

**Healthy sexual aging: Sexual activity and
satisfaction in older partnered heterosexual adults
from four European countries**

Nantje Fischer



Department of Psychology

UNIVERSITY OF OSLO

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GENERAL SUMMARY

The content and experience of partnered sex may likely change as couples age, which can lead to sexual distress but also greater intimacy and sexual quality (Lodge & Umberson, 2012). The overall purpose of this thesis is to explore what sociocultural and interpersonal mechanisms and predictors add to healthy sexual aging in partnered heterosexual adults aged 60–75 years from four European countries (Norway, Denmark, Belgium, and Portugal).

In the first study, we examine the relative influence of biopsychosocial factors on sexual intercourse frequency among partnered older men and women in northern (Norway & Denmark), central (Belgium), and southern (Portugal) Europe. The results show that older adults tend to have more intercourse activity when they have positive attitudes towards sexuality and when they perceive that their partner is not troubled with sexual difficulties. Even though we did expect to find substantial cross-country and gender disparities in predictors and their relative strengths, our findings imply more similarities than differences.

In the second study, the aim is to explore the underlying mechanisms between perceived discrepancy in sexual interest and sexual satisfaction in older partnered men and women. The results show that as older men and women perceive greater discrepancy between their own sexual interest and that of their partner, they report lower sexual intercourse activity and less sexual intimacy—which in turn lowers their sexual satisfaction. These psychosocial and interpersonal mechanisms are valid in both aging men and women.

In the third study, we investigate the relationship between two sexual discrepancy concepts (actual versus perceived discrepancy in sexual interest) and sexual satisfaction in older couples. The results show that partners who perceive greater discrepancy between their own sexual interest and that of their partners tend to be less sexually satisfied—actual discrepancy within couples plays no important role for partners' sexual satisfaction. However, greater emotional intimacy predicts higher sexual satisfaction in both male and female partners. These findings suggest that while emotional intimacy may facilitate healthy sexual aging, perceived discrepancy in sexual interest may be an important obstacle.

Overall, along with recent literature, our findings suggest that it is both an intra- and interpersonal pathway that may constitute healthy sexual aging. Particularly, an active and satisfying sex life rests on a couples' mutual resources, such as having positive sexual attitudes, perceiving sexual compatibility, feeling emotionally and sexually connected, and having access to a healthy partner.

LIST OF PAPERS

Paper I

Fischer, N., Træen, B., & Hald, G. M. (2018). Predicting partnered sexual activity among older adults in four European countries: The role of attitudes, health, and relationship factors. *Sexual and Relationship Therapy*, 1–19. <https://doi.org/10.1080/14681994.2018.1468560>

Paper II

Fischer, N., Træen, B., Štulhofer, A., & Hald, G. M. (2019). Mechanisms underlying the association between perceived discrepancy in sexual interest and sexual satisfaction among partnered older adults in four European countries. *European Journal of Ageing*, 1–12. <https://doi.org/10.1007/s10433-019-00541-x>

Paper III

Fischer, N., Štulhofer, A., Hald, G. M., Carvalheira, A. A., & Træen, B. (2020). Sexual satisfaction in older heterosexual couples from four European countries: Exploring the roles of actual and perceived discrepancy in sexual interest. *Journal of Sex Research* (resubmitted)

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1. INTRODUCTION

We are older now and our bodies are not as supple, but he still rocks me because our sex is about us, not “me” or “I.” We recently had great sex on the bathroom floor after revamping the whole room. I was stinky, we both had paint on us, and I was just putting away the toilet paper when he started the tickling and the chasing and the funny comments and, well, we were on the carpet in no time at all. I wasn’t pretty, perfumed, and I hadn’t shaved my legs in three days but between us there was a powerful flow of sexuality and it was great for both of us. We may be older, and sex may be less frequent, but when we get down to it, it is GOOD. I have enjoyed more multiple orgasms than I ever did in my younger years. (Gillespie, 2017b, p. 449)

In older age, the content, expression, and frequency of sexual experiences may vary (Clarke, 2006; Hinchliff & Gott, 2004; Müller et al., 2014). The quotation illustrates some of these changes. While the sex frequency may be less important to later life sexual well-being, emotional intimacy, feeling connected and valued, compatibility in desire, and mutual commitment become more essential (Clarke, 2006; Janssen et al., 2008; Lodge & Umberson, 2012; Sandberg, 2013). This thesis will explore processes that constitute healthy sexual aging in partnered adults aged 60–75 years from four European countries.

1.1 Sexuality in older age

Much of the literature on late life sexuality has a one-sided biomedical focus pointing at declines in sexual function and capabilities with increasing age (Bell et al., 2017; DeLamater, 2012; Fileborn et al., 2017; Ménard et al., 2015). This is despite evidence that a substantial proportion of older adults are satisfied with their sexual lives and report high levels of relationship happiness (Corona et al., 2010; Heiman et al., 2011). In a multi-country survey of the subjective sexual well-being of 40–80-year-olds, approximately two-thirds of the respondents from Western countries reported being in emotionally and physically satisfying relationships, and about eight in ten were satisfied with their present sexual functioning (Laumann et al., 2006).

Although it is common that sexual difficulties increase with age (Laumann et al., 2005; Lee et al., 2016; Schick et al., 2010), older adults’ reported concern or distress related to such difficulties seem to be lower than among younger adults (Corona et al., 2010; Hendrickx et al., 2015; Shifren et al., 2008; Træen, Hald, et al., 2016). For instance, while

many partnered older men and women report one or more sexual problems (71%), the majority (44%) seem unbothered or only mildly distressed about it (Santos-Iglesias et al., 2016). Moreover, the fact that sexual problems are more common in older age, and that the frequency of intercourse seems to decline, does not necessarily stop varied sexual expression or diminish the quality of aging couples' sexual experiences (Corona et al., 2010; Gillespie, 2017b, Lodge & Umberson, 2012; Ménard et al., 2015). In the European Male Ageing Study, including 40–79-year-old men from eight European countries, Corona et al. (2010) found that although over half of the men in the oldest age cohort (70+ years) reported moderate to severe erection problems, 49% had engaged in intercourse activity, 58% reported sexual activities such as petting, kissing, and fondling, 24% had masturbated, and 75% had had sexual thoughts during the past month.

Further, other studies point to increases in the quality of sexual experiences as people age (Forbes et al., 2017; Gillespie, 2017b; Lodge & Umberson, 2012). In a recent three-wave longitudinal study, Forbes et al. (2017) found an increase in older adults' sexual quality of life when accounting for several sexual aspects, such as feelings of control over one's sex life, sexual frequency, number of sex partners, and level of investment into sex life. Sexual quality of life was measured by participants' evaluation of "the sexual aspect of [their] life these days", from the worst to the best possible situation (p. 139). The same study showed that whilst the amount of sexual activity became less substantial in older age, the investment in terms of effort and thought devoted to one's sexual life increased in importance. The authors suggest that sexual aging may be related to processes of learning and adaptivity, which in turn may constitute a buffer against aged-related decreases in older adults' sexual lives. Similar tendencies have been indicated by many qualitative studies (Hinchliff & Gott, 2004; Lodge & Umberson, 2012; Sandberg, 2013). Given these findings, a narrow perspective on healthy sexual aging, where sexual health is understood as being equivalent to sexual function and high levels of intercourse activity, seems questionable (Marshall, 2012).

On this background, this thesis aims to employ a broad, positively framed approach to exploring healthy sexual aging. Guided by definitions of sexual health, sexual well-being, and healthy/successful aging, we aim to develop a conceptual definition of healthy sexual aging. Further, in the context of biopsychosocial and interpersonal frameworks, and based on cross-sectional data from four European countries, our purpose is to identify psychosocial and interpersonal processes that may add to healthy sexual aging.

1.2 Healthy sexual aging

Healthy sexual aging is not an established concept reflected in the literature of later life sexuality. Although it has been common to use the term sexual health in conjunction with aging, previous literature has some conceptual gaps that narrow our understanding of the links between sexual health and aging. In order to address this gap, we will present two inherent concepts — *sexual health* and *healthy aging* — and based on these develop a conceptual definition of healthy sexual aging.

Sexual health. The first definition of sexual health (as well as subsequent definitions) are built upon the conceptualization of health proposed by the World Health Organization (WHO) in 1946 (Edwards & Coleman, 2004), which defines health as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (WHO, 1948, p. 100). Similarly, their initial definition of sexual health (WHO, 1975) emphasized a positive view of sexuality that entails more than the absence of sexual problems or sexual functionality (Giarni, 2002). More recent definitions of sexual health rely on this initial definition, although further aspects were added such as the inclusion of sexual responsibility, well-being as a value-defined quality, and the recognition of sexual rights as a requirement to achieve sexual health (WHO, 2006; Pan American Health Organization [PAHO]/World Association for Sexology [WAS], 2000). For the purpose of defining *healthy sexual aging* —relating the concept of sexual health to a process of aging— we turn to the definition by PAHO/WAS (2000):

Sexual health is the experience of the ongoing process of physical, psychological and social-cultural well-being related to sexuality. Sexual health is evidenced in the free and responsible expressions of sexual capabilities that foster harmonious personal and social wellness, enriching individual and social life. It is not merely the absence of dysfunction, disease and/or infirmity. For sexual health to be attained and maintained it is necessary that the sexual rights of all people to be recognized and upheld. (p. 6)

Although this definition does not specifically target sexual health at older age, it stresses a holistic and life-course perspective to sexuality and emphasizes well-being as a key aspect of sexual health.

Healthy aging. Healthy aging is another important concept that is extensively used, yet lacks a mutual definition and descriptor (Lu et al., 2019; Peel et al., 2004). Although it is common to use the terms “successful” and “active” interchangeably with “healthy aging,”

there is no scientific consensus on whether these are synonyms, and *if they are not*, how to differentiate between them (Fernández-Ballesteros et al., 2013). In an overview of the diverse terminology, Fernández-Ballesteros et al. describe healthy aging as a narrow biomedical concept —specified by functional (dis)ability and the occurrence or absence of illness. The WHO (2015), on the contrary, suggests a more holistic model of healthy aging. Specifically, they suggest that healthy aging incorporates individuals' *intrinsic capacity* (e.g., genetics, personal characteristics, and health factors), *environments* (external factors that shape the conditions of people's lives), and *functional ability* (the linkage and interaction between individuals intrinsic capacity and their environments). According to this model, individuals' functional ability will enable them to do things that they value; however, whether or how much these can be achieved will depend on their internal capacities (e.g., psychological adaptation, personality, physiological resources) and external capacities (e.g., access to health care, assistive devices, social support). In keeping with this integrative framework, WHO (2015) defines healthy aging “as the process of developing and maintaining the functional ability that enables well-being in older age” (p. 28). While this definition does not link aging to sexuality, it is similar to the concept of sexual health (PAHO/WAS, 2000), as it emphasizes well-being (happiness, satisfaction and fulfilment) as an essential part of healthy aging (WHO, 2015).

The definition of sexual health and healthy aging, though not final or consensus-based (Edwards & Coleman, 2004; Giami, 2002; Lu et al., 2019; Peel et al., 2004), do present frameworks applicable to the conceptualization of healthy sexual aging. In this thesis, we define healthy sexual aging as the experience of an ongoing process of developing and maintaining opportunities that enable physical, psychological and social-cultural well-being related to sexuality in older age.

1.3 A clarification of related concepts

Two concepts that seem to be highly related to sexual health and healthy aging are the construct of *Subjective Sexual Well-being* and *Successful Aging*. Due to some overlap between sexual health and sexual well-being, and between healthy aging and successful aging, we will give an overview of how these concepts are operationalized, and thus organized, within a broader theoretical framework.

Subjective Sexual Well-being. Generally in the literature, the term subjective sexual well-being represents a sort of overarching concept for “good” or “positive” facets of

sexuality (Štulhofer, Jurin et al., 2018). Conceptual definitions of sexual well-being are few (Lorimer et al., 2019) and often informed by the subjective well-being literature (Byers & Rehman, 2014; Laumann et al., 2006; Muise et al., 2010). Regarding the field of subjective well-being, there is an affective and cognitive approach to defining psychological well-being (Diener et al., 2003; Neto, 2012). Transferring these to the area of sexuality, the affective approach would define sexual well-being in terms of a person's appraisal of a beneficial balance between positive and negative affects in relation to their sexual life (Byers & Rehman, 2014). The cognitive approach would define sexual well-being with respect to individuals' evaluation of their present versus ideal sex life. Although conceptual definitions of sexual well-being often include both emotional and cognitive evaluations of a person's sexual life (Byers & Rehman, 2014; Laumann et al., 2006; Lorimer et al., 2019; Muise et al., 2010), the underlying construction, and how to measure it, remains unclear.

In a study exploring the relationship between sexual attitudes and sexual well-being among adults aged 45–74 years, sexual well-being was measured as a multifaceted construct incorporating sexual interest, sexual frequency, and sexual satisfaction (Graf & Patrick, 2014). Given that it is likely that the content of sexual well-being may change throughout older age, the former approach, which focuses on sexual interest and frequency, has been criticized as being less suitable to assess sexual well-being in older men and women (Štulhofer, Jurin et al., 2018). In the Global Study of Sexual Attitudes and Behaviour (Laumann et al., 2006), sexual well-being was operationalized as older adults' evaluation of the physical and emotional aspects of their relationship, their assessment of the importance of sex, and satisfaction with their current sexual health. This approach—assessing sexual well-being in terms of evaluations limited to aspects of satisfaction—has been criticized for being too narrow (Syme et al., 2019).

To overcome a narrow framework of sexual well-being—focusing on function and sexual frequency—Štulhofer, Jurin et al. (2018) proposed a comprehensive multifaceted measure of sexual well-being adjusted to older adults' needs and sexual reality. The 5-dimensional model of sexual well-being has been validated in both individual and dyadic samples (based on data from the current project). The measure includes sexual satisfaction, sexual intimacy, physical affection, perceived sexual compatibility, and perceived distress over sexual problems (Štulhofer, Jurin et al., 2018; Štulhofer et al., 2020). This recent approach addresses the implications of the fact that being entirely free from sexual restraints at an advanced age is illusory but that concerns over sexual difficulties seem to be low in the

older population (Corona et al., 2010; Graham et al., 2020; Hald et al., 2019; Santos-Iglesias et al., 2016). As with previous measures (e.g. Laumann et al., 2006; Santos-Iglesias et al., 2016), this operationalization focuses on evaluative domains of older adults' sexual satisfaction and sexual functionality. It also addresses elements related to intimacy and physical affection, which seem to increase in importance as people age (Clarke, 2006; Hinchliff & Gott, 2004; Hinchliff et al., 2018; Lodge & Umberson, 2012; Müller et al., 2014; Sandberg, 2013). Finally, this conceptualization points to the interrelatedness of sexual relationships by addressing the importance of older adults' perceived sexual compatibility, which is considered to be associated with higher sexual satisfaction and sexual activity in older men and women (Gillespie, 2017a, 2017b).

Although sexual well-being and sexual health seem to overlap, and are sometimes used interchangeably, it has been argued that these are distinct concepts (Byers & Rehman, 2014). How these concepts relate to each other in a conceptual framework depends on the researcher's definition of the respective concept. If one defines sexual health in narrow terms, such as being equitable with sexual function, sexual health may be seen as a subcomponent of sexual-well-being. However, if one defines sexual health in a broad multidimensional fashion, it seems that sexual well-being is a subdomain of sexual health (e.g., see Byers & Rehman, 2014; PAHO/WAS, 2000).

Successful Aging. Besides the term "healthy aging" there exists a magnitude of concepts used to define processes or states of aging, such as, successful, productive, positive, vital, active, competent, and optimal aging (Fernández-Ballesteros et al., 2013; Villar, 2012). Among these, "successful aging" has been one of the most prominent, and criticized, in the aging literature (Fernández-Ballesteros et al., 2013; Martinson & Berridge, 2015; Phelan & Larson, 2002; Villar, 2012). A model that has been quite influential for the development of the concept suggests defining successful aging as (i) "low probability of disease and disease related disability," (ii) "high cognitive and physical function capacity," and (iii) "active engagement with life" (Rowe & Kahn, 1997, p. 433). Although this model suggests a positive approach to aging, it has been criticized for being unrealistic, limited, too focused on biomedical properties, and not taking into account older adults' understanding and subjective evaluations of being "successful" (Bowling & Dieppe, 2005; Martinson & Berridge, 2015; Teater & Chonody, 2019; Villar, 2012). Over time, numerous suggestions have been made to change the conceptualization of successful aging, for example by modifying facets, adding new components or even discarding the construct itself (Martinson & Berridge, 2015).

Although successful aging approaches have included various aspects of aging, only recently have there been attempts to relate later life sexuality to successful aging (Buczak-Stec et al., 2019; Kolodziejczak et al., 2019; Štulhofer, Hinchliff, et al., 2018; Štulhofer, Hinchliff, Jurin, et al., 2019; Thompson et al., 2011; Woloski-Wruble et al., 2010). For instance, Woloski-Wruble et al. (2010) propose a conceptual link between WHO's biopsychosocial definition of sexual health (WHO, 2006) and Rowe and Kahn's successful aging model (1997), suggesting that *social* and *emotional well-being* may reflect the component active engagement with life and that *physical* and *mental well-being* may mirror the components low probability of disease and high cognitive function. Further, some recent studies have started to explore the relationship between different indicators/precursors of successful aging (e.g., life satisfaction, self-rated successful aging, health, and psychosocial factors) and older men and women's sexuality (see Kolodziejczak et al., 2019; Thompson et al., 2011; Woloski-Wruble et al., 2010). For instance, in a community-based survey of 1,235 US women between 60 and 89 years, Thompson et al. (2011) found that women's self-assessed successful aging was positively associated with sexual activity and measures of sexual function. Further, in a sample of 1,514 German adults (mean age 68 years), Kolodziejczak et al. (2019) explores the relationship between aspects of sexuality (sexual thoughts, intimacy, and activity) and "resources for successful aging" (p. 390). Even though Kolodziejczak and colleagues introduce the term successful aging, they do not define or operationalize it, but rather refer to measures of physical health (grip strength and morbidity) and psychosocial/relationship factors (e.g., relationship satisfaction, loneliness) as "sources" for successful aging. These initial studies are mainly explorative and little explicit in that they lack conceptual and operational definitions of successful aging (Štulhofer, Hinchliff, Jurin, et al., 2019). However, they emphasize that sexuality (experienced and/or expressed) may be important for healthy aging.

The first systematic examination of potential ties between successful aging and sexuality in older adults was proposed by Štulhofer, Hinchliff et al. (2018, 2019), who developed and validated a multifaceted measure of successful aging and investigated its relationship with sexual satisfaction and change in sexual interest and enjoyment among European adults aged 60–75 years. Their operationalization of successful aging is indicated by three facets: (i) satisfaction with life, (ii) perceived social connectedness, (iii) absence of depression as a proxy for mental health. Findings from this study suggest important relationships between successful aging and sexual satisfaction and the maintenance of sexual

interest and enjoyment. However, due to high variability in sexual expression in later life, the authors stated that one should be careful when integrating specific sexual behavior as facets of successful aging (Štulhofer, Hinchliff, et al., 2018).

1.4 Two indicators of healthy sexual aging

As previously emphasized, healthy sexual aging is a holistic concept that incorporates different aspects of experienced or expressed sexuality in older age. Without narrowing the understanding of the concept, we argue in this thesis for sexual satisfaction and partnered sexual activity as two integrative indicators of healthy sexual aging (cf. Kleinstäuber, 2017).

Sexual satisfaction. Many studies show that a considerable number of older adults report a high degree of sexual satisfaction (Beckman et al., 2008; Heiman et al., 2011; Heywood et al., 2018; Laumann et al., 2006; Stroope et al., 2015; Træen, Carvalheira, et al., 2016). In a population-based survey of 15,162 adults aged 16–74 years from Britain, more than every second person in the age group 55–74 years was satisfied with their sex life in the past year (Field et al., 2013). Further, findings from a multi-center survey of European men aged 40–79 years shows that 51% aged 60–69 years, and 43% aged 70 and above, report being sexually satisfied (Corona et al., 2010). Similar proportions have also been found in other European countries, ranging from 40% to 60% (see Bucher et al., 2003; Træen et al., 2019).

Often studies do not present a conceptual definition of sexual satisfaction (Pascoal et al., 2014), and if they do, they tend to define it as “an affective response arising from one’s subjective evaluation of the positive and negative dimensions associated with one’s sexual relationship”— a definition proposed by Lawrance and Byers (1995, p. 268). Paradoxically, the former definition has also been used as a proxy to define sexual well-being (see an overview of sexual well-being by Byers & Rehman, 2014). Sexual satisfaction and sexual well-being are sometimes used interchangeably. However, there seem to be some conceptual distinctions in that “subjective well-being provides a wider and more global assessment of the sexual experience, seeing beyond sexual function and differing from the concept of sexual satisfaction” (Contreras et al., 2016, p. 339). In this thesis, the term subjective sexual well-being is applied to refer to the broad multidimensional concept (see i.e., Laumann et al., 2006; Štulhofer, Jurin, et al., 2018), whilst sexual satisfaction points to a subcomponent of sexual well-being, referring to individuals’ overall judgment of their sexual life (Neto, 2012).

Sexual activity. Sexual activity is an ambiguous term that can refer to various forms of sexual behavior and expression (Malacad & Hess, 2011). Similar to the conceptualization of many key concepts in this thesis, the definition and operationalization of sexual activity has for the most part been inconsistent across studies (Bell et al., 2017; Gillespie et al., 2017). Research steadily shows high proportions of older adults being sexually active, particularly when sexual behavior is assessed in broad terms including various activities such as, for example, kissing, masturbation, hugging, petting, sexual intercourse, oral sex, and fondling (Palacios-Cena et al., 2012; Træen et al., 2019). However, more specified sexual behaviors, such as partnered sexual intercourse, also seem to be frequent in older populations (Beckman et al. 2014; Corona et al., 2010; Herbenick et al., 2010; Nicolosi et al., 2006; Træen et al., 2019). In the Global Study of Sexual Attitudes and Behaviors (GSSAB) involving a sample of 10,000 adults aged 40–80 years from eight European countries, 83% of men and 66% of women report sexual intercourse activity in the past year (Nicolosi et al., 2006). Further, in the European Male Ageing Study, a population-based survey of 3,369 men from eight European centers shows that among those aged 60–69 years with access to a sexual partner, 82% report having had intercourse activity at least once in the past month (respective proportions among those 70+ years were 61%) (Corona et al., 2010). In a cross-European survey among adults aged 60–75 years, proportions of intercourse activity (vaginal, oral, or anal) during the past month ranged from 64%–80% in men and 40%–63% in women (Træen et al., 2019). Overall, the majority of research on older adults’ sexual behavior has focused on partnered sexual activity (Bell et al., 2017). Following this trend, in the current thesis, we investigate partnered sexual activity, indicated by the frequency of vaginal, oral or anal intercourse during the previous month.

2. THEORETICAL PERSPECTIVES

While the former sections were about contextualizing healthy sexual aging within a broader theoretical network of related constructs (e.g., see sexual well-being, successful aging), the following section presents two overarching theoretical frameworks that will offer some perspective on how to interpret different pathways to healthy sexual aging: (i) biopsychosocial framework, and (ii) interpersonal theories.

2.1 Biopsychosocial framework

Biopsychosocial frameworks refer to the interplay of biological, psychological, and social factors that determinate health and illness (Last, 2007). A model derivate from this perspective is Lindau et al.'s (2003) Interactive Biopsychosocial Model (IBM) —a model grounded in research on older adults' sexuality. According to this model a person's health endowment is composed of biophysical capital (e.g., genes, physiological function), psychocognitive capital (e.g., personality, coping strategies, self-esteem), and social capital (e.g., quality of relationships). Individuals' health endowment can increase, such as when a person enters into a romantic relationship, or decline in the case of becoming ill. However, capital resources can shift, be redistributed, and be shared within individuals and couples. For example, a couple's investment in their sexual relationship (social capital) may buffer the impact of the partner's diabetes (physical capital), and thus positively influence the couple's endowment of health.

In the sex and aging literature the biopsychosocial perspective has been an increasingly popular approach to understanding later life sexuality (DeLamater, 2012; DeLamater & Koepsel, 2015; Schwartz et al., 2014; Syme et al., 2019). In this thesis, the biopsychosocial perspective was most explicitly applied in our first study as an approach to guiding the selection of prospective predictor variables. Beyond that, the framework is used as an umbrella for the interdependent and multidimensional understanding of sexual health in older age. Specifically, we argue for healthy sexual aging being a function of *individual aspects* (e.g., sociodemographic characteristics, genetics), *biomedical aspects* (e.g., physiological capacity, sexual function, illness), *psychological aspects related to sexuality* (e.g., sexual attitudes, body image), *psychological disposition* (e.g., expectations, cognitions, perception), *psychological health* (e.g., well-being, depression), *relationship aspects* (e.g., relationship quality, sexual intimacy, sexual compatibility, partner's health), and *socioeconomic and socio-cultural aspects* (e.g., living conditions, gender-equality, sexual culture) (see Figure 1).

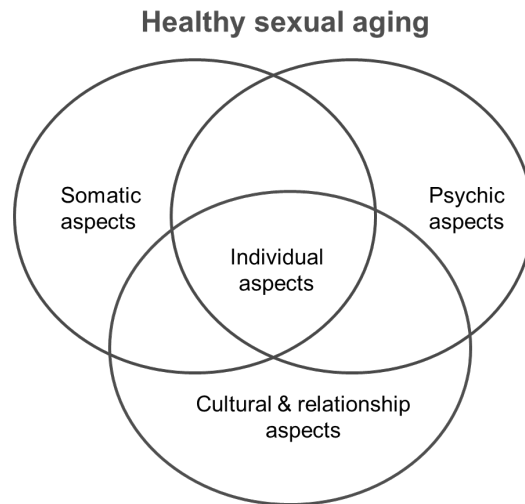


Figure 1. A schematic illustration of a biopsychosocial approach to sexual health in older age.

Cross-cultural perspective. As indicated, pathways to healthy sexual aging may not only be influenced by individual characteristics, but also by contextual factors, such as differences in socioeconomic standards. Considering the living conditions observed along a North-South gradient in Europe, the median disposable income in 2016 was highest in Western and Nordic countries (particularly high in Norway), and lowest in southern Europe (Portugal, Spain, and Italy) (Eurostat, 2018). According to the Eurostat report on living conditions in Europe, there are substantial cross-European differences in peoples' access to medical checkups and treatments. A comparison of self-perceived health among adults aged 65–75 years in Norway, Denmark, Belgium, and Portugal, show that proportions reporting bad or very bad health were highest in Portugal (31%) and lowest in Denmark (7%), with Norway (11%), and Belgium (12%) somewhere in between (Eurostat, 2018). Thus, structural disparities in the socioeconomic realities of Europe may constitute different premises to healthy sexual aging across countries. For example, differences in health care systems and the affordability of medications to enhance sexual function may be reflected in the use of those medications (Træen et al., 2020). Træen et al. found that among men with erectile difficulties, 42% of men in Norway, but only 18% of men in Portugal, reported that they ever had taken any medication to improve their sexual function (e.g., Viagra, Levitra, Spedra or Cialis). However, across-country differences in the use of erectile medications could also reflect reporting bias and cultural differences in the stigmatization of using medical aids to get or improve an erection. This stresses the role of sociocultural traditions and the influence of sexual culture, and gender- and religion-based norms on healthy sexual aging.

Cultural differences in the social regulation of sexuality and gender-specific norms can affect the power dynamics within couples and the degree to which women and men may enjoy and express their sexuality (Katz-Wise & Hyde, 2014; Laumann et al., 2006; Lodge & Umberson, 2012). For example, in an international survey of subjective well-being among 27,500 adults aged 40–80 years in 29 countries, the reported levels of physically and emotionally satisfying relations were greatest in more gender egalitarian countries (Laumann et al., 2006). Specifically, in gender-equal sexual regimes sexual satisfaction in men and women ranged from 60%–71% (Western European and Western English-speaking countries) compared, to 36%–52% in male-centered sexual regimes (Mediterranean and Asian countries, and Brazil). According to Laumann et al., male-centered sexual regimes are characterized by patriarchal structures and a sexual culture linked to reproduction, duty and to a lesser degree, women’s pleasure. In contrast, in more gender-equal societies, both, partners’ sexual desires and capabilities are equally valued, which in turn results in more relationally satisfying relationships. Similar evidence was found in a cross-European study among adults aged 60–75 years, where sexual satisfaction was greatest among women from countries characterized by high gender egalitarianism (Norway and Denmark) (Træen et al., 2019).

Both in Europe and across the world, there are country variations in levels of gender-equality (European Institute for Gender Equality, 2017; World Economic Forum, 2017). According to the EU Gender Equality Index in 2015, the Nordic countries were ranked at the top of the most gender-equal countries (Sweden 1st and Denmark 2nd). Belgium was ranked the 7th, while Portugal (21th) fell below the average score of 28 EU Member States (European Institute for Gender Equality, 2017). Furthermore, as opposed to other western societies, the Nordic countries seem to be characterized by more liberal, accepting and permissive attitudes towards sexuality (Francoeur & Noonan, 2004; Haavio-Mannila & Kontula, 2003; Træen & Kvaem, 1996). On the contrary, in Mediterranean regions, patriarchal traditions are still more pronounced (Baćak & Štulhofer, 2011; Štulhofer et al., 2011). Within this context of cross-country disparities along a North-South gradient in Europe, it is central to explore how differences in life standards, gender equality, and sexual cultures influence older partnered adults’ sexual satisfaction and sexual activity in the four featured European countries.

2.2 Interpersonal theories

Partnered sexual activity presupposes ongoing non-verbal communication and interaction between partners (de Jong & Reis, 2014). While partnered sexual activity is an

inherently interdependent experience (de Jong & Reis, 2014; Mark & Lasslo, 2018), it is striking that there exists so few interpersonal theories and dyadic research approaches in sexuality research (Byers & Rehman, 2014; Muise et al., 2018). In the following section, we present different interpersonal frameworks applicable to the exploration of processes and mechanisms through which partnered older adults may experience greater sexual satisfaction in their relationships.

Basson's Alternative Sexual Response Cycle. A model that describe the influence of interpersonal factors on sexual motivation is Basson's (2000) alternative sexual response cycle. The alternative sexual response cycle was primarily developed to help to understand women's sexual response and improve the treatment of female sexual difficulties. According to this model, sexual desire does not appear spontaneously but is a result of an active decision to be responsive to or seek sexual stimulation. This choice is for the most part motivated by emotional needs, such as a wish to enhance emotional intimacy, mutual commitment, affection, and to feel bonded, close, and accepted.

Motivators that initiate a positive sexual response cycle in long-term relationships are vulnerable for disruptions and are affected by the sexual experience itself (Basson, 2000, 2002). If previous sexual interactions were emotionally and physically satisfying (e.g., increased emotional connection, commitment, physical well-being), then they generate a wish for more emotional intimacy and serve as a facilitator that triggers a desire for more sexual interaction. Thus, a positive sexual response cycle is reinforced and strengthened. However, if pervious sexual encounters result in negative experiences, such as physical strain (e.g., pain, discomfort) and/or emotional strain (e.g., disappointment, emotional distance, anger, guilt, feeling inadequate, used or abused), the positive sexual response cycle is likely weakened (Basson, 2001, 2002). Although this model primarily aims to describe the female sexual response, Basson (2001, 2008) suggests that gender differences in the cycle may be less prominent in aging adults. Some initial support for a similar response cycle in aging men and women was found in a four-country study among partnered adults aged 60–75 years (Træen et al., 2018). Specifically, feeling emotionally close during sex was significantly associated with similar or greater sexual enjoyment compared to 10 years earlier in both older men and women.

A multidimensional model of sexual synchronicity. Another model that describes the influence of interpersonal factors is the sexual synchronicity model (Gillespie, 2017b; Gillespie et al., 2017). Based on a qualitative assessment of older partnered adults' narratives,

Gillespie (2017b) identifies three areas of synchronicity that affect the amount of sexual activity and sexual satisfaction in older men and women. One area, situational synchronicity, refers to all structural factors that enable sexual interactions. For example, partnered adults with satisfying and active sexual relations report that more time and privacy had resulted in a revitalization of their partnered sexuality. While situational synchronicity is mostly related to the *amount* of sexual activity, the other two areas (attitudinal and behavioral synchronicity) are more associated with the sexual *quality*. In particular, attitudinal synchronicity refers to partners being similar in their sexual attitudes and the values related to their sexual lives. For example, partnered adults with satisfying and active sexual relations report that they match their partner in terms of the importance attributed to sex, the view that great sex requires patience, negotiation and work, and that mutual affection results in more sex (Gillespie, 2017b). Finally, behavioral synchronicity refers to partners being complementary in sexual behavior, desire and activity. According to Gillespie, partnered adults with a satisfying and active sexual life are sexually open and eager to try out new things, while those with low satisfaction report routine-oriented sex, a lack of emotional closeness, mismatch in sexual preferences and desires. One last important element of the sexual synchronicity model is the quantity and quality of open communication. According to Gillespie et al. (2017), open communication supplements situational, attitudinal and behavioral synchronicity and may facilitate sexual exploration and expression in later life. While open sexual communication seems to set the stage for sexual synchronicity and highly satisfying and active sexual relationships, poor communication is linked to sexual asynchronicity and less sexually satisfying relationships (Gillespie, 2017b).

While the alternative sexual response cycle focuses on how the relationship context facilitates individuals' sexual motivation, the sexual synchronicity model focuses on how interpersonal factors may increase individuals' sexual activity and sexual satisfaction. Common for both models is that they emphasize the centrality of partner related factors to individuals' sexuality. Although each model refers to an interpersonal context, neither explicitly refers to *partner effects*, such as the effect that a partner's own characteristics/behavior has on the other partner's experience (Kenny et al., 2006). For instance, there is a lack of clarity concerning whether the sexual synchronicity model refers to actual sexual synchronicity within couples or partners' perceived sexual synchronicity. Nevertheless, the narratives on which it is built relies on individuals' perceptions of their

partner's experiences, sexual attitudes, and sexual preferences, not couple reports (Gillespie, 2017b). Similarly, in Basson's alternative sexual response cycle, partner variables are only indirectly implied through perceived interpersonal rewards, such as greater emotional closeness with the partner.

Despite the importance of capturing the experiences, attitudes, and preferences of both partners and assessing how they mutually influence older male and female partners' sexuality, sex research using dyadic data approach is scarce (Byers & Rehman, 2014; Muise et al., 2018). In this thesis, the interrelatedness of sexual relationships is explored in both partnered individuals (Paper II), and within couples (Paper III).

3. GENERAL AIMS

In order to understand what mechanisms and predictors may constitute healthy sexual aging in partnered heterosexual older adults, this thesis will examine the following empirical questions:

Paper I

1. How common is partnered sexual activity in older adults in Norway, Denmark, Belgium, and Portugal? Do patterns vary across cultures?
2. Which psychological, social, and biological factors predict intercourse activity at ages 60–75? Are there gender-specific predictors?
3. What is the relative importance of different biopsychosocial factors on sexual intercourse activity? Are there cultural differences along the North-South gradient?

Paper II

1. Are older adults' less sexually satisfied if they perceive a mismatch between their own and their partner's interest in sex?
2. If there is a link between perceived discrepancy in sexual interest and older adults' sexual satisfaction, what are the underlying mechanisms behind this association? Is this association mediated by the amount of sexual activity and feelings of sexual intimacy?
3. If there are underlying mechanisms between perceived discrepancy and sexual satisfaction, are these gender-specific?

Paper III

1. Does a couples' actual mismatch in sexual interest differ from individuals' perceived mismatch in sexual interest? Are there conceptual and empirical differences between the two concepts?
2. To what extent does actual and perceived discrepancy in sexual interest influence older couples' sexual satisfaction?
3. Does accounting for emotional intimacy change the relation between actual and perceived discrepancy in sexual interest and sexual satisfaction?

Guided by these core questions, we will investigate the dynamics of partnered sexual activity and satisfaction among 60–75 year-old-adults in heterosexual relationships. The thesis will follow a funnel-shaped structure —going from the general to the particular (see Figure 2). First we focus on a broad biopsychosocial country-specific perspective concerning partnered sexuality at older age. Second, we investigate the interrelatedness of sexual relationships by addressing the links between sexual interest discrepancy and sexual satisfaction among partnered individuals, and the last paper focusing on how this functions within couples.

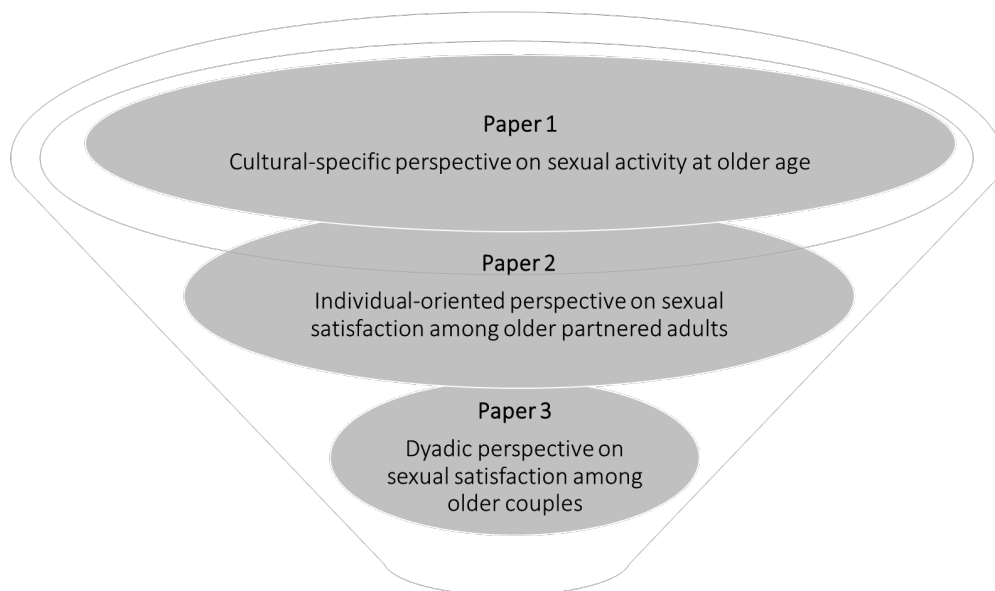


Figure 2. Conceptual illustration of each studies’ perspectives: “From the general to the specific”

4. MATERIALS AND METHODS

The three studies presented in this thesis are part of a multi-national research project titled “Healthy sexual aging: A mixed-method study of sexual function and sexual well-being in older European adults,” which was designed by an international research team and coordinated by Professor Bente Træen (PI). In collaboration with the Department of Psychology (University of Oslo), the recruitment and data collection were organized and carried out by the global polling agency Ipsos. Between October 2016 and February 2017, self-administered questionnaires in national probability-based samples of 60–75-year-olds were sent out in four European countries. The total sample included 1271 Norwegian, 1045 Danish, 991 Belgian, and 509 Portuguese participants.

4.1 Participants and procedure

First, in each country prospective participants were contacted by Ipsos’ trained interviewers, who conducted telephonic recruitment interviews. In Norway, Denmark, and Belgium the entire population is assessable via landline and mobile phones, and therefore national telephone databases were used to draw the probability-based samples in these countries. Because Portugal has no up-to date and complete national telephone registry, the sample in Portugal had to be drawn by utilizing commonly used approaches for opinion polls in this country: (a) telephone numbers from Ipsos’s company database and randomly picked fixed telephone books; (b) selection of individuals by age and sex in order to gain a distribution representative of the target population; and (c) the exclusion of men and women who had not finished primary school (ISCED) from the sample, due to expected problems with illiteracy. The names and addresses of those who gave their consent were listed, and paper questionnaires for self-completion were sent out by mail shortly after the recruitment interview. As each questionnaire was coded, only those who did not return it received a reminder. Owing to a low response rate in Portugal, it was decided to contact and remind prospective Portuguese participants by phone. However, after three calls to each of the 2000 previously contacted individuals, 500 were unreachable and an additional 561 said that they were unwilling to participate after seeing the questions. Across all countries, of the 7,607 mailed questionnaires (based on accepted participation during the recruitment interview), 3,816 were filled out and returned, giving respective response rates of 68% in Norway, 57% in Belgium, 52% in Denmark, and 26% in Portugal.

Dyadic subsample. As part of the general sampling frame, all recruited participants were asked if they were in a relationship with a partner within the age range of 60 to 75 years and whether it was possible to talk to the partner about participation. If the partner was willing and at home, the interviewer repeated the short background questionnaire. In the event that the partner was not available at that time, the interviewer registered the partner's telephone number. Couples were asked to fill out the questionnaire in private. In total, 218 Norwegian couples, 207 Danish couples, 135 Belgium couples, and 117 Portuguese couples were sampled.

4.2 Questionnaire

The survey of the multi-national research project assessed participants' basic sociodemographic characteristics, indicators of general health, depression and anxiety, drinking and exercise behaviors, life satisfaction, aspects related to body appearance, relationship quality, sexual interaction, masturbation, attitudes towards sexuality, sexual difficulties, and satisfaction with overall sex life. Most of these measures were retrieved from previous sex-surveys (Træen et al., 2019). The questionnaire was designed in English and then translated into Norwegian, Danish, Dutch/French, and Portuguese. The translation was undertaken by Ipsos staff and the principal investigators based in each country. The outcome variables used in this thesis are partnered sexual activity and sexual satisfaction.

4.3 Ethical considerations

The study of human sexuality is sensitive (Malacad & Hess, 2011; Schick et al., 2014). That older adults' sexuality often is marginalized, stigmatized and tabooed (Schwartz et al., 2014) stresses this aspect. For this reason, it was important to choose a data collection method that promoted increased anonymity and privacy and that data processing was practiced in a confidential manner. Based on the previous experiences Ipsos had from surveys on potentially private and/or taboo topics (e.g., incest, tax evasion and sexual habits), paper-based anonymous questionnaires for self-completion was chosen as a well-suited method. Ethical procedures throughout the recruitment, data collection and processing were conducted by Ipsos, who carefully followed the ethical guidelines of the Norwegian Association of Marketing and Opinion Research and ESOMAR-standards (The European Society for Opinion and Market Research) (Ipsos, 2016). As a member of ESOMAR, Ipsos is bound to follow the internationally recognized ICC/ESOMAR Code (ICC/ESOMAR, 2016). The code has been developed in collaboration with the International Chamber of Commerce (ICC) and

provides international norms on self-regulation for data analysts and researchers, “while also requiring strict adherence to any relevant regional, national and local laws or regulations, and industry/professional codes of conduct that may set a higher standard” (ICC/ESOMAR, 2016, p. 5). Potential participants in this project received an information letter about the project’s content, purpose, and proceeding instructions (filling out the questionnaire in private and returning it in the freepost envelope without writing any name on the envelope or questionnaire). Prospective participants were informed that participation is entirely voluntary, and that all information is treated as strictly confidential. Ipsos repeatedly emphasized that participation was independent of being sexually (in)active or having a partner/no partner, and that all experiences were of equally great importance to the study.

4.4 Operationalization of outcome variables

Paper I. The one-item indicator assessing partnered sexual activity was derived from the ELSA (English Longitudinal Study of Ageing) SRA-Q (Sexual Relationships and Activities Questionnaire), an instrument adapted from previous validated measures and assessed for its face validity (Lee et al., 2016). The indicator was measured by the frequency of “[having] had or attempted sexual intercourse (vaginal, anal, or oral sex) during the past month,” with responses ranging from 1 = none to 7 = more than once a day. Additional clarifications of the following terms were given: (1) Sexual intercourse: “This includes vaginal, oral and/or anal sex with another person,” (2) vaginal sex/sexual intercourse: “A penis, or other objects inserted in a women’s vagina,” (3) oral sex/sexual intercourse: “A women’s/ men’s mouth on a partners genital area,” and (4) anal sex/sexual intercourse: “A penis or other objects inserted in own/ partner’s anus (rectum or back passage).”

Papers II & III. In Paper II, the following single-item indicator was used to measure older adults sexual satisfaction: “Thinking about your sex life in the last year: All things considered, how satisfied are you with your sexual life?” Response options were ranged on a 5-point scale (1 = completely dissatisfied to 5 = completely satisfied). For the purpose of the analyses conducted in Paper III, sexual satisfaction in the third study was indicated by an additional question: “How satisfied are you with the current level of sexual activity in your life, in a general way?” Response categories (1 = very satisfied to 5 = very dissatisfied) were recoded, so that higher scores represent greater sexual satisfaction. The indicator demonstrated satisfactory internal reliability in the dyadic sample (Cronbach’s $\alpha = .90$).

4.5 Operationalization of predictor variables

Predictors of the proposed conceptual model in Paper I were *age*, *education* (arranged into three matching categories), *relationship duration* (in years), self-assessed *general health* indicated on a scale from 1 = excellent to 5 = poor, and *previous sexual activity* assessed on a 5-point reversed-coded scale, with higher scores indicating higher levels of sexual activity before the age of 60. Composite measures of *sexual attitudes* were developed using principal component analysis (PCA) of a pool of 9 items (1= strongly agree to 5 = strongly disagree) derived from the ELSA SRA-Q (<http://www.elsa-project.ac.uk>). The extraction of the components was theoretically driven, and it suggested a 4-factor structure with similar factor solutions in all countries. Attitudes evaluating the beneficial quality of sexual relations were reflected by the following items: “Satisfactory sexual relations are essential to the maintenance of a long-term relationship” and “Being sexually active is physically and psychologically beneficial to older people.” Attitudes reflecting whether one believes that sexuality changes due to aging were measured by two items (e.g. “The ability to have sex decreases as a person grows older”). Another two items (e.g. “There's too much sex in the media nowadays”) were summed to create a composite indicator tapping into the belief that modern society is too sexualized. Attitudes reflecting the love ideology consisted of three items (e.g. “Having one-night stands is wrong”). For each component, the respective scores were summed into a composite indicator with higher scores indicating more positive sexual attitudes.

Relationship related measures were *emotional intimacy*, using the 5 items composed and validated Emotional Intimacy Scale (EIS) (Sinclair & Dowdy, 2005) (Cronbach's α by country= .90–.91), and *relationship happiness* measured by a one-item indicator ranging from 1 = completely dissatisfied to 7 = completely satisfied. Three additional indicators (two items assessing *sexual compatibility* and one-item assessing participant's rating of his/her *partner's sexual problems*) were taken from the NATSAL-SF tool, a valid and reliable measure of sexual function (Mitchell et al., 2012). All three were rated on a 5-point scale (“strongly agree” to “strongly disagree”).

To test the proposed conceptual model in Paper II, we calculated a difference score based on a single-item measure of participants' own sexual interest, “I am not interested in sex,” and a single-item measure assessing participants' perception of their partner's sexual interest, “My partner has no interest in sex.” The new *discrepancy indicator* (using relative values) was scaled from -4.0 to 3.0 for men and -4.0 to 4.0 for women, whereas scores more

closely to 0 referred to less discrepancy between self-rated sexual interest and the rating of their partner’s sexual interest. For men, the relative discrepancy score was negative ($M = -.59$; $SD = 1.1$), suggesting that men on average tend believe that they have a greater interest in sex compared to their female partner. The average discrepancy score for women was slightly positive ($M = .17$; $SD = 1.0$), implicating that women perceive their partners sexual interest to be greater than their own sexual interest. The graphical assessment of the association between the relative discrepancy indicator (accounting for the direction of perceived discrepancy) and the model’s key variables point to a wedge relation as schematically illustrated in Figure 3. Technically, the wedge model is estimated by first computing the absolute values of discrepancy in sexual interest and using these in an ordinary linear model (higher scores reflect an increasing discrepancy).



Figure 3. The conceptual model as a wedge relation

The proposed conceptual model in Paper II included two mediating variables: (1) *Intercourse activity* (same measure used as the outcome variable in Paper I) (Lee et al., 2016), and (2) *sexual intimacy*, taken from the NATSAL-SF tool (Mitchell et al., 2012). Sexual intimacy was indexed via the following item: “I feel emotionally close to my partner when we have sex together.” Scores (1 = always to 5 = hardly ever) were recoded, with higher scores referring to greater sexual intimacy.

For the purpose of Paper III, comparing perceived discrepancy in sexual interest (the same measure used in Paper II) and actual discrepancy in sexual interest, an additional difference score, had to be constructed. A single-item measure, “I am not interested in sex,” scaled from 1= strongly agree to 5 = strongly disagree (higher scores reflecting greater sexual interest) was used to calculate couple’s actual discrepancy in sexual interest. To assess the degree of mismatch in sexual interest between partners, participants’ self-reported sexual

interest was subtracted from their partner's self-reported sexual interest (using the absolute values). The actual discrepancy indicator was scaled from 0 to 4, with lower values reflecting less actual discrepancy in sexual interest within a dyad. To control for emotional intimacy, we included the reverse-scored and validated Emotional Intimacy Scale developed by Sinclair and Dowdy (2005). The five-item scale assesses the general emotional quality a person perceives within his or her intimate relationship ("I can share my deepest thoughts and feelings with this person," "This person would willingly help me in any way," etc.), with higher values reflecting greater emotional intimacy. The reliability of the scale in the couples study (Paper III) was excellent (Cronbach's α by sex = .90–.91).

4.6 Statistical analyses

All analysis throughout the thesis were restricted to heterosexual partnered older adults. In Papers I and II we used two different sources of data: (i) those who had a current partner, without this partner participating in the study (individual based data), and (ii) those whose partner was part of the dyadic subsample (dyadic based data). The approach used in the first two studies had the advantage of not losing any data; however, incorporating dyadic and individual data causes difficulties in the statistical analysis (Kenny, 1996). Couples share a common past; they communicate, and influence each other, which implies that their scores are probably the same (e.g., intercourse frequency) or more alike (e.g., sexual satisfaction) than scores from two random individuals. Thus, scores from couples tend to be interdependent (Cohen et al., 2003; Kenny et al., 2006). However, most statistical analyses (e.g., ANOVA, chi-square test, regression analysis) require independent observations (Cook & Kenny, 2005; Kenny et al., 2006). Violating this requirement can result in inaccurate standard errors of the test statistics (e.g. F or t) and biased significance tests (e.g. p -values) (Cohen et al., 2003; Kenny et al., 2006). In order to prevent dependency in the data in the first two studies, all statistical procedures were conducted separately for men and women (all dyad members were distinguishable by sex), treating couples' based data as if it were from independent men and women (Kenny et al., 2006).

Contrary to the first two studies, in the third study we only used data from the couple's subsample (dyadic data). In order to account for non-independence in Paper III, we applied a model developed to measure processes of mutual influence (Cook & Kenny, 2005). The Actor-Partner Interdependence Model (APIM) (Kenny et al., 2006) is a commonly used approach to analyze dyadic data, and it offers the possibility to simultaneously estimate direct

and indirect influences for each dyad member while accounting for the interdependence of their scores.

Descriptive analysis. Various descriptive procedures were used to explore the different research questions throughout this thesis. In all papers, bivariate associations were assessed employing Pearson's r . In Paper I, principal component analysis was utilized to create composite measures of sexual attitudes. One-way analysis of variance (ANOVA) and a chi-square test were used to test for group differences among countries (Paper I). In the dyadic sample, paired two-tailed t -tests were employed to test for gender differences (Paper III). Data weighting was only applied in Paper I (adjusting for differential probabilities of selection with regard to sex, region and age). All descriptive analyses were conducted in IBM SPSS version 24.0/25.0.

Multiple regression analysis. Multiple regression analysis is a statistical procedure that enables one to estimate the relationship between multiple predictor variables and a single continuous outcome variable. This, was specifically suitable to address the main purpose of our first study (Foster et al., 2006), where we examined the relative importance of biopsychosocial factors on partnered sexual activity among older European adults. Using multiple regression analysis, model parameters are estimated by the ordinary least square approach, which aims to fit a model with the lowest sum of the squared deviations between the observed and predicted scores (Pederson, 2017). The coefficient of multiple determination (R^2) illustrates the proportion of variance in the outcome variable that is explained by the combination of the predictor variables and indicates how well the model fits. The relative influence each predictor has on the outcome variable was evaluated by standardized regression coefficients (β) (Segrin, 2010). In this study, hierarchical/sequential regression was conducted separately for men and women and for each country in order to assess the association between partnered sexual activity and several sociodemographic characteristics, health factors, sexual attitudes, and relationship characteristics. Hierarchical regression allowed us to add several sets/blocks of predictor variables sequentially, with each set being assessed for how much additional explained variance it contributes to the model while accounting for prior sets/blocks (see ΔR^2) (Tabachnick & Fidell, 2014). All hierarchical regression analyses were carried out in IBM SPSS version 24.0.

Multiple mediation analysis. As we investigated mechanisms underlying the link between perceived discrepancy in sexual interest and sexual satisfaction, multiple mediation analysis was particularly suitable to explore the purpose of our second study. Hayes' PROCESS, a computational add-on developed to facilitate the implementation of mediation, moderation, and conditional process analysis of observed variable models, was used to conduct *parallel multiple mediation analysis* (Hayes, 2018; Hayes et al., 2017). PROCESS uses three ordinary least square equations, namely

$$\begin{aligned} (1) \quad M_1 &= i_{M1} + a_1X + e_{M1} \\ (2) \quad M_2 &= i_{M2} + a_2X + e_{M2} \\ (3) \quad Y &= i_Y + c'X + b_1M_1 + b_2M_2 + e_Y \end{aligned}$$

to estimate two specific indirect effects of X (perceived partner's interest in sex) on Y (sexual satisfaction); one through M_1 (sexual intercourse activity) is a_1b_1 and one through M_2 (emotional closeness during sex) is a_2b_2 (control variables are not denoted in the equations) (Hayes, 2018). Although multiple mediation analysis can be applied using a variety of analytical approaches (Hayes et al., 2017), in this study we utilized PROCESS program. Compared to previous stepwise approaches, where claims of mediation are based on a collection of inferential tests without directly estimating the indirect effect, employing PROCESS mediation can be justified by the use of only one inferential test of the indirect effect (abi) (Hayes, 2009, 2018). An alternative analytical strategy to PROCESS is the use of structural equation modeling (SEM) although, for models based on observed/manifest variables both PROCESS and SEM tend to produce comparable results (Hayes et al., 2017). For the purpose of testing the hypothesized mediation, we used bootstrapping with 10,000 resamples (Hayes, 2018). Separate parallel multiple mediation analysis for men and women were run using PROCESS macro version 3 in IBM SPSS version 24.0.

Structural equation modeling. Structural equation modeling (SEM), a data-analytic technique especially useful to analyze APIM (Cook & Kenny, 2005), was applied to explore the relationship among perceived discrepancy in sexual interest, actual discrepancy in sexual interest, emotional intimacy, and sexual satisfaction. An important advantage of SEM is that it enables one to estimate several equations simultaneously. When applying SEM to dyadic data, the unit of analysis is not the person, but the dyad, which in our case means that N is equal to the number of couples (Kenny et al., 2006). In dyadic data analysis, dyad members are categorized as being either distinguishable (e.g., husband and wife) or indistinguishable (e.g., roommates). The distinguishability is important, as it affects the applicability of the

data-analytic technique. In our sample of heterosexual couples, all dyad partners were distinguishable by their sex, making SEM approach easy to apply (Ledermann & Kenny, 2017). Model fit was assessed by the Root Mean Square Error of Approximation (RMSEA) and the Comparative Fit Index (CFI) (Kline, 2016). Because of a large sample size (677 couples) we expected the model chi-square value to be significant, independent of the models actual fit (Kenny et al., 2006). Full Information Maximum Likelihood (FIML) was applied to deal with missing values (Graham, 2012). The SEM APIM analysis was carried out in IBM AMOS version 25.0 statistical software package (Arbuckle, 2017).

5. RESULTS

5.1 Paper I

The purpose of Paper I is to acquire further knowledge about the association between partnered sexual activity and selected sociodemographic characteristics, health properties, sexual attitudes, and relationship characteristics among partnered older adults (60–75 years). In particular, we aim to explore the relative predictive strength of these biopsychosocial factors on the frequency of sexual intercourse activity and to examine if/how these differ across northern (Norway and Denmark), central (Belgium), and southern (Portugal) European countries. Figure 4 represents the conceptual model of the first paper.

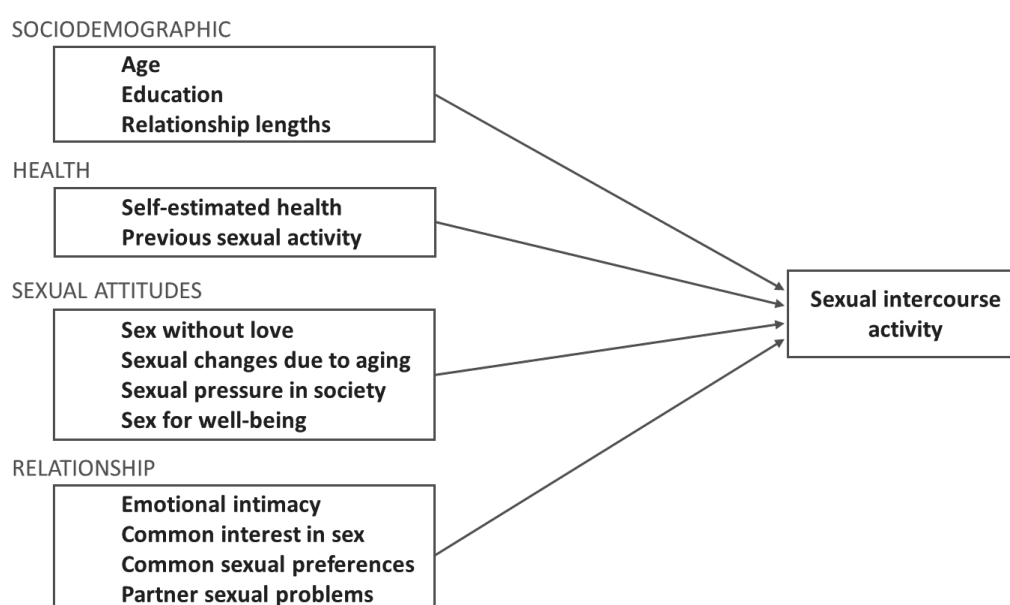


Figure 4. Conceptual model of Paper I.

We found that across all countries, between 63% and 80% reported having had sexual intercourse (vaginal, oral, or anal) at least once during the past month. Compared to women, sexual intercourse activity was somewhat more common in men. In terms of cross-cultural variations in sexual frequency, there were similar patterns in Norwegian, Danish, and Belgium men, with about 27% having had intercourse 2-3 times in the past month. Half of the men in Portugal reported having had sex 1-3 times a week. The percentage of women who have had intercourse at least once in the past month were 63% in Denmark and Belgium, 70% in Norway and 78% in Portugal. The respective percentages among men were 70% in Denmark, 73% in Belgium, 74% in Norway, and 80% in Portugal.

Even though we expected to find substantial disparities in predictors and their relative strengths between the four European countries, our findings implied more cross-country similarities than differences. One of the major predictors of sexual intercourse activity across countries was having favorable attitudes toward sex for well-being. These attitudes were tapping the participants' perception of whether sexual relations are essential to older adults' health and the maintenance of intimate relationships. The other important cross-country predictor of intercourse frequency was partners' sexual problems. Older adults who perceived that their intimate partner had sexual difficulties in the previous year reported less intercourse activity compared to their respective counterparts. Interestingly, we found these two factors to be the most influential predictors of partnered sexual activity across sex and in almost all countries.

Other, considerable predictors of older adult's intercourse activity, although not consistently found in all countries, were attitudes toward sexual changes due to aging, sexual activity before the age of 60, and happiness within the relationship. In terms of country-specific predictors, associations between perceiving common interest in sex and intercourse frequency were significant only in the North of Europe. Lastly, in the light of previous research, it was surprising that age and health did not seem to play an essential role in older adults' intercourse activity. Summing up, the results suggest substantial cross-country similarities, with positive attitudes toward "Sex for well-being," and the perception of less sexual difficulties in one's partner being the best predictors of partnered sexual activity in all four countries and across sex.

5.2 Paper II

The purpose of Paper II is to gain insights into links among perceived differences in sexual interest, sexual intimacy, sexual activity, and satisfaction with sex life in partnered individuals (60–75 years). Specifically, we aim to explore the relationship between a perceived mismatch in sexual interest and sexual satisfaction and examine if/how this link is mediated by older adults' emotional closeness during sex and their reported levels of intercourse activity, while accounting for country affiliation and age. Figure 5 schematically illustrates the most important results of the proposed mediation model in this paper.

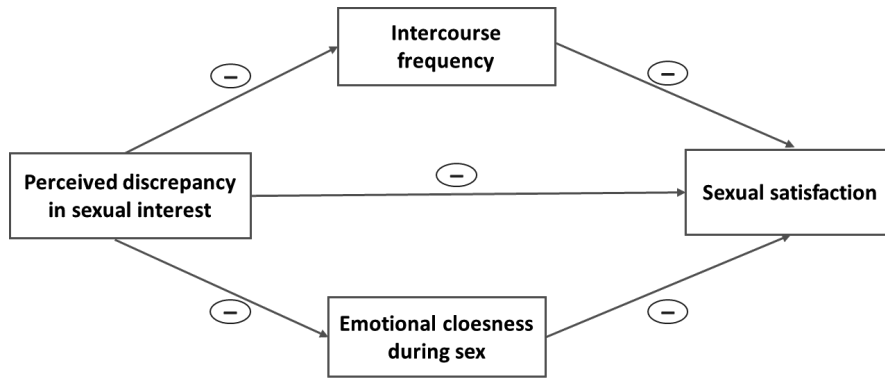


Figure 5. Main results Paper II

First, older men and women who perceived a mismatch between their own and their partner’s interest in sex reported lower levels of sexual satisfaction. Second, for both men and women, perceiving a discrepancy in sexual interest was associated with having less sexual intercourse and feeling less emotionally close while having sex—which in turn were negatively linked to sexual satisfaction in older partnered adults. Also noteworthy was that intercourse frequency and sexual intimacy significantly mediated the relationship between perceived discrepancy in sexual interest and sexual satisfaction in both sexes. In conclusion, the results support the proposed mediation model of sexual satisfaction in aging men and women, suggesting important gender similarities in the links between perceived discrepancy in sexual interest, intercourse activity, sexual intimacy, and sexual satisfaction in older partnered adults.

5.3 Paper III

The purpose of Paper III is to obtain a better understanding of the interrelatedness of older heterosexual couples’ (60–75 years) sexual relationships by examining the relationships between sexual interest discrepancies and sexual satisfaction when controlling for perceived emotional intimacy, age, and country residence. There is a particular interest to 1) compare couples’ actual versus partners’ perceived discrepancy in sexual interest; 2) explore the relationship between each discrepancy concept and partners’ sexual satisfaction; and 3) examine the robustness of the links, by accounting for emotional intimacy. Figure 6 illustrates the conceptual path analytic Actor-Partner Interdependence Model used in this paper.

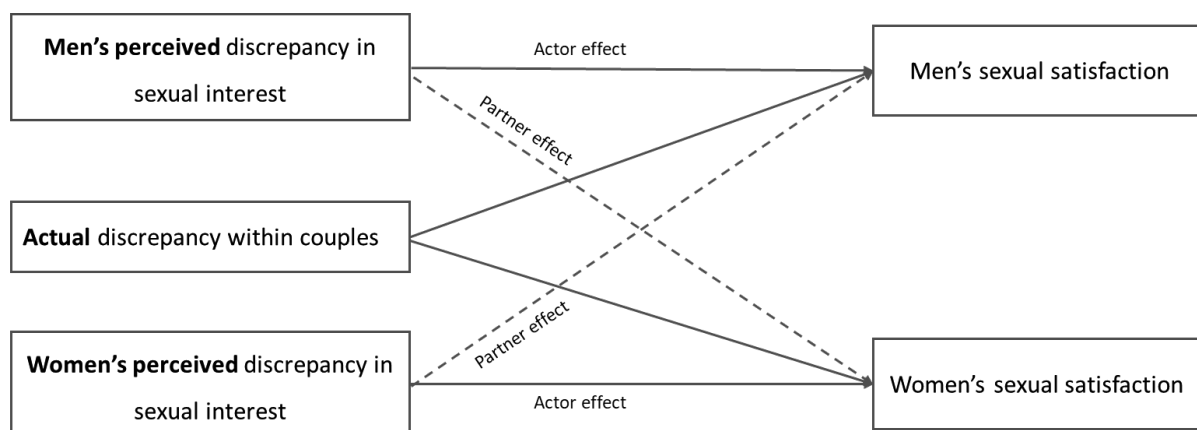


Figure 6. Conceptual model of Paper III

First, there were significant differences between the two conceptualizations, with actual discrepancy being significantly higher than each partners' perceived discrepancy in sexual interest. Second, we found significant actor effects between men and women's perceived discrepancy in sexual interest and their sexual satisfaction. That is, the more mismatch in sexual interest the individual perceived, the lower their self-reported sexual satisfaction. Considering partner effects, one gender-specific finding emerged: the higher the discrepancy in sexual interest by the male partners, the lower his female partner's reported sexual satisfaction. Interestingly, actual discrepancy within couples was unrelated to sexual satisfaction in both men and women. Third, the pattern of relationships among the studied discrepancy constructs and sexual satisfaction did not change as we accounted for emotional intimacy. Moreover, two additional actor effects were found: the higher emotional intimacy partners' perceived in their intimate relationship, the greater their reported sexual satisfaction.

Overall, our findings indicate that perceiving a discrepancy in sexual interest may be more important to older couples' sexual satisfaction than their actual mismatch. Further, the positive impact of emotional intimacy on sexual satisfaction in aging couples supports the diverse and flexible pathways to healthy sexual aging.

6. DISCUSSION

As the specific findings of the three empirical studies are discussed in the respective papers, the current section adopts a more theoretically and comprehensive approach to discussing potential pathways to healthy sexual aging. Guided by the thesis core research questions, we examine the dynamics of partnered sexual activity and satisfaction among 60–75 year-old-adults in heterosexual relationships. The findings reveal that although sexual frequency may differ across countries, the predictors of sexual activity are consistent across countries and sex. Another main finding points to important links between different types of intimacy and later life sexual satisfaction. One final important finding reveals the detrimental effect of perceived discrepancy in sexual interest on partnered sexual activity, sexual intimacy, and sexual satisfaction in older age. In the following section, these main findings are discussed in view of i) different cultural contexts versus psychological and interpersonal processes for partnered sexual activity in later life; ii) the impact of emotional and sexual intimacy as flexible means to healthy sexual aging; and iii) sexual discrepancy as a potential threat to healthy sexual aging. Finally, we will conclude with a theoretical discussion of the healthy sexual aging concept and the implications of a positive sexual health paradigm for aging adults.

6.1 Cultural, psychological and interpersonal processes

Overall, findings from the first study indicate some cross-country variations in sexual intercourse frequency among older partnered adults. Specifically, in Portugal more men and women reported having had sexual intercourse at least once in the past month, compared to, participants from Norway, Denmark, and Belgium. Due to differences in measuring intercourse frequency, such as variability in wording, time frames, and studied age cohorts, a direct comparison of prevalence rates across studies is not warranted. A relative comparison of previous cross-European studies suggests some North-South pattern findings (Corona et al., 2010; Nicolosi et al., 2006). For example, a multi-center survey of European men aged 40–79 years indicates that the highest intercourse frequency (once a week or more) are in Spain, Italy, and Belgium (60%–67%), with the lowest rates reported in Sweden (53%) and the UK (50%) (Corona et al., 2010). In a multi-national survey of adults aged 40–80 years from eight European countries, being very sexually active (intercourse more than once a week) was highest in southern and central Europe (Italy, Austria, Belgium) and lowest in northern Europe (Sweden, UK) (Nicolosi et al., 2006). Our finding that more men and women

in Portugal reported intercourse activity during the past month, compared to, older adults from the other three European countries, may reflect differences in sexual cultures and gender roles (Træen et al., 2019). However, it is also possible that it reflects a bias in sample selection in that the refusal rates for Portugal was considerably higher than for Norway, Denmark, and Belgium.

Interestingly, despite cross-country differences in reported intercourse activity, and significant differences in most exploratory variables, predictors of partnered sexual activity were consistent across all four European countries. Specifically, positive attitudes towards sex for well-being and partners' sexual problems were found to be the most important predictors of intercourse activity across countries and sex. These findings suggest that although average levels of sexual frequency may vary across cultures, the underlying psychological and interpersonal mechanisms are not necessarily culture-bound. It is reasonable to assume that some cultures are characterized by more traditional attitudes, with others more liberal and accepting towards sexuality (Laumann et al., 2006; Schwartz et al., 2014). Although the baseline level of sexual attitudes may vary in countries with more traditional versus more permissive sexual cultures, it is likely that the basic mechanisms, attitudes predicting behavior (Fazio & Roskos-Ewoldsen, 2005), remain consistent across cultures. Likewise, although self-reported health has been found to be lowest in southern Europe (Eurostat, 2018; Nicolosi et al., 2006), which in turn is negatively related to sexual activity in aging adults and their partners (Kleinstäuber, 2017; Lindau et al., 2007), the underlying interpersonal mechanism predicting intercourse activity remained the same across countries. That is, if older adults perceive that their partner has sexual difficulties, this will likely affect their intercourse activity, independent of whether they live in Norway, Denmark, Belgium, or Portugal.

Similar dynamics of cultural variations on the one hand, but stable underlying psychological mechanisms on the other, have been found in different cross-national studies (Laumann et al., 2006; Štulhofer, Hinchliff, et al., 2018). In a global survey including adults aged 40–80 years from 29 countries, Laumann et al. (2006) found cultural differences in overall levels of reported sexual satisfaction, with gender-equal societies being most satisfied with their sexual relationships. The factors predicting sexual well-being, however, have for the most part been similar across global regions. Similarly, in a four-country study (Norway, Denmark, Belgium, Portugal), Štulhofer, Hinchliff et al. (2018) observed cross-country differences in successful aging, with general scores being lowest among Portuguese men and women. Despite these differences, the underlying mechanisms between successful aging and

the maintenance of sexual interest and enjoyment were consistent across all four European countries.

6.2 Emotional and sexual intimacy as flexible pathways to healthy sexual aging

Another main finding points to important links between intimacy (emotional and sexual) and later life sexual satisfaction. While sexual intimacy refers to the amount of emotional closeness a person feels during sex with his or her partner (Mitchell et al., 2012), emotional intimacy is the overall emotional support and closeness a person perceives within his or her closest relationship (Sinclair & Dowdy, 2005). Although emotional and sexual intimacy may be seen as two different constructs, they are often inextricably linked (Birnie-Porter & Lydon, 2013; Fileborn et al., 2017; Sandberg, 2013).

Findings from the current thesis indicate important links between emotional and sexual intimacy, and sexual satisfaction in both aging men and women. In particular, in our couples-based study (Paper III), perceived emotional intimacy was significantly and positively related to female and male partners' sexual satisfaction. Likewise, in our study based on partnered older adults (Paper II), the links among perceived discrepancy in sexual interest, emotional closeness during sex, and sexual satisfaction were found in partnered women and men. These findings confirm Basson's (2001, 2008) alternative sexual response cycle to be valid for both aging men and women and affirm Basson's assumption that gender differences in the cycle may decrease with increasing age. Further evidence supporting the alternative sexual response cycle in aging men has been observed in a qualitative study on men's sexual arousal (Janssen et al., 2008). Whilst younger men emphasized erection as an initiator of sexual arousal/interest, older men who often have less reliable erections and were thus more inclined to focus on emotional and psychological cues. For example, the importance of feeling emotionally close to one's partner during sex was particularly common among older men. Partner's physical characteristics, on the contrary, became less central in aging men's sexual interest.

Further insights into how intimacy and bonding may constitute healthy sexual aging has been provided by qualitative research (Erens et al., 2019; Sandberg, 2013). A common finding is that older adults evolve broader sexual scripts that emphasize bonding, emotional intimacy, and physical affection (e.g., kissing, cuddling, fondling, hugging) as central aspects of their intimate relationships (Clarke, 2006, Fileborn et al., 2017; Lodge & Umberson, 2012; Sandberg, 2013). For example, many older men and women expand their understanding of

what sex “means” and adjust their sexual repertoire away from penetration to direct their attention on emotional intimacy and physical affection (Clarke, 2006; Fileborn et al., 2017; Gott & Hinchliff, 2003; Hinchliff & Gott, 2004; Hinchliff et al., 2018; Sandberg, 2013). As sexual function becomes less reliable in older age, reassessing interpersonal sexual expression may be a means to protect one’s self-image (Fileborn et al., 2017; Sandberg, 2013). According to Træen (2008), individuals have a tendency to reconstruct sexual situations if it threatens their positively projected self-image. The reinterpretation of unfavorable sexual events helps the individual to see his or her participation as acceptable and successful. In that respect, the individual maintains a positive self-image. As older adults redefine their sexual expression by reversing it into something positive and respectable, their reduced sexual function may feel less threatening and helps to perceive the image of oneself as a sexually competent partner (Sandberg, 2013; Træen, 2008). In a qualitative study among older Swedish men (Sandberg, 2013), intimacy operated as a strategic resource to reconstruct initially distressing sexual changes into a positive self-image. In particular, several men described how their sexual decline made them “become a better and more considerate lover” (p. 271). In sum, redefining sexuality in later life can be seen as a flexible strategy that enables couples to match their available resources and develop opportunities to maintain or increase sexual well-being (Clarke, 2006; Sandberg, 2013).

Another possible pathway is that emotional closeness fosters healthy sexual aging by buffering negative health declines, such as minimizing distress associated with sexual difficulties (Erens et al., 2019; Graham et al., 2020). For instance, a four-country study among partnered older women shows that women who tended to feel emotionally close during sex were less likely to be distressed about orgasmic difficulties; women with greater emotional intimacy reported less distress about vaginal dryness (Graham et al., 2020). Further, in a dyadic assessment of the relationships between emotional intimacy, sexual distress and help-seeking behavior among older couples, higher emotional intimacy within couples decreased the likelihood of the female partner feeling distress about sexual functioning (Štulhofer, Hinchliff, & Træen, 2019). These findings correspond well with Lindau et al.’s (2003) Interactive Biopsychosocial Model. In light of this model, a couple’s intimacy may constitute a joint relationship resource (social capital) that buffers the impact of a partner’s sexual problems (physical capital) by decreasing his/her distress associated with the problem. Within this perspective, increased emotional intimacy in later life may function as an investment in a couple’s joint health endowment (see Lindau et al., 2003). In sum, our findings add to an

emerging research literature that highlights the importance of emotional and sexual intimacy to later life sexual satisfaction and suggests there are substantial similarities in men's and women's pathways to healthy sexual aging in this regard.

6.3 Perceived sexual discrepancy as a potential threat to healthy sexual aging

One final main finding concerns the detrimental effect of perceived discrepancy in sexual interest on partnered sexual activity, sexual intimacy, and sexual satisfaction in older age. In most western cultures, sexual activity is not only related to gaining and giving physical pleasure, but a powerful symbolic act to express love and intimacy; older adults are no exception (Fileborn et al., 2017; Hinchliff & Gott, 2004; Træen, 2008). In a study assessing the meaning of sex and sexual pleasure among men aged 60 and above, Fileborn et al. (2017) found that men commonly “defined sex as a physical manifestation or expression of love” (p. 2103). Similarly, in a qualitative study among adults aged 50–86 years, expressing and enhancing love, relationship reassurance, and being desired by a partner were important benefits of sexual activity (Hinchliff & Gott, 2004). In this regard, perceiving that one's partner has less interest in sex than oneself is not only interpreted in terms of partners' intrinsic amount of sexual desire, but as an marker of partners' love, personal desirability and the overall quality of the relationship.

With an increase in age, the risk of substantial health problems increases, e.g. poorer overall health or chronic diseases (Corona et al., 2010), and one result may be reduced sexual function (Field et al., 2013; Laumann et al., 2005; Lee et al., 2016; Rosen et al., 2016; Syme et al., 2013). Due to the symbolic function of sexual interactions, the occurrence of a sexual difficulty in a romantic relationship may foster physical and emotional distance (Frost & Donovan, 2019; Træen, 2008). In particular, the fact that emotional and physical intimacy are intrinsically linked to a fear of rejection (Murray et al., 2006), and that sexual desire discrepancy leads to rejection, may explain why ongoing desire discrepancies cease emotional connection among partners. When changes in sexual functioning result in one partner deciding to shutdown the sexual relationship and a lack of communication, sexual mismatches are likely distressing and adversely affecting the relationship in later life couples (Gillespie, 2017b; Hinchliff et al., 2018; Lee et al., 2016). Under such circumstances, sexual desire discrepancies may elicit deep substantial feelings that threaten individual's self-esteem and the eligibility of the partnership (Frost & Donovan, 2019; Træen, 2008). Negative feelings, like not being loved, desired, understood or valued, and feelings of guilt, anger, sadness,

frustration, anxiety and a perception of being a sexually incompetent partner, are common. Under such circumstances a couple's positive sexual response cycle is likely impaired (Basson, 2001, 2002).

In contrast, for some older adults the experience of sexual decline has no detrimental effect on their relationships or psychological well-being (Clarke, 2006; Hinchliff & Gott, 2004). One possible explanation may be that partners have high behavioral and attitudinal synchronicity, and that the relationship is characterized by open communication (Gillespie, 2017b). In the face of physical decline, these couples are proficient to adapt and evolve their mutual sexual scripts, for example by including alternative elements and maintaining communication and negotiation (Kleinplatz & Diamond, 2014). In particular, for couples with similar sexual attitudes (e.g., sexual activity is essential for the relationship) and beliefs of what constitutes great partnered sexuality (e.g., patience, negotiation and work), it will be easier to adjust to changes in sexual function (Gillespie, 2017b; Ménard et al., 2015). Likewise, couples where both feel that sexual activity has become less important with age, may report high well-being and emotionally satisfying relationships (Hinchliff & Gott, 2004; Lodge & Umberson, 2012).

As suggested in Gillespie's (2017a, 2017b) sexual synchronicity model, not being "in sync" sexually (whether situational asynchronicity, behavioral asynchronicity, or attitudinal asynchronicity), and having poor communication, may lower sexual activity, sexual satisfaction, or both. Our findings reveal some insights into the mechanisms underlying the association between perceived discrepancy in sexual interest and sexual satisfaction, illustrating that sexual mismatch impedes healthy sexual aging through less sexual intimacy and fewer sexual encounters. Despite the detrimental impact of perceived sexual discrepancy on older adults' sexuality, it is important to note that the vast majority of sampled adults were compatible in their sexual interest. About eight in ten men and almost nine in ten women had none or only marginally perceived mismatches between their own interest in sex and that of their partners. In line with previous research (Janssen et al., 2008; Lodge & Umberson, 2012; Træen et al., 2018), and Basson's (2001, 2008) cyclic model, these findings suggest that adults may become more sexually similar in older age. Nevertheless, it may also reflect an oversampling of generally more sexually satisfied partnered older adults.

6.4 Overall discussion

As outlined in the introduction, much research on older adults' sexuality has tended to focus on decreased sexual function and activity, viewing later life sexuality as part of a biomedical model of decline (Bell et al, 2017; DeLamater, 2012; Fileborn et al., 2017; Ménard et al., 2015). On the other hand, more recently there has been increasing attention directed towards positive aspects of later life sexuality, like sexual satisfaction (Heiman et al., 2011), sexual well-being (Bell & Reissing, 2017; Graf & Patrick, 2014; Laumann et al., 2006; Štulhofer, Jurin, et al., (2018), sexual wellness (Syme et al., 2019), and links between sexual behavior and happiness (Freak-Poli et al., 2017). Although the aforementioned perspectives seem contradictory, they both lean on a discourse suggesting that later life sexuality is important for other health/well-being outcomes (Gupta, 2011). For instance, while negatively framed studies (e.g., focused on decline in sexual capabilities) link sexual function with specific health outcomes, studies on positive sexual aging link sexuality to successful aging (Štulhofer, Hinchliff et al., 2018; Woloski-Wruble et al., 2010), and subjective well-being (Freak-Poli et al., 2017; Laumann et al., 2006).

Depicting aging sexuality as part of a successful aging agenda is, however, not without problems (Hinchliff & Gott, 2008; Marshall, 2012; Ménard et al., 2015; Sandberg, 2013). With increases in health and life expectancy in Western countries, socio-cultural expectations of later life sexuality have been changed (Marshall, 2012). Within this context, remaining sexually active has become an indicator of “youthfulness,” “not yet being old,” and “aging positively” (Marshall, 2012; Sandberg, 2013). In fact, later life sexuality may have become a domain of social competence, where older adults seek to be acknowledged as sexually competent individuals (Træen, 2008). Norms of what constitutes sexual competence are socially and cultural dependent, and among other things disseminated via social media and the popular press (Gupta, 2011; Træen, 2008). Propagated ideas are, for example, that older adults should engage in frequent partnered sex, monitor their sexual function, prevent sexual decline, seek medical help in case their sexuality does not match societal expectations, and believe that sex makes you happier and healthier (Gupta, 2011; Marshall, 2012). As social competence is characterized by high levels of self-control and the realization of one's potential, the inability to perform sexually is a marker of sexual incompetence (Træen, 2008). In an era where age-related changes in sexual function are no longer understood as an indicator of natural aging, but as a disease, growing older threatens individual's self-appreciation (Marshall, 2010; Træen, 2008).

Although a healthy sexual aging discourse seems favorable, as it may legitimize and normalize later life sexuality and eliminate the myth of the “asexual” older adult, it may also promote unrealistic expectations about aging and sexuality (Syme et al., 2019). Furthermore, linking aspects of sexuality to greater health and well-being may exert pressure and foster feelings of sexual inadequacy, guilt, and incompatibility among many older adults (Gupta, 2011; Hinchliff & Gott, 2008; Marshall, 2010; Træen, 2008). For instance, how does a healthy sexual aging agenda affect those who have no access to a partner, or who have a partner who suffers from severe illness? What does it mean for older men and women who have distressing sexual problems and/or limited access to adequate health care? Not to forget that many older men and women are content despite being sexually inactive (Hinchliff & Gott, 2004). In this sense it is important to not establish a stereotype that implies that all older adults have to be sexually active and free from sexual problems in order to be happy, healthy and successful (Fileborn et al., 2017; Hinchliff & Gott, 2004).

6.5 Methodological reflections

As the specific methodological strengths and challenges of the three empirical studies are discussed in the respective papers, the current section reviews some overall methodological issues and elaborates the quality of the healthy sexual aging indicators in more detail. In particular, we discuss i) properties of the outcome measures ii) generalizability of the findings; and iii) causality. Following this, we will point out potential directions for future research.

Properties of the measurements. A common problem in the sexual satisfaction literature concerns the ambiguity of defining and measuring sexual satisfaction (Lawrance & Byers, 1995; McClelland, 2010; Pascoal et al., 2014). Besides the conceptual confusion, measures aiming to assess sexual satisfaction often suffer from predictor-criterion overlap (Mark et al., 2014). Namely, if a sexual satisfaction measure does not directly assess sexual satisfaction, but the researcher uses other related concepts as direct indicators of sexual satisfaction (e.g., importance of sex, sexual health), then this refers to a predictor-criterion overlap. As the current thesis uses two single global item measures of sexual satisfaction, a predictor-criterion overlap was not a concern.

A common issue brought up when using a single-item measurement is that it may not grasp the complexity of the concept (DeVellis, 2012). Although no scientific agreement on the applicability of single-item measures exists, the use of 1-3 items to assess sexual

satisfaction is a common approach (Mark et al., 2014; Træen, Carvalheira, et al., 2016). For instance, many large-scale national surveys have used one or two global items to assess sexual satisfaction (e.g., see the British National Survey of Sexual Attitudes and Lifestyles (Natsal-3; Field et al., 2013); the International Survey of Relationships (ISR; Heiman et al., 2011); the European Male Aging Study (EMAS; Corona et al., 2010); and the English Longitudinal Study of Ageing (ELSA; Lee et al., 2016)). Although our sexual satisfaction measures are not pre-validated, they differ only slightly in wording to other one-item measures of sexual satisfaction. For example, in the English Longitudinal Study of Ageing (ELSA; Lee et al., 2016), where 6,201 adults completed the Sexual Relationships and Activities Questionnaire (SRA-Q), participants were asked: “How satisfied have you been with your overall sex life?” where responses ranged from 1 = very satisfied to 5 = very dissatisfied. Moreover, similar wording was used in the third National Survey of Sexual Attitudes and Lifestyles (Natsal-3; Field et al., 2013), a probability sample of 15,162 men and women aged 16–74 years. Here participants were asked: “Thinking about your sex life in the last year, how much do you agree or disagree with the following statements: “I feel satisfied with my sex life” (response options ranging from 1 = strongly agree to 5 = strongly disagree). Comparable single-item measures of sexual satisfaction have been used in many other studies (see e.g., Araujo et al., 2004; Buczak-Stec et al., 2019; Corona et al., 2010; Fisher et al., 2010; Heywood et al., 2018; Hyde et al., 2010).

As single-item measures make it impossible to assess more psychometrically sophisticated characteristics, such as factor structures or the measure’s internal consistency, the psychometric properties of multiple-item scales may outweigh those of a single-item measure (Mark et al., 2014). However, a study exploring the validity of the *New Sexual Satisfaction Scale* (NSSS) found moderately high correlations between a single-item measure of sexual satisfaction and the NSSS ($r = .44-.67$) (Štulhofer et al., 2010). Further, a study assessing the psychometric characteristics of a one-item measure compared to three sexual satisfaction scales indicates that the single item had good convergent validity (Mark et al., 2014). Specifically, the single-item measures of sexual satisfaction were positively associated with the *Index of sexual satisfaction* (ISS), $r = .22$, $p < .001$), the *Global Measure of Sexual Satisfaction* (GMSEX), $r = .54$, $p < .001$), and the *New Sexual Satisfaction Scale-Short* (NSSS-S), $r = .54$, $p < .001$). Moreover, in support of convergent validity, they found that the single-item measure of sexual satisfaction is positively associated with the two theoretically related measures of relationship satisfaction (Mark et al., 2014). Both the single item measure

of relationship satisfaction (“Over the past two months, how satisfied have you been with your relationship with your partner?”) and the *General Measure of Relationship Satisfaction* (GMREL) were significantly correlated with the single item measure of sexual satisfaction. As with Mark et al. (2014), we correlated the sexual satisfaction indicator with a theoretically associated measure from our questionnaire (participant’s relationship satisfaction) and found support for convergent validity.

A lack of clarity and consistency in defining and operationalizing sexual activity has also been common in assessing sexual behavior (Bell et al., 2017; Gillespie et al., 2017). A methodological review of sex-survey research found that of all included studies (62 articles between 2005 and 2010), only 32% use adequate and explicit terminology to define the assessed sexual behavior (Malacad & Hess, 2011). In this thesis, a pre-existing single-item measure was used to assess sexual intercourse frequency. The measure was retrieved from the SRA-Q, an instrument adapted from pre-validated measures, and evaluated for its face validity (Lee et al., 2016). The wording of the item was specifically referring to “sexual intercourse (vaginal, anal or oral sex)” and additional clarifications of the used terms were given (e.g., “sexual intercourse: This includes vaginal, oral and/or anal sex with another person;” “oral sex/sexual intercourse: A women’s/ men’s mouth on a partners genital area,” etc.). Due to the level of specificity concerning the terms used, we did not expect variability in the interpretation of the questions being a concern (Malacad & Hess, 2011; Schick et al., 2014).

However, two issues related to item formation need to be discussed. First, our sexual intercourse measure did not specifically ask whether the sexual interaction was consensual or non-consensual. Although this is a very common shortcoming in sex-survey research (Malacad & Hess, 2011), lacking clarity concerning whether the sexual activity was consensual is problematic, as this may lead to multivariate outliers that can distort the findings (Tabachnick & Fidell, 2014). In particular, most participants are likely to experience consensual sexual activity, which is in turn shown to be linked to greater sexual satisfaction. However, those who are exposed to frequent non-consensual sexual activity are likely to report low sexual satisfaction. Second, the measure did not assess the circumstances in which the sexual intercourse occurred; hence, to what extent the findings refer to sexual encounters with the participants’ committed partner or an extradyadic partner are unknown. This ambiguity may compromise the validity of the findings (Malacad & Hess, 2011). However, considering that previous research indicates strong links between sexual activity and having

access to a committed partner (DeLamater, 2012; Erens et al., 2019; Schwartz et al., 2014; Træen et al., 2019), this may give some reassurance that the intercourse activity is likely to occur within a coupled relationship. Also, an item on the context of participant's latest sexual encounter reveals that most participants (97% of the men and 98% of the partnered women) report having had their latest sexual encounter with their regular committed partner.

Finally, although the indicator of partnered sexual activity is a pre-validated measure that has been developed to study the sexuality of older populations (Lee et al., 2016), the content validity of the used construct might be questioned. In particular, as older adults seem to acquire broader definitions of sexual activity (Hinchliff & Gott, 2004; Gott & Hinchliff, 2003), both the conceptual and operational definition of sexual activity in terms of vaginal, oral, or anal intercourse might be too narrow and thus inadequate to fully capture the essence of the construct in later life (Bell et al, 2017; Loseke, 2017). Thus, as our sexual activity measure did not include age-related sexual activities, such as for example fondling, cuddling, sexual touching etc., the validity of the measure for older populations may be lowered.

Generalizability. During the past thirty years survey-based research has suffered from a decline in participation rates (Galea & Tracy, 2007; Træen & Stigum, 2010). In this multi-national research project, the refusal rates in Norway, Denmark and Belgium were relatively low, which in view of the recruitment procedure (probability-based sampling using national telephone registry) may provide some assurance that these national samples reflect the target population (60–75-year-olds) in these countries. In Portugal, however, the participation rate was comparatively low. Moreover, differences in the recruitment procedure in Portugal (no complete national telephone registry available), and some practical problems (delays in the recruitment process due to problems delivering the printed survey), may likely compromise the generalizability of the findings.

Another issue that suggests caution in generalizing the results pertains the possibility for volunteer bias (Boughner, 2010). A volunteer bias occurs when, due to nonresponse, those who do participate differ on some characteristics (e.g., higher education, more unconventional) from the target population. It is feasible that our samples of partnered older adults were biased towards having more positive and open views on sexuality, as well as being more sexually experienced than those who refused to participate (Bogaert, 1996; Dunne et al. 1997), especially given that the survey was announced as a study investigating healthy sexual aging. Older adults who are conservative in their attitudes towards sex and/or more likely to perceive sexual guilt were presumably also more likely to reject the invitation to our

sex survey (Dunne et al. 1997; Strassberg & Lowe 1995). Although it was pointed out that study-participation was independent of whether one was sexually active or inactive, we have to assume that partnered older adults with more active sexual lives and positive sexual attitudes were oversampled (Dunne, 2002). Another selection-bias that may threaten the external validity occurs when prospective participants withdraw from the study without completing it (Fritz & Lim, 2018). Questions about one's sexual life are often deemed as sensitive and may elicit unpleasant feelings (e.g., embarrassment) among some older adults, leading them to withdraw from the study (Boughner, 2010; Schick et al., 2014). For example, in Portugal 561 of 1498 re-contacted participants refused to fill out the survey after they had seen the type of questions. Considering the high refusal rate in Portugal and an overrepresentation of the urban population (often more liberal views), the selection bias might be most distinct in the Portuguese sample (Boughner, 2010).

Additional factors that limited the generalizability of the findings refers to the exclusion of non-partnered older adults, a restricted age-range, and a lack of diversity in sexual orientation. Across the three empirical studies our investigation was restricted to older adults who reported they were in a committed/steady relationship (the duration averaged 34 years in men and 36 years in women). Accordingly, our results should not be generalized to non-partnered older men and women. Furthermore, as the recruitment was limited to adults aged 60–75 years, it is uncertain what constitutes healthy sexual aging among those who are younger than 60 or older than 75 years. Also, due to a lack of diversity in sexual orientation, the findings from this thesis cannot be transferred to non-heterosexual older adults. Although potential participants were recruited independent of their sexual orientation, only 22 partnered men and 15 partnered women identified as bisexual, lesbian or gay (38 men and 37 women checked the box “other”). As the numbers of non-heterosexual participants were fairly small, a statistical exploration of sexual orientation was not warranted.

The validity of the results partly leans on the premise that all relevant and necessary variables are part of the model and that they are assessed without any measurement error (Tabachnick & Fidell, 2014). The amount of explained variance in the three empirical studies was moderate (varied from 22–46% across models), which suggests that there might be other relevant factors that have not been measures, but that might be essential to understanding what constitutes healthy sexual aging. In addition to partners' sexual health, individual's own sexual difficulties may likely be an important variables that influence the sexual intercourse frequency in older adults, particular among aging men (Bell et al., 2017; DeLamater &

Moorman, 2007). As suggested by one theory (Gillespie, 2017b), open communication might be an important variable influencing the association between sexual discrepancy and sexual satisfaction.

Causality. Finally, because findings from this thesis are based on cross-sectional data, it is not possible to draw any causal conclusions. The direction of the relationships in our models are presumed and rely solely on theoretical premises (e.g., sexual synchronicity model, interpersonal exchange model of sexual satisfaction). For instance, despite the fact that low sexual satisfaction may adversely affect individuals' perceived discrepancy in sexual interest, we assume that is more likely that high perceived discrepancy influences sexual satisfaction negatively. Nevertheless, the explored relationships in our studies might go in both directions, as well as contain some bidirectional links. In order to provide insights into the directionality of the processes that may add to healthy sexual aging, associations need to be explored over time. Thus, future research would benefit from the use of repeated measure design.

6.6 Future research

The results from this thesis suggest several directions for further research. In this thesis, the intimacy variables examined play a major role for sexual satisfaction in later life. Along with insights from qualitative studies (Clarke, 2006; Sandberg, 2013), it is reasonable to assume that emotional connection plays an important role in adjusting to age-related changes, yet it remains to examine why some couples manage to enhance intimacy while others grow apart. In particular, what are the underlying processes that may lead to high couple intimacy (e.g., communication, similar working models, personality)? Moreover, to allow for comparisons across intimacy concepts, and to foster further research on how intimacy relates to healthy sexual aging, standard definitions and measures of different intimacy concepts (e.g., emotional intimacy, physical intimacy/affection, sexual intimacy) need to be established. Another important finding of this thesis reveals the adverse influence that perceived discrepancy in sexual interest has on sexual satisfaction, sexual activity and sexual intimacy. Considering that sexual interest is known to fluctuate, both within the individual and the couple, it is important to be mindful that discrepancies in sexual interest do not always reflect a permanent distressing problem for the individual and/or couple (Herbenick et al., 2014). Thus, it is particularly important to investigate when and why discrepancies in sexual interest are experienced as distressing versus non-distressing (Dewitte

et al., 2020). In addition, in order to understand the processes leading to distressing desire discrepancy, future research would benefit from exploring intra- and interpersonal predictors of high/low sexual discrepancy.

In this thesis, both individual- and dyad level data was used to explore the dynamics of sexual activity and satisfaction among 60–75 year-old-adults. Due to the flexibility of the dyadic data (Mark & Leistner, 2014), we were able to assess actual discrepancy in sexual interest within couples and compare it to partners' perceived discrepancy in sexual interest. Couples-based approaches enables the disentangling of intrapersonal from interpersonal influences, thus allowing for a more valid exploration of how each partners' sexual motivations, attitudes, functions and preferences affect the other partner's experience and behavior (Muisse et al., 2018). As dyadic data opens up new opportunities to ask and explore research questions, future studies should take advantage of more dyad-focused approaches (Byers & Rehman, 2014; Mark & Leistner, 2014; Muise et al., 2018). Finally, as with previous research (DeLamater, 2012), in this thesis the operationalization of partnered sexual activity was narrow. A direction for future investigation of later life sexuality should focus on developing conceptual and operational definitions that to a larger degree capture older adults' own understanding of sexual activity. Furthermore, our findings along with previous research suggests that research on aging sexuality includes more interpersonal factors (e.g., facets of sexual (a)synchronicity, couple communication) and measures that capture individuals' psychological adaptation, personality, and sexual flexibility.

7. CONCLUSION AND IMPLICATIONS

By studying the pathways to healthy sexual aging in partnered heterosexual older adults, we have had the possibility to explore how different psychosocial and interpersonal mechanisms facilitate or hamper later life sexuality. Four important findings emerge from this thesis.

First, the findings of this thesis add to an emerging research literature that highlights the centrality of sexual and emotional intimacy to later life sexual satisfaction and suggests substantial similarities in men's and women's pathways to healthy sexual aging in this respect. Along with insights from recent research (Clarke, 2006; Sandberg, 2013), it is feasible to assume that intimacy plays an important role in helping individuals adjust to physical changes and thus develop opportunities to maintain or increase sexual well-being. The centrality of emotional bonding in old age suggests important implications for health professionals and researchers. Broader definitions of sexuality in later life are needed to expand possibilities for diverse and flexible sexual expression (Fileborn et al., 2017).

Second, our findings suggest important links between positive attitudes towards sexuality and partnered sexual activity across countries and sex. These findings further contradict a common myth of older men and women being "asexual" (Hinchliff & Gott, 2008; Kenny, 2013). In order to tackle this predominant ageist myth about aging sexuality and normalize and legitimize later life sexuality, there is a need to improve age-relative sexual knowledge among policy-makers, health professionals, the broader public and older adults in particular (Syme & Cohn, 2020).

Third, we found important interpersonal pathways to healthy sexual aging. The perception of partners' sexual difficulties played a significant role in lowering sexual intercourse activity in both aging men and women. Although this finding does not rest on reports of partners' *actual* sexual function, but rather on individuals' *perception* of their partners' sexual function, it stresses the interdependent context of sexual relationships is embedded. Due to this sexual interdependency, it is crucial that sexual health promotion and treatment not only focus on the individuals' physiology, but also on the psychological and interpersonal processes, as these individually or in combination may hamper a couple's sexual enjoyment (Fileborn et al., 2015). Further, resources and information about aging sexuality, for example about 'normal' changes in sexual function due to aging, illness, and/or the use of

medications, as well as the diversity of sexual expression and inspirations for how to adjust one's sexual life in the face of health barriers, are needed (Fileborn et al., 2015; Hinchliff & Gott, 2004).

Fourth, our findings suggest important links between perceived sexual incompatibility and sexual satisfaction in partnered older adults. More precisely, our findings reveal some insights into the mechanisms underlying the association between perceived discrepancy in sexual interest and sexual satisfaction, illustrating that perceived sexual mismatch impedes healthy sexual aging through less sexual intimacy and fewer sexual encounters. In line with recent recommendations (Dewitte et al., 2020; Mark, 2015), our findings highlight the importance of exploring sexual interest within a couple's context. In particular, to understand one's own interest in sex, not as being "wrong" but in relation to a partner's level of sexual interest, may be a fruitful way to open up for communication within couples and reduce negative self-perceptions and guilt (Davies et al., 1999; Dewitte et al., 2020).

In sum, along with recent research, our findings suggest that it is not only an intra- but also an interpersonal pathway that constitutes satisfying sexual relations. Specifically, an active and satisfying sex life is based on the couples' joint resources in terms of being emotionally connected, having positive attitudes towards sexuality, perceiving sexual compatibility, and being with a healthy partner.

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PAPER II – Published in European Journal of Aging



Mechanisms underlying the association between perceived discrepancy in sexual interest and sexual satisfaction among partnered older adults in four European countries

N. Fischer¹ · B. Træen¹ · A. Štulhofer² · G. M. Hald³

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Abstract

The ways in which the discrepancy between one's own interest in sex and that of one's partner may affect personal sexual satisfaction has rarely been systematically studied, especially among older adults. Previous research among younger adults indicates that a discrepancy in sexual desire can be detrimental in terms of several relationship outcomes, including sexual satisfaction. This study aimed to investigate a conceptual model of sexual satisfaction among coupled older adults which posits that the association between perceived discrepancy in sexual interest and sexual satisfaction is mediated by the frequency of sexual activity and emotional closeness during sex. Data from a probability-based postal survey that included 2695 partnered heterosexual adults aged 60–75 years from four European countries (Norway, Denmark, Belgium, and Portugal) were used to test the mediation model. Due to expected gender differences in the two mediators, all analyses were carried out separately for men and women. The findings supported the proposed model, suggesting that as an individual's perception of a discrepancy in sexual interest increases, his or her levels of sexual frequency and perceived closeness during sex decrease—which in turn diminishes sexual satisfaction. The results of this study provide insights into links among sexual interest, sexual frequency, emotional closeness, and sexual satisfaction in older adults, and point to substantial similarities in the sexuality of aging men and women in this regard.

Keywords Perceived sexual desire discrepancy · Sexual activity · Emotional closeness · Sexual satisfaction · Older adults' sexuality

Introduction

Background

Many studies show that sexual satisfaction in later life is related to positive life outcomes such as greater life satisfaction, higher relationship quality, better health, and higher self-esteem (Choi et al. 2011; Heywood et al. 2018; Stroepe

et al. 2015; Thompson et al. 2011; Woloski-Wruble et al. 2010). Further, more recently, aspects of sexuality have been linked to successful aging (Štulhofer et al. 2018, 2019; Thompson et al. 2011; Woloski-Wruble et al. 2010). For instance, a study among older European couples found a significant association between successful aging, defined by psychological health, satisfaction with life, social connectedness, and sexual satisfaction (Štulhofer et al. 2019).

In general, it seems that considerable numbers of older adults are satisfied with their overall sex life (Beckman et al. 2008; Bucher et al. 2003; Field et al. 2013; Heywood et al. 2018; Huang et al. 2009; Stroepe et al. 2015; Træen et al. 2017a; Wang et al. 2015). Nevertheless, there are also challenges related specifically to late-life sexuality (Schwartz et al. 2014). Older age can affect sexual satisfaction and sexual well-being through poorer general health, age-related chronic diseases, diminished sexual function, and/or psychological factors (Field et al. 2013; Laumann et al. 2006; Rosen et al. 2016; Schick et al. 2010; Syme et al. 2013; Træen et al.

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✉ N. Fischer
nantje.fischer@psykologi.uio.no

¹ Department of Psychology, University of Oslo, Forskningsveien 3A, 0373 Oslo, Norway

² Department of Sociology, University of Zagreb, Zagreb, Croatia

³ Department of Public Health, University of Copenhagen, Copenhagen, Denmark

2017a). Moreover, the interpersonal context can also negatively interfere with individuals' sexual satisfaction, such as through partner's lowered health or sexual functioning, poor communication, and/or negative spousal interaction (Rosen et al. 2016; Scott et al. 2012; Stroebe et al. 2015; Syme et al. 2013; Træen et al. 2017a).

An issue that seems to be essential for the quality and satisfaction of older adults' sexual lives is how much couples coincide, or in other words, are not divergent in several sexual aspects. For instance, there is evidence that concepts such as sexual asynchronicity, low sexual compatibility, incongruity in the importance assigned to sex, and discrepancy in sexual desire are negatively related to sexual and/or relationship outcomes (Gillespie 2017a, b; Offman and Matheson 2005; Orr et al. 2019; Willoughby et al. 2014). For instance, in a non-probability online survey of older adults aged 50–85 years, “synchronicity in sexual desire” was significantly related to high levels of partnered sexual activity and high sexual satisfaction (Gillespie 2017a, p. 416). According to Gillespie's (2017b) multidimensional model of sexual synchronicity, older adults' sexual activity and sexual satisfaction is influenced by three types of sexual synchronicity (situational, behavioral, and attitudinal synchronicity) and by the openness in communication between partners. Situational asynchronicity (external factors interrupting the couple's sexual frequency, i.e., health and/or sexual problems), behavioral asynchronicity (dissimilarities in sexual interests and sexual preferences), and attitudinal

asynchronicity (incompatible attitudes toward sexuality, i.e., the importance of sex) were found to be related to low reported sexual satisfaction and low sexual frequency (Gillespie 2017b). Moreover, discrepancies in sexual interest/desire among aging adults have been found to be associated with distress and relationship conflict (Hartmann et al. 2004; Lodge and Umberson 2012).

Thus, despite knowing that age-specific circumstances might challenge sexual health in older age (Træen et al. 2017b) and the importance of the interrelational context on sexuality (Gillespie et al. 2017), to the best of our knowledge there are no studies exploring how perceived discrepancy in sexual interest between partners might affect sexual satisfaction among older adults (for an exception see Gillespie 2017a, b). Research on sexual desire discrepancy among younger adults, however, indicates negative associations between desire discrepancy and relational factors, such as lowered sexual satisfaction, relationship satisfaction, decreased quality of sexual interactions, less sexual contact, more reported couple conflicts, and less positive interpersonal communication (Bridges and Horne 2007; Davies et al. 1999; Mark 2014; Mark and Murray 2012; Willoughby et al. 2014). Using a national probability-based sample of individuals 60–75 years old from four European countries (Norway, Denmark, Belgium, and Portugal), this study addresses the association between perceived discrepancy in sexual interest and sexual satisfaction, and explores if/how this association is mediated by sexual frequency and emotional intimacy during sex (see Fig. 1 for our conceptual model).

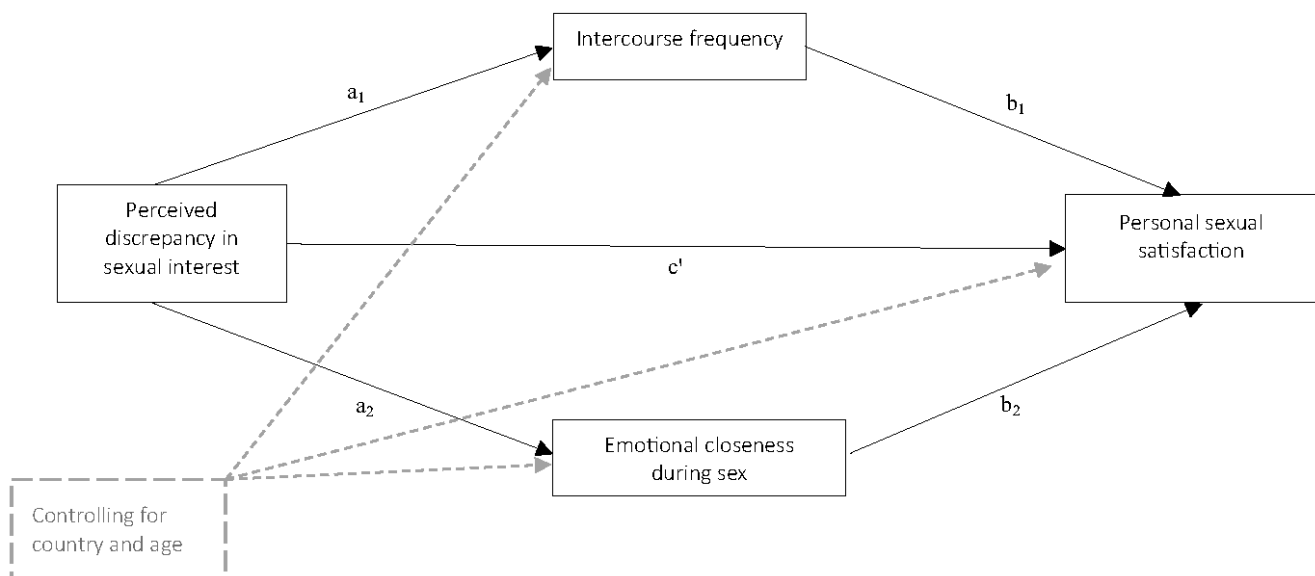


Fig. 1 Conceptual mediation model illustrating the association between perceived discrepancy in sexual interest and personal sexual satisfaction with sexual frequency and emotional closeness during sex as parallel mediators, statistically controlling for country and age

Conceptual framework

The Interpersonal Exchange Model of Sexual Satisfaction (Lawrance and Byers 1995) may explain the reasons that discrepancy in sexual interest between partners adversely affects sexual satisfaction. According to this model, sexual satisfaction is the result of the perceived level of sexual rewards and costs that partners experience in their relationship. Furthermore, the model states that the balance of sexual rewards to costs is appraised relative to what one expects that one deserves in the relationship, and by the perceived equality between one's own sexual costs/rewards and those of one's partner. Several studies have shown that sexual satisfaction increases or decreases relative to the history of either favorable or unfavorable sexual encounters between partners (Byers and Macneil 2006; Lawrance and Byers 1995). Accordingly, greater (actual or perceived) discrepancy in sexual interest between partners may indicate that previous sexual interactions have had a higher cost and were less rewarding than expected, which in turn, decreased sexual satisfaction. This complements the findings of previous research, which has shown that a discrepancy in sexual desire adversely affects the quality and frequency of sexual interaction, as well as personal sexual satisfaction (Bridges and Horne 2007; Gillespie 2017a; Mark 2014; Mark and Murray 2012). In particular, a study which used a daily diary approach found that on days when there was a greater discrepancy between partner's interest in sex, women perceived the sexual encounter as lower in quality (Mark 2014). Another study among women in same-sex relationships found negative associations between problematic desire discrepancy and frequent sexual contact, and sexual satisfaction (Bridges and Horne 2007). This suggests that an increased discrepancy in sexual interest will diminish the frequency of mutually rewarding sexual interactions, which in turn decreases an individual's sexual satisfaction.

Research on factors related to women's sexuality seems to emphasize the centrality of emotional factors such as closeness, bonding, commitment, love, affection, acceptance, and tolerance (Basson 2000, 2002). For instance, according to Basson's Alternative Sexual Response Cycle (2000), a woman's sexual response cycle is retroactively strengthened by mainly non-sexual rewards, such as increased emotional closeness with her partner. The model was particularly tailored for women in long-term relationships and suggests that, compared to women, men's sexual response cycle is less dependent on contextual factors. However, Basson adds that emotional rewards are not irrelevant to men, but may be less often the core motivators prompting them to seek, or be receptive to, sexual contact. This complements the findings of

previous research indicating that men's sexuality is more grounded in physical qualities such as sexual frequency and variation (Baumeister 2000; Lawrance and Byers 1995; McNulty and Fisher 2008; Peplau 2003; Regan and Bersched 1996; Sánchez-Fuentes et al. 2014). In contrast, more recent studies suggest that emotional intimacy is also important for men's sexual desire and satisfaction (Ferreira et al. 2014; Janssen et al. 2008; Mark and Lasslo 2018; Štulhofer et al. 2014). For instance, a focus group study of men aged 18–70 years indicated that feelings of emotional connectedness were central for men's sexual arousal and desire, which was particularly important among older men (Janssen et al. 2008).

Thus, according to Basson's model (2000, 2001), a history of rewarding sexual encounters in terms of sexual and/or non-sexual benefits (e.g., bonding, acceptance, commitments, affection, love, and emotional closeness) in turn serve as strong motivators for responding to and seeking sexual stimuli, and thus reinforce the positive sexual response cycle of individuals and couples. However, in the case of previous negative and disappointing experiences, such as, for example, conflicts due to discrepancy in sexual desire or negative feelings related to past sexual encounters, the couple's positive sexual response cycle may be disrupted (Basson 2001; Lee et al. 2016). Both a rejection of a partner's sexual invitations or being frequently rejected are often related to negative feelings, such as guilt, anger, anxiety, sadness, frustration, lower self-esteem, and feelings of being a sexually incompetent partner (Træen 2008). Accordingly, a perceived discrepancy in sexual interest is likely to inhibit feeling emotionally close to one's partner, which decreases sexual satisfaction and weakens the couple's sexual response cycle.

Based on the proposed theoretical rationale and previous research, three specific hypotheses are tested in this study:

Hypothesis 1 We hypothesize that there is a negative association between participants' perceived discrepancy in sexual interest and personal sexual satisfaction in both men and women.

Hypothesis 2 We hypothesize that the link between perceived discrepancy in sexual interest and sexual satisfaction is mediated by an individual's intercourse activity. The assumed mechanism behind the association is that a perceived imbalance in sexual interest between partners diminishes pleasurable and rewarding sexual intercourse, which decreases personal sexual satisfaction.

Hypothesis 3 We hypothesize that the association between the perceived discrepancy in sexual interest and personal sexual satisfaction is mediated by participants' feelings of emotional closeness to their partner during sex. We expect that perceiving an imbalance in sexual interest will be

negatively related to emotional closeness during sex, which in turn will be negatively associated with personal sexual satisfaction.

Methods

Participants and procedure

From October 2016 to February 2017, a study on healthy sexual aging was carried out using national probability-based samples of individuals aged 60–75 years from Norway, Denmark, Belgium, and Portugal. A benchmark of 700–800 individuals was set for each country with the final sample including 3814 individuals (1760 men and 2054 women): 1270 from Norway, 1045 from Denmark, 990 from Belgium, and 509 from Portugal. Data collection in the four respective countries was conducted by the polling organization Ipsos. Potential participants were recruited by phone. Both during the recruitment interview and in the information letter it was stressed that all responses were equally important to the study, independent of whether one is sexually active/inactive or has a partner or no partner. In Norway, Denmark, and Belgium, national phone registries (landline and mobile) were used to draw the samples from each country. However, due to the nonexistence of an updated and complete telephone registry in Portugal, the polling agency had to implement standard multistage stratified sampling, which is typically used for public opinion surveys in this country. Shortly after the recruitment interviews, self-administered questionnaires were sent out through the mail to those who agreed to participate. Due to delivery problems of the printed questionnaire to Ipsos in Lisboa, the recruitment process in Portugal was somewhat delayed. All prospective participants received an information letter in which they were informed about the project's background and purpose, the confidentiality of their responses, the voluntariness of participation, and that they should fill out the questionnaire alone without letting anyone see their responses. Reminders were sent out continuously approximately a week after the participants received their first letter. Due to a low response rate in Portugal compared to the other countries, Ipsos decided to make the reminders by phone in Portugal. Approximately, 500 of the 2000 Portuguese who had accepted to participate in the recruitment interview could not be reached again, and of the 1498 who had been reached again 37% declined to participate after they had seen the survey questions. The participation rates (those who agreed to participate and returned the survey) were 68.2% in Norway, 52.3% in Denmark, 56.9% in Belgium, and 25.5% in Portugal. More details about the sampling methods and data collection have been described elsewhere (Træen et al. 2018a). All analyses in this paper were restricted to individuals who reported that they were in

a heterosexual committed relationship (including married/cohabiting individuals), which reduced the sample size to 1392 men and 1303 women.

Measures

Sexual satisfaction was measured by the following question: 'Thinking about your sex life in the last year: All things considered, how satisfied are you with your sexual life?' The response categories were evaluated on a 5-point scale which ranged from 1 = completely dissatisfied to 5 = completely satisfied.

Perceived discrepancy in sexual interest was measured by two separate items: 'My partner has no interest in sex' (perception of partner's interest in sex) and 'I am not interested in sex' (personal interest in sex). The participants were asked to indicate their level of agreement with each statement using a scale which ranged from 1 = strongly agree to 5 = strongly disagree. To examine discrepancy in sexual interest, a new variable was constructed to represent the difference between one's own sexual interest and perception of the sexual interest of one's partner. Zero indicated no discrepancy. For men, the mean scoring on the discrepancy variable was negative, indicating that men tended to perceive their own sexual interest as higher than that of their partner (mean = $-.59$; SD = 1.1, range = -4.0 to 3.0). Contrary to men, most women tended to perceive their own sexual interest as lower than their perception of that of their partner (mean = $.17$; SD = 1.0, range = -4.0 to 4.0). This means that the scoring of men and women moved in opposite directions. However, in this study, we will argue that the degree of discrepancy is the most important factor in determining satisfaction, not the direction in which men and women tend to score. For this reason, the discrepancy variable used in the multivariate analyses was calculated as the absolute scores of participants' own sexual interest and the perceived sexual interest of the partner. Responses for the new variable ranged from 0 to 4, with 0 indicating no discrepancy, and higher scores reflecting an increasing discrepancy.

Intercourse frequency was measured by the question previously used in Lee et al. (2016): 'How many times have you had or attempted sexual intercourse (vaginal, anal, or oral sex) during the past month?' The response options were 1 = none to 7 = more than once a day.

Emotional closeness during sex was assessed by the following item: 'Thinking about your relationship with your partner, how often does this apply to your situation: I feel emotionally close to my partner when we have sex together'. The response options were 1 = always, 2 = most of the time, 3 = sometimes, 4 = not very often, 5 = hardly ever. The item was reverse scored (higher scores reflect higher levels of perceived emotional closeness during sex).

Statistical analysis

Hayes' PROCESS, a macro for IBM SPSS statistical software package, was used to test the *parallel multiple mediation model* (Hayes 2018). In order to formally test whether there is statistical evidence of mediation, Hayes proposes bootstrapping a 95% confidence interval around indirect effects (path a_1b_1 and path a_2b_2 , respectively; see Fig. 1). For cases in which the interval does not include zero, mediation is confirmed. Here, we used bootstrapping with 10,000 resamples to formally test the hypothesized mediation. Because we were exploring older adults' sexual relationships, participants who reported that they never had had any sexual activity (sexual intercourse, masturbation, petting, or fondling) (3%) were excluded from the mediation analysis. Of the remaining 2727 partnered respondents, 1234 (91%) heterosexual men and 1082 (88%) heterosexual women had data available for all variables in the mediation analysis. In total, 2% of the studied men and 3% of women had missing data on the outcome variable (sexual satisfaction), 7% had missing data on the predictor variable (perceived discrepancy in sexual interest), 2% of men and 3% of women had missing data on the mediator sexual frequency, and 5% of men and 7% of women had missing data on the mediator emotional closeness during sex. Only complete cases (CC) were included in the mediation analysis (Hayes 2018). Conducting multiple imputation (MI) for all model variables suggested no substantial differences in direction or size of the regression coefficients of most predictors and the outcome, except for the regression coefficient a_1 (both men and women), which seemed somewhat overestimated in the complete case analysis (men: $b_{CC} = -.34$ vs. $b_{MI} = -.24$; women: $b_{CC} = -.39$ vs. $b_{MI} = -.28$). All statistical analyses were carried out in IBM SPSS 24.0.

Results

Sample characteristics

Table 1 presents the sociodemographic and partner-related characteristics of the sample. Both men and women had a mean age of 67 years. With regard to the level of education, most participants reported either secondary (40% of men and 44% of women), or tertiary education (43% of men and 37% of women). Most participants (more men than women) were retired from paid work (74% and 71%, respectively) and had been in their relationship for 30 years or more. The majority of participants reported that they had been sexually active (sexual intercourse, masturbation, petting, or fondling) in the past year (92% of men and 85% of women). However, the proportion of having had or attempted sexual intercourse (vaginal, anal, or oral) in the past month was somewhat

Table 1 An overview of the sociodemographic and partner-related variables in partnered heterosexual men and women aged 60–75 years

	Men		Women	
	<i>N</i>	%	<i>n</i>	%
Age groups				
60–64	418	30.0	488	37.5
65–69	457	32.8	432	33.2
70–75	517	37.1	383	29.4
Level of education				
Primary	249	17.9	244	18.8
Secondary	550	39.6	574	44.3
Tertiary	590	42.5	478	36.9
Work status				
Retired	1032	74.1	919	70.5
In paid work	357	25.6	260	20.0
Relationship duration (in years)				
≤ 1	88	6.5	69	5.5
2–9	94	7.0	86	6.9
10–29	222	16.5	179	14.3
≥ 30	940	69.9	917	73.3
Sexual active in the past year^a				
Yes	1224	91.5	1021	84.5
No	113	8.5	187	15.5
Intercourse frequency in the past month^b				
None	344	25.8	395	32.9
Once	207	15.5	183	15.2
2 or 3 times	339	25.5	286	23.8
Once a week	270	20.3	217	18.1
2 or 3 times a week	152	11.4	115	9.6
Once a day or more	20	1.5	6	.5
Perceived discrepancy in sexual interest				
No perceived discrepancy	762	60.2	787	68.7
Partner more interested	40	3.2	249	21.7
Partner less interested	463	36.6	110	9.6

^aIncludes sexual intercourse, masturbation, petting, or fondling, ^bIncludes actual or attempted sexual intercourse (vaginal, anal, or oral sex)

lower with 74% of men and 67% of women reporting any intercourse activity in the past month.

The majority of surveyed individuals reported no perceived discrepancy between their own level of sexual interest and that of their partner (60% of men and 69% of women). However, more than one-third of men (37%) reported that their female partner was less interested in sex than they were. The respective proportion was substantially lower among women (10%).

Table 2 presents the mean scores of sexual satisfaction, emotional closeness during sex, sexual frequency, and three sexual interest variables (personal interest in sex, perceived partners interest in sex, and perceived discrepancy in sexual

Table 2 Bivariate associations between sexual satisfaction, sexual intercourse activity, emotional closeness during sex, and sexual interest variables, separately for men ($n=1234$) and women ($n=1082$)

	1	2	3	4	5	6	Mean	SD	Min	Max
1. Sexual satisfaction										
Men	1						3.5	1.0	1	5
Women	1						3.5	1.0		
2. Perceived partner's interest in sex										
Men	.45***	1					3.9	1.1	1	5
Women	.38***	1					4.1	1.0		
3. Personal interest in sex										
Men	.22***	.43***	1				4.5	.8	1	5
Women	.31***	.52***	1				4.0	1.1		
4. Perceived discrepancy in sexual interest										
Men	-.40***	-.75***	.07*	1			.7	1.0	0	4
Women	-.33***	-.19***	-.45***	1			.5	.9		
5. Intercourse activity										
Men	.53***	.44***	.37***	-.24***	1		2.8	1.4	1	7
Women	.53***	.54***	.49***	-.26***	1		2.7	1.4		
6. Emotional closeness during sex										
Men	.31***	.38***	.17***	-.32***	.19***	1	4.5	.8	1	5
Women	.36***	.33***	.48***	-.31***	.32***	1	4.3	1.0		

* $p < .05$, *** $p < .001$ (2-tailed)

interest), as well as their intercorrelations, separately for men and women. Most participants disagreed with the statement that they or their partner had no interest in sex. On average, men and women reported intercourse activity (vaginal, anal, or oral sex) between once a month, and two to three times in the past month. Most of the time, participants felt emotionally close to their partner during sex.

The highest bivariate correlation found in men appeared between the perception of their partner's interest in sex and the perceived discrepancy in sexual interest ($r = -.75$; $p < .001$). In women, the highest correlation was found between the perception of the partner's interest in sex and intercourse activity ($r = .54$; $p < .001$). In men, the weakest bivariate correlation was between their personal interest in sex and the perceived discrepancy in sexual interest ($r = .07$; $p < .05$). In women, the weakest correlation was between the perception of their partner's interest in sex and the perceived discrepancy in sexual interest ($r = -.19$; $p < .001$).

Multiple mediation analysis

Multiple mediation analysis was carried out separately for men (Table 3) and women (Table 4) to test the hypothesized structure of the associations in the proposed model.

Hypothesis 1 We found a direct association between perceived discrepancy in sexual interest and personal sexual satisfaction in both aging men ($b = -.24$; $p < .001$), and women ($b = -.18$; $p > .001$).

Hypothesis 2 Sexual frequency significantly mediated the association between the perception of a discrepancy in sexual interest and personal sexual satisfaction in both men (estimate = $-.11$, 95% BCI [$-.132$, $-.083$]), and women (estimate = $-.12$, 95% BCI [$-.151$, $-.095$]). Aging men and women who perceived a discrepancy between their personal interest in sex and that of their partner experienced lower levels of intercourse activity, which in turn is negatively associated with their level of sexual satisfaction.

Hypothesis 3 Emotional closeness during sex also significantly mediated the key association in both men (estimate = $-.04$, 95% BCI [$-.062$, $-.026$]), and women (estimate = $-.05$, 95% BCI [$-.080$, $-.032$]). Aging men and women who perceived an imbalance between their personal interest in sex and that of their partner experienced lower emotional closeness during sex, which in turn is negatively related to their level of sexual satisfaction.

Discussion

The aim of this study was to investigate mechanisms underlying the association between perceived discrepancy in sexual interest and sexual satisfaction among partnered older adults. We found that both intercourse activity and perceived emotional closeness during sex significantly mediated the association between perceived discrepancy in sexual interest and sexual satisfaction.

Table 3 Model coefficients for the mediation analysis among partnered heterosexual men ($n = 1234$) illustrating the role of perceived discrepancy in sexual interest on sexual satisfaction via two parallel mediators (sexual frequency and emotional closeness during sex, respectively) with country affiliation and age (not presented in the table) as covariates. Unstandardized regression coefficients (b), standard errors (SE), multiple correlations squared (R^2)

Independent variables	Intercourse frequency			Emotional closeness during sex			Sexual satisfaction		
	b	SE	p	b	SE	p	b	SE	p
Perceived discrepancy in sexual interest	a_1		a_2			c'			
	-.34	.04	<.001	-.25	.02	<.001	-.24	.02	<.001
Intercourse frequency							b_1	.02	<.001
							b_2	.03	<.001
Emotional closeness during sex								.05	.143
Denmark	-.17	.09	.062	.02	.05	.681	.08	.06	.123
Belgium	-.11	.11	.325	-.19	.06	.003	-.10	.07	.161
Portugal	.41	.12	.001	-.14	.07	.050	-.10		
	$R^2 = .09^{***}$			$R^2 = .11^{***}$			$R^2 = .38^{***}$		
								95% BCI	
								Lower	Upper
Total effect of perceived discrepancy in sexual interest on sexual satisfaction ^a				Point Estimate		Boot SE		-.439	-.339
Indirect effects									
Intercourse frequency				-.39		.03			
Emotional closeness during sex									
								-.132	-.083
								-.062	-.026

*** $p > .001$; Norway is reference category; bootstrapped with 10,000 resamples; BCI = 95% bootstrapped confidence interval, ^aStandard error (SE) and CI = 95% confidence interval

Table 4 Model coefficients for the mediation analysis among partnered heterosexual women ($n = 1082$) illustrating the role of perceived discrepancy in sexual interest on sexual satisfaction via two parallel mediators (sexual frequency and emotional closeness during sex, respectively) with country affiliation and age (not presented in the table) as covariates. Unstandardized regression coefficients (b), standard errors (SE), multiple correlations squared (R^2)

Independent variables	Intercourse frequency			a_2	Emotional closeness during sex			c'	Sexual satisfaction		
	b	SE	p		b	SE	p		b	SE	p
Perceived discrepancy in sexual interest	a_1	.04	<.001		.32	.03	<.001		.18	.03	<.001
Intercourse frequency		-	-						b_1	.02	<.001
Emotional closeness during sex									b_2	.03	<.001
Denmark		-.08	.10	.441		.07	.477		.03	.06	.584
Belgium		-.16	.11	.149		.08	.031		-.07	.07	.304
Portugal		.07	.13	.580		.09	.214		-.10	.08	.208
		$R^2 = .07^{***}$			$R^2 = .10^{***}$			$R^2 = .35^{***}$			
				Point Estimate			Boot SE			95% BCI	
Total effect of perceived discrepancy in sexual interest on sexual satisfaction ^a										Lower	Upper
Indirect effects											
Intercourse frequency							.03				
Emotional closeness during sex											
										-.151	-.095
										-.080	-.032

*** $p > .001$; Norway is reference category; bootstrapped with 10,000 resamples; $BCI = 95\%$ bootstrapped confidence interval; ^aStandard error (SE) and $CI = 95\%$ confidence interval

Confirming Hypothesis 1, we found that those who perceived a greater discrepancy in sexual interest had lower personal sexual satisfaction for both men and women. This finding is similar to that of Davies et al. (1999), who examined the individual's perception of a sexual desire discrepancy among young couples and found that perceived desire discrepancy was associated with lower sexual satisfaction, which in turn diminished relationship satisfaction. Likewise, empirical support has been obtained for the detrimental impact of incompatibilities in sexual interest among older adults (Hartmann et al. 2004; Heywood et al. 2018; Lee et al. 2016). Accordingly, it has been found that the individual with higher sexual interest may experience a mismatch between the desired or expected sexual activity and the "actual" frequency, which in turn is shown to be negatively associated with sexual satisfaction in both older men and women (Heywood et al. 2018). Conversely, the person with lower interest in sex may feel obligated to accept sexual invitations or initiate sexual interaction (Hartmann et al. 2004), which in turn is shown to be associated with increased concerns about the overall sex life in older men and increased dissatisfaction in older women (Lee et al. 2016).

Pertaining to our second study hypothesis, we found that the association between perceived discrepancy and personal sexual satisfaction was mediated by the frequency of sexual activity. This confirms our second study hypothesis and indicates that when men and women perceive a discrepancy in their own interest in sex and that of their partner, the frequency of intercourse is reduced; as a result, the overall level of sexual satisfaction decreases. This corresponds well with previous research that has shown a negative relationship between the discrepancy in the partner's sexual interest and frequency of sexual contact (Bridges and Horne 2007), as well as the quality of sexual experiences (Mark 2014). Moreover, many studies have shown a significant association between partnered sexual activity and sexual satisfaction (DeLamater et al. 2008; Fisher et al. 2010; Heiman et al. 2011; Heywood et al. 2018; Kontula and Haavio-Mannila 2009; Lee et al. 2016; Stroope et al. 2015). Within the context of the Interpersonal Exchange Model of Sexual Satisfaction (Lawrance and Byers 1995), a couple's discrepancy in sexual interest may reflect an unfavorable balance between sexual costs and rewards, which in turn is likely to adversely affect sexual contact and personal sexual satisfaction.

In Hypothesis 3, we proposed that as men and women perceive an increasing discrepancy between their own interest in sex and that of their partner, they feel less emotionally connected during sexual interactions, which is negatively related to their sexual satisfaction. Our data confirmed this hypothesis. The finding is consistent with previous research, which shows a negative link between reduced sexual desire and satisfaction with emotional closeness during sex (Rosen et al. 2016). For instance, Rosen et al. (2016) found that

women whose partners lacked interest in sex for one month or longer reported less sexual satisfaction and less satisfaction with the amount of emotional closeness during sexual activity. Our findings are also consistent with Basson's (2001, 2002) alternative female response cycle, where previous negative sexual experiences (caused by, for example, discrepancy in sexual interest) can lead to avoidance of sexual interaction in women. Although the model proposes that emotional rewards are more central to the sexual response cycle of women than to that of men (Basson 2000), recent studies suggest that emotional factors are also relevant to men's sexual desire and sexual satisfaction (Ferreira et al. 2014; Mark and Lasslo 2018; Štulhofer et al. 2014), and that this may hold particularly true for older men (Basson 2001, 2008; Janssen et al. 2008; Træen et al. 2018b). Accordingly, the finding that the relationship between perceived discrepancy in sexual interest and personal sexual satisfaction was negatively mediated by emotional closeness during sex for both genders, supports Basson's model of the female sexual response cycle, while extending the response cycle as one that is also valid for older men.

When evaluating the study findings, some limitations have to be taken into consideration. Although our mediation model describes a causal process owing to the cross-sectional data used in the analysis, causality is not implied by our study, which was only able to establish and test non-causal associations in the proposed model (Hayes 2018). Even though during the recruitment phase it was emphasized that we were interested in all responses independent of whether one had a sexual life or not, we can reasonably assume that older adults who were more sexually active and/or who had more liberal attitudes toward sex were more likely to participate in our study compared to those who had more conservative views of sexuality, were sexually inactive, and/or had no interest in sex (Boughner 2010). For instance, previous research has confirmed a volunteer bias in sex surveys, indicating that volunteers in sex studies generally have more sexual experience, more positive attitudes toward sexuality, more interest in new sexual experiences, and less feelings of sexual guilt than nonvolunteers (Bogaert 1996; Dunne et al. 1997; Strassberg and Lowe 1995). This volunteer bias might threaten the generalizability of the research findings and might particularly concern the Portuguese sample due to the high refusal rate of those who had initially accepted participation but then declined to answer after they had seen the questionnaire (Boughner 2010). In view of the less reliable sampling procedure in Portugal and the comparatively low response rate in the Portuguese sample, the generalizability of the findings might be problematic (Træen et al. 2018a). Finally, at the onset of the research project, the selection of countries for this study was intended to depict the geographical variation of northern, southern, eastern, and western Europe. However, due to challenges in finding

research collaborators from eastern Europe and restraints in terms of funding, the selection of countries is rather mirroring the country affiliations of the research group members (Štulhofer et al. 2019).

Conclusion

This study identified a significant association between perceived discrepancy in sexual interest and sexual satisfaction among partnered older adults across four European countries. Further, this association was negatively mediated by the frequency of sexual activity and perceived emotional closeness during sex. Accordingly, the findings suggest that as older adults perceive a discrepancy between their own interest in sex and that of their partners, their level of intercourse activity is reduced, and they tend to feel less emotionally connected during sex; this, in turn, diminishes their sexual satisfaction. Moreover, the study findings support previous suggestions regarding the complexity of the sexual response of not only women but also men (Ferreira et al. 2014; Štulhofer et al. 2014). Age-related changes in sexual functioning might change the dynamics in sexual interest within aging couples' sexual relationships. Important for specialists working with older adults is that sexual satisfaction should not be seen as an individual but as a relational outcome, dependent on whether an individual is perceiving synchronicity between their own interest in sex and that of their partner.

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PAPER III – Resubmitted to Journal of Sex Research

**Sexual Satisfaction in Older Heterosexual Couples from four European Countries: Exploring the
Roles of Actual and Perceived Discrepancy in Sexual Interest**

Fischer, N¹., Štulhofer, A²., Hald, G. M³., Carvalheira, A⁴., & Træen, B¹.

¹ Department of Psychology, University of Oslo, Oslo, Norway

² Department of Sociology, University of Zagreb, Zagreb, Croatia

³ Department of Public Health, University of Copenhagen, Copenhagen, Denmark

⁴ William James Center for Research, ISPA, University Institute, Lisbon, Portugal

Corresponding author:

Nantje Fischer

Forskningsveien 3A,

0373 Oslo, Norway

nantje.fischer@psykologi.uio.no

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Sexual satisfaction in older heterosexual couples from four European countries: Exploring the roles of actual and perceived discrepancy in sexual interest

Abstract

Even though sexual activity frequently takes place with another person, research rarely focuses on how partners influence each other's sexual lives. This study uses the sexual dyad to compare the concept of *actual* versus *perceived* discrepancy in sexual interest and explore how each is related to older partnered individuals' sexual satisfaction. Further, the study assesses the robustness of the association between sexual interest discrepancy and sexual satisfaction, if any, by controlling for emotional intimacy. The Actor-Partner Interdependence Model using structural equation modeling, is applied to examine 677 heterosexual couples aged 60–75 years in Norway, Denmark, Belgium, and Portugal. Although a couple's *actual discrepancy* in sexual interest was not predictive of female and male partners' sexual satisfaction, *perceived discrepancy* was negatively associated with sexual satisfaction in both partners after controlling for emotional intimacy. This indicates that the subjective feelings of being sexually dissimilar seem to be more important to sexual satisfaction than the actual mismatch amongst partners in older heterosexual couples. Moreover, the finding that emotional intimacy is linked with sexual satisfaction underscores the importance of a broader perspective on sexuality among older adults.

Introduction

Conceptual definitions of sexual satisfaction are scarce (Pascoal, Narciso, & Pereira, 2014). An assessment of layperson's understanding of being sexually satisfied within heterosexual relationships defines it "as the emotional experience of frequent mutual sexual pleasure" (p. 27). This definition stresses that partnered sexuality is a joint activity, involving desires, feelings, and pleasure as mutual experiences. Despite this, the majority of studies assess sexual health from an individualistic perspective (Mark & Leistner, 2014). For example, an extensive amount of research based on individual-level data points to the prevalence of sexual desire problems in older individuals (Laumann et al., 2005; Mitchell et al., 2013; Waite, Laumann, Das, & Schumm, 2009). Loss of sexual desire appear to be especially prevalent among older women (Lindau & Gavrilova, 2010; Waite et al., 2009). Contrary to an individualistic approach, it seems important to understand sexual desire problems within a couple's context (Mark & Lasslo, 2018; Mark & Leistner, 2014). For instance, findings based on a self-selected online survey of US adults aged 50–85 years showed a significant and positive association between individuals' reports on wanting sex as much as their partner and sexual satisfaction (Gillespie, 2017a). Moreover, several theoretical conceptualizations about interpersonal processes, such as *sexual desire discrepancy* (Mark, 2015; Mark & Lasslo, 2018; Willoughby, Farero, & Busby, 2014), little *sexual synchronicity* (Gillespie, 2017a, b), *mismatched emphasis on sex* (Orr, Layte, & O'Leary, 2019), and *perceived sexual incompatibility with partner* (Witting et al., 2008) have all been negatively associated with important relationship aspects, such as sexual satisfaction, frequency of sexual activity, relationship quality, relationship stability, and couple conflict.

According to the sexual synchronicity model, sexual frequency and sexual satisfaction among older men and women are affected by communication and three intertwined forms of sexual synchronicity/asynchronicity (Gillespie, 2017b; Gillespie, Hibbert, & Sanguinetti,

2017). The first, *situational* asynchronicity, refers to conditions outside of the couple's relationship that disrupt the possibility for sexual activity (i.e., conflicting time schedules or health incapability). The second, *behavioral* asynchronicity, refers to partners being different in their sexual interest and behavior, and the absence of sexual reciprocity (i.e., one partner requesting, but not giving oral sex). The third, *attitudinal* asynchronicity, pertains to differences in sexual attitudes (i.e., the way partners evaluate the importance of sex in older age). Although initial evidence suggests a negative relationship between sexual desire discrepancy and sexual satisfaction (Mark, 2015), research exploring mismatches in sexual interest in older heterosexual couples is lacking. Our aim in this study is to focus on the interpersonal dynamics of sexual interest by exploring the links between two sexual discrepancy concepts (actual discrepancy in sexual interest within couples versus individuals' perceived discrepancy in sexual interest), and sexual satisfaction in heterosexual couples aged 60 to 75 years.

Actual versus perceived discrepancy concepts

A study among heterosexual dating couples with a mean age of 20 years found that the perception of a discrepancy in sexual desire was negatively associated with both men and women's sexual satisfaction (Davies, Katz, & Jackson, 1999). In men, however, the study did not show a significant association between a couple's actual desire discrepancy score (measured by a divergence between his and her reports of the level of sexual desire) and sexual satisfaction. Furthermore, no significant association was found between the individual's perception of desire discrepancy and the couple's actual desire discrepancy score, which may indicate conceptual differences between the two measures. The possibility that there may be systematic differences in actual and perceived desire discrepancies complements the findings of three dyadic studies indicating perceptual biases in the estimation of a partner's sexual desire, with men being particularly likely to underperceive their female

partner's level of desire in all three studies (Muise, Stanton, Kim, & Impett, 2016). Women also significantly underperceived their partner's sexual desire, but only in one of the three studies. Another study exploring the association between sexual satisfaction and actual versus perceived desire discrepancies among two samples of middle-aged (on average aged 30–40 years) long-term couples found that greater perceived, but not actual, sexual desire discrepancy was negatively related to sexual satisfaction (Sutherland, Rehman, Fallis, & Goodnight, 2015). A limitation of this study was, however, that couples' actual and perceived desire discrepancy was assessed in separate samples and that different measures were used to assess the two concepts.

Emotional intimacy in aging couples

Some studies suggest that sexual satisfaction and well-being in older women and men are not matters of quantity, but quality (Forbes, Eaton, & Krueger, 2017; Gillespie, 2017b; Lodge & Umberson, 2012; Ménard et al., 2015). For instance, research findings seem to indicate that, compared to penetrative intercourse, other types of intimate physical activities such as exchanging affections (kissing, cuddling, hugging, caressing) become more essential as a source of sexual satisfaction as people age (Clarke, 2006; Hinchliff & Gott, 2004; Hinchliff, Tetly, Lee, & Nazroo, 2018; Sandberg, 2013). In addition, emotional intimacy, defined as “a perception of closeness to another that is conducive to the sharing of personal feelings, accompanied by expectations of understanding, affirmation, and demonstrations of caring” (Sinclair & Dowdy, 2006, p. 194) seems to be associated with what is perceived as “good sex”. For example, a qualitative study investigating facilitators of “optimal” sexuality in older age indicated a strong link between relationship quality (closeness, emotional intimacy, trust, feelings of love, caring for each other, and communication) and “optimal sexual experiences” (Ménard et al., 2015, p. 87). It is interesting that, while a growing number of qualitative approaches point to the importance of emotional and sexual intimacy in older

ages (Clarke, 2006; Hinchliff & Gott, 2004; Hinchliff et al., 2018; Lodge & Umberson, 2012; Ménard et al., 2015; Sandberg, 2013), quantitative studies exploring the relationship between emotional intimacy and sexual satisfaction in older heterosexual couples are lacking.

Aims

Four considerable gaps in the research literature can be revealed. First, despite the fact that sexual relations are inherently dualistic (Byers & Rehman, 2014; de Jong & Reis, 2014), there are few studies that have used dyadic approaches to explore sexual satisfaction, particularly in older adults (Muise, Maxwell, & Impett, 2018; Štulhofer, Jurin, Graham, Janssen, & Træen, 2019). This is regrettable, as recent evidence demonstrates how dynamics within couples can promote relationship quality and sexual satisfaction in midlife and older couples (Fisher et al., 2015; Orr et al., 2019). Second, despite the fact that initial research points to the significance of emotional intimacy and physical affection later in life (Clarke, 2006; Lodge & Umberson, 2012; Sandberg, 2013), scant attention has been directed to the dynamics of older couple's sexuality and their perceived emotional support. The third gap in the literature concerns the lack of an interpersonal perspective on sexual interest (Dewitte et al., 2020; Mark, 2015). For instance, while it is common to explore the lack of sexual interest in older individuals (Laumann et al., 2005; Mitchell et al., 2013), understanding an individual's sexual interest relative to the partner's sexual interest, seems highly understudied in aging couples. A fourth gap can be found in sexual desire discrepancy literature, which relates to the conceptualization of discrepancy concepts (Mark, 2012, 2015). Preliminary explorations point to conceptual and empirical differences between actual and perceived desire discrepancy (Davies et al., 1999; Sutherland et al., 2015). However, to the best of our knowledge, there are no studies that have explored these concepts in older heterosexual couples.

Based on four literature gaps and building on a recent exploration of the mechanisms underlying the association between perceived discrepancy in sexual interest and sexual satisfaction among older heterosexual partnered adults (Fischer, Træen, Štulhofer, & Hald, 2019), the present study aims to: (1) examine how discrepancies amongst partner’s self-reported sexual interest score compares to a persons perceived discrepancy by applying similar methodologies within the same sample; (2) assess if and how each concept is related to sexual satisfaction in older heterosexual couples using dyadic analysis; and (3) explore the robustness of the associations between sexual interest discrepancy and sexual satisfaction by controlling for perceived emotional intimacy. The theoretically expected associations of the dyadic model are depicted in Figure 1.

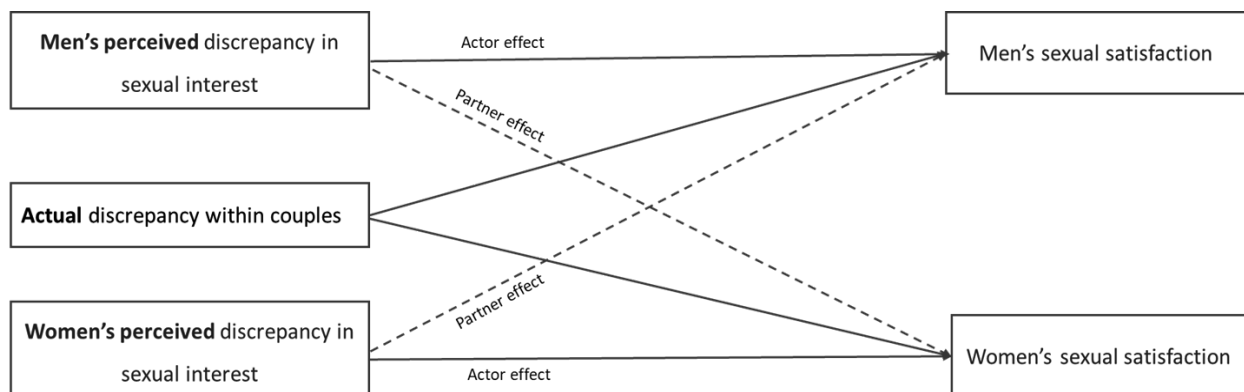


Figure 1. The Actor-Partner Interdependence Model (APIM) schematically illustrating the association between discrepancy in sexual interest (actual and perceived) and each partner’s sexual satisfaction, statistically controlling for age and country affiliation. Perceived emotional intimacy used as an additional control in the second path analytic APIM (control variables and covariances are not depicted in the conceptual model).

Using dyadic data collected from European heterosexual couples aged 60–75 years, the study addresses three specific research questions:

(RQ1) Is there a significant difference between perceived discrepancy in sexual interest and the actual discrepancy in sexual interest within the couple?

(RQ2) What are the associations between actual and perceived discrepancy in sexual interest and sexual satisfaction in older couples?

(RQ3) Finally, does controlling for perceived emotional intimacy change the associations between actual and perceived discrepancy and sexual satisfaction, if any?

Methods

Procedure

Data for this multinational survey on healthy sexual aging was collected between late 2016 and early 2017. Using probability-based sampling, the international polling organization Ipsos recruited 3,816 individuals aged 60–75 years from Norway, Denmark, Belgium, and Portugal. In keeping with the WHO and UN working definition of “older age” (World Health Organization, 2001), the inclusion criteria for both partners was defined as at least 60 years. Due to concerns for falling response rates and the uncertainty of whether decreasing cognitive skills would impede participation above the age of 75, the upper age limit was set as 75 years. Potential subjects were contacted by phone using the national phone registry in Norway, Denmark and Belgium. Due to the absence of an updated and complete national phone registry, multi-stage stratified sampling was implemented in Portugal. Individuals who confirmed their participation during the telephonic recruitment interview received a 200-item postal/mail questionnaire with a prepaid return envelope. The rates of those who actually returned the completed and approved questionnaire after having confirmed their participation during the recruitment interview were 68% in Norway, 57% in Belgium, 52% in Denmark,

and 26% in Portugal. For a more detailed description of the sample and the recruitment process, see Træen et al., 2019.

In addition to recruiting individual participants, we aimed to collect data from both members of a couple. The object was to recruit at least 100 couples in each country within the targeted age range of 60–75 years. During the telephonic recruitment interview, Ipsos asked the prospective participant whether he/she lived with a partner, and if they could talk to this partner. In case the partner was at home, Ipsos continued the interview with the partner (reciting all recruitment text). If the partner was not available, Ipsos asked for the partner's name and telephone number, as well as best time to call. Sampled couples were asked to fill out the questionnaire in private and submit it separately. In the current study, all analyses were based on this dyadic subsample of 677 heterosexual couples (218 from Norway, 207 from Denmark, 135 from Belgium, and 117 from Portugal). No details about response rates of the dyadic sample were accessible to the project team.

Questionnaire

The survey contained approximately 200 items covering questions on participants sociodemographic characteristics, physical and mental health, lifestyle, satisfaction with life, body image, relationship factors, sexual behavior, sexual attitudes, sexual function and sexual satisfaction, with most of the indicators being used in previous sex-surveys (Træen et al., 2019). Questions were initially written in English and thereafter translated into the countries respective languages (Norwegian, Danish, Dutch/French, and Portuguese) by native speakers on the project's research team and staff from the international polling agency Ipsos.

Measures

The main components of the proposed model were sexual satisfaction, actual discrepancy in sexual interest (defined as actual differences in sexual interest amongst partners), perceived discrepancy in sexual interest (defined as a person's own sexual interest

compared to the perception of their partner's sexual interest), and emotional intimacy (see "Appendix A" for the wording and the construction of all items).

Sexual satisfaction. Two single-item indicators assessed sexual satisfaction. One item assessed participants' satisfaction with their sexual life in the last year on a 5-point scale (ranging from 1 = completely dissatisfied to 5 = completely satisfied) and one asked participants to assess how satisfied they are with their current level of sexual activity on a 5-point scale (ranging from 1 = very satisfied to 5 = very dissatisfied). Scores from the latter item were reverse-recoded, so higher scores denoted higher sexual satisfaction. The indicator demonstrated a satisfactory internal consistency reliability in our dyadic sample (coefficient $\alpha = .90$).

Actual discrepancy in sexual interest. All participants were asked to indicate their sexual interest, while having their regular partner or spouse in mind. The item was rated on a 5-point Likert scale with 1 = strongly agree and 5 = strongly disagree, where higher scores denoted greater interest in sex. To assess the actual discrepancy in sexual interest within couples, we computed the difference between each partner's score (the absolute value of the male partner's interest in sex subtracted from the absolute value of the female partner's interest in sex). Difference scores ranged from zero (no actual difference in partners' sexual interest) to 4, with higher scores indicating greater actual discrepancy in sexual interest within a couple. Since both members of each couple have the exact same actual discrepancy score (the absolute discrepancy score in sexual interest can vary across couples but not within a couple), the new construct is a dyad-level indicator (Kenny, Kashy, & Cook, 2006).

Perceived discrepancy in sexual interest. To assess perceived discrepancy in sexual interest, we computed the absolute difference between participants' own sexual interest ("I am not interested in sex"), and participants' perception of his/her partner's sexual interest ("My partner has no interest in sex") (Fischer et al., 2019). Perceived discrepancy scores ranged

from 0 to 4, with zero indicating no mismatch between partners' interest in sex. The higher the score, the greater the perceived discrepancy in sexual interest.

Emotional intimacy. Adopted from Sinclair and Dowdy (2006), the validated 5-item *Emotional Intimacy Scale* assessed a person's perceived emotional support in his or her closest relationship (e.g., My thoughts and feelings are understood and affirmed by this person"). All items were measured on a 5-point scale (ranging from 1 = strongly agree to 5 = strongly disagree), and were reverse-scored, so higher scores reflect higher emotional intimacy. The scale had excellent internal consistency reliability in the dyadic sample (coefficient $\alpha = .90$).

Statistical Analysis

We used the Actor-Partner Interdependence Model (APIM) (Kenny et al., 2006) to examine intimate partners' influence on each other's sexual satisfaction. One advantage of APIM is that it enables the estimation of individuals sexual satisfaction, taking into account both intrapersonal (actor effect) and interpersonal effects (partner effect). In the current study, actor effects refer to how an individual's perceived discrepancy in sexual interest influences his/her own sexual satisfaction, while partner effects refer to how the individual's perceived discrepancy in sexual interest influences his/her partner's sexual satisfaction (see Figure 1) (Cook & Kenny, 2005; Kenny et al., 2006). Because actual discrepancy in sexual interest is a dyad-level variable—both partners have the same discrepancy score—the distinction between actor and partner effects is not feasible here. Perceived emotional intimacy was used as a control in the second path analytic APIM. All analyses were controlled for age and country residence (three dummy variables with Norway as a reference category were used).

Actor and Partner effects were estimated using a Structural Equation Modeling (SEM) approach (Kenny et al., 2006). Model fit was evaluated using the Comparative Fit Index (CFI; values ≥ 0.95 represent good fit) (Hu & Bentler, 1998; Kenny et al., 2006), and the Root

Mean Square Error of Approximation (RMSEA; values \leq 0.08 indicate acceptable fit and \leq 0.05 good fit) (Byrne, 2016). Due to the size of our sample (677 dyads), the model chi-square value was expected to be significant—regardless of actual fit (Kenny et al., 2006). To handle missing values, we applied the Full Information Maximum Likelihood (FIML) method (Graham, 2012). Except for descriptive and bivariate analyses, which were carried out in SPSS 25.0, all statistical analyses were conducted in IBM AMOS version 25.0 (Arbuckle, 2017).

Results

Sample Characteristics

On average, male partners were older than female partners ($M_{\text{men}} = 68.0$, $SD = 4.04$; $M_{\text{women}} = 66.1$, $SD = 3.92$, $t_{(676)} = 15.24$, $p < .001$; $\eta^2 = .26$) (Table 1). Most couples reported either secondary (40% of men and 42% of women) or tertiary/college education (lower to higher university level) (39% of men and 37% of women). The majority of partners were retired (79% of men and 70% of women), and were living in a small town (37%) or rural area (29%). Most couples had been in the relationship for 30 years or more (81%). With regard to the level of sexual activity (sexual intercourse, masturbation, petting, or fondling) in the past year, the vast majority reported that they had been sexually active (89% of men and 87% of women), with almost all participants reporting that their most recent sexual partner had been their spouse (99%). Since all recruited couples were heterosexual, all dyad members could be distinguished/differentiated from one another by their sex (Kenny et al., 2006).

Table 1. Individual and relational characteristics of couples from four European countries aged 60–75 years ($n = 677$ dyads).

		Male partner	Female partner
		<i>n</i> (%)	
Age groups			
	60-65	204 (30.1)	309 (45.6)
	66-70	260 (38.4)	259 (38.3)
	71-75	213 (31.5)	109 (16.1)
Level of education			
	Primary	140 (20.8)	142 (21.1)
	Secondary	271 (40.2)	284 (42.1)
	Tertiary	263 (39.0)	248 (36.8)
Work status			
	In paid work	131 (19.4)	134 (19.8)
	Retired	534 (78.9)	471 (69.6)
Place of residence			
	Rural	191 (28.6)	
	Small town	248 (37.2)	
	Medium sized city	92 (13.8)	
	Suburb of a large city	64 (9.6)	
	Central large city	72 (10.8)	
Relationship length			
	≤ 1 years	41 (6.5)	
	2-9 years	16 (2.5)	
	10-29 years	65 (10.4)	
	≥ 30 years	506 (80.6)	
Sexual active in the past year ^a			
	Yes	574 (89.0)	541 (86.7)
	No	71 (11.0)	83 (13.3)
Recent sexual partner			
	Spouse	581 (99.0)	573 (98.8)
	Not spouse/wont's say	6 (1.0)	7 (1.2)

Note. ^aIncluding sexual intercourse, masturbation, petting or fondling

Female partners reported being more sexually satisfied than their male partners ($t_{(668)} = -3.65, p < .001, \eta^2 = .02$) (Table 2). No significant difference in reported levels of emotional intimacy was found between male and female partners. Actual discrepancy in sexual interest was observed in 56% of the couples. A discrepancy between how an individual's sexual interest compared to their partner's perceived sexual interest was observed in 38% of the male partners and 31% of the female partners.

Table 2. Overview of the studied variables; means and standard deviations, frequencies and percent ($n = 677$ dyads).

	Male partner	Female partner	Gender difference	Within-couple correlation
	Mean (<i>SD</i>) / <i>n</i> (%)			
Sexual satisfaction ^a	3.4 (1.0)	3.6 (.95)	***	.53***
Emotional intimacy ^b	4.3 (.64)	4.3 (.69)	<i>ns</i>	.44***
Actual discrepancy in sexual interest ^c				
None	251 (44.3 %)			
1 unit discrepancy	213 (37.6 %)			
2 units discrepancy	65 (11.5 %)			
3 units discrepancy or more	38 (6.7 %)			
Perceived discrepancy in sexual interest			<i>ns</i>	.27***
None	380 (62.1 %)	410 (69.0 %)		
1 unit discrepancy	132 (21.6 %)	112 (18.9 %)		
2 units discrepancy	71 (11.6 %)	40 (6.7 %)		
3 units discrepancy or more	29 (4.7 %)	32 (5.4 %)		

Note. Dyadic sample size varies somewhat across analyses due to missing data; Gender difference (paired two-tailed t -test); Within couple correlation (pearsons r); ^aSexual satisfaction values range from 1–5; ^bEmotional intimacy values range from 1–5; ^cDyad-level variable: both members of the couple have the same score; *** $p > .001$; *ns* = not significant

The strongest within-couple correlation was found between male and female sexual satisfaction ($r = .53, p < .001$), whilst the weakest association was observed between male and female perceived discrepancy in sexual interest ($r = .27, p < .001$).

Comparison of actual versus perceived discrepancy

To test for group differences in the discrepancy concepts (RQ1), a paired-sample t -test was conducted (Table 3). Couples' actual discrepancy in sexual interest was significantly higher than both male ($p < .001$) and female partners' perceived discrepancy interest in sex (p

< .001). No significant difference between male and female partners' perceived discrepancy was found ($p < .059$).

Table 3. Bivariate analyses: Differences in discrepancy in sexual interest in older heterosexual couples.

	Mean	SD	<i>t</i>	<i>df</i>	<i>p</i> ^b	η^2
Actual discrepancy within couples	.83	.96	-5.37	.562	< .001	.05
Perceived discrepancy in male partners	.60	.93				
Actual discrepancy within couples	.83	.96	-9.20	.559	< .001	.13
Perceived discrepancy in female partners	.51	.91				
Perceived discrepancy in male partners	.60	.94	1.89	.555	.059	.01
Perceived discrepancy in female partners	.51	.92				

Note. Dyadic sample size varies somewhat across analyses due to missing data. ^b *p*-values derived from paired two-tailed *t*-test

Actor and Partner Effects

The results of path analytic APIM analysis (Models 1 and 2) are presented in Table 4. Both models were a good fit to the data (Model 1: $\chi^2_{(15)} = 18.10$, CFI = .999; RMSEA = .017, 90% CI [.000–.042]; Model 2: $\chi^2_{(144)} = 415.26$, CFI = .961; RMSEA = .053, 90% CI [.047–.059]).

To answer the second research question (RQ2), we assessed the associations between actual and perceived discrepancy in sexual interest and sexual satisfaction, while controlling for age and country (Model 1). Three patterns in the findings emerged. First, the more discrepancy in sexual interest partnered women and men perceived, the lower their reported sexual satisfaction (actor effects). Second, male partners' perceived discrepancy in sexual interest was negatively related to their female partner's sexual satisfaction; the greater the male partner's perceived discrepancy, the lower the female partner's sexual satisfaction (partner effect). Third, actual discrepancy in sexual interest was unrelated to sexual satisfaction in both partners.

Table 4. Relationships between actual and perceived discrepancy in sexual interest and sexual satisfaction in older couples from four European countries.

Model 1: Controlling for country^a and age. Model 2: Controlling for country^a, age, and perceived emotional intimacy (path analytic APIM).

	Male partner's				Female partner's			
	sexual satisfaction		sexual satisfaction		sexual satisfaction		sexual satisfaction	
	b (SE)		b (SE)		b (SE)		b (SE)	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Male perceived discrepancy in sexual interest	AE	-.36*** (.04)	-.28*** (.05)	PE	-.12** (.04)	-.10* (.04)		
Female perceived discrepancy in sexual interest	PE	-.04 (.05)	.00 (.05)	AE	-.21*** (.05)	-.17*** (.05)		
Actual discrepancy in sexual interest ^b		-.03 (.05)	-.05 (.05)		-.07 (.05)	-.06 (.05)		
Male emotional intimacy	AE	.33*** (.07)		PE		.06 (.06)		
Female emotional intimacy	PE		.10 (.06)	AE		.27*** (.06)		

Note. ^a Norway is reference category; b = Unstandardized path coefficients; SE = standard errors; AE = actor effect and PE = partner effect; ^bDyad-level

variable: both members of the couple have the same score; * $p < .05$; ** $p < .01$; *** $p < .001$

Concerning our third research question (RQ3), we found that, when controlling for age, country, and emotional intimacy (Model 2), the pattern of relationships between discrepancy in sexual interest (actual and perceived) and sexual satisfaction did not substantially change. Additionally, we observed a positive association between emotional intimacy and reported sexual satisfaction, but only as actor (and not partner) effects. That is, the more emotional intimacy partnered men and women perceived, the greater their own sexual satisfaction.

Considering the other control variables, country residence was not significantly associated with either male or female partner's sexual satisfaction. Age was negatively related to male sexual satisfaction ($b = -.03$; $p < .05$), but positively related to female sexual satisfaction ($b = .02$; $p < .05$). Overall, the APIM model explained 25% of variance in female and 26% of variance in male sexual satisfaction.

Discussion

Compared to other couple-related research (e.g., study of romantic relationships), the implementation of dyadic approaches in sexual satisfaction research is limited (Byers & Rehman, 2014; Muise et al., 2018). In the current study, a dyadic sample of heterosexual adults was used to investigate actual versus perceived discrepancy in sexual interest, and to explore their role in older couples' sexual satisfaction. We found that, whilst a couple's actual discrepancy in sexual interest did not predict his and her sexual satisfaction, perceived discrepancy was negatively associated with sexual satisfaction in both men and women. In addition, reported emotional intimacy was positively related to sexual satisfaction, but only as actor (and not partner) effects.

Concerning our first research question (RQ1), exploring the differences between actual and perceived discrepancy in sexual interest, we found that actual discrepancy in sexual interest within couples was significantly higher than his and her perceived discrepancy in

sexual interest. This finding is similar to Davies et al. (1999), who found a higher prevalence of couples' actual desire discrepancy than the individuals' perception of desire discrepancy. One possible explanation for why older adults perceive less within-couple differences in sexual interest may be due to the unintentional use of heuristic shortcuts, where the individual uses personal characteristics/preferences as a point of reference when assessing their partner's characteristics/preferences (Davis, Hoch, & Ragsdale, 1986; Schul & Vinokur, 2000). For instance, in three dyadic studies that sampled established couples, Muise et al. (2016) found that individuals were inclined to project their own level of sexual desire onto their intimate partner—assuming similarity between their own level of sexual desire and the desire of their partners. Despite the possibility that projection may lead to biased judgments (Schul & Vinokur, 2000), assumed similarity, such as perceived sexual compatibility, has been found to increase the likelihood of being sexually satisfied (Mark, Milhausen, & Maitland, 2013; Offman & Matheson, 2005). Moreover, it has recently been suggested that individuals' sexual satisfaction may be a result of *motivated cognitions strategies* (de Jong & Reis, 2014). Specifically, according to de Jong and Reis, individuals are motivated to overperceive sexual similarity as a strategy to reduce vulnerability in their sexual relationship—thereby promoting positive feelings of security, safety, intimacy, and sexual satisfaction. Motivational cognition strategies may also explain why the average levels of perceived discrepancy in sexual interest were generally low in our sample.

In exploring the association between actual and perceived discrepancy in sexual interest and sexual satisfaction (RQ2), it was found that, as older adults perceive a greater discrepancy between their own and their partner's interest in sex, they tend to report lower sexual satisfaction. This finding is consistent with previous research, suggesting a negative link between perceived desire discrepancy and sexual satisfaction in several samples of partnered adults (Bridges & Horne, 2007; Davies et al., 1999; Fischer et al., 2019; Gillespie,

2017a; Sutherland et al., 2015). Moreover, it corroborates with Gillespie's (2017b) model of sexual synchronicity, where feeling "out of sync" (p. 453) can lead to lower sexual satisfaction in aging men and women. Interestingly, actual mismatch in partners' sexual interest did not predict their sexual satisfaction levels. This suggests that perceptions may be more important than reality—a finding that has also been evident in other research areas (Cohen, Schulz, Weiss, & Waldinger, 2012; Hinnekens, Stas, Gistelinck, & Verhofstadt, 2019; Mark et al., 2013; Montoya, Horton, & Kirchner, 2008; Murray, Holmes, Bellavia, Griffin, & Dolderman, 2002). This means that the subjective feelings of being sexually similar/dissimilar seem to be more important to sexual and/or relationship satisfaction than a couple's actual sexual (mis)match (de Jong & Reis, 2014; Mark et al., 2013). Our findings strongly support conceptual, methodological, and empirical distinctions between perceived and actual sexual interest and/or desire (Davies et al., 1999; Sutherland et al., 2015).

In addition to the aforementioned actor effects, we found one gender-specific partner effect. Men's perceived discrepancy in sexual interest significantly contributed to their female partners' sexual satisfaction. One possible explanation may be that the man's perceived discrepancy in sexual interest elicits feelings of pressure or sexual obligation, which in turn decreases her sexual satisfaction. For instance, both partner conflicts due to sexual desire discrepancies and feelings of obligation to meet the partner's sexual desires are common among older women (Hartmann, Philippsohn, Heiser, & Ruffer-Hesse, 2004).

Regarding the third research question (RQ3), we found that controlling for emotional intimacy did not change the pattern of significant/non-significant relationships between discrepancy in sexual interest (actual and perceived) and sexual satisfaction in aging couples. Additionally, we found positive associations between individuals' emotional intimacy, and older adults' sexual satisfaction. These findings are similar to those of earlier studies where

emotional intimacy, was found to be associated with sexual satisfaction (Štulhofer, Ferreira, & Landripet, 2014).

Strengths and Limitations

The strengths of the current research include a dyadic approach to the examination of processes of mutual influence in older couples' sex lives and a statistical, high-powered, large-scale sample. However, several limitations also need to be addressed. First, it should be noted that actual discrepancy in sexual interest, although different from the measure of perceived discrepancy, is not an objective measure. It is likely that individuals use different benchmarks when they evaluate their level of sexual interest. This means that two partners may in fact have the same level of sexual interest but report different scores (or vice versa)—due to specific personal benchmarks. We acknowledge that calculating actual discrepancy in sexual interest through an item measuring each partner's agreement with the statement "I'm not interested in sex" may cause variability in how partners interpret the item and may encourage misinterpretations of the finding (Schick, Calabrese, & Herbenick, 2014). To address this limitation, we suggest that future studies build their discrepancy measures on components assessing, not the degree, but the absolute frequency of each partners' sexual interest (e.g., "Thinking about the past month, how often have you been interested in engaging in some kind of sexual activity with your partner?", scaled from 1= Not at all to 7 = Many times a day). Further, it is important to note that although we find that couples differ in their actual and perceived levels of sexual interest, the means of the reported discrepancies were fairly small. It is likely that couples with major desire discrepancies may not have wanted to participate in a study on sexual health, or that those couples already have dissolved their relationship, and thus were no longer accessible for recruitment (Fisher et al., 2015; Heiman et al., 2011). Although individual data was collected in national probability-based samples of adults' aged 60–75 years in Norway, Denmark, Belgium, and Portugal, the

sampling procedure of the dyadic subsample does not ensure that our findings are representative of the respective European populations at that age. It is likely that more liberal and sexually positive older couples are being overrepresented in the sample (Bogaert, 1996; Dunne et al., 1997; Strassberg & Lowe, 1995). Exactly how this sampling bias has affected our findings is not clear, but it may limit the generalizability of results. In addition, we were unable to recruit non-heterosexual couples, so this study's findings cannot be extended to older same-sex couples.

Another limitation pertains to the use of single-item measures to assess sexual satisfaction. We acknowledge that the psychometric properties of multiple-item scales may outweigh those of a single-item measure. However, comparable one-item measures of sexual satisfaction have been used in many large-scale national surveys (Corona et al., 2010; Field et al., 2013; Heiman et al., 2011; Lee, Nazroo, O'Connor, Blake, & Pendleton, 2016). Further, there is evidence that single-item measures of sexual satisfaction demonstrate convergent validity with several sexual satisfaction scales (Mark, Herbenick, Fortenberry, Sanders, & Reece, 2014; Štulhofer, Buško, & Brouillard, 2010). In addition, Mark et al. (2014) found support for convergent validity by assessing the association between a single-item measure of sexual satisfaction and participant's relationship satisfaction. As with Mark et al. (2014), we correlated the additive indicator of sexual satisfaction with participants' relationship satisfaction, and found a significant positive associations between the two theoretically related concepts ($r_{\text{men}} = .36, p < .001$; $r_{\text{women}} = .40, p < .001$). Next, it was originally planned to select countries that would reflect different geographical regions in Europe (south, north, east, and west), which we assumed would differ in their sexual cultures. Owing to financial restraints and problems in finding research associates from Eastern Europe, the selected countries (Norway, Denmark, Belgium, and Portugal) rather represent the national affiliation of the final project team (Štulhofer, Hinchliff, Jurin, Carvalheira, & Træen, 2019). Finally, given the

cross-sectional design of our study, the direction of paths between emotional intimacy, actual and perceived discrepancy in sexual interest, and sexual satisfaction could not be established. Consequently, the terms actor and partner “effects” were used in a methodological, not causal, sense. Longitudinal dyadic studies would be needed to explore the direction of these associations.

Conclusion

Previous research on sexual desire discrepancy suggested several important conceptual and methodological points: (1) the construct should be explored in both short-term and long-term relationships; and (2) the construct should be carefully specified to minimize inconsistent findings (Davies et al., 1999; Mark, 2012, 2015; Sutherland et al., 2015). The current study’s findings provide evidence supporting the need to differentiate between actual and perceived discrepancy in sexual interest/desire. We found that only perceived discrepancy in sexual interest predicted sexual satisfaction in older couples (Davies et al., 1999; Sutherland et al., 2015). In addition, the findings that emotional intimacy was important for sexual satisfaction in older heterosexual couples add to an emerging body of literature concerning diverse, intimate, and erotically flexible pathways to healthy sexual aging (Clarke, 2006; Hinchliff et al., 2018; Müller, Nienaber, Reis, Kropp, & Meyer, 2014; Sandberg, 2013; Štulhofer, Jurin, et al., 2019).

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APPENDIX A (PAPER III)

Table 5. The wording and construction of the variables used in the APIIM

Survey variables	Item wording	Response scale
Sexual satisfaction	Thinking about your sex life in the last year: All things considered, how satisfied are you with your sexual life?	1 = Completely dissatisfied 2 = Dissatisfied 3 = Neither satisfied nor dissatisfied 4 = Satisfied 5 = Completely satisfied
	How satisfied are you with the current level of sexual activity in your life, in a general way? ^a	1 = Very satisfied 2 = Rather satisfied 3 = Neither satisfied nor dissatisfied 4 = Rather dissatisfied 5 = Very dissatisfied
Emotional intimacy scale	Please indicate how much you agree with each of the following statements with your regular partner or spouse in mind: ^a This person completely accepts me as I am I can share my deepest thoughts and feelings with this person This person cares deeply for me This person would willingly help me in any way My thoughts and feelings are understood and affirmed by this person	1 = Strongly agree 2 = Agree 3 = Neither agree nor disagree 4 = Disagree 5 = Strongly disagree
Sexual interest	Please indicate how much you agree with each of the following statements with your regular partner or spouse in mind: I am not interested in sex ^b My partner has no interest in sex ^c	1 = Strongly agree 2 = Agree 3 = Neither agree nor disagree 4 = Disagree 5 = Strongly disagree
Discrepancy variables	Item construction	Scale range
Actual discrepancy in sexual interest	Absolute score of male's sexual interest ^b subtracted from absolute score of female's sexual interest ^b	0 = No discrepancy in sexual interest 1 = One unit discrepancy in sexual interest 2 = Two units discrepancy in sexual interest 3 = Three units discrepancy in sexual interest 4 = Four units discrepancy in sexual interest
Perceived discrepancy in sexual interest	Absolute score of own interest in sex ^b subtracted from absolute score of perceived partner's interest in sex ^c	0 = No discrepancy in sexual interest 1 = One unit discrepancy in sexual interest 2 = Two units discrepancy in sexual interest 3 = Three units discrepancy in sexual interest 4 = Four units discrepancy in sexual interest

^a Scores are reverse-coded; ^b Personal interest in sex; ^c Perception of partner's interest in sex

