**.691**
Sexual Desire			.230

Note. Significant factor loadings >.1 are shown and factor loadings >.3 are bolded.

GAD = generalised anxiety disorder, OCD = obsessive-compulsive disorder, PE = premature ejaculation.

Factor Mixture Analysis

Models with one to three classes and one to three factors were fit to the data, based on the results of the EFA and LPA. The factor structures were based on the EFA results for one- two- and three-factor models. All of the three-class models had non-significant LRTs, which indicated a two-class model. The two-class two-factor FMA had a low BIC, significant LRTs, and excellent entropy (see Table 16).

Figure 11 shows the profile patterns for the two-class two-factor FMA for men. The mean for class one was given a starting value from the initial solution to help the model converge. Class one was large —88% of the sample— and showed similar estimated mean symptom levels across all disorders. The second class —comprised of the other 12%— had elevated mood and anxiety symptoms, with spikes at OCD and PE-related distress. This FMA clearly

represents the three-class LPA, with the middle class from the LPA (31%) absorbed in the asymptomatic class (60%) to create the dimensional class in the FMA. This suggests that the conditional independence assumption was preventing the model from recognising that 88% of the sample had the same symptom profiles, but with varying severity.

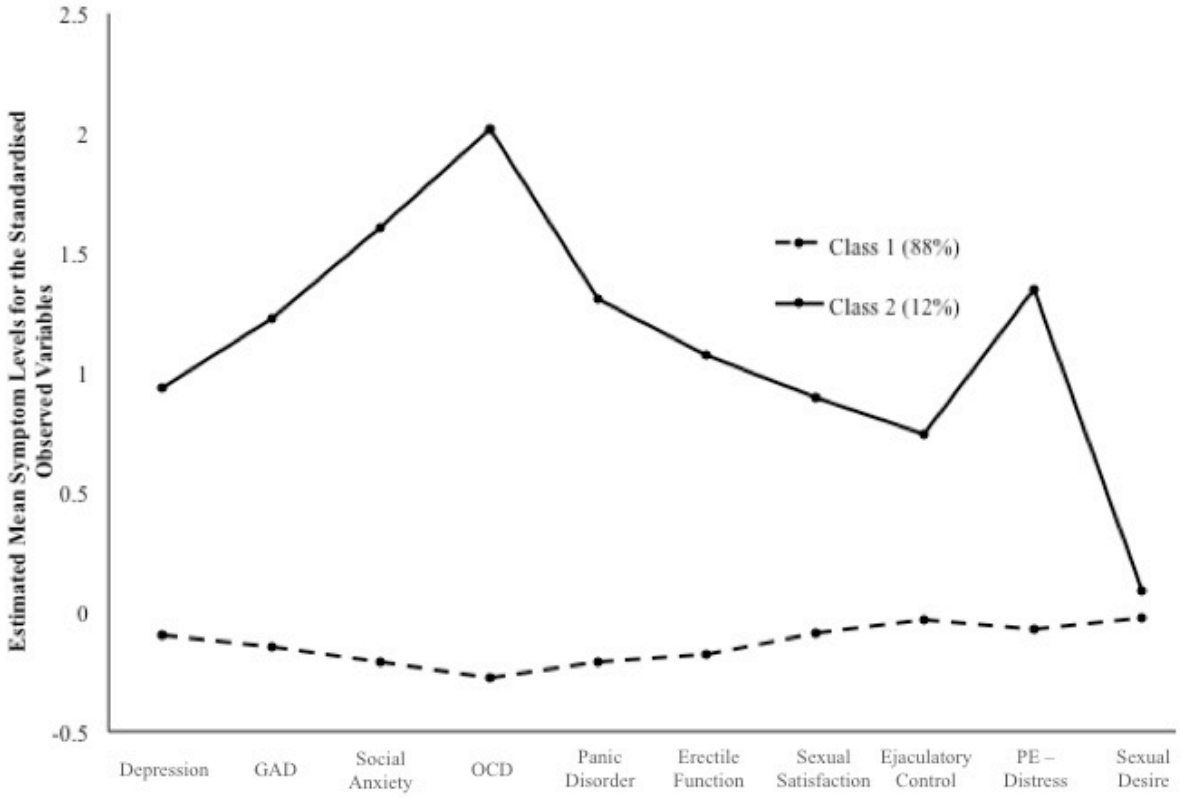

Figure 11. Estimated mean profiles for the two-class two-factor factor mixture analysis for men who had engaged in intercourse in the past four weeks (n = 181).

Note. GAD = generalised anxiety disorder, OCD = obsessive-compulsive disorder, PE = premature ejaculation.

Table 18 shows the internal factor structure of the two classes in the two-class two-factor FMA. In contrast to the FMA for women, the two classes show very different internal factor structures; while the observed variable loadings are similar between the two classes, the relationships between the factors are polar opposites. Class one has a strong highly significant correlation between the factors (r = .56, p < .001), whereas class two has a non-significant negative relationship between the factors (r = -.23, p = .331). For both classes, desire is not a strong indicator. This structure suggests that for 88% of the sample, there is a clear dimensional structure —with two related, but distinct latent variables. However, the other 12% of the sample have a clear categorical relationship, where the latent variables are

unrelated. Follow-up analyses were conducted to better understand these group differences using independent samples *t*-tests. Compared with class one, class two had significantly higher levels of all symptoms, except desire, which explains why desire was not a good indicator for class membership. There were no demographic differences between the classes. Class two is a small group ($n = 22$) so lacks the power to detect group differences effectively, but the bivariate zero-order correlation matrix showed almost no intercorrelations between latent variables, in contrast with class one. This suggests that class two has higher symptom levels, but that these men are displaying either sexual *or* affective disorders, not both, and tend to cluster within diagnostic groups.

Table 18

Standardised Factor Loadings for Factor Mixture Analysis (FMA) Classes for Men who had Engaged in Intercourse in the Past Four Weeks (n = 181)

Disorder	FMA			
	Class 1		Class 2	
	1	2	1	2
Depression	**.813**		**.887**	
GAD	**.849**		**.911**	
Social Anxiety	**.561**		**.683**	
OCD	**.705**		**.808**	
Panic Disorder	**.513**		**.636**	
Erectile Function		**.447**		**.424**
Sexual Satisfaction		**.674**		**.650**
Ejaculatory Control		**.957**		**.951**
PE-Related Distress		**.809**		**.789**
Sexual Desire		.289		.272

Note. Factor loadings >.1 are shown and factor loadings >.3 are bolded. Standardised loadings are shown to take into account differences in factor variance across models in order to compare the loadings.

GAD = generalised anxiety disorder, OCD = obsessive-compulsive disorder, PE = premature ejaculation.

Due to the interpretable factors, the low BIC, excellent entropy, and significant LRTs, the two-class two-factor model was chosen as the best FMA (see Table 16). This model mirrored the LPA, but absorbed the middle class by allowing variations in severity in class one. It also described the strong dimensional structure for the majority of the sample, and accounted for the small group with categorical distinctions. Combined with the fact the FMA was the most parsimonious and had a lower BIC than the best FA and LPA models, these strengths led us to choose the FMA as the best model for men.

Men Who Had Not Engaged in Intercourse

This model was also examined for the men who had not engaged in intercourse in the past four weeks (n = 98). Control over ejaculation could not be estimated, because it was assessed solely from ejaculation during intercourse, but PE-related distress had complete responses for 55 participants, who appear to have responded based on sexual activity other than penetrative intercourse. The model had entropy of .83, but had non-significant LRT p-values (VLMR p = .086, LMR p = .091), which suggested that a one-class model might be suited better to the data. However, a one-class two-factor FMA failed to converge. In the two-class two-factor FMA, 87% of the sample showed dimensional patterns in class one, while the 13% in class two had high estimated mean ED, and low sexual satisfaction.

Discussion

Dimensional, categorical and hybrid models were compared separately for men and women, and hybrid models provided the best fit for both groups. For women, a three-class two-factor model was best, which had the same factor structure in all three classes. For men, a two-class two-factor model was best, which showed a strong dimensional model for 88% of the sample, but clear categorical distinctions for 12% of the sample. The models also provided reasonable fit for participants who had not engaged in intercourse in the past four weeks. The statistical results are summarised and interpreted below to explain how they inform theoretical models, followed by an explanation of the implications for sexual dysfunctions in the meta-structure of psychopathology.

Results for Women

The model of best fit for women was a three-class two-factor hybrid model. This model had a large class (77%) with similar estimated means for all disorders, a medium-sized class (18%) with high levels of panic, and a small class (5%) with high sexual pain and distress. Although the factor structure was free to vary within each class, a very similar structure was evident in all three classes: Depression and anxiety disorders loaded strongly onto factor one,

all sexual problems except pain loaded strongly onto factor two, and the factors were correlated with one another. The fact that pain was a poor factor indicator in the models could be explained by the finding that sexual pain functions as a relatively independent dimension from other sexual problems, and so may be characterised by predominantly unique variance in these models (Binik et al., 2002). However, pain was important for the model in describing the characteristics of the participants in class three, where it had an elevated estimated mean. The slightly larger factor loadings in classes two and three suggest that the factors have more influence in these classes, and that the disorders tend to be more highly correlated with one another. This is likely related to the higher symptom levels in these classes, and the higher rates of comorbidity associated with elevated symptom levels (Kessler et al., 2005).

The three-class two-factor FMA showed separate but related factors for depression, anxiety, and sexual problems, and also provided an adequate fit for women who had not engaged in intercourse in the past four weeks. These women tended to have higher levels of all affective and cognitive symptoms compared with women who had engaged in intercourse, which might suggest a further relationship between low mood and stress and a lack of sexual interest or activity. Taken together, these findings are compatible with our nosology —they signal a need for the relationships between depression, anxiety, and sexual problems to be explicitly recognised, and for discrete diagnoses to be retained to recognise different groups (e.g., high levels of panic disorder in class two, or sexual pain in class three).

Results for Men

The best model for men was a two-class two-factor FMA. Depression and anxiety disorders loaded strongly onto the first factor, and all sexual problems except sexual desire loaded strongly onto the second factor. Desire did not discriminate between groups, or provide a significant contribution to the model. This is in contrast to the results for women, where desire was a strong indicator in all of the models tested, and seems to imply that male sexual desire is characterised by unique variance, and may not share the same underlying

factor as other aspects of sexual function, and depression and anxiety. The best model for men also showed very strong dimensional relationships for a large proportion of the sample (88%) with strongly correlated factors. However, 12% of the sample showed no relationship between the depression and anxiety latent variable and the sexual problems latent variable. This is an interesting finding, because this class had higher levels of all disorder symptoms, and is in contrast to the literature that shows increased severity is related to higher levels of comorbidity between disorders (Kessler et al., 2005). Within this smaller class, the relationships between disorders tended to be within diagnostic groups, compared with the dimensional class, which had strong intercorrelations across all disorders. The characteristics that differentiate these men require further investigation in future research, but it could be as simple as non-comorbid disorder presentation.

It was interesting that the best FA for men had a factor structure that mapped cleanly onto the internalising model that has been found to fit well for women previously (see Chapter 2). This is consistent with the body of literature on the relationships between depression, anxiety, and sexual problems, but is in contrast to Chapter 2, which did not find this model to fit well for men. It seems likely that the sample used in the present study provided a better test, as it included a much wider variety of symptom levels, for men in particular. The LPA fit poorly due to the rigid assumptions, but the two-class two-factor FMA combined the FA and LPA models effectively.

A one-class FMA was indicated for men who had not engaged in intercourse in the past four weeks, which suggests that a single dimensional class may be better suited to the data (i.e., that there is not a smaller class with categorical distinctions in this group), but the one-class models did not converge. The two-class two-factor FMA was subsequently examined for this group, and it provided adequate fit: there was a large dimensional class (88%) and a small group of men with high estimated ED and low sexual satisfaction, which might suggest that they were sexually inactive *because* of their sexual problems. However, the likelihood

ratio tests indicated that it is also possible this second class was artificially imposed on the data.

The men who had not engaged in intercourse in the past four weeks had no significant symptom level differences from men who had engaged in intercourse, except for slightly lower desire and sexual satisfaction. This is in contrast to the series of significant differences found for women, which might suggest that presence or absence of sexual intercourse is less related to affective states for men than for women. The gender differences found here are consistent with the research reviewed earlier on male and female sexual response cycles: desire, arousal and orgasm appear to be functioning as separate but theoretically related domains for men, and the sexual domains for women are closely related, and appear to be influenced by emotional, contextual and relationship factors. This research can shed some light on the apparently stronger influences of mood and stress on the presence of intercourse for women, and on the pervasive relationships between depression, anxiety, and sexual problems.

Implications

Taken together, these results suggest there are dimensional relationships between depression, anxiety, and sexual problems for the majority of men and women, including those who had not engaged in intercourse. This is a particularly significant finding, given that the statistical methods allowed for the delineation of separate groups with disparate relationships, and provides the strongest evidence yet that sexual dysfunctions belong in the internalising spectrum of psychopathology alongside depression and anxiety. Specific disorders were also important to characterise some sub-groups, and 12% of men showed no dimensional relationships, but rather diagnostic-class-specific disorder grouping (e.g., the presence of one type of sexual problem was related to other sexual problems, rather than to depression or anxiety). These findings can be simultaneously accommodated in a nosology that explicitly recognises the relationships between the diagnostic chapters of Depressive and Anxiety

Disorders and Sexual Dysfunctions, but still maintains discrete diagnoses, which is compatible with the structure of the DSM-5 and ICD-11. This could be in the form of moving the Sexual Dysfunctions chapter closer to the Depressive Disorders and Anxiety Disorders chapters in the DSM-5, in continuity with the current representation of the meta-structure of psychopathology; through a recommendation for clinicians and physicians to screen for comorbid symptoms in the presence of related diagnoses; or in the form of multiple coding where disorders can be classified as members of multiple classes so clinicians appreciate the presence of both mechanisms in their understanding of pathology and treatment (as in the ICD-11 Beta Draft; WHO, 2013). Regardless of the method, by recognising these relationships our nosology will progress towards an empirically supported structure, and may improve patient outcomes.

Limitations

The primary limitation of this study is a non-representative convenience sample, which may have limited generalisability to the wider population and to clinical samples. The sample sizes for men were also small in the context of the complexity of some of the models, so the results may be unstable and require replication in other samples. However, the sample shows a broad range of symptom levels. This study also has strengths in its sophisticated statistical analyses that overcame the limitations of analysing dimensional and categorical models in isolation. The present study also improved on past research through better measurement of sexual problems in particular, through the inclusion of a stronger sample, and by testing models for participants who had not engaged in intercourse and/or were sexually inactive in the study period.

Conclusion

In short, this study strengthens our understanding of the relationships between depression, anxiety, and sexual problems, and suggests that an empirically driven nosology should explicitly recognise the relationships between them. Such a move would facilitate research

across these diagnostic chapters, which would work toward improving our understanding of aetiology, risk factors, course, and treatment response. A raised awareness of these relationships would increase the likelihood of screening for comorbid symptoms, and treating the disorders in synchrony, which could subsequently improve patients' outcomes. Future research should investigate these models in clinical and representative samples, and examine longitudinal data to understand possible causal relationships.

Chapter Six

A structural equation modelling analysis of the relationships between depression, anxiety, and sexual problems over time

Miriam K. Forbes, Andrew J. Baillie, and Carolyn A. Schniering

Abstract

Background: Sexual dysfunctions are related to depressive and anxiety disorders, but the nature of the relationships between them remains unclear. This study examined the relationships between symptoms of these disorders over time by comparing three alternative conceptualisations: 1) a model that elucidated causal relationships between the groups of disorders; 2) a model that accounted for change over time with a shared latent liability between all of the disorders; and 3) a model that conceptualised sexual dysfunctions as unrelated to depressive and anxiety disorders over time.

Methods: Women (n = 728) and men (n = 284) self-selected into a longitudinal online study, and completed self-report measures of sexual dysfunctions and depressive and anxiety disorders across six time points at either weekly (n = 645) or monthly (n = 367) time intervals. The data from waves four weeks apart were analysed separately by gender to compare the fit of the three models using structural equation modelling.

Results: Models 1 and 2 provided equal fit for both genders, but there were no significant causal relationships. Both models were subsequently tested using data from waves one week and six months apart. Model 2 provided good fit for these data for women, but neither model converged for men, due to low covariance coverage.

Conclusions: These results are consistent with a shared latent liability akin to internalising psychopathology driving the change in the disorders over time, which provides a direction for future research into efficacious diagnosis and treatment, and for an empirically driven nosology.

Introduction

Depression, anxiety, and sexual dysfunctions tend to co-occur, share cognitive and affective characteristics, and have shared treatment response to cognitive-behavioural therapy and mindfulness therapies (Brotto et al., 2008; Laurent & Simons, 2009; McCabe, 2001; Nobre & Pinto-Gouveia, 2009). There are a number of theories about the directional nature of the relationships between the disorders, and studies have found mixed results. For example, the maladaptive schemas found in depression and anxiety may have an aetiological role in sexual dysfunctions (Nobre & Pinto-Gouveia, 2009); sexual dysfunction may trigger the development of depression (Seidman & Roose, 2000); or symptoms of depression, anxiety, and sexual dysfunction might coincide with one another as different expressions of the same process (Corretti et al., 2006; van Lankveld & Grotjohann, 2000). The vast majority of the studies in this area rely on cross-sectional research or case studies, and so any directional conclusions are purely speculative. In their review, Laurent and Simons (2009) suggested that the relationship between sexual dysfunction, anxiety, and depressive disorders is "multi-factorial, complex and often bidirectional, implying that the causal path is not clear, with sexual and depressive or anxious symptoms often manifesting at the same time" (p. 575). In short, the literature shows that the disorders are undoubtedly related, but it is not clear how or why. Some cross-sectional research has suggested that a shared underlying factor between the disorders, akin to internalising psychopathology, might explain the relationships between the disorders and account for their high rates of comorbidity (see Chapter 2). However, to our knowledge, no longitudinal studies have investigated the relationships over time.

The examination of the relationships between depression, anxiety, and sexual dysfunctions over time is vital to ascertain whether there are causal, directional relationships between the disorders, or whether a latent liability better explains change over time. These possibilities each support different inferences about lifetime comorbidity and the continuity and development of the disorders. For example, if there are causal relationships between the

disorders, this finding will inform early diagnosis and pre-emptive treatment; and if a shared underlying factor (or 'latent liability'; Eaton et al., 2013) accounts for the change in the disorders over time, the development of targeted transdiagnostic treatment protocols should be a clear priority for research.

One way to understand whether there are causal relationships between disorders is to model the natural variation in symptoms of sexual dysfunction, depression and anxiety over time (i.e., causal inference from passive observation; Cook & Campbell, 1979). For example, if depression and anxiety were causing hypoactive desire (Donahey & Carroll, 1993), we would expect increased depression and anxiety to predict later levels of desire; if experiencing erectile dysfunction or premature ejaculation were contributing to and/or maintaining anxiety (Leiblum & Rosen, 2000, as cited in McCabe, 2005), we would expect levels of these sexual problems to predict later levels of anxiety; or if depression and anxiety were unrelated to sexual problems —as implied by the DSM (see Chapter 2)— we would expect to see no relationships between the disorders cross-sectionally or over time. However, if the disorders share a latent liability, we would not expect to see causal relationships, but rather a higher-order factor accounting for the change in the disorders over time.

Despite their potential impact, models of these relationships have not been examined to date. The aim of the present study was, therefore, to examine the comparative fit of three alternative conceptualisations of the interrelationships between sexual dysfunction, depression and anxiety over time using structural equation modelling (SEM). Figure 12 depicts the three models tested. Model 1 is based on Eaton et al. (2013), and is structured to elucidate causal relationships. In this model, observed variables load onto three correlated latent variables at each wave (a reparameterisation of the higher-order internalising spectrum model in Chapters 2 and 4). The Fear and Distress latent variables in Model 1 are based on research that has found a two-factor structure to be the best representation of the internalising spectrum for depressive and anxiety disorders (most recently: Eaton et al., 2013; and in a meta-analysis:

Krueger & Markon, 2006). The three latent variables are correlated, which represents their relationships to a shared latent liability; the latent variables at Wave Two are regressed onto the latent variables at Wave One; and the parameters are invariant across waves. These models examine the prospective prediction of the disorders and latent variables by earlier levels of disorders and latent variables, and test whether the latent variables at Wave One predict each other at Wave Two (i.e., have significant cross-lags that indicate causal relationships). In Model 2, the cross-lags will be removed to test whether they are contributing important information. This model implies that a shared latent liability drives the change in the disorders over time, rather than one group of disorders causing another. Model 3 is based on the meta-structure of the *Diagnostic and Statistical Manual of Mental Disorders – Fifth Edition* (DSM-5, American Psychiatric Association, 2013a): The DSM-5 explicitly recognises the relationships between depressive and anxiety disorders to represent the body of research that has found them to have a shared latent liability of internalising psychopathology (Krueger, 1999), but it does not recognise their relationships with sexual dysfunctions. To represent this, the Sexual Problems latent variable in Model 3 is not related to the Distress and Fear latent variables. As such, this model simultaneously tests whether the DSM-5 is accurately representing the relationships between the diagnoses, and whether all three latent variables are required to be related in a strong model.

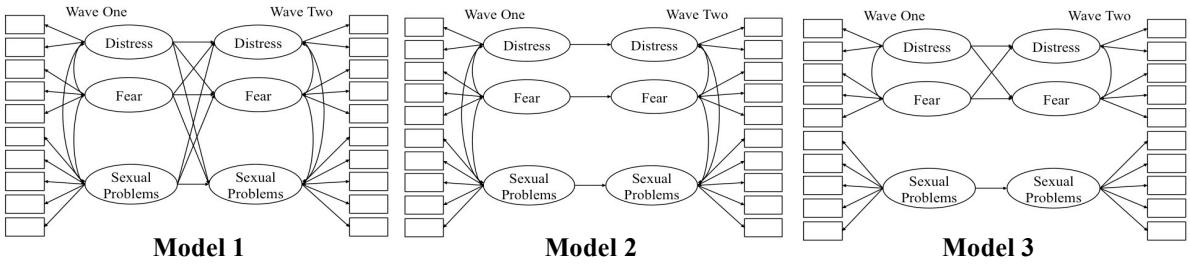

Figure 12. The three models to be tested.

It is hypothesised that Model 2 will provide the best fit to the data for men and women. More specifically, it is hypothesised that there will not be any significant cross-lags (i.e., causal relationships).

Method

Participants and Procedure

Descriptive statistics for the sample and reliability statistics of the measures in the present sample are presented in Table 19, separated by gender and wave. Participants self-selected into the study and were given the option to complete the six time points of self-report measures on either a weekly (n = 645, 64%) or monthly (n = 367, 36%) schedule. This study focused on two time points spaced four weeks apart, to maximise sample size (i.e., the first time point for both sub-samples, the fourth time point for the weekly respondents, and the second time point for the monthly respondents). There were no differences between the weekly and monthly groups in the prevalence of sexual activity or intercourse, for both women and men. Of the 1110 respondents that began the first time point, 1012 (91%) completed it. Incomplete responses (n = 98, 9%)[h] were excluded. Of the participants who completed Wave One, 530 (52%) continued on to complete the time point four weeks later (Wave Two). People who did not continue to Wave Two tended to have higher symptom levels, and paired samples t-tests showed that the people who did continue reported lower symptom levels at Wave Two compared to their symptom levels at Wave One; these factors combined to result in lower symptom levels for the sample at Wave Two.

The study was approved by the Macquarie University Human Ethics Committee, and respondents were required to provide informed consent and declare their age before they were able to access the study. Those under 16 were not permitted to participate, and this was the only eligibility criterion. At the completion of each time point, respondents were automatically entered into the draw for a $100 prepaid credit card.

---

[h] Twelve responses (five men and seven women) that were considered to be incomplete in Chapter 5 were included in these analyses. The missing items could be ignored in these analyses because the twelve respondents were not sexually active over the past four weeks, and the missing items were for sexual problems scales that could only be estimated in the presence of sexual activity.

Table 19

Descriptive Statistics for Observed Variables for Women and Men at Wave 1 and Wave 2, and Reliability Statistics for the Measures.
Means (Standard Deviations) or N (% of respondents)

Variable (possible range)	*Women*		*Men*		*Reliability Statistics*	
					Test-Retest	α_{W1}
	Wave 1 (n = 728)	*Wave 2 (n = 407)*	*Wave 1 (n = 284)*	*Wave 2 (n = 123)*	*Women* *Men*	
Depression (0-27)	8.81 (6.06)	6.81 (5.79)*	7.96 (6.01)	6.92 (5.60)	.72 | .79	.90
Moderate to severe depression	229 (31.5%)	79 (19.4%)	88 (31.0%)	27 (22.0%)	-	-
GAD (0-21)	7.37 (5.27)	5.40 (4.65)*	6.64 (5.42)	5.50 (4.98)	.64 | .72	.91
Significant or Severe GAD	175 (24.0%)	62 (15.2%)	73 (25.7%)	20 (16.3%)	-	-
Social Anxiety (0-68)	16.92 (13.36)	13.94 (12.72)*	15.32 (14.28)	13.77 (12.40)	.77 | .82	.93
Over threshold for SA	234 (32.1%)	83 (20.4%)	87 (30.6%)	25 (20.3%)	-	-
Obsessive Compulsivity (0-72)	13.18 (12.06)	8.47 (8.95)*	11.83 (12.40)	9.79 (9.62)	.79 | .85	.92
Over threshold for OCD	167 (22.9%)	42 (10.3%)	55 (19.4%)	15 (12.2%)	-	-
Panic Disorder (0-4)	3.56 (4.99)	2.21 (4.00)*	3.08 (4.66)	2.19 (4.15)	.63 | .71	.85
Mild or Severe PD	121 (16.6%)	31 (7.6%)	43 (15.1%)	11 (8.9%)	-	-
Sexually Related Distress (0-52)	17.45 (14.22)	14.78 (12.57)*	-	-	.76	.95
Over cut-off for likely FSD	417 (57.3%)	173 (42.5%)	-	-	-	-
Sexual Desire (0-26)	16.04 (6.72)	15.57 (6.48)	-	-	.66	.90
High Probability of HSDD	327 (44.9%)	174 (42.8%)	-	-	-	-
Arousal Sensation (0-16)	7.43 (4.17)	7.04 (4.13)	-	-	.59	.88
High Probability of FSAD	181 (24.9%)	107 (26.3%)	-	-	-	-
Lubrication (0-8)	3.46 (2.12)	3.15 (2.13)	-	-	.61	.83
High Probability of FSAD	176 (24.2%)	108 (26.5%)	-	-	-	-
Cognitive Arousal (0-8)	3.35 (2.17)	3.17 (2.24)	-	-	.59	.86
High Probability of FSAD	171 (23.5%)	102 (25.1%)	-	-	-	-
Orgasmic Function (0-14)	5.99 (4.30)	5.79 (4.05)	-	-	.69	.91
High Probability of FSOD	211 (29.0%)	92 (22.6%)	-	-	-	-
Sexual Pain (0-13)	2.08 (1.66)	3.34 (2.81)	-	-	.64	.84
High Probability of Dyspareunia	27 (3.7%)	7 (1.7%)	-	-	-	-
Erectile Function (0-24)	-	-	4.19 (5.73)	2.93 (4.90)	.57	.91
Mild to severe ED	-	-	66 (23.2%)	18 (14.6%)	-	-
Sexual Satisfaction (0-100)	-	-	43.36 (33.97)	44.86 (33.75)	.65	.90
Ejaculatory Control (0-100)	-	-	39.27 (33.50)	32.36 (30.52)	.52	.93
Distress about PE (0-100)	-	-	34.47 (28.70)	28.81 (24.13)*	.53	.92
Sexual Desire (0-98)	-	-	33.93 (16.51)	36/15 (17.85)	.82	.90

Note. All variables were scored so that higher scores indicate higher symptom levels. α_{W1} = Cronbach's alpha at wave one, GAD = generalised anxiety disorder, OCD = obsessive-compulsive disorder, PD = panic disorder, FSD = female sexual dysfunction, HSDD = hypoactive sexual desire disorder, FSAD = female sexual arousal disorder, FSOD = female sexual orgasmic disorder, ED = erectile dysfunction, PE = premature ejaculation. Of the women who completed both time points, 265 had engaged in intercourse at both time points (i.e., had complete responses at both time points). For men, only 44 participants had engaged in intercourse at both time points.

Measures

These measures were all self-report Likert scales, chosen for their brevity, sensitivity to change, and high criterion validity to DSM disorders. Only the relevant symptomatic measures are described here. The measures generally had excellent internal consistency and a range of test-retest reliabilities in the present study, as shown in Table 19.

Depression

The Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001) is a 9-item measure of depression. Diagnostic validity of the PHQ-9 has been established, and diagnostic cut-off scores with good sensitivity and specificity (88%) are available to differentiate the severity of symptom levels (Lowe et al., 2004).

Generalised Anxiety Disorder

The Brief Measure for Assessing Generalized Anxiety Disorder (GAD-7; Spitzer et al., 2006) is a 7-item measure of generalised anxiety (GAD) with very good reliability and high construct validity. It has established cut-off scores to ascertain the severity of GAD.

Social Anxiety

The Social Phobia Inventory (SPIN; Connor et al., 2000) consists of 17 items, and is the only self-report measure of social anxiety that measures a spectrum of fear, avoidance, and physiological symptoms. It has good construct validity, and a threshold to establish the likely presence of social anxiety.

Obsessive-Compulsive Disorder

The Obsessive-Compulsive Inventory-Revised (OCI-R; Foa et al., 2002) is an 18-item measure of obsessive-compulsive disorder (OCD). It has been shown to have good convergent validity (Foa et al., 2002), and has a threshold score to determine the likely presence or absence of OCD.

Panic Disorder

The Panic Disorder Severity Scale - Self-Report (PDSS-SR; Shear et al., 1997) is a 7-item measure of panic disorder severity. The PDSS-SR has good convergent and discriminant validity (Houck et al., 2002), has clinical and criterion validity, and existing clinical severity cut-off scores.

Sexual Problems

The Abbreviated Sexual Function Questionnaire (ASFQ; Williams et al., 2010) is a 20-item screening tool for female sexual dysfunction (FSD). We included the seven domains with criterion validity to DSM disorders: desire, arousal sensation, cognitive arousal, lubrication, orgasm and pain. It has excellent criterion validity, and good reliability and construct validity.

The Female Sexual Distress Scale – Revised (FSDS-R; Derogatis et al., 2008) is a 13-item measure of for assessing sexually related distress in women, to be used in conjunction with the ASFQ for screening for sexual problems. It has demonstrated good discriminant validity and has a cut-off score established to determine the presence of likely FSD.

The International Index of Erectile Function – Erectile Function subscale (IIEF; Rosen et al., 1997) was used to measure symptoms of erectile dysfunction, as it has outstanding psychometric properties, and an established cut-off score to ascertain the severity of symptoms.

The Index of Premature Ejaculation (IPE; Althof et al., 2006) is a 10-item index of premature ejaculation (PE) that assesses changes in ejaculatory control, distress related to PE, and general sexual satisfaction. The IPE has been shown to possess very good discriminant validity and good convergent validity.

The Sexual Desire Inventory (SDI; Spector et al., 1996) has 13 items, and was used to measure sexual desire. It has been shown to have good construct validity.

Data Analysis

A primary aim of this study was to investigate the presence or absence of possible causal relationships between sexual problems and depressive and anxiety disorders. Due to the passive observational nature of this study, the statistical methods are central to the validity of the findings. As such, the decisions made in analysing the data are described in some detail here.

The data were analysed using SPSS Statistics Version 19.0 for Macintosh, and MPlus Version 6.1 (Muthén & Muthén, 2011). The measures were scored according to instructions, and resulted in seventeen continuous observed variables. The "did not attempt intercourse" responses on sexual function measures were scored as missing (Meyer-Bahlburg & Dolezal, 2007; Yule et al., 2011). Sexual function items were reverse-scored so that higher scores indicated greater dysfunction, in line with all other measures. The scores for all observed variables were then standardised, as the scales of the observed variables varied greatly. A maximum likelihood estimator with robust standard errors (MLR) was used to account for non-normality, which computes the covariance matrix for all individuals on the basis of their observed data. All participants who completed Wave One were included in the analyses, and missing data were accounted for using full information maximum likelihood (FIML) under a missing at random (MAR) assumption.

In order to determine whether the weekly and monthly respondents could be analysed together, structural invariance between the sub-samples was investigated at Wave One, separately by gender. Two multi-group SEMs of three correlated latent factors were tested: one allowed all of the parameters to be free, and the other held the structural parameters between the latent variables and observed variables to be equal between weekly and monthly sub-samples. The unconstrained multi-group SEMs were not significantly different from the structural invariance model for women (Satorra-Bentler $\chi^2 = 9.375$, $df = 11$, $p = .587$) or for men (Satorra-Bentler $\chi^2 = 17.804$, $df = 10$, $p = .058$), which suggested that the weekly and

monthly sub-samples had the same structural relationships within gender, so these groups were combined for all analyses.

The SEMs were run separately by gender to determine the nature of the relationships between the latent variables. Models that held observed variable loadings and latent variable means, variances and synchronous correlations[7] to be equal between the waves (i.e., configural, metric and partial scalar invariance; or strong structural invariance and weak measurement invariance; Meredith, 1993) provided strong fit for women, and slightly weaker fit for men, compared to their unconstrained counterparts. These invariant parameters were included in the primary analyses to aid the interpretation of the relationships between the latent variables over time, and to prevent confounds through changes in item functioning or factor dimensionality (Cook & Campbell, 1979).

The disorder-specific correlated residuals were examined in each model to determine whether the specific variance of a disorder at Wave One accounted for more than 10% of the specific variance for that same disorder at Wave Two (disorder-specific correlated residual $\geq .316$). If this condition was met, a correlated residual term was included for that disorder (cf. Eaton et al., 2013). Correlated residuals are not being included as a *post hoc* model fitting technique, but are anticipated *a priori* to allow the disorders to change at different rates, and to account for shared measurement variance from using the same measure at both waves. These residuals were the same for each of the three models, within gender, and their inclusion did not alter the interpretation of the models.

The models were initially analysed using data from waves four weeks apart, and the best models for each gender were then tested using data from waves that were one week and six months apart. This was to examine whether the time lag between the waves affected the parameters, and also to account for the likelihood that causal relationships may only manifest

[7] This means the correlations between the latent variables were held equal between Wave One and Wave Two

in a specific time frame. The models were compared using predominantly substantive interpretation to explore the nature of the longitudinal relationships, and the presence and significance of cross-lags. Model fit was also examined using the Tucker-Lewis index (TLI), the comparative fit index (CFI) and the root mean square error of approximation (RMSEA) using the less stringent cut-offs given in Hu and Bentler (1999) to minimise Type I error rate (CFI and TLI > .9 and RMSEA < .08), as the models are complex and the samples with complete information are small (n < 500). Due to the MLR estimator used, Satorra-Bentler chi-square difference testing (S-B χ^2) was also used to compare nested models, although this test is known to be conservative (Weston & Gore, 2006).

Results

SEM Across Two Waves

Women

Model fit indices are shown in Table 20. Models 1, 2, and 3 had the same disorder-specific correlated residuals ≥ .316 for women (rs within .01). The following variables accounted for more than 10% of their own disorder-specific variance over time in all of the models: social anxiety (11.8%), OCD (20.4%), panic disorder (14.1%), sexually related distress (34.8%), sexual desire (13.1%), orgasmic function (19.4%), and sexual pain (36.2%). These variables were subsequently given correlated residual terms in the models. The remaining correlated residuals were small, although sexually related distress and pain had small to moderate significant positive correlations with symptoms of depressive and anxiety disorders at both waves.

Table 20

Model Fit Indices for Women (n = 728) Using Data from Waves Four Weeks Apart

Women	S-B χ^2	*df*	*p*	k	TLI	CFI	RMSEA
Model 1	-	-	-	79	.89	.90	.059
Model 2	12.6396	6	.049	73	.89	.90	.059
Model 3	159.0271	6	<.0001	73	.87	.89	.063

Note. S-B χ^2 = Satorra-Bentler scaled chi-square test, compared to Model 1; *df* = degrees of freedom for S-B χ^2; *p* = *p*-value for S-B χ^2; k = number of free parameters; TLI = Tucker-Lewis index; CFI = comparative fit index; RMSEA = root mean square error of approximation.

Model 1. Figure 13 shows the relationships in Model 1. Given the rigid, conservative and complex model that was specified, the fit indices were acceptable. The latent variables at Wave Two were prospectively predicted by the latent variables at Wave One. The standardised path coefficients shown in Figure 13 can be interpreted as regression coefficients, and were close to $\beta = .6$ for all of the latent variables' direct lags. No cross-lags were >.1, and none of them reached significance.

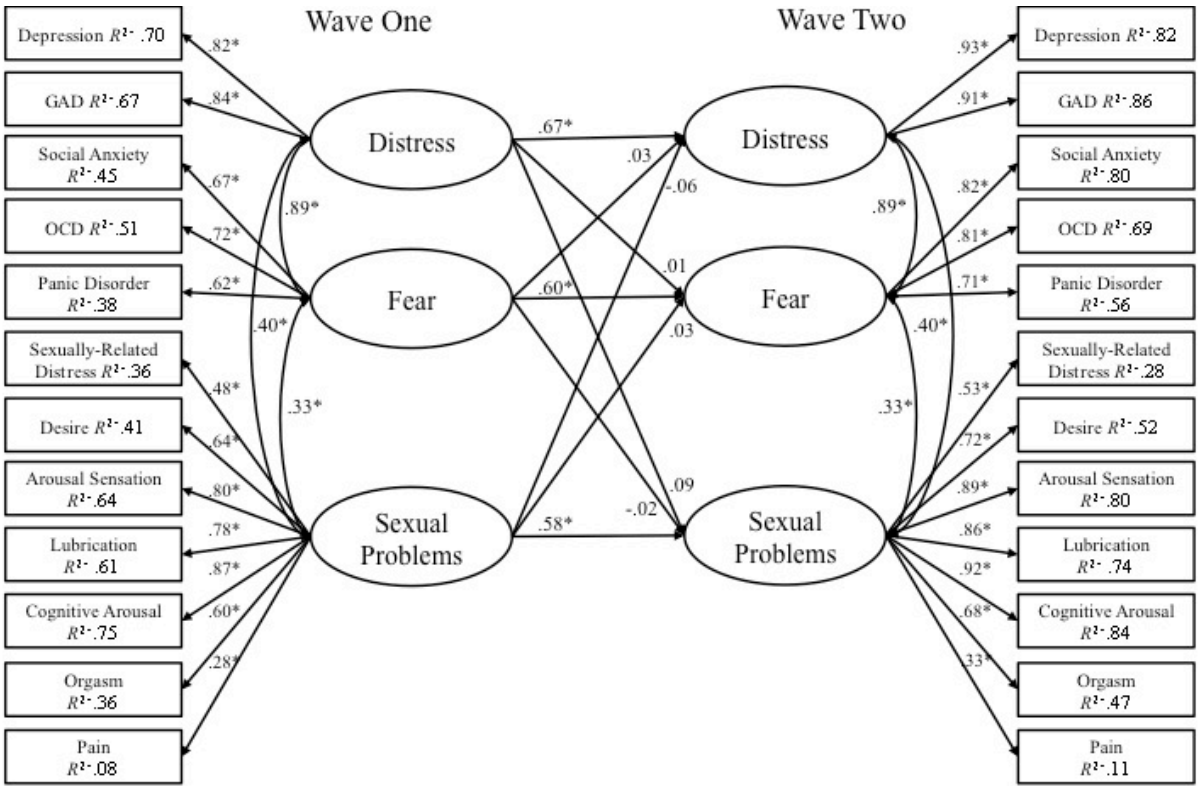

Figure 13. Model 1 for women, with standardised loadings (n = 728).

Note. GAD = generalised anxiety disorder. OCD = obsessive-compulsive disorder. Correlated residuals not shown for: social anxiety (r = .71), OCD (r = .76), panic disorder (r = .49), sexually related distress (r = .70), sexual desire (r = .63), orgasmic function (r = .67), and sexual pain (r = .63).

The factor loadings of the observed variables were moderate to strong, with the exception of sexual pain, which also had a small R^2. The factor loadings were held equal between waves, but the standardised loadings shown in Figure 13 are larger at Wave Two because the variables had less variance. Distress and Fear had moderate correlations with Sexual Problems, and were strongly correlated with one another. Overall, this model depicted three related latent variables that prospectively predict themselves at Wave Two with very small

and non-significant cross-lags. Sexual pain did not appear to be a good indicator for the model.

Model 2. While there was a small and barely significant change in S-B χ^2, the parameters of Model 2 were almost identical to Model 1, and the model fit indices were identical. This suggested that the small and non-significant cross-lags in Model 1 did not contribute to the model.

Model 3. Model 3 provided the poorest fit. There was a substantial and significant increase in S-B χ^2, and the model fit indices were worse, which suggested that the relationships for Distress and Fear with Sexual Problems were important parts of the model.

One-Week and Six-Month Time Lags. Because Models 1 and 2 had equal fit indices, they were both tested for participants who completed the survey on a weekly schedule (n = 476), using data from waves one week apart. The models were tested with all parameters constrained based on the initial analyses. Both models provided adequate fit, and had identical fit indices for this group (TLI = .90, CFI = .89, RMSEA = .061). Models 1 and 2 were also tested with constrained parameters for participants who completed the survey on a monthly schedule (n = 251), using data from waves six months apart. Again, both models fit the data well, and had identical fit indices (TLI = .92, CFI = .91, RMSEA = .050).

Men

Model fit indices are shown in Table 21. Models 1, 2, and 3 had the same disorders with correlated residuals ≥ .316. For men, the following variables accounted for more than 10% of their own disorder-specific variance over time in all of the models: social anxiety (10.2%), OCD (18.9%), panic disorder (17.6%), erectile function (10.2%), sexual satisfaction (13.8%), ejaculatory control (10.1%), and sexual desire (42.6%). These variables were subsequently given correlated residual terms in the models.

Model 1. Figure 14 shows Model 1 for men. The model fit indices were close to the recommended cut-offs, but were not strong. The latent variables at Wave Two were

prospectively predicted by the latent variables at Wave One. The cross-lags from Fear to Distress and from Distress to Sexual problems were > .1, but neither reached significance.

Table 21

Model Fit Indices for Men (n = 284) Using Data from Waves Four Weeks Apart

Men	S-B χ^2	*df*	*p*	k	TLI	CFI	RMSEA
Model 1	-	-	-	69	.86	.88	.069
Model 2	21.1957	6	.002	63	.86	.88	.069
Model 3	86.8832	6	<.0001	63	.83	.85	.078

Note. S-B χ^2 = Satorra-Bentler scaled chi-square test, compared to Model 1; *df* = degrees of freedom for S-B χ^2; *p* = *p*-value for S-B χ^2; k = number of free parameters; TLI = Tucker-Lewis index; CFI = comparative fit index; RMSEA = root mean square error of approximation.

The factor loadings of the observed variables were moderate to strong, except sexual desire, which also had a small R^2. The factor loadings were held equal between waves, but the standardised loadings shown in Figure 14 are larger for Wave Two because the variables had less variance. Distress and Fear had moderate to strong correlations with Sexual Problems, and were strongly correlated with one another. Overall, this model showed three related latent variables that prospectively predicted themselves at Wave Two, with two small but non-significant cross-lags. Sexual desire was not a good indicator for the model.

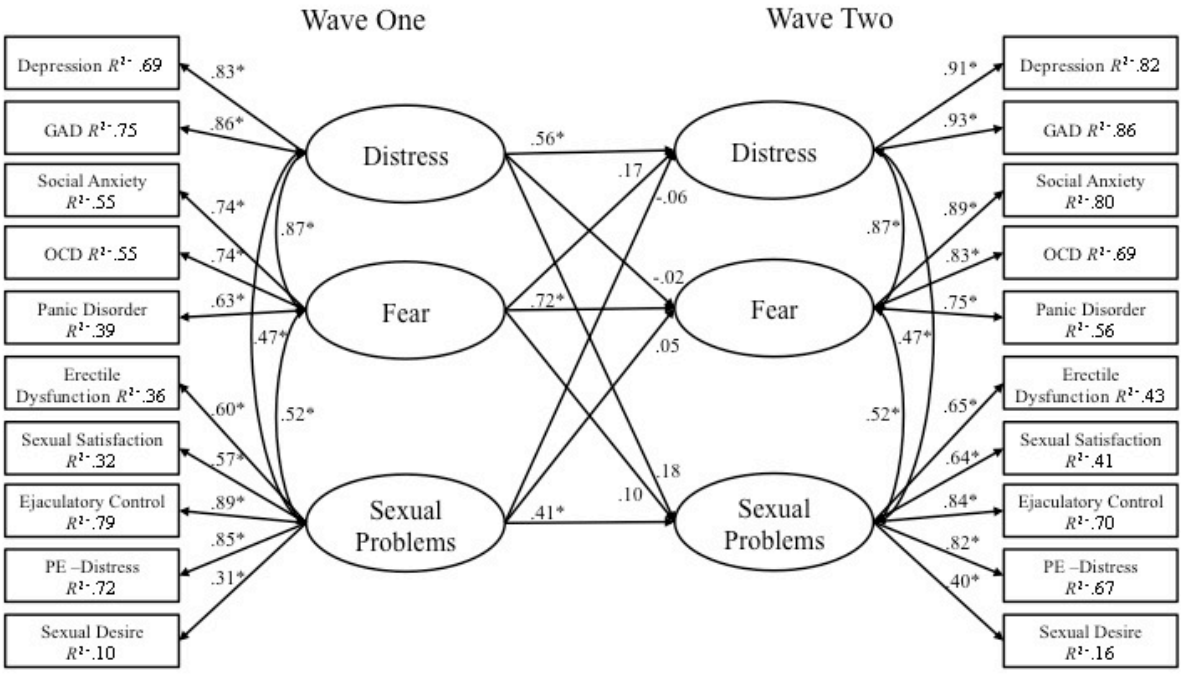

Figure 14. Model 1 for men, with standardised loadings (*n* = 284)

Note. GAD = generalised anxiety disorder. OCD = obsessive-compulsive disorder. PE = premature ejaculation. Correlated residuals not shown for: social anxiety (*r* = .70), OCD (*r* = .76), panic disorder (*r* = .52), erectile dysfunction (*r* = .68), sexual satisfaction (*r* = .65), ejaculatory control (*r* = .39), and sexual desire (*r* = .80).

Model 2. While there was a small but significant increase in S-B χ^2 for Model 2, the model fit indices were identical. The removal of the cross-lags resulted in an increase in the direct lags for Distress and Sexual problems, by $\beta = .09$ and $\beta = .14$ respectively, but the other relationships remained unchanged. Taken together, this suggested that the cross-loadings were a small part of the relationships between the disorders for men.

Model 3. Model 3 had similar parameters to Model 1, but there was a substantial and significant increase in S-B χ^2, and the model fit indices decreased. This suggested that the relationships for Distress and Fear with Sexual Problems were important parts of the model.

One-Week and Six-Month Time Lags. Models 1 and 2 had equal best fit indices, and were both subsequently tested with fixed parameters for participants who completed in the survey on a weekly schedule ($n = 169$) using data from waves one week apart, and for participants who completed the survey on a monthly schedule ($n = 116$) using data from waves six months apart. However, none of these models converged due to low covariance coverage, which was likely due to the small samples with complete information for both weekly and monthly schedules ($n = 44$ and $n = 31$, respectively).

Discussion

The main aim of this study was to examine the nature of the relationships between depression, anxiety, and sexual problems over time. No causal relationships were observed, and the models were consistent with a shared latent liability between the groups of disorders. The first hypothesis was partially supported, as Model 2 provided the equal best fit (along with Model 1) for both men and women. The second hypothesis was also supported, as the cross-lags (which represented directional causal relationships) were not significant in any of the models.

Results for Women

For women, the models with and without cross-lags (Models 1 and 2) provided equivalent fit and had nearly identical parameters. The cross-lags were small and non-significant in

Model 1, which indicated that there were no causal relationships between the disorders, so Model 2 provided the most useful substantive interpretation: The liabilities of Fear, Distress and Sexual Problems are related to one another and predict their own change over time. This model was stable with and without correlated residuals, invariant synchronous correlations across waves, and structural invariance between waves; it was also robust across a variety of time lags —from one week to six months apart. Similarly to other studies that have investigated these relationships, the correlations for Sexual Problems with Distress and Fear were weaker than the correlation between Distress and Fear (e.g., Chapter 2). This is attributable to the shared measurement variance and symptom overlap between depressive and anxiety disorders, which inflates the relationship between their corresponding latent variables. However, Model 3 provided significantly worse fit than Models 1 and 2, which demonstrated that the relationships for Fear and Distress with Sexual Problems were an important part of the model.

An interesting finding was the number of disorders that explained more than 10% of their own variance over time, including social anxiety, OCD, panic disorder, sexually related distress, sexual desire, orgasmic function and sexual pain. It was anticipated that disorders would predict some of their own variance over time through their unique aspects (e.g., the social aspect of social anxiety), through the shared measurement variance from using the same self-report measure at both waves, and/or through greater comparative temporal stability for some disorders. This appeared to be the case for the social anxiety, OCD, panic disorder, desire and orgasmic function variables, some of which had very high test-retest correlations, and all of which had strong relationships in the models. These variables also had more variance predicted by the model than unique variance; sexually related distress and sexual pain were two exceptions to this pattern.

Sexually related distress and pain had small loadings onto the Sexual Problems latent variable, small R^2 and the largest correlated residuals. This could imply that they operate

independently from the shared latent liability between the other disorders. However, the correlated residuals of sexual distress and pain seemed to suggest that they might be more closely related to the depressive and anxiety disorders than to other sexual problems, and the specific relationships between disorders were not accounted for in the model; instead disorders related to one another through latent variables. Because sexually related distress and sexual pain had weak relationships with the Sexual Problems latent variable, their relationships with the other groups of disorders were not accounted for in the model. The relationships found in this study are consistent with the body of research that has found diagnosed sexual dysfunctions (which necessarily include sexually related distress) and sexual pain to be consistently related to depression and anxiety (e.g., Frohlich & Meston, 2002; Kaya et al., 2006; Laumann et al., 1999), but to operate relatively independently from desire, arousal and orgasm function levels (Bancroft et al., 2003b; Binik et al., 2002).

Results for Men

The results for men were less clear-cut, but generally mirrored the results for women. The cross-lags were slightly larger for men, but remained non-significant, and the models with and without cross-lags provided equivalent fit. Comparison of the three models suggested that the cross-lags were not an important part of the models, but that the relationships for Fear and Distress with Sexual Problems were. The latent variables were closely related to one another, which provided strong evidence for a shared latent liability between the groups of disorders.

As was the case for women, multiple variables were given correlated residual terms in the models: social anxiety, OCD, panic disorder, erectile function, sexual satisfaction, ejaculatory control, and sexual desire. These disorders explained less than 20% of their own variance over time, and were strong indicators in the model —with large R^2 and factor loadings— with the exception of sexual desire. Sexual desire explained 43% of its own variance over time, had a small loading in the model, and had a small amount of variance accounted for by the model (10-16%). In contrast to sexual distress and pain for women, male sexual desire did not have

any substantial residual correlations with other disorders. This suggested that male sexual desire might function as an independent mechanism from the shared underlying factor between the other observed variables. This is in contrast to the body of literature that has found hypoactive desire to be related to depression and anxiety (see Laurent & Simons, 2009 for a review). A possible explanation for this finding could be that some men report increased levels of desire during negative mood states (Angst, 1998; Bancroft et al., 2003a), and this positive effect could counteract the negative effect for other men. Alternatively, desire may indeed operate independently from the processes in this model. This would be consistent with previous studies' findings on these broad relationships (e.g., Chapter 2), and with studies that have found male sexual desire to form a separate factor from erectile and orgasmic function in non-clinical samples (Carvalho, Vieria & Nobre, 2011).

Implications

Taken together, these findings suggest that depression, anxiety, and sexual problems are related within and between time points for men and women. The substantive interpretation of the models suggested that there were no causal relationships between the disorders. The models were consistent with a shared liability driving the change in the disorders over time, and the relationships between the variables were predominantly stable over time. These findings are congruous with cross-sectional studies that have found an underlying dimensional spectrum to account for the interrelationships between the disorders (e.g., Chapters 2 and 4), and have important implications for the diagnosis and treatment of comorbid depression, anxiety, and sexual problems. The shared liability implies that the presence of any one of these disorders will predict the development of others in future, and this knowledge should prompt clinicians and primary care physicians to screen for comorbid disorders, and encourage the concurrent treatment of sub-threshold symptoms. Furthermore, the results showed that the strongest model of these relationships explicitly recognised the interrelationships between the three latent variables, and consequently add to the body of

literature suggesting that an empirically driven nosology should incorporate explicit associations between depressive and anxiety disorders with sexual dysfunctions (e.g., Chapters 2, 4, and 5). It is also plausible that transdiagnostic treatment programs (e.g., the Unified Protocol; Ellard, Fairholme, Boisseau, Farchione & Barlow, 2010) that target the shared underlying factors between these disorders will prove to be effective, in which case their investigation, development and evaluation should be a clear priority for future research.

Limitations

It is important to recognise the limitations of the present study: this was a convenience sample of participants that self-selected into the study, and so we cannot rule out bias. The dropout rate was high (48%), as would be expected in any longitudinal online study, but the level of missing data remains a methodological concern. Although the inclusion of all available data based on an MAR assumption was the most defensible option (Enders, 2011), the missing data could contribute to further bias, as people with higher symptom levels were more likely to drop out, which may limit the generalisability of the present study's findings to clinical levels of the disorders. Participants that continued the study also showed regression to the mean, but the relationships between the latent variables were still interpretable, as synchronous correlations and structural invariance were held between waves. The model fit indices were not outstanding, but the focus of this study was predominantly the substantive interpretation of the relationships between the latent variables. The analyses for men in particular also relied heavily on the FIML estimator, as a small number of participants had complete responses at both waves (i.e., provided two completed survey responses and had engaged in sexual intercourse at both waves). While this is a particularly robust method to account for missing data, the small sample size will likely have generated unstable parameter estimates, and the results for men should be interpreted with this in mind. Further, the (lack of) causal relationships inferred here were based on passive observational data, rather than experimental manipulation, and are specific to the time lags investigated in the present study.

However, this study included a large sample of adolescent and adult men and women with a broad range of symptom levels across all sexual activity levels, and consequently offers the best and only data available on the relationships of interest. The use of a non-clinical sample also offers important new insights with better generalisability to broad populations, as existing research on combinations of depressive and anxiety disorders with sexual dysfunctions has relied almost exclusively on clinical samples (Laurent & Simons, 2009).

Conclusion

This study is the first to investigate the broad relationships between depression, anxiety, and sexual problems over time, and adds to the body of literature that suggests these disorders all share a latent liability akin to internalising psychopathology. This finding has important implications for diagnosis and treatment, as well as for research into the broad structure of psychopathology and future directions for an empirically driven nosology. Future research should test these models using smaller and larger time lags, and investigate the relationships between the disorders through experimental manipulations of disorders (i.e., treatment change) as well as within a broader framework of common mental disorders. It should also be a priority to include the assessment of sexual dysfunctions in future representative epidemiological surveys, so these important questions can be addressed using the best possible data.

Chapter Seven

General Discussion

General Discussion

The preceding chapters demonstrate that sexual problems, depression, and anxiety share common factors. A variety of statistical and methodological approaches revealed predominantly dimensional relationships between the disorders, and this finding has extensive implications for how we understand, classify, diagnose, and treat them. The implications and limitations of the individual studies have been discussed throughout the thesis. This closing chapter critically analyses the program of research as a whole, starting with a discussion of how the methodological details of each study informed the subsequent studies. In this chapter's second section, the results of the studies as a whole are interpreted separately for women and for men; gender similarities and differences are then discussed; and the results are considered in the frameworks of Clark and Watson's (1991) tripartite model of depression and anxiety and Krueger and Markon's (2006) multivariate models of comorbidity. In the third section, the implications of this research are discussed and critically analysed in the broader context of the current body of literature. Finally, limitations and future directions are mentioned throughout the chapter, and revisited before the conclusion.

The Progression and Development of Methodologies

The careful consideration of the progression and development of methodologies was a central theme of this research, particularly with reference to (i) the conceptualisation and measurement of mental disorders, (ii) the samples included and analysed in each chapter, and (iii) the statistical approaches to analyses. The measurement and conceptualisation of disorders is emphasised because they impact directly on the validity of the results.

Conceptualisation of Mental Disorders

This thesis examined comorbidity based on a number of assumptions. The use of self-report measures focused on the presence and severity of symptoms, which relate to the notion of a mental disorder as a "syndrome" where self-reported symptoms and behaviours are observable and measureable surface markers of disorders. Disorders were thus

conceptualised, measured, and analysed as continuous latent constructs indicated by the severity levels of these observed clinical symptoms. This approach provided information about disorder severity across a full spectrum from 'normal' to 'abnormal' function (Widiger & Trull, 2007). In contrast, DSM diagnoses are made using polythetic criteria based on the presence of a (somewhat arbitrary) set number of symptoms (Krueger et al., 1998). As such, although the measures we used had good criterion validity to DSM and ICD disorders, the results are not necessarily generalisable to diagnoses.

Sexual dysfunctions were more difficult to conceptualise than the common mental disorders. Their symptoms are often only observable in the presence of sexual activity, and about a third of the population over the age of consent are not sexually active (de Visser et al., 2003; Harrison, 2009). Furthermore, it is likely that individuals with high levels of sexual problems may be less sexually active. Given the nosological focus of the present research, it was important to assess sexual problems across a spectrum of severity, and to derive models that are broadly appropriate across all levels of sexual activity and symptom severity; a variety of steps thus were taken to ensure the validity of the results. The large sample sizes required the investment of considerable time and effort in order to engage participants across the spectrum of severity, and subsequently to maximise retention of the participants in the longitudinal study. While the drop out rate from Wave One to Wave Two was substantial (48%), this was anticipated due to the nature of the study: There were six waves of 30-60 minute surveys, and there was no personal contact between the participants and researchers. A website and blog for the study were created to maximise participant engagement in the research, and updates on the progress of the research were given regularly during the 18 months of data collection. There was very little dropout following the second wave —at the sixth time point, 49% of the full sample remained.

Measurement of Mental Disorders

Sexual Problems. Given that sexual intercourse can be a low-frequency behaviour, the symptom recall period was another important consideration. A longer time frame would allow more participants to provide information on sexual problems during sexual activity, but this needed to be balanced with the potential for recall bias over longer time frames. Ultimately, a maximum of a four-week recall period was chosen. This decision generated a measurement artefact of "sexually inactive" groups of participants who had not engaged in sexual activity during that time (i.e., their inactivity was defined by the measurement period). The consequent sample and missing data issues are discussed further below.

The reliable and valid measurement of each sexual problem was an unanticipated challenge. Chapter 2 had unexpected results regarding sexual problems for men, and sexual desire for women. Consequently, Chapter 3 examined the measurement capabilities of the FSFI and IIEF, and found them to be flawed: the FSFI desire scale relies on an oversimplified and generally circular definition, and includes only two brief questions about the level and frequency of desire. The recommended diagnostic cut-offs (Gerstenberger et al., 2010) are theoretically pathologising, and the scale is psychometrically weak. The FSFI self-report measurement of female sexual arousal problems is also problematic when physiological arousal is an outcome of interest, as self-reported and physiological measures have low concordance (Chivers et al., 2010). For the IIEF, the primary concerns were that the desire and orgasmic function scales lacked validity and clinical utility. These findings informed the inclusion of observed variables in Chapter 4, and influenced the decisions regarding measures included in the collection of longitudinal data.

Female sexual desire was discussed at length throughout Chapters 3 and 4 (see Appendix B for further discussion). Female sexual arousal was the subject of less discussion, but was also considered from a number of perspectives. For example, the study in Chapter 2 used the FSFI lubrication scale in isolation to represent female sexual arousal difficulties. This

decision was made in order to reflect the DSM-IV diagnosis of female sexual arousal disorder, which is defined by the lack of an adequate lubrication/swelling response (APA, 2000). The subsequent review of research on the measurement of sexual dysfunction —that was conducted for Chapter 3— revealed that self-reported physiological arousal is not necessarily a reliable proxy for genital measures of arousal (Chivers et al., 2010). Chapter 4 thus included a composite measure of combined subjective arousal and self-reported physiological arousal, which reflected the strong relationship between these constructs (Rellini et al., 2005) and guarded against the limitations of using the lubrication scale in isolation. While the analyses in Chapter 3 showed that this was a statistically viable composite scale, it may be theoretically problematic, as some research has suggested that subjective and physiological arousal are independent constructs (Basson, 2001). Chapters 5 and 6 utilised different measures of sexual function, and included the three independent constructs of female sexual arousal measured by the Abbreviated Sexual Function Questionnaire (ASFQ): cognitive arousal, arousal sensation, and lubrication. While these domains do not have direct criterion validity to DSM and ICD diagnoses, they were analysed separately to allow the constructs to function differentially in the models.

Different self-report measures were used for the two samples (hereafter Sample 1 and Sample 2). As discussed above, modifications were made in the data collection for Sample 2 where convergent validity with DSM diagnoses and sensitivity to change were emphasised. However, the change of sexual function measures was more purposeful: The ASFQ was used to measure female sexual dysfunctions in Sample 2, because it has good discriminant and construct validity (Quirk, Haughie & Symonds, 2005). It also uses five questions to assess desire (as opposed to two on the FSFI). Although the ASFQ does not rely on a single definition of sexual desire, it is still overly reliant on the notion of spontaneous desire. This is not consistent with the body of research that has supported an incentive-motivation model of sexual response, which suggests that female sexual desire may often be triggered (responsive)

as opposed to spontaneous (Brotto, 2010), and future research should therefore use different measures. The multidimensional measurement of arousal is another strength of the ASFQ, as it captures a more nuanced picture of this complex construct. While multi-domain sexual function measures may often be flawed due to their limited scope (McCabe & Goldhammer, 2013), the ASFQ provided a good balance between the coverage of the domains of sexual function and the requirement for brevity to retain participants in the longitudinal study. Sexually related distress was also measured in Sample 2 by using the Female Sexual Distress Scale (Derogatis et al., 2008). However, the measurement of sexual function could have been strengthened further with the inclusion of the enjoyment and sexual satisfaction domains that are available as part of the full length Sexual Function Questionnaire (Quirk et al., 2002).

For men, the IIEF erectile function domain showed strong psychometric properties in the literature and in the statistical analyses for Chapter 3, and it was consequently included in both samples. To strengthen the measurement of the orgasmic function and sexual desire domains, specific measures were included in Sample 2 to measure premature ejaculation, and solitary and dyadic desire; it was an oversight not to measure delayed ejaculation. With a focus on criterion validity to the DSM diagnosis of hypoactive sexual desire disorder, desire for sexual activity with a partner (dyadic desire) and desire for solitary sexual activity (solitary desire) were combined into a single construct in Chapters 5 and 6. However, dyadic and solitary desire have been found to be distinct concepts for women (Brotto, 2010) and were also delineated as separate factors for men and women in the development of the Sexual Desire Inventory (Spector et al., 1996). Male sexual desire did not contribute to any of the models, regardless of the sexual desire measure utilised, and this could be related in part to the effects of solitary and dyadic desire being merged, which is considered in more depth later in this chapter. The inclusion of a specific measure for premature ejaculation (PE) in Sample 2 was associated with much stronger dimensional models, which provides strong evidence that it belongs in the models. Distress associated with PE was measured in Sample 2, but

distress associated with erectile dysfunction and low desire was not measured, which limits criterion validity to DSM diagnoses. In order to provide some additional information on the valence of sexual experience, sexual satisfaction was also included in the models, and was a good indicator.

Common Mental Disorders. Less consideration was given to the measurement of the common mental disorders that have been researched extensively. Obsessive-compulsive disorder (OCD) was assessed in the second sample, and was included in the analyses despite the fact that it was removed from the diagnostic chapter of Anxiety Disorders in the DSM-5 (APA, 2013a). While OCD has been deemed distinct from anxiety disorders in the meta-structure of the DSM-5, it responds to similar treatments as anxiety and tends to co-occur with anxiety disorders (Mataix-Cois, Pertusa & Leckman, 2007). OCD is also related to desire, arousal, and orgasmic difficulties independently of the phenotypes of OCD and after controlling for the use of selective serotonin reuptake inhibitors (SSRIs) (Aksaray, Yelken, Kaptanoglu, Oflu & Ozaltin, 2001; Vulink, Denys, Bus & Westenberg, 2006). To reflect these findings, OCD was retained in analyses even after the publication of the DSM-5. This inclusion represented the shared aspects between OCD, other anxiety disorders, and sexual problems, but it also allowed for the unique components of OCD (i.e., its key features of obsessions and compulsions; Mataix-Cois et al., 2007).

Inclusion Criteria for Each Study

As detailed above, this thesis included two large samples. Sample 1 was analysed in Chapters 2 through 4, and had some measurement limitations: the narrow range of sexual problems for the male sample was of particular concern, and it also became clear that the sexual function measures were not ideal for the purposes of this research. The superficial measurement of sexual problems beyond erectile dysfunction prematurely narrowed the construct of male sexual dysfunction; as such, the results for men in Chapters 2 and 4 are potentially unreliable. The female sub-sample of Sample 1 was larger and more varied, and

the results were consequently more robust. However, the exclusion criteria in Chapters 2 and 4 resulted in limited generalisability for the results for both genders: With a focus on complete and reliable information for the key variables of interest, Chapter 2 included only the sexually active participants, and Chapter 4 included only those who that had engaged in intercourse in the past four weeks.

Sample 2 —analysed in Chapters 5 and 6— was assessed at six time points, and responses were collected on either weekly or monthly schedules. This study overcame many of the limitations of Sample 1: it utilised stronger measures with better criterion validity to DSM disorders; the sample was larger, had higher mean symptom levels and greater variation between participants; and it included adolescents aged 16 and 17. The variation in symptom levels is particularly important because the covariation among disorders was analysed to determine the nature of the relationships in the latent variable models. The range of disorder severity in Sample 2 was fundamentally important for the male sample, as there was limited variance for men in Sample 1. Consequently, the analyses that utilised Sample 2 showed much stronger dimensional relationships for men, whereas the results for women remained fairly constant across the two samples. Another strength of Chapters 5 and 6 was the inclusion of sexually inactive participants in the models, which strengthened the generalisability of the results.

Given that all of the results rely on convenience samples, it would be ideal to replicate them in representative population samples —particularly for men. However, such data does not currently exist and would be costly to produce. While the inclusion of sexual function measures in epidemiological studies of common mental disorders would be an ideal outcome, the data sets analysed in this thesis had strengths in their combination of large sample sizes, cross-sectional and longitudinal data, an assortment of self-report measures, and the variety of disorders measured.

Statistical Methods

Conceptual models of the relationships between sexual problems and anxiety and depression were examined using novel statistical methods that progressed with each study. Each chapter utilised methods that developed and reconceptualised the findings in the preceding chapters, and accounted for their limitations. Consequently, the statistical methods were a key strength of this body of research. While the modelling approaches were discussed in some detail throughout the chapters, the statistical methods are revisited and integrated here.

Chapter 2 used structural equation modelling (SEM) to substantiate an expanded dimensional model of the internalising spectrum, and was a seminal paper for the thesis. SEM was the best way to test the hypothesised underlying dimensional structure, but as discussed in Chapter 5, these analyses relied on the *a priori* assumption that the underlying relationships were dimensional, and that all participants had the same set of underlying relationships. Furthermore, the models that were designed to assess the DSM-IV-TR structure did not provide a fair test because GAD was included with the other anxiety disorders. This move was made to mirror the DSM structure, but extensive analyses have found that the best place for GAD, empirically, is with depression under the Distress liability (see Watson, 2005). Consequently, the decrease in the fit indices for these models included the effect of moving GAD, along with the intended test for uncorrelated diagnostic chapters.

Chapter 4 utilised latent profile analyses (LPA) and SEM, which offer the best methods for comparing categorical and dimensional spectrum models when disorders are conceptualised as continuous. This was a necessary follow-up to Chapter 2 because the finding of a strong dimensional model does not preclude the possibility that an alternative categorical model could also be valid. Chapter 4 also provided a fairer test for the goodness of fit of the DSM structure, as the LPA allowed for groups of individuals to be characterised by different groups of disorders: If a group with high depression and anxiety emerged as distinct

from a group with sexual problems, this would have supported the categorical structure of the DSM. Instead, these analyses provided further support for a dimensional model for women, and a dimensional model fit well for 96% of men. However, LPAs do not allow for varying severity within or across classes, and rely on the assumption that disorders are completely unrelated to each other within each class (Masyn et al., 2010). While the analyses in Chapters 2 and 4 were theoretically important and informative, their assumptions precluded a suitable test of our nosological systems.

Chapter 5 utilised factor mixture analysis (FMA), which allows for categorical and dimensional components simultaneously. FMA can detect common processes for large groups of people, but also allows for different structural relationships within groups that do not share these common processes. This feature is excellent for modelling comorbidity, as it can delineate groups that highlight flaws in nosological models that should be broadly relevant to all groups. A further strength of the FMA approach is that it overcomes the flawed assumptions of SEM and LPA. We decided *a priori* that the FMA-4 from Clark et al. (2013) was most appropriate for our research questions and data, rather than testing the five different levels of measurement invariance that Clark et al. described. FMA-4 is one of the less restrictive models described and, given its adequate fit, a more restrictive model might also fit the data. The results are informative nonetheless: Chapter 5 reaffirmed the dimensional relationships found between the disorders for women in Chapters 2 and 4, and found even stronger dimensional relationships for the large majority of men. These analyses were key strengths of this research because they suited the nature of the data, were robust to the limitations of the preceding analyses, and provided useful information to be interpreted in the context of our current classification systems.

Chapter 6 was an important gauge of the findings of Chapters 2, 4, and 5, but also provided a preliminary examination of the relationships between the liabilities over time using SEM. This study replicated the three-factor structure from Chapters 2 and 4 in Sample 2,

demonstrated stability in the structure over time, and found no evident causal relationships. These results strengthen our confidence in the notion of a shared underlying factor accounting for change over time. The return to three latent liabilities in Chapter 6 (as opposed to the two-factor structure in Chapter 5) was due to the return to SEM, where the Fear and Distress liabilities have been shown to be the best representation of the underlying internalising spectrum (e.g., Eaton et al., 2013). While longitudinal FMAs would be a promising direction for future research, the analyses would presently be computationally demanding.

The causal inferences made in Chapter 6 were based on passive observation, which requires caution in interpretation. This method does not do more than document an association (or lack thereof), even when temporal order is known, and so causal inference is not demonstrated (Cook & Campbell, 1979). While this method necessarily precludes the possibility of concluding an absence of causal relationships between the disorders, the lack of any apparent directional relationships is consistent with a shared liability. These models should also be tested on other time scales in order to be confident that causal relationships do not account for the relationships between the disorders. For example, causal relationships could exist on a brief time scale where emotional stress causes concurrent arousal difficulties, or on a larger time scale where years of chronic sexual dysfunction eventually foster depression or anxiety. The net effects of these time scales were included in our analyses, but in order to disentangle the relationships these time scales should be examined using ecological momentary assessment and longitudinal epidemiological research, respectively.

Within the broad statistical models in each chapter, missing data was an important consideration. As mentioned previously, the decision to use a four-week recall period created an artificially "sexually inactive" group that had missing data for most sexual problems.[8]

[8] The FSFI and IIEF scoring instructions score 'Did not engage in sexual intercourse/activity' a '0', which denotes a higher level of dysfunction than even the most severe symptom levels (i.e., experiencing pain during sex 'almost always or always' is scored '1'). To avoid this bias, these responses were scored as missing (Meyer-Bahlburg & Dolezal, 2007; Yule et al., 2011).

Missingness was thus a complicated consideration, as it may have been meaningful. Missing data tends to be dealt with under one of three assumptions, as outlined by Rubin (1976): missing completely at random (MCAR), missing at random (MAR), or missing not at random (NMAR). To briefly summarise, MCAR describes missing data that is unrelated to any variables measured (i.e., sexual inactivity is unrelated to depression, anxiety, or sexual problems). MAR data is related to other variables, but not to the would-be missing values (i.e., sexual inactivity is related to depression, anxiety, and sexual problems, but the fact that a person did not engage in intercourse in the past one-to-four weeks is not related to the symptoms of sexual dysfunction that they *would have* reported, had they been sexually active). Finally, NMAR is outcome-dependent missingness (i.e., sexual inactivity is *because* of the sexual problems that would have been reported; that is, the respondent was sexually inactive because of their sexual problems). Logically, MCAR is an unrealistic assumption for this data, and both MAR and NMAR involve propositions about unobserved data that cannot be tested (Enders, 2011). Given the fact that the measurement period artificially created the missing data, we decided that an MAR assumption would be the most defensible assumption; it is unlikely that all of the people who were sexually inactive at a given wave would have experienced high levels of sexual problems if they were sexually active because we did not have a high symptom level sample. The assumption of MAR does not infer cause to the sexual inactivity, but instead allows it to be an observed characteristic of the data.

This assumption informs the implications of the methods we used to account for missingness. For example, Chapters 2, 3 and 4 only analysed the sexually active samples, in order to have variables with complete information in the analyses. This was a limitation for these studies, as it severely limited the generalisability of the results to those who are sexually inactive — about one third of the Australian population (de Visser et al., 2003; Harrison, 2009). Further, this "deletion method" decreased the power in those studies, and relied on an MCAR assumption, which will have introduced bias into the results (Enders, 2011).

Chapter 5 overcame the limitation of excluding all sexually inactive participants by comparing the model of best fit for those who had engaged in intercourse and those who had not, using the available variables (e.g., sexual pain and premature ejaculation could not be assessed). Chapter 6 used full information maximum likelihood (FIML) estimation under the MAR assumption, which is much more robust to bias than listwise deletion (Enders, 2011). FIML uses all of the available data from each respondent to generate the most likely population parameter estimates without discarding incomplete cases or imputing values. Non-normality was also dealt with by using a variety of approaches throughout the studies (i.e., a logarithmic transformation, treating the variables as censored from below, and maximum likelihood estimation with standard errors that are robust to non-normality). The fact that a variety of methods for dealing with missing data and non-normality all converged on similar models acts as a pseudo-sensitivity analysis across the studies and it suggests the results are robust.

In summary, these studies have combined different measures and conceptualisations of disorders in two distinct samples of men and women with varying levels of sexual activity. A variety of statistical modelling techniques have been employed in cross-sectional and longitudinal analyses that have divergent assumptions and limitations. Within these techniques a number of approaches for missingness and non-normality have also been utilised. The heterogeneity in these methods strengthens our confidence in the findings of the body of research as a whole.

Interpreting the Studies Together

Results for Women

Overall, the results for women were consistent between studies. Chapters 2, 4, 5 and 6 all showed dimensional relationships between sexual problems and depression and anxiety, and Chapters 5 and 6 extended these findings to women who had not engaged in intercourse in the past four weeks. There was some variability in the findings for specific disorders across the

studies: We can be fairly confident that the divergence of desire in Chapter 2 was due to poor measurement, as it was a strong indicator for the models when a new measure was used in Sample 2. Sexual pain and sexually related distress also diverged somewhat from the other sexual problems in Chapters 5 and 6, but the correlated residuals in Chapter 6 suggested that pain and distress were more closely related to depression and anxiety disorders, and both constructs were important indicators for the models throughout the studies. The finding that sexually related distress was less related to the sexual problems than to depression and anxiety is consistent with Bancroft et al.'s (2003b) finding that emotional wellbeing is the best predictor of distress, and with Hayes' (2008) recommendation to analyse sexual function and distress separately. Overall, the results for women described a complex set of interrelationships that were consistent with the body of research and uniformly showed clear dimensional relationships between depression, anxiety, and sexual problems.

Results for Men

The results for men were less consistent between studies. One consistent and puzzling finding was that desire was a poor indicator in every model. This finding remained even after the 14-item Sexual Desire Inventory (Spector et al., 1996) was included, which makes "the poor measurement properties of the IIEF desire domain" (Chapter 4, p. 87) a less convincing explanation. As previously mentioned, this could be a result of the decision to combine the dyadic and solitary desire factors: Spector et al. (1996) suggested that solitary desire might serve a different purpose (e.g., tension release) than the emotional and physical intimacy associated with dyadic desire. Correspondingly, Bancroft et al. (2003a) suggested that the increased desire during negative mood states they found for some young men might be specifically related to the emotional and intimacy components of dyadic desire. In contrast, Frohlich and Meston (2002) suggested that solitary desire might drive this "self-soothing" phenomenon, as masturbation offers more reliable pleasure and orgasm than partnered sexual

activity.[9] Thus, it is possible that solitary and dyadic desire have differential roles that were not accounted for, or even opposing effects that cancel each other out. Alternatively, there may have been insufficient variability in sexual desire (i.e., restriction of range) to capture the relationships with depression, anxiety and other sexual problems.

Another interesting finding was the delineation of a group of men within both samples that had categorical distinctions between affective disorders and sexual problems. The processes that characterise these men remain unclear; the simplest explanation would be that these groups represent men that presented with symptom clusters that fit within depressive and anxiety disorders *or* sexual dysfunctions. It is important to note that this explanation is compatible with dimensional conceptualisations of psychopathology, which do not hypothesise comorbid symptom presentation in every case. Future research will need to investigate the characteristics of these groups further, but the finding that 88-96% of men had strong dimensional relationships suggests some important implications. In short, while the results for men were less clear-cut than the results for women, the analyses based on the more robust data from the second sample showed strong dimensional relationships between the latent variables for the majority of men.

Gender Similarities and Differences

Research on male and female sexual response cycles has suggested strong gender differences exist. For example, a simple linear sexual response cycle is generally accepted for men (Masters & Johnson, 1970). However, this model has been challenged for women, where motivation to engage in sexual activity and other contextual factors are given a prominent role, and desire and arousal are particularly intertwined with one another (Basson, 2000, 2001, 2005; Brotto, Graham, Binik, Segraves & Zucker, 2010). In contrast, looking at the literature more broadly, the results of some factor analytic studies suggest that there may

[9] This hypothesis was made specifically for women.

actually be similarity between men and women experiencing sexual dysfunction, and between men and women with healthy sexual function. The sexual response cycle has been found to have distinct desire, arousal, and orgasm phases for both men (Carvalho et al., 2011) and women (Giles & McCabe, 2009) with healthy sexual function, whereas sexual desire, arousal, and orgasm tend to overlap for men and women experiencing sexual dysfunction (Carvalho et al., 2012; Carvalho et al., 2011; Giles & McCabe, 2009). Our conceptualisation of 'normal' function on the same spectrum with 'abnormal' function (i.e., dysfunction) meant that we did not investigate these group differences specifically, but these findings are consistent with the notion of higher symptom severity being associated with greater comorbidity (Kessler et al., 2005; Krueger, 1999) and this was accounted for in the models. Despite the fact that women tend to have higher levels of internalising psychopathology (Kendler et al., 2003; Krueger, 1999), strong similarities have been found between men and women for the structure of underlying relationships between common mental disorders. On the whole, it seems there may be fewer structural gender differences than might be expected based on a review of the sexual response cycle research in isolation. The gender differences in our studies suggested that it was important to analyse men and women separately nonetheless.

With a focus on the consistency between studies, the dimensional models were stronger and more robust for women. However, if the reliability of the samples is taken into account, the results for men based on the data from Sample 2 should be given more weight; Chapters 5 and 6 found stronger dimensional relationships for the majority of men (the liabilities were correlated at about $r = .5$), compared to women (with correlations of $r = .3$ to $r = .4$). For some readers, the magnitude of these relationships might raise the question: Is a .3 to .5 relationship for Sexual Problems with the Fear and Distress liabilities sufficient to presume a dimensional structure? After all, this is about the same magnitude as the relationships that have been found between the internalising and externalising spectra, which have been conceptualised as distinct entities (Krueger, 1999). Explanations as to why the relationships

with Sexual Problems would be weaker than the relationships between Fear and Distress have been discussed throughout the studies, and include: the symptom overlap between depressive and anxiety disorders; the overlap in domains that are measured (i.e., cognitive and emotional versus sexual); and similar stem-and-response measures for depressive and anxiety symptoms (i.e., measurement overlap). However, the strongest case for interpreting these relationships as an indication of a shared liability between the disorders is in their high rates of comorbidity, shared cognitive and affective characteristics, likely shared treatment response (which is discussed in more detail later), and the lack of causal relationships between them.

Other Models of Comorbidity

Clark and Watson's (1991) tripartite model accounts for the shared aspects of depression and anxiety with a higher-order factor of negative affect. The lower-order factor of anxious arousal characterises anxiety (which corresponds to Fear in the internalising spectrum), and low positive affect or anhedonia characterises depression (analogous to Distress). Accordingly, Laurent and Simons (2009) suggested that sexual problems might have differential relationships with the Fear and Distress liabilities: Sexual problems related to physiological arousal (e.g., erectile function, lubrication, and sexual pain) might be specifically related to anxiety disorders, and sexual problems with more prominent cognitive and motivational components (e.g., desire and orgasmic function) might be related to depression. Nobre and Pinto-Gouveia (2006) found a general differential relationship between the liabilities, as emotions associated with depression —rather than anxiety— were more strongly associated with sexual dysfunction. More recently, Kalmbach et al. (2012) specifically tested Laurent and Simons' ideas in the context of the tripartite model using regression analyses. They found that anhedonia was associated with all sexual problems for women, and with subjective arousal, orgasm and satisfaction for men. On the other hand, anxious arousal was associated with lubrication difficulties and sexual pain for women, and

with erectile and orgasmic function for men. These findings are broadly consistent with the predictions for Fear, but show a more generalised pattern of results for the Distress liability.

Generally, the present results did not indicate differential or specific relationships for the Sexual Problems liability with the Fear and Distress liabilities. More specifically, Chapter 2 tested cross-loadings that represented Laurent and Simons' (2009) predicted relationships and found them to be non-significant; the higher-order internalising liability accounted for the shared variance between the disorders to the extent that the specific cross-loadings did not account for any additional variance. However, the possibility of disorders being influenced by multiple liabilities (i.e., multivariate multiformity models; Krueger & Markon, 2006) was not explored further in other chapters, which instead focused on associated liabilities models. This was due to the preliminary nature of the studies, and the inflation of Type I error rates that would accompany the exploration of modification indices. Future research should investigate whether some disorders are better accounted for through relationships with multiple liabilities (i.e., hybrid associated liabilities and multiformity models; Krueger & Markon, 2006). For example, a model that allows GAD to be influenced by both Fear and Distress liabilities has been found to offer the best representation of the relationships among common mental disorders (Eaton et al., 2013). It seems likely that the inclusion of multiformity models might also account for the specific relationships for female sexual pain and distress with depressive and anxiety disorders.

Summary

Taken together, this thesis provides answers to the research questions posed in Chapter 1: Yes, the disorders appear to share a common underlying factor akin to internalising psychopathology with depressive and anxiety disorders. No, our nosological systems are not accurate representations of the interrelationships between the disorders. Yes, there is an empirically supported nosological model that recognises the relationships between the DSM chapters of Sexual Dysfunctions, Depressive Disorders, and Anxiety Disorders, while

maintaining discrete diagnoses. No, there are not any evident causal relationships between the disorders. These findings provide a springboard to bring sexual dysfunctions into the broad psychopathology research framework.

Implications of this Research

The results of Chapters 2, 4, 5 and 6 are the focus of the broad implications discussed here. Chapter 3 has important implications for the measurement of sexual problems using self-report measures; these implications were discussed in depth in Chapter 3, and are discussed further in Appendix B. The fundamental implication of this body of research is that the relationships between these disorders should be more explicitly acknowledged in our diagnostic systems.

How These Results Relate to Our Evolving Diagnostic Systems

The relevance of this research to DSM and ICD categories is both a weakness and a strength. The domains of psychopathology that were the focus of these studies (i.e., depressive and anxiety disorders and sexual dysfunctions) were defined by the DSM-IV. Paradoxically, this means that the diagnostic system under review is the same system that guided the data collection and the inclusion of variables (Widiger & Sankis, 2000), and the possibility that broader, narrower, or different syndromes might offer better representations of the symptom clusters was not examined. The DSM-based disorders were conceptualised as syndromes indicated by observable symptoms. These syndromes were subsequently conceptualised as indicators of broad psychopathology liabilities. However, the conceptualisation of each disorder as a real and valid construct is called into question by the methodological underpinnings of how the disorder constructs originated. For example, the disorders in the DSM are organised into sixteen diagnostic chapters, predominantly for the purposes of maximising clinical utility and to provide a common language for describing psychopathology (Widiger & Sankis, 2000). The evolution of the structure has been largely atheoretical; empirically driven change has been slowed by the aims of continuity and

consensus, and under the influence of competing social and political processes. Despite their lack of empirical support as distinct entities, the diagnostic conventions from the ICD and DSM are vulnerable to reification, which means the diagnoses often become viewed as natural kinds (i.e., valid and distinct entities) instead of being viewed as conventional names for symptom clusters that often co-occur (Goldberg, 2014; Sanislow et al., 2010). In this sense, the language used throughout this thesis —which tended to described disorders as valid entities— was not ideal.

It is important to note that there is no consensus on how to empirically evaluate our classification systems, and there is no singular definition of what constitutes "empirical evidence" for change. From a psychometric perspective, DSM and ICD disorders have reliability through their specific descriptors that maximise clinician agreement, but lack validity. The strongest challenges to the psychometric validity of DSM and ICD diagnoses are based on genetic, molecular, cellular and systems neuroscience research findings, which are not generally consistent with the boundaries between existing mental disorders (National Institute of Mental Health [NIMH], 2011). The NIMH has proposed Research Domain Criteria (RDoC) based on the notion that specificity might exist outside the framework of the currently recognised diagnoses. This framework begins with current understandings of behaviour-brain relationships, and links them to clinical symptoms —rather than relying on pre-defined DSM disorder constructs and seeking their neurobiological underpinnings. This approach has been argued to have more validity than the DSM and ICD, as it does not rely on a flawed categorical nosology that obscures common factors (Goldberg, 2014). However, given that there is not currently enough information to base our nosology on genetic and biomarker research, the APA and NIMH agreed that the DSM and ICD offer "the best information currently available for clinical diagnosis of mental disorders" (Insel & Lieberman, 2013, para. 2), and suggested that RDoC represents a complementary framework for characterising disorders. Correspondingly, Goldberg (2014) suggests that even if the

RDoC project is successful, it will probably not replace the existing descriptive classifications of the ICD and DSM, but rather will inform future editions.

Perhaps the best way to balance these perspectives is to conceptualise the sets of symptoms that are typical of common mental disorders as "symptom complexes" rather than disease entities, and to accept that they often co-occur (Goldberg, 2014). An appreciation of the underlying multifactorial nature of disorders and the arbitrariness of diagnostic boundaries could flourish by explicitly replacing the 'disorder entity' constructs with 'syndromes'. Further, maintaining labels that identify examples of common syndromes will retain the functionality of the nosologies (Goldberg, 2014; Widiger & Sankis, 2000). The present research fits well in this framework, with particular emphasis on the underlying multifactorial nature of disorders. In this context, the use of DSM-based disorders was a strength of this research, as it is both immediately relevant to our current classification systems and compatible with the foreseeable future of nosology.

In the evolution of the DSM and ICD, the DSM-5 and ICD-11 represent one more step in the successive approximation of an empirically based nosology. Evidence for subsequent change should come from consistency in outcomes over different measures, samples, and methods, and a balance between theoretical, ethical, and pragmatic considerations (Klein & Riso, 1993). Taken together, the findings from this body of research indicate the inclusion of sexual problems in the meta-structure of the DSM and ICD while retaining the current diagnostic chapters and labels. Such a step allows for the dimensional elements of classification to be conservatively and gradually integrated. This offers the most realistic and least disruptive way forward, and would not generate significant complications for any diagnostic activities, but rather improve diagnostic sensitivity.

Implications for Diagnosis and Treatment

Our classification systems are inherently intertwined with the diagnosis of disorders, so these nosology implications have subsequent implications for diagnostic processes and could

raise the low recognition levels of sexual problems and their under-diagnosis in primary care. While sexual problems are evidently prevalent, doctors' recognition of symptoms in primary care settings is alarmingly low (Richters et al., 2003). For example, Dunn et al. (1998) found that 52% of their survey respondents that reported a sexual problem wanted help, but only 5% had sought or received help; Read et al. (1997) reported that 70% of primary care patients with a sexual problem thought it was an appropriate topic to discuss with their doctor, but only 2% had done so. In a representative national survey of the Australian population, Najman et al. (2003) found that 55% of men and 60% of women reported at least one sexual problem for several of the last twelve months, but only 6% had sought help. Taken together, these data suggest that the onus is on the doctor to screen for sexual problems, as patients are not actively seeking the help they require in primary care settings. If the relationships between depression, anxiety, and sexual problems were explicitly recognised in our classification systems, this would highlight likely patterns of co-occurrence and the formalisation of the screening process could overcome some of the discomfort associated with initiating conversation about sexual problems. Althof et al. (2005) emphasised the importance of inquiring about predisposing, precipitating, contextual, and maintaining factors —such as depression and anxiety— in the assessment of sexual dysfunction. The results in this thesis support this recommendation, and more broadly highlight the importance of screening for comorbid sub-threshold symptoms in presenting sexual dysfunction, depression, and/or anxiety.

As has been discussed throughout the thesis, these findings may also have transdiagnostic treatment implications, based on the likelihood of shared treatment response between the disorders. While shared treatment response for depression, anxiety, and sexual dysfunctions has not been explicitly tested to our knowledge, it can be inferred from findings in existing studies: For example, sexual dysfunctions have been found to respond to cognitive-behavioural and mindfulness therapies (Brotto et al., 2008; Jones & McCabe, 2011), which

are the prevailing psychotherapeutic approaches to treat depression and anxiety. While cognitive-behavioural therapy (CBT) covers a broad variety of therapeutic techniques that can be effective for most mental disorders, CBT for sexual dysfunctions has been found to affect the maladaptive cognitions that are shared with depression and anxiety, such as negative attributions, self-perceptions, automatic thoughts and core irrational beliefs (e.g., McCabe, 2001; Trudel et al., 2001). Further, sexual problems have been found to improve with treatment for depression and anxiety symptoms (e.g., Hoyer et al., 2009; ter Kuile et al., 2010), and vice versa (e.g., Bocchio et al., 2009). Taken together, it seems likely that these disorders have shared treatment response, and the high rates of comorbidity between disorders thus undermine the efficacy and logic of treating them separately (Nolen-Hoeksema & Watkins, 2011). The potential for efficacious transdiagnostic treatment programs to target the disorders concurrently is an exciting possibility. However, to our knowledge, there are currently no transdiagnostic CBT programs to treat the comorbid presentation of depression and anxiety disorders with sexual dysfunctions. This is despite the fact that patients tend to have negative treatment outcomes when the disorders are not treated together (Shabsigh et al., 1998; van Lankveld & Grotjohann, 2000).

Transdiagnostic CBT programs have been developed that reduce the internalising liability by targeting the shared mechanisms between depression and anxiety (e.g., Ellard et al., 2010; Kushner et al., 2013). While these programs have the potential to be applied to sexual dysfunctions, the nature of the underlying mechanisms between the disorders will need to be investigated before targeted treatment programs can be developed. It is likely that pharmacologic treatment will be an effective addition to these programs, and this should be investigated, as studies have suggested that neither medication nor psychotherapy alone is maximally effective (Althof et al., 2005; Heiman, 2002).

Limitations

Certain limitations of the studies have been discussed throughout the empirical studies and already mentioned in this chapter. Overall, the thesis has methodological strengths in its innovative questions, theory-based model testing, large sample sizes, and a progression of sophisticated statistical methods. However, there were some additional limitations of the studies that have not yet been addressed. They relate to the sole reliance on self-report measures, the male samples, and not accounting for the effects of known covariates. The models based on the male samples tended to have more estimation and convergence problems, compared to the models for women. In Sample 1, these problems were likely a result of the lack of bivariate relationships between the diagnostic categories, where the assumption of an underlying dimensional structure was violated. The LPA in Chapter 4 suggested that the weak relationships in Chapter 1 were being driven by 4% of the sample, and the SEM from Chapter 2 provided a good fit to the remaining 96% of the sample. An interesting addition to this story was that the strongest factor analysis model for men in Chapter 5 had an internalising spectrum structure. In the analyses based on Sample 2, the convergence and estimation problems were likely due to the sample sizes, which were relatively small considering the complexity of the models. Overall, the biases in the male samples are likely to have provided unstable estimates with limited generalisability to the general population; it will be important for the findings for men and women to be replicated —ideally in representative epidemiological samples— before the implications of these studies can realistically be incorporated in our classification systems.

Due to the scope of the program of research, there was an additional limitation in that the effects of known covariates that affect depression, anxiety, and sexual dysfunctions —such as stressful life events and relationship quality (e.g., Althof et al., 2005)— were not accounted for. Perhaps the most important covariate that was not accounted for was the use of SSRIs, which are the medication of choice for depression and anxiety treatment (Goldberg et al.,

2009) and have profound negative impacts on all aspects of sexual function, except premature ejaculation (Figueira et al., 2001). Comorbidity among these disorders is aggravated by SSRIs through the activation of the 5-HT_2 receptor, which impairs all stages of sexual response for men and women (Zemishlany & Weizman, 2008). While it is likely that SSRI use contributed to some of the effects in the models, the relationships between the disorders have been found over and above SSRI use (Laurent & Simons, 2009), and strong comorbidity with sexual dysfunctions has been found in depression before medication (Kennedy, Dickens, Eisfeld & Bagby, 1999) and in untreated patients (Baldwin, 2001). Future research, however, should take known covariates into account, given the analyses will no longer be preliminary and exploratory.

Future Directions

The findings of the present research indicate some interesting future directions beyond those already discussed. Further studies on the causal relationships between the disorders are required. For example, a study of participants entering treatment for depression, anxiety, or sexual problems could provide a proxy for the experimental manipulation of symptom levels, where the response of other disorders during treatment could indicate possible causal processes. Perhaps the most important area for future research is to define the transdiagnostic mechanisms between the disorders, and subsequently to determine whether they can be targeted effectively using transdiagnostic treatment. To date, research on the overarching comorbidity between depression, anxiety, and sexual dysfunction has been based on a psychiatric epidemiology approach that focuses on the latent structure of the relationships and on the spectra of psychopathology (cf. Krueger & Markon, 2006). In order to extend this research to efficacious interventions, it will be essential to combine this approach with a focus on how the shared spectra manifest in specific cognitive, affective, and behavioural mechanisms (cf. Harvey, Watkins, Mansell & Shafran, 2004). The shared characteristics found across depression, anxiety, and sexual dysfunctions (e.g., distraction, worry, guilt,

negative automatic thoughts, emotion dysregulation, rigid assumptions, avoidance; Carvalho et al., 2012; Nobre & Pinto-Gouveia, 2009) have been researched extensively in depression and anxiety, and Nobre and his colleagues have begun research into these characteristics in sexual dysfunctions. However, the role of these characteristics has not been examined in comorbid disorder presentation. If they prove to be responsive to experimental interventions, this could potentially lead to the development of transdiagnostic treatment programs. More broadly, research into the shared genes and biomarkers —as well as common aetiological factors for the disorders— would be consistent with the current directions for psychopathology research, and would strengthen our understanding of the interrelationships. Finally, epidemiological surveys must be revised to include sexual problems. The lack of epidemiological data on sexual dysfunctions together with the common mental disorders likely perpetuates the absence of sexual problems in psychopathology research, and good quality data is currently lacking.

Conclusion

Depression, anxiety, and sexual problems are highly prevalent and, when combined, they have a profound negative impact, are resistant to treatment, and are associated with poor long-term outcomes for patients. The studies in this thesis are the first to investigate the overarching relationships between these disorders. They address a substantial gap in the literature and represent important steps towards understanding how and why the disorders are related. This thesis has made theoretical breakthroughs in defining these interrelationships with careful consideration given to its theoretical, methodological, measurement, and statistical underpinnings. A shared latent liability between the disorders was found to account for their comorbidity and interrelationships over time, and this finding offers the valuable opportunity to integrate sexual dysfunctions into the framework of psychopathology research through the internalising spectrum. Ultimately, these relationships should be incorporated in our classification systems, which will subsequently inform diagnosis and treatment.

References

Acton, G. S., Kunz, J. D., Wilson, M., & Hall, S. M. (2004). The construct of internalization: Conceptualization, measurement, and prediction of smoking treatment outcome. *Psychological Medicine, 34*, 1-14. doi: 10.1017/S0033291704003083

Acton, G. S. & Zodda, J. J. (2005). Classification of psychopathology: Goals and methods in an empirical approach. *Theory Psychology, 15*, 373-399. doi: 10.1177/0959354305053220

Aksaray, G., Yelken, B., Kaptanoglu, C., Oflu, S., & Ozaltin, M. (2001). Sexuality in women with obsessive compulsive disorder. *Journal of Sex & Martial Therapy, 27*, 273-277. doi: 10.1080/009262301750257128

Althof, S. E., Leiblum, S. R., Chevret-Measson, M., Hartmann, U., Levine, S. B., McCabe, M., . . . Wylie, K. (2005). Psychological and Interpersonal Dimensions of Sexual Function and Dysfunction. *Journal of Sexual Medicine, 2*, 793-800. doi: 10.1111/j.1743-6109.2005.00145.x

Althof, S. E., Rosen, R. C., Symonds, T., Mundayat, R., May, K., & Abraham, L. (2006). Development and validation of a new questionnaire to assess sexual satisfaction, control, and distress associated with premature ejaculation. *Journal of Sexual Medicine, 3*, 465-475. doi: 10.1111/j.1743-6109.2006.00239.x

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders, (4th ed.), Text Revision, International Version*. Washington, DC: American Psychiatric Association.

American Psychiatric Association. (2010). DSM-5 development. Retrieved February 22, 2010, from http://www.dsm-5.org

American Psychiatric Association. (2013a). *Diagnostic and statistical manual of mental disorders, (5th ed.), International Version*. Arlington, VA: American Psychiatric Publishing.

American Psychiatric Association. (2013b). DSM-5 Development. Retrieved January 1st, 2013, from http://www.dsm5.org

American Psychiatric Association. (2014). DSM: History of the Manual. Retrieved June 1, 2014, from http://www.psychiatry.org/practice/dsm/dsm-history-of-the-manual

Anderson, J. & Gerbing, D. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin, 103*, 411-423. doi: 10.1037/0033-2909.103.3.411

Andrews, G., Anderson, T., Slade, T., & Sunderland, M. (2008). Classification of anxiety and depressive disorders: Problems and solutions. *Depression and Anxiety, 25*, 274-281. doi: 10.1002/da.20489

Andrews, G., Morris-Yates, A., Holt, P., & Henderson, S. (1990). Evidence for a general neurotic syndrome. *British Journal of Psychiatry, 157*, 6-12. doi: 10.1192/bjp.157.1.6

Angst, J. (1998). Sexual problems in healthy and depressed persons. *International Clinical Psychopharmacology, 13*, S1-S4. doi: 10.1097/00004850-199807006-00001

Aragona, M. (2009). The concept of mental disorder and the DSM-V. *Dialogues in Philosophy, Mental and Neuro Sciences, 2*, 1-14. Retrieved from http://www.crossingdialogues.com/Ms-A08-02.htm

Arbuckle, J. L. (2009). Amos 18 user's guide. Crawfordville, FL: Amos Development Corporation.

Australian Bureau of Statistics. (2007). National survey of mental health and wellbeing: Summary of results. Canberra.

Bach, A. K., Wincze, J. P., & Barlow, D. H. (2007). Sexual Dysfunction. In D. H. Barlow (Ed.), *Clinical Handbook of Psychological Disorders: A Step-by-Step Treatment Manual - Fourth Edition*. New York: The Guilford Press.

Baldwin, D. (2001). Depression and sexual dysfunction. *British Medical Bulletin, 57*, 81-99. doi: 10.1093/bmb/57.1.81

Balon, R. (2006). Mood, anxiety, and physical illness: Body and mind, or mind and body. *Depression and Anxiety, 23*, 377-387. doi: 10.1002/da.20217

Bancroft, J., Janssen, E., Strong, D., Carnes, L., Vukadinovic, Z., & Long, J. (2003a). The relation between mood and sexuality in heterosexual men. *Archives of Sexual Behavior, 32*, 217-230. doi: 10.1023/A:1023409516739

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

Barlow, D. H. (1986). Causes of sexual dysfunction: The role of anxiety and cognitive interference. *Journal of Consulting and Clinical Psychology, 54*, 140-148. doi: 10.1037/0022-006X.54.2.140

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

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

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

Basson, R. (2003). Biopsychosocial models of women's sexual response: Applications to management of 'desire disorders'. *Sexual and Relationship Therapy, 18*, 107-115. doi: 10.1080/1468199031000061308

Basson, R. (2005). Women's sexual dysfunction: Revised and expanded definitions. *Canadian Medical Journal, 172*, 1327-1333. doi: 10.1503/cmaj.1020174

Bayer AG, Zonagen Inc., & Target Health Inc. (2013). FSFI Website. Retrieved September 17th, 2013, from http://www.fsfiquestionnaire.com/

Berkson, J. (1946). Limitations of the application of fourfold table analysis to hospital data. *Biometrics Bulletin, 2*, 47-53. doi: 10.2307/3002000

Binik, Y. M., Reissing, E., Pukall, C., Flory, N., Payne, K. A., & Khalifé, S. (2002). The female sexual pain disorders: Genital pain or sexual dysfunction? *Archives of Sexual Behavior, 31*, 425-429. doi: 10.1023/A:1019892125163

Blumentals, W., Gomez-Caminero, A., Brown, R., Vannappagari, V., & Russo, L. (2004). A case-control study of erectile dysfunction among men diagnosed with panic disorder. *International Journal of Impotence Research, 16*, 299-302. doi: 10.1038/sj.ijir.3901147

Bocchio, M., Pelliccione, F., Mihalca, R., Ciociola, F., Necozione, S., Rossi, A., . . . Francavilla, S. (2009). Treatment of erectile dysfunction reduces psychological distress. *International Journal of Andrology, 32*, 74-80. doi: 10.1111/j.1365-2605.2007.00820.x

Boisseau, C. L., Farchione, T. J., Fairholme, C. P., Ellard, K. K., & Barlow, D. H. (2010). The development of the Unified Protocol for the transdiagnostic treatment of emotional disorders: A case study. *Cognitive and Behavioral Practice, 17*, 102-113. doi: 1077-7229/09/102–113

Bradford, A. & Meston, C. (2006). The impact of anxiety on sexual arousal in women. *Behaviour Research and Therapy, 44*, 1067-1077. doi: 10.1016/j.brat.2005.08.006

Brotto, L. A. (2009). Letter to the Editor. *Journal of Sex and Marital Therapy, 35*, 161-163. doi: 10.1080/00926230802716294

Brotto, L. A. (2010). The DSM diagnostic criteria for hypoactive sexual desire disorder in women. *Archives of Sexual Behavior, 39*, 221-239. doi: 10.1007/s10508-009-9543-1

Brotto, L. A., Basson, R., & Luria, M. (2008). A mindfulness-based group psychoeducational intervention targeting sexual arousal disorder in women. *Journal of Sexual Medicine, 5*, 1646-1659. doi: 10.1111/j.1743-6109.2008.00850.x

Brotto, L. A., Graham, C. A., Binik, Y. M., Segraves, R. T., & Zucker, K. J. (2010). Should sexual desire and arousal disorders in women be merged? A response to DeRogatis, Clayton, Rosen, Sand, and Pyke (2010). *Archives of Sexual Behavior*. doi: 10.1007/s10508-010-9706-0

Brown, C., Schulberg, H. C., Madonia, M. J., Shear, M. K., & Houck, P. R. (1996). Treatment outcomes for primary care patients with major depression and lifetime anxiety disorders. *American Journal of Psychiatry, 153*, 1293–1300. Retrieved from http://ajp.psychiatryonline.org/article.aspx?articleid=172002

Carvalho, J., Vieira, A. L., & Nobre, P. (2012). Latent structures of female sexual functioning. *Archives of Sexual Behavior, 41*, 907-917. doi: 10.1007/s10508-011-9865-7

Carvalho, J., Vieria, A. L., & Nobre, P. (2011). Latent structures of male sexual functioning. *Journal of Sexual Medicine, 8*, 2510-2511. doi: 10.1111/j.1743-6109.2011.02349.x

Caspi, A., Houts, R. M., Belsky, D. W., Goldman-Mellor, S. J., Harrington, H., Israel, S., . . . Moffitt, T. E. (2013). The p Factor: One General Psychopathology Factor in the Structure of Psychiatric Disorders? *Clinical Psychological Science, 2*, 119-137. doi: 10.1177/2167702613497473

Chambless, D. L., Caputo, G. C., Bright, P., & Gallagher, R. (1984). Assessment of 'fear of fear' in agoraphobics: The Body Sensations Questionnaire and the Agoraphobic Cognitions Questionnaire. *Journal of Consulting and Clinical Psychology, 52*, 1090-1097. doi: 10.1037//0022-006X.52.6.1090

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*, 5-56. doi: 10.1007/s10508-009-9556-9

Clark, L. A. & Watson, D. (1991). Tripartite model of anxiety and depression: Psychometric evidence and taxonomic implications. *Journal of Abnormal Psychology, 100*, 316-336. doi: 10.1037//0021-843X.100.3.316

Clark, L. A., Watson, D., & Reynolds, S. (1995). Diagnosis and classification of psychopathology: Challenges to the current system and future directions. *Annual Review of Psychology, 46*, 121-153. doi: 10.1146/annurev.ps.46.020195.001005

Clark, S. L., Muthen, B., Kaprio, J., D'Onofrio, B. M., Viken, R., Rose, R. J., & Smalley, S. (2013). Models and strategies for factor mixture analysis: Two examples concerning the structure underlying psychological disorders. *Structural Equation Modeling, 20*, 681-703. doi: 10.1080/10705511.2013.824786

Connor, K. M., Davidson, J. R. T., Churchill, L. E., Sherwood, A., Foa, E., & Weisler, R. H. (2000). Psychometric properties of the Social Phobia Inventory. *British Journal of Psychiatry, 176*, 379-386. doi: 10.1192/bjp.176.4.379

Cook, T. D. & Campbell, D. T. (1979). Inferring cause from passive observation *Quasi-experimentation: Design and analysis issues for field settings* (pp. 295-339). Chicago: Rand-McNally.

Corretti, G. & Baldi, I. (2007). The relationship between anxiety disorders and sexual dysfunction. *Psychiatric Times, 24*. Retrieved from http://www.psychiatrictimes.com/articles/relationship-between-anxiety-disorders-and-sexual-dysfunction - sthash.b4Vp7Peo.dpuf

Corretti, G., Pierucci, S., De Scisciolo, M., & Nisita, C. (2006). Comorbidity between social phobia and premature ejaculation: Study on 242 males affected by sexual disorders. *Journal of Sex & Martial Therapy, 32*, 183-187. doi: 10.1080/00926230500442342

de Visser, R. O., Smith, A. M., Rissel, C. E., Richters, J., & Grulich, A. E. (2003). Sex in Australia: heterosexual experience and recent heterosexual encounters among a

representative sample of adults. *Australian and New Zealand Journal of Public Health, 27*, 146-154. doi: 10.1111/j.1467-842X.2003.tb00802.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*, 357-364. doi: 10.1111/j.1743-6109.2007.00672.x

Derogatis, L. R., Meyer, J. K., & King, K. M. (1981). Psychopathology in individuals with sexual dysfunction. *American Journal of Psychiatry, 138*, 757-763. Retrieved from http://ajp.psychiatryonline.org/article.aspx?Volume=138&page=757&journalID=13

Donahey, K. M. & Carroll, R. A. (1993). Gender differences in factors associated with hypoactive sexual desire. *Journal of Sex and Marital Therapy, 19*, 25-40. doi: 10.1080/00926239308404886

Dunn, K. M., Croft, P. R., & Hackett, G. I. (1998). Sexual problems: A study of the prevalence and need for health care in the general population. *Family Practice, 15*, 519-524. doi: 10.1093/fampra/15.6.519

Dunn, K. M., Croft, P. R., & Hackett, G. I. (1999). Association of sexual problems with social, psychological, and physical problems in men and women: A cross sectional population survey. *Journal of Epidemiology and Community Health, 53*, 144-148. doi: 10.1136/jech.53.3.144

Eaton, N. R., Krueger, R. F., Markon, K. E., Keyes, K. M., Skodol, A. E., Wall, M., . . . Grant, B. F. (2013). The structure and predictive validity of the Internalizing disorders. *Journal of Abnormal Psychology, 122*, 86-92. doi: 10.1037/a0029598

Edwards, A. L. (1976). *Introduction to linear regression and correlation*. San Francisco, CA: W. H. Freeman and Co.

Ehrenreich, J. T., Buzzella, B., & Barlow, D. H. (2007). General therapeutic principles for the treatment of emotional disorders. In S. H. J. Weinberger (Ed.), *The art and science of psychotherapy*: Brunner-Routledge.

Ellard, K. K., Fairholme, C. P., Boisseau, C. L., Farchione, T. J., & Barlow, D. H. (2010). Unified protocol for the transdiagnostic treatment of emotional disorders: protocol development and initial outcome data. *Cognitive and Behavioral Practice, 17*, 88-101. doi: 1077-7229/09/88–10

Elliot, A. N. & O'Donohue, W. T. (1997). The effects of anxiety and distraction on sexual arousal in a nonclinical sample of heterosexual women. *Archives of Sexual Behavior, 26*, 607-624. doi: 10.1016/j.brat.2005.08.006

Enders, C. K. (2011). Analyzing longitudinal data with missing values. *Rehabilitation Psychology, 56*, 267-288. doi: 10.1037/a0025579

Feinstein, A. R. (1970). The pre-therapeutic classification of co-morbidity in chronic disease. *Journal of Chronic Diseases, 23*, 455-468. doi: 10.1016/0021-9681(70)90054-8

Figueira, I., Possidente, E., Marques, C., & Hayes, K. (2001). Sexual dysfunction: A neglected complication of panic disorder and social phobia. *Archives of Sexual Behavior, 30*, 369-377. doi: 10.1023/A:1010257214859

First, M. (2009). Reorganizing the diagnostic groupings in DSM-V and ICD-11: A cost/benefit analysis. *Psychological Medicine, 39*, 2091-2097. doi: 10.1017/S0033291709991152

Foa, E., Huppert, J. D., Leiberg, S., Lagner, R., Kichic, R., Hajcak, G., & Salkovskis, P. M. (2002). The Obsessive-Compulsive Inventory: Development and validation of a short version. *Psychological Assessment, 14*, 485-496. doi: 10.1037/1040-3590.14.4.485

Forbes, M. K. (2014). Response to Rosen et al. (2014) "Commentary on 'Critical Flaws in the FSFI and IIEF'". *Journal of Sex Research, 51*, 498-502. doi: 10.1080/00224499.2014.895795

Forbes, M. K., Baillie, A. J., & Schniering, C. A. (2014). Critical flaws in the Female Sexual Function Index and the International Index of Erectile Function. *Journal of Sex Research, 51*, 485-491. doi: 10.1080/00224499.2013.876607

Forbes, M. K. & Schniering, C. A. (2013). Are sexual problems a form of internalizing psychopathology? A structural equation modeling analysis. *Archives of Sexual Behavior, 42*, 23-44. doi: 10.1007/s10508-012-9948-0

Frohlich, P. & Meston, C. (2002). Sexual functioning and self-reported depressive symptoms among college women. *Journal of Sex Research, 39*, 321-326. doi: 10.1080/00224490209552156

Gerstenberger, E. P., Rosen, R. C., Brewer, J. V., Meston, C. M., Brotto, L. A., Wiegel, M., & Sand, M. (2010). Sexual desire and the female sexual function index (FSFI): A sexual desire cutpoint for clinical interpretation of the FSFI in women with and without hypoactive sexual desire disorder. *Journal of Sexual Medicine, 7*, 3096-3103. doi: 10.1111/j.1743-6109.2010.01871.x

Giles, K. & McCabe, M. (2009). Conceptualizing women's sexual function: Linear vs. circular models of response. *Journal of Sexual Medicine, 6*, 2761-2771. doi: 10.1111/j.1743-6109.2009.01425.x

Goldberg, D. P. (2014). Psychopathology and classification in psychiatry. *Social Psychiatry and Psychiatric Epidemiology*, 1-5. doi: 10.1007/s00127-014-0924-y

Goldberg, D. P., Krueger, R. F., Andrews, G., & Hobbs, M. J. (2009). Emotional Disorders: Cluster 4 of the proposed meta-structure for DSM-V and ICD-11. *Psychological Medicine, 39*, 2043-2059. doi: 10.1017/S0033291709990298

Gorman, J. M. (1997). Comorbid depression and anxiety spectrum disorders. *Depression and Anxiety, 4*, 160–168. doi: 10.1002/(SICI)1520-6394(1996)4:4%3C160::AID-DA2%3E3.0.CO;2-J

Graziottin, A. (1998). The biological basis of female sexuality. *International Clinical Psychopharmacology, 13*, S15-S22. doi: 10.1097/00004850-199807006-00004

Harris, J. M., Cherkas, L. F., Kato, B. S., Heiman, J. R., & Spector, T. D. (2008). Normal variations in personality are associated with coital orgasmic infrequency in heterosexual women: a population-based study. *Journal of Sexual Medicine, 5*, 1177-1183. doi: 10.1111/j.1743-6109.2008.00800.x

Harrison, C. (2009). Sexual health. In H. Britt & G. C. Miller (Eds.), *General practice in Australia, health priorities and policies 1998 to 2008* (Vol. General practice series no. 24. Cat. no. GEP 24). Canberra: Australian Institute of Health and Welfare.

Harvey, A. G., Watkins, E. R., Mansell, W., & Shafran, R. (2004). *Cognitive behavioural processes across psychological disorders: A transdiagnostic approach to research and treatment*. Oxford: Oxford University Press.

Hayes, R. (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. doi: 10.1071/SH08016

Heiman, J. (2002). Psychologic treatments for female sexual dysfunction: Are they effective and do we need them? *Archives of Sexual Behavior, 31*, 445-450. doi: 10.1023/A:1019848310142

Henry, J. D. & Crawford, J. R. (2005). The short-form version of the Depression Anxiety Stress Scales (DASS-21): Construct validity and normative data in a large non-clinical sample. *British Journal of Clinical Psychology, 44*, 227-239. doi: 10.1348/014466505X29657

Houck, P. R., Spiegel, M. D., Shear, M. K., & Stat, P. R. D. (2002). Reliability of the self-report version of the panic disorder severity scale. *Depression and Anxiety, 15*, 183-185. doi: 10.1002/da.10049

Hoyer, J., Uhmann, S., Rambow, J., & Jacobi, F. (2009). Reduction of sexual dysfunction: By-product of cognitive-behavioral therapy for psychological disorders? *Sexual and Relationship Therapy, 24*, 64-73. doi: 10.1080/14681990802649938

Hu, L. & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1-55. doi: 10.1080/10705519909540118

Insel, T. R. & Lieberman, J. A. (2013). DSM-5 and RDoC: Shared Interests. Retrieved June, 2013, from http://www.nimh.nih.gov/news/science-news/2013/dsm-5-and-rdoc-shared-interests.shtml

Jackson, D. L., Gillaspy, J. A., & Purc-Stephenson, R. (2009). Reporting practices in confirmatory factor analysis: An overview and some recommendations. *Psychological Methods, 14*, 6-23. doi: 10.1037/a0014694

James, L. M. & Taylor, J. (2008). Revisiting the structure of mental disorders: Borderline personality disorder and the internalizing/externalizing spectra. *British Journal of Clinical Psychology, 47*, 361-380. doi: 10.1348/014466508X299691

Jones, L. M. & McCabe, M. P. (2011). The effectiveness of an internet-based psychological treatment program for female sexual dysfunction. *Journal of Sexual Medicine, 8*, 2781-2792. doi: 10.1111/j.1743-6109.2011.02381.x

Kalmbach, D. A., Ciesla, J. A., Janata, J. W., & Kingsberg, S. A. (2012). Specificity of anhedonic depression and anxious arousal with sexual problems among sexually healthy young adults. *Journal of Sexual Medicine, 9*, 505-513. doi: 10.1111/j.1743-6109.2011.02533.x

Kaplan, H. S. (1979). *Disorders of sexual desire and other new concepts and techniques in sex therapy*: Bruner Meisel U.

Kaya, B., Unal, S., Ozenlia, Y., Gursoy, N., Tekiner, S., & Kafkasli, A. (2006). Anxiety, depression and sexual dysfunction in women with chronic pelvic pain. *Sexual and Relationship Therapy, 21*, 187-196. doi: 10.1080/14681990500359897

Kendler, K. S. (2009). Introduction to 'A proposal for a meta-structure for DSM-V and ICD-11'. *Psychological Medicine, 39*, 1991. doi: 10.1017/S0033291709991772

Kendler, K. S., Prescott, C. A., Myers, J., & Neale, M. C. (2003). The structure of genetic and environmental risk factors for common psychiatric and substance use disorders in men and women. *Archives of General Psychiatry, 60*, 929-937. doi: 10.1001/archpsyc.60.9.929

Kendurkar, A. & Kaur, B. (2008). Major depressive disorder, obsessive-compulsive disorder, and generalized anxiety disorder: do the sexual dysfunctions differ? *Primary Care Companion for the Journal of Clinical Psychiatry, 10*, 299-305. doi: 10.4088/PCC.v10n0405

Kennedy, S., Dickens, S., Eisfeld, B., & Bagby, M. (1999). Sexual dysfunction before antidepressant therapy in major depression. *Journal of Affective Disorders, 56*, 201-208. doi: 10.1016/S0165-0327(99)00050-6

Kessler, R. C., Chiu, W. T., Demler, O., & Walters, E. E. (2005). Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry, 62*, 617 - 627. doi: 10.1001/archpsyc.62.6.617

Kessler, R. C., McGonagle, K. A., Zhao, S., Nelson, C. B., Hughes, M., Eshleman, S., . . . Kendler, K. S. (1994). Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States. *Archives of General Psychiatry, 51*, 8-19. doi: archpsyc.1994.03950010008002

Kessler, R. C. & Price, R. H. (1993). Primary prevention of secondary disorders: A proposal and agenda. *American Journal of Community Psychology, 21*, 607-. doi: 10.1007/BF00942174

Klein, D. N. & Riso, L. P. (1993). Psychiatric Disorders: Problems of boundaries and comorbidity. In C. G. E. Costello (Ed.), *Basic issues in psychopathology* (pp. 19-66). New York: Guilford Press.

Kline, R. B. (2004). *Principles and practice of structural equation modelling* (Second ed.). New York: Guilford Press.

Kontula, O. & Haavio-Mannila, E. (2009). The impact of aging on human sexual activity and sexual desire. *Journal of Sex Research, 46*, 46-56. doi: 10.1080/00224490802624414

Kotov, R., Chang, S., Fochtmann, L., Mojtabai, R., Carlson, G., Sedler, M., & Bromet, E. (2010). Schizophrenia in the internalizing-externalizing framework: A third dimension. *Schizophrenia Bulletin, 24*, 1-11. doi: 10.1093/schbul/sbq024

Kramer, M. D., Krueger, R. F., & Hicks, B. M. (2008). The role of internalizing and externalizing liability factors in accounting for gender differences in the prevalence of common psychopathological syndromes. *Psychological Medicine, 38*, 51-61. doi: /10.1017/S0033291707001572

Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2001). The PHQ-9: validity of a brief depression severity measure. *Journal of General Internal Medicine, 16*, 606-613. doi: 10.1046/j.1525-1497.2001.016009606.x

Krueger, R. F. (1999). The structure of common mental disorders. *Archives of General Psychiatry, 56*, 921-926. doi: 10.1001/archpsyc.56.10.921

Krueger, R. F. (2005). Continuity of axes I and II: Toward a unified model of personality disorders, and clinical disorders. *Journal of Personality Disorders, 19*, 233-261. doi: 10.1521/pedi.2005.19.3.233

Krueger, R. F., Caspi, A., Moffit, T., & Silva, P. (1998). The structure and stability of common mental disorders (DSM-III-R): A longitudinal-epidemiological study. *Journal of Abnormal Psychology, 107*, 216-227. doi: 10.1037//0021-843X.107.2.216

Krueger, R. F., Chentsova-Dutton, Y. E., Markon, K. F., Goldberg, D., & Ormel, J. (2003). A cross-cultural study of the structure of comorbidity among common psychopathological syndromes in the general health care setting. *Journal of Abnormal Psychology, 112*, 437-447. doi: 10.1037/0021-843X.112.3.437

Krueger, R. F. & Finger, M. (2001). Using item response theory to understand comorbidity among anxiety and unipolar mood disorders. *Psychological Assessment, 13*, 140-151. doi: 10.1037//1040-3590.13.1.140

Krueger, R. F. & Markon, K. E. (2006). Reinterpreting comorbidity: A model-based approach to understanding and classifying psychopathology. *Annual Review of Clinical Psychology, 2*, 111-133. doi: 10.1146/annurev.clinpsy.2.022305.095213

Krueger, R. F., Markon, K. E., Patrick, C. J., & Iacono, W. G. (2005a). Externalizing psychopathology in adulthood: A dimensional-spectrum conceptualization and its implications for DSM-V. *Journal of Abnormal Psychology, 114*, 537-550. doi: 10.1037/0021-843X.114.4.537

Krueger, R. F. & Piasecki, T. M. (2002). Toward a dimensional and psychometrically-informed approach to conceptualizing psychopathology. *Behaviour Research and Therapy, 40*, 485-499. doi: 10.1016/S0005-7967(02)00016-5

Krueger, R. F., Watson, D., & Barlow, D. H. (2005b). Introduction to the special section: Toward a dimensionally based taxonomy of psychopathology. *Journal of Abnormal Psychology, 114*, 491-493. doi: 10.1037/0021-843X.114.4.491

Kushner, M. G., Krueger, R. F., Wall, M. M., Maurer, E. W., Menk, J. S., & Menary, K. R. (2013). Modeling and treating internalizing psychopathology in a clinical trial: A

latent variable structural equation modeling approach. *Psychological Medicine*, 1-13. doi: 10.1017/S0033291712002772

Laumann, E. O., Paik, A., & Rosen, R. C. (1999). Sexual dysfunction in the United States: Prevalence and predictors. *American Medical Association, 281*, 537-541. doi: 10.1001/jama.281.6.537

Laurent, S. M. & Simons, A. D. (2009). Sexual dysfunction in depression and anxiety: Conceptualizing sexual dysfunction as part of an internalizing dimension. *Clinical Psychology Review, 29*, 573-585. doi: 10.1016/j.cpr.2009.06.007

Lewis, R. W., Fugl-Meyer, K. S., Bosch, R., Fugl-Meyer, A. R., Laumann, E. O., Lizza, E., & Martin-Morales, A. (2004). Epidemiology/risk factors of sexual dysfunction. *Journal of Sexual Medicine, 1*, 35-39. doi: 10.1111/j.1743-6109.2004.10106.x

Lilienfeld, S. O., Waldman, I. D., & Israel, A. C. (1994). A critical examination of the use of the term and concept of *comorbidity* in psychopathology research. *Clinical Psychology: Science and Practice, 1*, 71-83. doi: 10.1111/j.1468-2850.1994.tb00007.x

Lo, Y., Mendell, N. R., & Rubin, D. B. (2001). Testing the number of components in a normal mixture. *Biometrika, 88*, 767-778. doi: 10.1093/biomet/88.3.767

Lovibond, S. H. & Lovibond, P. F. (1995). *Manual for the Depression Anxiety Stress Scales*. Sydney: Psychology Foundation.

Lowe, B., Decker, O., Muller, S., Brahler, E., Schellberg, D., Herzog, W., & Herzberg, P. Y. (2008). Validation and standardization of the Generalized Anxiety Disorder Screener (GAD-7) in the general population. *Medical Care, 36*, 266-274. doi: 10.1097/MLR.0b013e318160d093

Lowe, B., Kroenke, K., Herzog, W., & Grafe, K. (2004). Measuring depression outcome with a brief self-report instrument: sensitivity to change of the Patient Health Questionnaire (PHQ-9). *Journal of Affective Disorders, 81*, 61-66. doi: 10.1016/S0165-0327(03)00198-8

Lubke, B. & Neale, M. C. (2006). Distinguishing between latent classes and continuous factors: Resolution by maximum likelihood? *Multivariate Behavioral Research, 41*, 499-532. doi: 10.1207/s15327906mbr4104_4

Lutfey, K., Link, C., Rosen, R., Wiegel, M., & McKinlay, J. (2009). Prevalence and correlates of sexual activity and function in women: Results from the Boston Area Community Health (BACH) Survey. *Archives of Sexual Behavior, 38*, 514-527. doi: 10.1007/s10508-007-9290-0

Lykins, A. D., Janssen, E., & Graham, C. A. (2006). The relationship between negative mood and sexuality in heterosexual college women and men. *Journal of Sex Research, 43*, 136-143. doi: 10.1080/00224490609552308

Maj, M. (2005). "Psychiatric comorbidity": an artefact of current diagnostic systems? *British Journal of Psychiatry, 186*, 182-184. doi: 10.1192/bjp.186.3.182

Markon, K. E. (2010). Modeling psychopathology structure: A symptom-level analysis of Axis I and II disorders. *Psychological Medicine, 40*, 273-288. doi: 10.1017/S0033291709990183

Markon, K. E., Krueger, R. F., & Watson, D. (2005). Delineating the structure of normal and abnormal personality: An integrative hierarchical approach. *Journal of Personality and Social Psychology, 88*, 139-157. doi: 10.1037/0022-3514.88.1.139

Marsh, H. W., Hau, K. T., & Wen, Z. (2004). In search of golden rules: Comment on hypothesis-testing approaches to setting cutoff values for fit indexes and dangers in overgeneralizing Hu and Bentler's (1999) findings. *Structural Equation Modeling, 11*, 320-341. doi: 10.1207/s15328007sem1103_2

Masters, W. H. & Johnson, V. E. (1970). *Human sexual inadequacy*. Toronto, New York: Bantam Books.

Masyn, K. E., Henderson, C. E., & Greenbaum, P. E. (2010). Exploring the latent structures of psychological constructs in social development using the dimensional-categorical spectrum. *Social Development, 19*, 470-493. doi: 10.1111/j.1467-9507.2009.00573.x

Mataix-Cois, D., Pertusa, A., & Leckman, J. F. (2007). Issues for DSM-V: How should Obsessive-Compulsive and related disorders be classified? *American Journal of Psychiatry, 164*. doi: 10.1176/appi.ajp.2007.07040568

Matic, H. & McCabe, M. P. (2007). The impact of the use of PDE5 inhibitors for erectile dysfunction on the lives of Australian men. *International Journal of Impotence Research, 19*, 418-423. doi: 10.1038/sj.ijir.3901566

McCabe, M. P. (1997). Intimacy and quality of life among sexually dysfunctional men and women. *Journal of Sex and Marital Therapy, 23*, 276-290. doi: 10.1080/00926239708403932

McCabe, M. P. (2001). Evaluation of a Cognitive Behavior Therapy Program for People with Sexual Dysfunction. *Journal of Sex and Marital Therapy, 27*, 259-271. doi: 10.1080/009262301750257119

McCabe, M. P. (2005). The role of anxiety in the development and maintenance of sexual dysfunction in men and women. *International Journal of Stress Management, 12*, 379-388. doi: 10.1037/1072-5245.12.4.379

McCabe, M. P. & Goldhammer, D. L. (2013). Prevalence of women's sexual desire problems: What criteria do we use? *Archives of Sexual Behavior, 42*, 1073-1078. doi: 10.1007/s10508-013-0107-z

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

Mercer, C., Fenton, K., Johnson, M., Wellings, K., Macdowall, W., McManus, S., . . . Erens, B. (2003). Sexual function problems and health seeking behaviour in Britain: national

probability sample survey. *British Medical Journal, 327*, 426-427. doi: 10.1136/bmj.327.7412.426

Meredith, W. (1993). Measurement invariance, factor analysis and factorial invariance. *Psychometrika, 58*, 525-543. doi: 10.1007/BF02294825

Meston, C. M. & Buss, D. M. (2007). Why humans have sex. *Archives of Sexual Behavior, 36*, 477-507. doi: 10.1007/s10508-007-9175-2

Meston, C. M. & Frohlich, P. F. (2000). The neurobiology of sexual function. *Archives of General Psychiatry, 57*, 1012-1030. doi: 10.1001/archpsyc.57.11.1012

Meyer-Bahlburg, H. F. L. & Dolezal, C. (2007). The Female Sexual Function Index: A methodological critique and suggestions for improvement. *Journal of Sex and Marital Therapy, 33*, 217-224. doi: 10.1080/00926230701267852

Michael, A. & O'Keane, V. (2000). Sexual dysfunction in depression. *Human Psychopharmacology: Clinical and Experimental, 15*, 337-345. doi: 10.1002/1099-1077(200007)15:5<337::AID-HUP207>3.0.CO;2-H

Mineka, S., Watson, D., & Clark, L. A. (1998). Comorbidity of anxiety and unipolar mood disorders. *Annual Review of Psychology, 49*, 377-412. doi: 10.1146/annurev.psych.49.1.377

Moreira, E., Glasser, D., King, R., Duarte, F., & Gingell, C. (2008). Sexual difficulties and help-seeking among mature adults in Australia: results from the Global Study of Sexual Attitudes and Behaviours. *Sexual Health, 5*, 227-234. doi: 10.1071/SH0705

Moyano, N. & Sierra, J. C. (2013). Relationships between personality traits and positive/negative sexual cognitions. *International Journal of Clinical and Health Psychology, 13*, 189-196. doi: 10.1016/S1697-2600(13)70023-1

Muthén, B. O. (2002). Beyond SEM: latent variable modeling. *Behaviormetrika, 29*, 81-117. doi: 10.2333/bhmk.29.81

Muthén, L. K. & Muthén, B. O. (2011). *Mplus User's Guide.* (Sixth Edition. ed.). Los Angeles, CA: Muthén & Muthén.

Najman, J., Dunne, M., Boyle, F., Cook, M., & Purdie, D. (2003). Sexual dysfunction in the Australian population. *Australian Family Physician, 32*, 951-954. Retrieved from http://www.academia.edu/4906022/Sexual_dysfunction_in_the_Australian_population

National Institute of Mental Health. (2011). NIMH Research Domain Criteria (RDoC) Draft 3.1: June, 2011. Retrieved June, 2011, from http://www.nimh.nih.gov/research-priorities/rdoc/nimh-research-domain-criteria.htm

Neale, M. C. & Kendler, K. S. (1995). Models of comorbidity for multifactorial disorders. *American Journal of Human Genetics, 57*, 935-953.

Nobre, P. J. (2009). Determinants of sexual desire problems in women: testing a cognitive-emotional model. *Journal of Sex and Marital Therapy, 35*, 360-377. doi: 10.1080/00926230903065716

Nobre, P. J. & Pinto-Gouveia, J. (2003). Sexual modes questionnaire: Measure to assess the interaction among cognitions, emotions, and sexual response. *Journal of Sex Research, 40*, 368-382. doi: 10.1080/00224490209552203

Nobre, P. J. & Pinto-Gouveia, J. (2006). Dysfunctional sexual beliefs as vulnerability factors for sexual dysfunction. *Journal of Sex Research, 43*, 68-75. doi: 10.1080/00224490609552300

Nobre, P. J. & Pinto-Gouveia, J. (2008). Cognitive and emotional predictors of female sexual dysfunctions: preliminary findings. *Journal of Sex and Marital Therapy, 34*, 325-342. doi: 10.1080/00926230802096358

Nobre, P. J. & Pinto-Gouveia, J. (2009). Cognitive schemas associated with negative sexual events: A comparison of men and women with and without sexual dysfunction. *Archives of Sexual Behavior, 38*, 842-851. doi: 10.1007/s10508-008-9450-x

Nobre, P. J., Pinto-Gouveia, J., & Gomes, F. A. (2006). Prevalence and comorbidity of sexual dysfunctions in a Portuguese clinical sample. *Journal of Sex and Marital Therapy, 32*, 173-182. doi: 10.1080/00926230500442334

Nofzinger, E. A., Thase, M. E., Reynolds, C. F., Frank, E., Jennings, R., Garamoni, G. L., . . . Kupfer, D. J. (1993). Sexual function in depressed men: assessment by self-report, behavioral, and nocturnal penile tumescence measures before and after treatment with cognitive behavior therapy. *Archives of General Psychiatry, 50*, 24-30. doi: archpsyc.1993.01820130026005

Nolen-Hoeksema, S. & Watkins, E. R. (2011). A Heuristic for Developing Transdiagnostic Models of Psychopathology: Explaining Multifinality and Divergent Trajectories. *Perspectives on Psychological Science, 6*, 589-609. doi: 10.1177/1745691611419672

Nylund, K. L., Asparouhov, T., & Muthén, B. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling, 14*, 535–569. doi: 10.1080/10705510701575396

O'Connor, B. (2002). The search for dimensional structure differences between normality and abnormality: A statistical review of published data on personality and psychopathology. *Journal of Personality and Social Psychology, 83*, 962-982. doi: 10.1037/0022-3514.83.4.962

Oliveira, C. & Nobre, P. J. (2013). The role of trait-affect, depression, and anxiety in women with sexual dysfunction: a pilot study. *Journal of Sex and Marital Therapy, 39*, 436-452. doi: 10.1080/0092623X.2012.665813

Palace, E. & Gorzalka, B. (1990). The enhancing effects of anxiety on arousal in sexually dysfunctional and functional women. *Journal of Abnormal Psychology, 99*, 403-411. doi: 10.1037/0021-843X.99.4.403

Peixoto, M. & Nobre, P. (2012). Trait-affect, depressed mood, and male sexual functioning: A preliminary study. *Journal of Sexual Medicine*. doi: 10.1111/j.1743-6109.2012.02779.x

Quinta Gomes, A. L. & Nobre, P. J. (2011). Personality traits and psychopathology on male sexual dysfunction: an empirical study. *Journal of Sexual Medicine, 8*, 461-469. doi: 10.1111/j.1743-6109.2010.02092.x

Quirk, F. H., Haughie, S., & Symonds, T. (2005). The use of the Sexual Function Questionnaire as a screening tool for women with sexual dysfunction. *Journal of Sexual Medicine, 2*, 469-477. doi: 10.1111/j.1743-6109.2005.00076.x

Quirk, F. H., Heiman, J. R., Rosen, R. C., Laan, E., Smith, M. D., & Boolell, M. (2002). Development of a sexual function questionnaire for clinical trials of female sexual dysfunction. *Journal of Women's Health and Gender-Based Medicine, 11*, 277-289. doi: 10.1089/152460902753668475

Read, S., King, M., & Watson, J. (1997). Sexual dysfunction in primary medical care: Prevalence, characteristics and detection by the general practitioner. *Journal of Public Health Medicine, 19*, 387-391. doi: 10.1093/oxfordjournals.pubmed.a024665

Redmond, D., Kosten, T., & Reiser, M. (1983). Spontaneous ejaculation associated with anxiety: psychophysiological considerations. *American Journal of Psychiatry, 140*, 1163-1166. Retrieved from http://ajp.psychiatryonline.org/article.aspx?articleid=161001

Rellini, A. H., McCall, K. M., Randall, P. K., & Meston, C. M. (2005). The relationship between women's subjective and physiological sexual arousal. *Psychophysiology, 42*, 116-124. doi: 10.1111/j.1469-8986.2005.00259.x

Richters, J., Grulich, A. E., de Visser, R. O., Smith, A. M. A., & Rissel, C. E. (2003). Sex in Australia: Sexual difficulties in a representative sample of adults. *Australian and New*

Zealand Journal of Public Health, 27, 164-170. doi: 10.1111/j.1467-842X.2003.tb00804.x

Rosen, R. C. (2000). Prevalence and risk factors of sexual dysfunction in men and women. *Current Psychiatry Reports, 2*, 189-195. doi: 10.1007/s11920-996-0006-2

Rosen, R. C., Brown, C., Heiman, J., Leiblum, S., Meston, C., Shabsigh, R., . . . D'Agostino, R. (2000). The Female Sexual Function Index (FSFI): A multidimensional self-report instrument for the assessment of female sexual function. *Journal of Sex and Marital Therapy, 26*, 191-208. doi: 10.1080/009262300278597

Rosen, R. C., Cappelleri, J. C., & Gendrano, N. (2002). The International Index of Erectile Function (IIEF): A state-of-the-science review. *International Journal of Impotence Research, 14*, 226-244. doi: 10.1038/sj.ijir.3900857

Rosen, R. C., Cappelleri, J. C., Smith, M. D., Lipsky, J., & Peña, B. M. (1999). Development and evaluation of an abridged, 5-item version of the International Index of Erectile Function (IIEF-5) as a diagnostic tool for erectile dysfunction. *International Journal of Impotence Research, 11*, 319-326. doi: 10.1038/sj.ijir.3900472

Rosen, R. C., Revicki, D. A., & Sand, M. (2014). Commentary on "Critical Flaws in the FSFI and IIEF". *The Journal of Sex Research, 51*, 492-497. doi: 10.1080/00224499.2014.894491

Rosen, R. C., Riley, A., Wagner, G., Osterloh, I. H., Kirkpatrick, J., & Mishra, A. (1997). The International Index of Erectile Dysfunction (IIEF): A multidimensional scale for assessment of erectile dysfunction. *Urology, 49*, 822-830. doi: 10.1016/S0090-4295(97)00238-0

Rubin, D. B. (1976). Inference and missing data. *Biometrika, 63*, 581-592. doi: 10.1093/biomet/63.3.581

Sanislow, C. A., Pine, D. S., Quinn, K. J., Kozak, M. J., Garvey, M. A., Heinssen, R. K., . . . Cuthbert, B. N. (2010). Developing constructs for psychopathology research:

Research Domain Criteria. *Journal of Abnormal Psychology, 119*, 631-639. doi: 10.1037/a0020909

Schumacker, R. E. & Lomax, R. G. (2004). *A beginner's guide to structural equation modeling*. Oxford: Routledge.

Seidman, S. N. & Roose, S. P. (2000). The relationship between depression and erectile dysfunction. *Current Psychiatry Reports, 2*, 201-205. doi: 10.1007/s11920-996-0008-0

Shabsigh, R., Klein, L., Seidman, S., Kaplan, S., Lehrhoff, B., & Ritter, J. (1998). Increased incidence of depressive symptoms in men with erectile dysfunction. *Adult Urology, 52*, 848-852. doi: 10.1016/S0090-4295(98)00292-1

Shabsigh, R., Zakaria, L., Anastasiades, A. G., & Seidman, A. S. (2001). Sexual Dysfunction and depression: etiology, prevalence, and treatment. *Current Urology Reports, 2*, 463-467. doi: 10.1007/s11934-001-0040-x

Shear, M. K., Brown, T. A., Barlow, D. H., Money, R., Sholomskas, D. E., Woods, S. W., . . . Papp, L. A. (1997). Multicenter collaborative Panic Disorder Severity Scale. *American Journal of Psychiatry, 154*, 1571-1575. Retrieved from http://ajp.psychiatryonline.org/article.aspx?articleid=172570

Slade, T. & Watson, D. (2006). The structure of common DSM-IV and ICD-10 mental disorders in the Australian general population. *Psychological Medicine, 36*, 1593-1600. doi: 10.1017/S0033291706008452

Smith, A. M. A., Pitts, M. K., Shelley, J. M., Richters, J., & Ferris, J. (2007). The Australian longitudinal study of health and relationships. *BMC Public Health, 7*, 139. doi: 10.1186/1471-2458-7-139

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

Spitzer, R. L., Kroenke, K. K., Williams, J. B. W., & Lowe, B. (2006). A brief measure for assessing generalized anxiety disorder: The GAD-7. *Archives of Internal Medicine, 166*, 1092-1097. doi: 10.1001/archinte.166.10.1092

Stengel. (1959). Classification of mental disorders. *Bulletin of the World Health Organization, 21*, 601-663. Retrieved from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2537983/

Strand, J., Wise, T. N., Fagan, P. J., & Schmidt, C. W. (2002). Erectile dysfunction and depression: Category or dimension? *Journal of Sex and Marital Therapy, 28*, 175-181. doi: 10.1080/00926230252851906

ter Kuile, M. M., Both, S., & van Lankveld, J. J. D. M. (2010). Cognitive behavioral therapy for sexual dysfunctions in women. *Psychiatry Clinics of North America, 33*, 595-610. doi: 10.1016/j.psc.2010.04.010

Trudel, G., Landry, L., & Larose, Y. (1997). Low sexual desire: The role of anxiety, depression and marital adjustment. *Sexual and Relationship Therapy, 12*, 95-99. doi: 10.1080/02674659708408204

Trudel, G., Marchand, A., Ravart, M., Aubin, S., Turgeon, L., & Fortier, P. (2001). The effect of a cognitive-behavioral group treatment program on hypoactive sexual desire in women. *Sexual and Relationship Therapy, 16*, 145-164. doi: 10.1080/14681990120040078

van den Hout, M. & Barlow, D. (2000). Attention, arousal and expectancies in anxiety and sexual disorders. *Journal of Affective Disorders, 61*, 241-256. doi: 10.1016/S0165-0327(00)00341-4

van Lankveld, J. J. D. M. & Grotjohann, Y. (2000). Psychiatric comorbidity in heterosexual couples with sexual dysfunction assessed with the Composite International Diagnostic Interview. *Archives of Sexual Behavior, 29*, 479-498. doi: 10.1023/A:1001995704034

van Minnen, A. & Kampman, M. (2000). The interaction between anxiety and sexual function: A controlled study of sexual functioning in women with anxiety disorders. *Sexual and Relationship Therapy, 15*, 47-57. doi: 10.1080/14681990050001556

Vollebergh, W., Iedema, J., Bijl, R., de Gråaf, R., Smit, F., & Ormel, J. (2001). The structure and stability of common mental disorders: the NEMESIS study. *Archives of General Psychiatry, 58*, 597-603. doi: 10.1001/archpsyc.58.6.597

Vulink, N., Denys, D., Bus, L., & Westenberg, H. (2006). Sexual pleasure in women with obsessive-compulsive disorder? *Journal of Affective Disorders, 91*, 19-25. doi: 10.1016/j.jad.2005.12.006

Watson, D. (2005). Rethinking the mood and anxiety disorders: A quantitative hierarchical model for DSM-V. *Journal of Abnormal Psychology, 114*, 522-536. doi: 10.1037/0021-843X.114.4.522

Weston, R. & Gore, P. A. (2006). A brief guide to structural equation modeling. *The Counseling Psychologist, 34*, 719-751. doi: 10.1177/0011000006286345

Widiger, T. & Samuel, D. (2005). Diagnostic categories or dimensions? A question for the Diagnostic and Statistical Manual of Mental Disorders - Fifth Edition. *Journal of Abnormal Psychology, 114*, 494-504. doi: 10.1037/0021-843X.114.4.494

Widiger, T. & Sankis, L. (2000). Adult psychopathology: Issues and controversies. *Annual Review of Psychology, 51*, 377-404. doi: 10.1146/annurev.psych.51.1.377

Widiger, T. & Trull, T. (2007). Plate techtonics in the classification of personality disorder: Shifting to a dimensional model. *American Psychologist, 62*, 71-83. doi: 10.1037/0003-066X.62.2.71

Wiegel, M., Meston, C., & Rosen, R. C. (2005). The Female Sexual Function Index (FSFI): Cross-validation and development of clinical cutoff scores. *Journal of Sex and Marital Therapy, 31*, 1-20. doi: 10.1080/00926230590475206

Wiegel, M., Scepkowski, L. A., & Barlow, D. H. (2007). Cognitive-affective processes in sexual arousal and sexual dysfunction. In E. Janssen (Ed.), *The psychophysiology of sex* (pp. 143-165). Indiana University Press: Bloomington.

Williams, K., Abraham, L., & Symonds, T. (2010). Psychometric validation of an abbreviated version of the Sexual Function Questionnaire (ASFQ). *Value in Health, 13*, A381. doi: 10.1016/S1098-3015(11)72548-7

Wolpe, J. (1958). *Psychotherapy by Reciprocal Inhibition*. Stanford, CA.: Stanford University Press.

World Health Organization. (2008). *ICD - 10: International statistical classification of diseases and related health problems* (10th Rev. ed.). New York: World Health Organization.

World Health Organization. (2013). ICD-11 Beta Draft. Retrieved December 13, 2013, from http://www.who.int/classifications/icd11

World Health Organization. (2014). ICD-11 Beta Draft User Guide. Retrieved June 23, 2014, from http://apps.who.int/classifications/icd11/browse/Help/Get/architecture/en

Yule, M., Davison, J., & Brotto, L. (2011). The International Index of Erectile Function: A methodological critique and suggestions for improvement. *Journal of Sex and Marital Therapy, 31*, 255-269. doi: 10.1080/0092623X.2011.582431

Zemishlany, Z. & Weizman, A. (2008). The impact of mental illness on sexual dysfunction. *Advances in Psychosomatic Medicine, 29*, 89-106. doi: 10.1159/000126626

Appendix A

Formatted Publication of Chapter Two

Pages 206-218 of this thesis have been removed as they contain published material.

Reference: Forbes, M. K., & Schniering, C. A. (2013). Are sexual problems a form of internalizing psychopathology? A structural equation modeling analysis. *Archives of Sexual Behavior, 42*, 23-44. doi: 10.1007/s10508-012-9948-0.

Appendix B

Formatted Publication of Chapter Three

Invited Commentary on Chapter 3 by Rosen, Revicki and Sand

Commentary Response

Pages 220-240 of this thesis have been removed as they contain published material.

References:

Forbes, M. K., Baillie, A. J., & Schniering, C. A. (2014). Critical Flaws in the Female Sexual Function Index and the International Index of Erectile Function. *The Journal of Sex Research, 51,* 485-491. doi: 10.1080/00224499.2013.876607

Rosen, R. C. Revicki, D. A., & Sand, M. (2014). Commentary on "Critical Flaws in the FSFI and IIEF". *The Journal of Sex Research, 51,* 492-497. doi: 10.1080/00224499.2014.894491

Forbes, M. K. (2014). Response to Rosen et al. (2014) "Commentary on 'Critical Flaws in the FSFI and IIEF' ". *The Journal of Sex Research, 51,* 497-502. doi: 10.1080/00224499.2014.895795