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Factors Associated with General Sexual Functioning and Sexual Satisfaction among People Living with HIV: A Systematic Review

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ABSTRACT

Sexual difficulties, experienced by half of the people living with HIV (PLWH), not only affect quality of life but have been associated with lower adherence to antiretroviral medication. This systematic review synthesizes studies published since 1997 which used statistical methods to investigate factors associated with general sexual functioning or sexual satisfaction of PLWH. We searched Medline, PsycINFO, Embase, Cinahl and Scopus with terms: HIV AND sexual dysfunction AND factors. Of 5552 records, 26 studies met selection criteria. Twenty-one studies on general sexual function, and five studies on sexual satisfaction. Two researchers separately extracted data and applied standardized quality assessment criteria. (Registration: CRD42018094146.) Regarding general sexual dysfunction, older age, general physical health, depression, body image and psychological distress were the most relevant factors. There was inconsistent evidence for: CD4, viral load, HIV symptom severity, HIV disease progression and time since diagnosis. From limited available evidence on sexual satisfaction, age, unemployment, and psychosocial factors were significant. Overall, anxiety and relational factors were under-researched, treatment center studies were over-represented and non-validated measurement of outcomes was common. Future research is required to build theoretical models of sexual well-being specific to PLWH to guide effective research and intervention to promote sexual quality of life of PLWH.

Life expectancy of people living with HIV (PLWH) has been improving and is approaching equivalence with that of HIV negative people (Nakagawa, May, & Phillips, 2013; Teeraananchai, Kerr, Amin, Ruxrungtham, & Law, 2017). Therefore, enhancing quality of life is of increasing importance to HIV care. While more general aspects of quality of life, such as physical health changes, are often addressed in clinical consultations with PLWH, sexual difficulties are less commonly raised and tend to go unaddressed (Miguez-Burbano, Espinoza, & Lewis, 2008). This is despite the consistent finding that about half of PLWH experience sexual difficulties (Collazos, 2007), with the most commonly raised difficulties including loss of libido (Bourne, Hickson, Keogh, Reid, & Weatherburn, 2012), erectile dysfunction (Madeo et al., 2012; Zona et al., 2012), and painful intercourse (among women) (Sandfort, Collier, & Grossberg, 2013). Moreover, when directly compared, the prevalence of sexual difficulties is higher among PLWH than among HIV negative people (Lamba, Goldmeier, Mackie, & Scullard, 2004), and PLWH experience lower sexual function than both HIV negative people (Denis & Hong, 2003) and other clinical care groups, such as people with cancer (Shacham, Lopez, Souza, & Overton, 2017).

Unaddressed sexual difficulties are problematic for two key reasons. Firstly, such difficulties interfere with intimate relationships. Such relationships are important to overall happiness and wellbeing (Holt-Lunstad, Smith, & Layton, 2010), and health professionals should seek to maximize this aspect of quality of life as part of HIV care. Secondly, an association has been found between sexual difficulties and lower adherence to antiretroviral medication (Miguez-Burbano et al., 2008; Scanavino, 2011; Trotta et al., 2008). While causation is not yet clear, it could be that an individual's belief that HIV medication is causing sexual difficulties means they are less adherent to HIV medication. Medication adherence results in better general health outcomes for PLWH (Lundgren et al., 2015). Moreover, effective antiretroviral treatment resulting in viral suppression prevents transmission of HIV to another person during sexual intercourse without condoms (Bavinton et al., 2018; Rodger et al., 2018, 2016). It is therefore imperative that health professionals address sexual difficulties of PLWH in their care not only to promote optimal sexual quality of life, but also to increase length of life, enhance general quality of life and relationships, and (through greater medication adherence) potentially nullify risk of transmission of HIV to another person.

Existing reviews relevant to this topic published in 2007 and 2011 both focused on medical treatment factors,

particularly protease inhibitors within combination therapy, as responsible for sexual dysfunction among PLWH (Collazos, 2007; Scanavino, 2011). When non-medical factors were considered, heterogeneity of study types and largely conflicting findings between studies were evident. Many changes have occurred in the past 8 years which have the potential to impact sexual wellbeing of PLWH. This includes the finding that there is effectively no risk of an HIV-positive person with undetectable viral load transmitting HIV during sex (Bavinton et al., 2018; Cohen et al., 2016; Rodger et al., 2019, 2016), findings of high efficacy of daily pre-exposure prophylaxis to prevent HIV transmission (Grant et al., 2014, 2010; Marcus, Hurley, Nguyen, Silverberg, & Volk, 2017) and the dissemination of these findings as HIV prevention and control strategies (CDC, 2018; EACS, 2018; Prevention-Access-Campaign, 2017). The aim of this work was therefore to conduct an up-to-date systematic review of studies published since 1997 which used statistical methods to investigate factors associated with general sexual functioning or sexual satisfaction of PLWH.

Method

Search Strategy and Selection Criteria

We searched Medline, PsycINFO, Embase, Cinahl and Scopus for terms: HIV AND sexual dysfunction AND factors (as well as synonyms of these terms). A search strategy was developed for each database with a combination of free text and controlled vocabulary (i.e., MeSH terms) by three research team members (BH, DM, IJ). See Online [Supplementary Table 1](#) for the full electronic search strategy used for Ovid databases. Reference lists of publications retrieved in the first step were screened for relevant studies.

Study Selection

Two authors (BH and DM) screened articles by title and abstract followed by the retrieval and screening of full-text articles using the eligibility criteria described below. Studies were included if they involved an HIV-positive sample or sub-sample recruited after the introduction of combination therapy (post-1997) which had performed a statistical analysis to determine which factors were associated with: a) sexual satisfaction, or b) general sexual function or dysfunction. Exclusion criteria included reviews, brief reports, conference proceedings, not peer-reviewed or used qualitative methods only, studies that did not include a (quantitative) measurement of sexual functioning, studies that were not published in the English language and studies which only compared people with HIV to other groups (e.g., people with cancer).

Data Extraction and Quality Assessment

Data were extracted by two reviewers (BH, DM) using the Joanna Briggs Institute standardized data extraction and critical appraisal tools (JBI, 2017). The data extracted included specific details about the populations, study methods, outcome measures, specific objectives, significant and non-significant findings

relevant to the review question, and available information on strength of association between dependent variable and variables of interest. We also calculated effect sizes for associations, but only if it was possible based on reported data and if information on strength of association had not already been reported. A research assistant crosschecked all extracted data for accuracy. Study quality was assessed by two independent reviewers using the Joanna Briggs Institute standardized Checklist for Analytical Cross Sectional Studies (JBI, 2017). This involved rating each of eight items (e.g., were the criteria for inclusion in the sample clearly defined?) using the response options “yes”, “no” (yes was given a score of 1, and no given a score of 0 which allowed a percentage score to be calculated). Any disagreements that arose between the reviewers were resolved through discussion, or with a third reviewer.

PROSPERO registration: CRD42018094146.

Results

Description of Included Studies

Of 5552 records found, 26 studies met selection criteria (see [Figure 1](#)). Of these studies, 10 sampled females, 9 sampled males, and 7 recruited samples of mixed gender. Twenty-one of these studies were conducted in HIV treatment centers, four were conducted within community organizations and one within a metabolic clinic. All studies used convenience sampling methods.

Sample sizes varied from 21 to 1,812 people with HIV (mean = 368) (See [Table 1](#)). Most included studies were conducted in high-income nations (USA = 8, Australia = 1, UK = 2, Europe = 9), with the remainder conducted in Africa (n = 3), Central America (n = 1) and India (n = 2), or country of study conduct was unclear (n = 1). Sixteen were published during or after 2013. All studies used analytic cross-sectional designs. The average quality rating across all studies (as a percentage) was 65%.

Non-validated sexual outcome measures were used by 12 studies, while 14 studies used a validated measure (see Online [Supplementary Table 2](#) for outcome measures and analyses used). Seven studies used the Female Sexual Function Index (FSFI) (Rosen et al., 2000) and two studies used the Derogatis Sexual Functioning Index (Derogatis & Melisaratos, 1979). The remaining validated questionnaires were each used by a single study. Online [Supplementary Table 2](#) gives the central tendency or prevalence figure for the sexual outcome measured in each study. Studies which used non-validated symptoms checklist-style measurement reported higher dysfunction than validated questionnaires. Among female sample studies, prevalence of sexual dysfunction ranged from 32% to 61%. One male sample study reported prevalence of sexual dysfunction as 49.1%. Reported dissatisfaction ranged from 25% to 39%. We decided to include the International Index of Erectile Dysfunction (IIEF-15) when treated as a total score in its full 15-item version as it measures additional aspects of the sexual response cycle in addition to erectile function, and therefore measured general sexual functioning (see Online [Supplementary Table 3](#) for descriptions of validated outcome measures used).

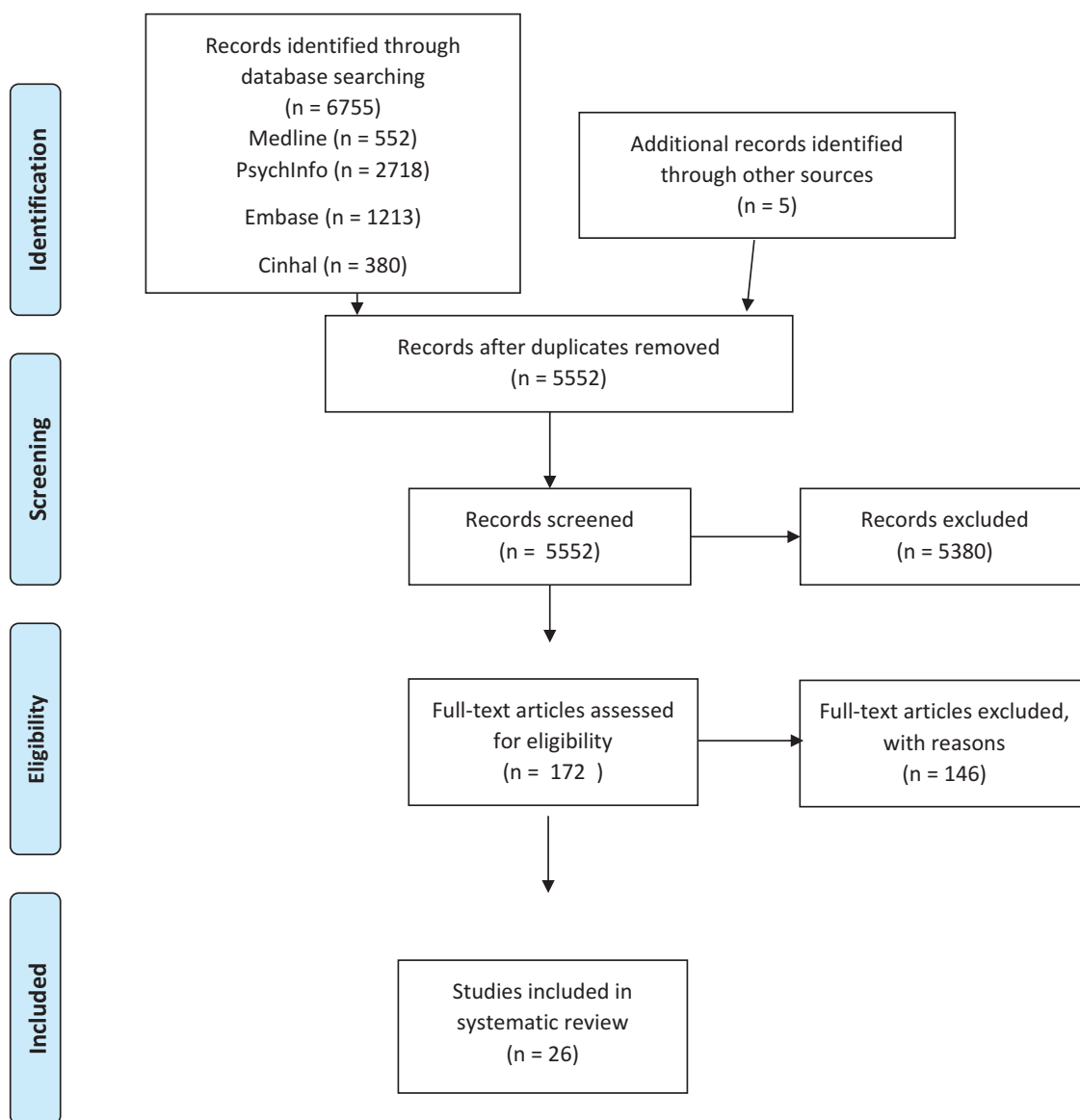


Figure 1. Flowchart of study selection.

Twenty-one studies investigated factors associated with general sexual functioning of PLWH (outcome 1), and five studies examined factors associated with sexual satisfaction (outcome 2). Factors associated with these two sexual outcome variables were organized under thematic headings, namely: i) demographic factors, ii) HIV parameters and treatment related factors (e.g., viral load, CD4 count, anti-retroviral drug regimen), iii) other non-HIV health-related factors, and iv) psychosocial factors.

Outcome 1: General Sexual Functioning (22 studies)

Demographic Factors

Nine of twenty-two studies examined if at least one demographic factor was associated with general sexual functioning. The majority of these papers were rated good to strong in quality, scoring >60%. Age was examined as a potentially associated factor in multiple studies. Other demographic

factors were examined, yet these results were not replicated across studies.

Age

Six of twenty-two studies investigated age. Three of these concluded, based on statistical significance testing, that age was relevant to general sexual functioning and four did not. When possible we calculated effect sizes for these six findings, and all were in the small to medium range (see Online Supplementary Table 4). The distribution of ages within female sample studies likely affected whether age as a factor was found to be statistically significant, and therefore whether it was concluded to be relevant to general sexual functioning. Specifically, the authors of the Nigerian study (Oyedokun, Odeigah, Alabi, Adegunloye, & Akujobi, 2014) with a slightly older mean sample age (38 years) concluded, based on statistical significance that age was relevant to general sexual dysfunction. Yet, the authors of the female sample study from India, whose sample was skewed toward a younger age group (20–39) (Muthiah, Kallikadavil,

Table 1. Characteristics of included studies (n = 27).

Study	n	Gender	Setting	Location	Age	Ethnicity	Study start to end date	Quality Rating %
Agaba et al. (2017)	370	Female	HIV Treatment Center	Jos, Nigeria	33 ± 5	Not reported.	March 2013 to February 2014	75
Bouhnik et al. (2008)	1812	Mixed Gender	Community	France	median = 42	No reported.	Unclear to 2003	37.5
Bova and Durante (2003)	101	Females	HIV Treatment Center	USA	mean = 37	51% Caucasian, 29% Latina (of which 94% were of Puerto Rican origin), 17% African-American, and 3% Other.	Not specified	50
Collazos et al. (2002)	189	Males	HIV Treatment Center	Spain	mean = 36.8	Not specified	September 1998 to Jan 2001	50
Colson et al. (2002)	241	Males	HIV Treatment Center	New England, USA	median age = 37 (21–68)	Not specified	1 Jan 1993 to 1 Nov 1998	87.5
Cove and Petrak (2004)	78	Males	HIV Treatment Center	UK	20–29: 15% 30–39: 53% 40–49: 25% 50–59: 7%	White UK – 72% Black UK – 0% Black Caribbean – 3% Other European – 11% Other – 14%	January to November 2001	62.5
De Ryck et al. (2012)	1017	Heterosexual men who acquired HIV through IVDU and migrants to Europe were excluded)	HIV Treatment Center	Belgium, Austria, Germany, Greece, Italy, Portugal, Spain, United Kingdom, Slovakia, Czech Republic, Hungary, Poland, Latvia and Switzerland "7 sites across Europe"	mean = 43	Not reported, but only people born in Europe were included.	March 2007 to October 2007	87.5
Florence et al. (2004)	166	Females	HIV Treatment Center	"7 sites across Europe"	mean = 36	83% Caucasian; 17% other	September 2000 to May 2002	75
Guaraldi et al. (2007)	357	Males 43.4% MSM	Metabolic Clinic	Modena, Italy	mean = 45	None reported.	June 2005 to May 2006	62.5
Lallemant et al. (2002)	156	Males	HIV Treatment Center	Unclear	median = 40.5 (SD = 7.7)	Not reported.	Unclear	50
Lambert et al. (2005)	82	Females	HIV Treatment Center	London, UK	mean = 37.9 (20–64)	75% of the women identified themselves as "black African," with 6% identifying as "white UK," 6% "European," and 13% "other" (black Caribbean, black UK, Pakistan, Irish)	January to December 2002	75
Lazar et al. (2014)	291	Mixed Gender 52% female	Community	Romania	[no measure central tendency] 204 aged 18–35 87 aged 36 or older mean = 42 ± 5	Not reported	May 2011 to October 2011	25
Luzi et al., 2009	185	Females	HIV Treatment Center	Modena, Italy	mean = 42 ± 5	Not reported.	June 2005 to May 2006	62.5
Mao et al. (2009)	542 HIV+ 325 HIV-	Male 100% MSM	HIV Treatment Center	Sydney, Australia; Adelaide, Australia	Whole sample: mean = 45 (20–81) HIV+ sample: mean = 46 (22–72) [no sig diff between HIV+ and HIV- neg] Unclear	Not reported	March 2007 to June 2007	50
Muthiah et al. (2016)	50	Female	HIV Treatment Center	Mysore, Karnataka, India	Unclear	Not reported.	September 2013 to August 2015	75

(Continued)

Table 1. (Continued).

Study	n	Gender	Setting	Location	Age	Ethnicity	Study start to end date	Quality Rating %
Naik et al. (2015)	85	Females	HIV Treatment Center	Mysore, India	Mean = 33 (SD = 7)	Not reported	May 2014 to December 2014	75
Newshan et al. (1998)	50	Males	HIV Treatment Center	NY, USA	mean = 35.9	Caucasian – 58% Hispanic – 26% Black – 16%	Not specified	62.5
Nokes et al. (2011)	1217	Mixed Gender 66.3% Male 31.0% Female 0.9% Transgender	HIV Treatment Center	United States: San Francisco and Fresno, California; Wilmington, North Carolina; Richmond, Virginia; Boston and Fall River, Massachusetts; New York City, New York; Patterson, New Jersey; Corpus Christi, Texas; and Columbus, Ohio, and four other countries: Puerto Rico, Taiwan, Colombia, and Norway. Ilorin, Nigeria	mean = 41.7 (SD = 9.06) (20 to 84)	African American/Black – 450 (37.0%) Hispanic/Latino – 313 (25.7%) White/Anglo – 271 (22.3%) Asian American – 126 (10.4%) Other – 33 (2.7%)	2003	62.5
Oyedokun et al. (2014)	370	Females	HIV Treatment Center	Ilorin, Nigeria	Mean = 38 (SD = 9.4)	Conducted in Nigeria. Yoruba 77% Hausa 8.1% Igbo 5.2% Others 9.7% African	December 2011 to June 2012	87.5
Peltzer (2011)	495	Mixed Gender 71.1% female 28.9% male	HIV Treatment Center	KwaZulu-Natal, South Africa	mean = 36.2 (18–67)		October 2007 to February 2008	75
Rodriguez-Diaz et al. (2015)	138	Male (trans excluded)	Community	Puerto Rico	mean = 38, (20–68)	Not reported. Place of birth: Puerto Rico 89.1% State of USA 8.7% Outside USA 2.2% 26.5% “fulfilled migration criteria”	October 2013 to May 2014	62.5
Rojas Castro et al. (2010)	521	Mixed Gender 63.3% Male	Community	France	mean = 42.8		2007	25
Rose (2005)	21	Females	HIV Treatment Center	Miami, Florida, USA	mean = 28.76 (SD = 8.70)	Not reported.	Not specified	87.5
Shacham et al. (2017)	202	Mixed Gender	HIV Treatment Center	St Louis, Missouri, USA	median = 43.5 (36–55)	72.6% African American, 27.4% caucasian	Not reported	37.5
Trotta et al. (2008)	612	Mixed Gender 72% male	HIV Treatment Center	Italy	mean = 37.0 ± 8.4	Not reported	Not reported AdiCoNA study data: May 99 to March 2000 AdeSpall study data: not reported	75
Wilson et al. (2010)	1,805 1,279 HIV+ 526 HIV-	Female	HIV Treatment Center, Community	Bronx, Manhattan, NY; Brooklyn, NY; Washington, DC; San Francisco/Bay Area, CA; Los Angeles/Southern California/Hawaii and Chicago, IL	[No indicator central tendency] 20–29 = 71 30–39 = 352 40–49 = 545 50+ = 311	White: 13% Black: 56% Hispanic: 28% Other: 3%	October 2006 to March 2007	100

Shivaswamy, & Menon, 2016), and those of the female sample study from Europe with a younger mean sample age (36 years) (Florence et al., 2004), did not form such a conclusion. The general health status of individuals of the same age, but living in low income versus high-income countries are likely to be different, which may have affected these conclusions.

Among mixed gender and male sample studies, the authors of USA mixed-gender study (66% male) (Nokes et al., 2011) concluded based on statistical significance that older age was relevant. Yet, the researchers of two less robustly conducted studies conducted in a metabolic clinic in Italy (Guaraldi et al., 2007) and an Australian male sample study (Mao et al., 2009) concluded that age was not relevant. Nokes et al. used a validated measurement of sexual dysfunction, and found participants over 50 years old were on average 10 points lower in sexual functioning (on a scale of 0 to 100), than younger participants. The measurement of sexual dysfunction was not validated in the latter study as participants were assigned to no sexual problem, some problems and multiple sexual problems groups based on their answers to seven yes or no questions about sexual function (Mao et al., 2009). The mean age of the sample in each of these three studies was 45 years. Therefore age distribution was roughly equivalent across studies.

Other Demographic Factors

Six of twenty-two studies considered additional demographic factors as potentially relevant to general sexual functioning. None were concluded, based on statistical significance, to be relevant. Indeed, there was little theoretical reason why such factors were expected to be relevant. It was not possible to calculate effect sizes for these findings as the authors did not report sufficient information to do so. These factors were: duration of marriage (Oyedokun et al., 2014), race (Shacham et al., 2017), income (Shacham et al., 2017), ethnicity (Florence et al., 2004; Oyedokun et al., 2014), religion (Oyedokun et al., 2014), and gender (Trotta et al., 2008).

HIV Parameters and Treatment-Related Factors

Nineteen of twenty-two studies examined whether HIV parameters and treatment-related factors (CD4, viral load, time since HIV diagnosis, HIV treatment and HIV symptom severity) were associated with general sexual functioning. The quality of these studies was rated as good to strong in most studies (>60%).

CD4

Twelve of eighteen studies investigated whether CD4 was relevant to general sexual functioning. Four of these studies concluded, based on statistical significance, that CD4 was relevant, yet eight did not. Effect sizes were calculated where possible, and most were small (see Online Supplementary Table 4). The weight of evidence is against CD4 as relevant to general sexual functioning. It may yet be that CD4 has an indirect effect on general sexual functioning (for example, via general physical health) rather than a direct effect, which would explain the inconsistency of these findings.

Specifically, the authors of a female sample analysis of variance ($n = 1279$) study concluded that CD4 count lower than 199 was associated with lower general sexual functioning (Wilson et al., 2010). This was supported by a study from India, which found CD4 counts between 200 and 499 to be associated with better general sexual functioning (Muthiah et al., 2016). In contrast, an Italian study (Luzi et al., 2009), a USA study (Shacham et al., 2017) and two correlational studies (Florence et al., 2004; Naik, Raman, Mothi, & Kumar, 2015) found CD4 count not to be relevant.

In male samples, a USA study (Shacham et al., 2017) and a UK study (Cove & Petrak, 2004) found CD4 counts below 200 to be associated with general sexual dysfunction. Conversely, male sample studies conducted in Spain (Collazos, Martinez, Mayo, & Ibarra, 2002) and Italy (Guaraldi et al., 2007) and a mixed sample study from France (Bouhnik, Preau, Schiltz, Obadia, & Spire, 2008) found CD4 not to be sexual dysfunction.

Viral Load

Ten of eighteen studies considered whether viral load was relevant to general sexual functioning. Eight of these studies employed statistical techniques that accounted for other variables and concluded that no relevant relationship with viral load existed: namely, three female sample studies (Florence et al., 2004; Luzi et al., 2009; Wilson et al., 2010), two male sample studies (Collazos et al., 2002; Guaraldi et al., 2007), and three mixed-gender studies (Bouhnik et al., 2008; Shacham et al., 2017; Trotta et al., 2008). Two studies which concluded that viral load was relevant were correlational (Bova & Durante, 2003; Lambert, Keegan, & Petrak, 2005), and therefore did not account for other variables in the analysis (see Online Supplementary Table 4). Therefore viral load does not appear to be relevant to sexual dysfunction; however, it may have an indirect effect which emerges as relevant in studies which do not account for other variables.

Importantly, in one of the mixed-gender studies which concluded that no relevant relationship existed, PLWH's perception of worsening viral and immunological parameters was relevant to sexual dysfunction (Trotta et al., 2008). Further, another mixed-gender study which also found viral load numbers not to be relevant found having an unsuppressed viral load among women was associated with general sexual dysfunction (Shacham et al., 2017). It may be that negative meanings ascribed to viral load by PLWH have an effect on sexual functioning, rather than the levels themselves.

Time since HIV Diagnosis

Six of eighteen studies investigated whether time since HIV diagnosis was relevant to general sexual functioning. Studies which concluded that time since diagnosis was not relevant were more numerous, and most used regression analyses which accounted for other variables in their analysis. Specifically, three studies which used regression analyses, including an Italian male sample study (Guaraldi et al., 2007), a French mixed gender sample study (Bouhnik et al., 2008) and a Nigerian female sample study (Agaba et al., 2017), as well as a female non-parametric correlational study (Florence et al., 2004) concluded that no relevant relationship existed; effect sizes were consistent with no relevant effect. Yet

a t-test study (Muthiah et al., 2016) and a correlational study (Naik et al., 2015) both from India did find time since diagnosis to be relevant, and effect sizes were large. We conclude that time since HIV diagnosis was not associated with sexual dysfunction, but may appear relevant in studies which do not account for other variables (e.g., age).

HIV Treatment

Nine of eighteen studies considered whether treatment related factors were relevant to general sexual functioning. Most studies concluded that there was no relationship between HIV medication and sexual dysfunction, however, one study published in 2002 concluded that taking protease inhibitors was relevant to sexual dysfunction. Effect sizes could not be calculated for most of these studies; however, the 2002 study reported a hazard ratio of 2.08 indicating those who had taken protease inhibitors had twice the chance of being in the sexual dysfunction group.

Four studies concluded, based on statistical significance, that no relationship between antiretroviral medication type and general sexual functioning existed (Florence et al., 2004; Luzi et al., 2009; Mao et al., 2009; Muthiah et al., 2016). Further, a French mixed gender study concluded that being naïve to treatment was not relevant (Bouhnik et al., 2008). However, one Spanish male sample study concluded that being on antiretroviral medication was relevant to sexual dysfunction in comparison to treatment-naïve patients (Collazos et al., 2002). Both used non-validated measurement of sexual function in different ways which may explain this discrepancy. The first asked PLWH if they had experienced sexual difficulties in the past 4 weeks (Bouhnik et al., 2008), and the second asked patients if they were currently experiencing decreased libido, erectile dysfunction or impaired ejaculation (Collazos et al., 2002).

Specific types of HIV medications were also examined. Three studies examined whether protease inhibitors were associated, including a female sample study (Wilson et al., 2010) which used analysis of variance and a male sample study (Lallemant, Salhi, Linard, Giami, & Rozenbaum, 2002) which used non-parametric tests. Each measured sexual functioning using validated questionnaires and concluded that no relationship existed. One male sample study concluded that an association existed between sexual dysfunction and: i) the use of any protease inhibitor (PI), as well as ii) Ritonavir specifically (a PI), and iii) Lamivudine specifically (a nucleoside reverse transcriptase inhibitor) (Colson et al., 2002). Yet this study used a non-validated outcome measure by searching medical records for mentions of sexual dysfunction in medical notes which may explain this difference. One USA female sample study concluded that non-nucleoside reverse transcriptase inhibitor use was unrelated to sexual functioning (Wilson et al., 2010).

With regard to adherence to HIV medication, an Italian-mixed gender sample study (Trotta et al., 2008) concluded that non-adherence to HIV medication was relevant to sexual dysfunction; however, one USA female sample study (Wilson et al., 2010) concluded this was not relevant. It is possible a gender difference exists here, such that men may be less

adherent to HIV medication if they believe it is causing sexual dysfunction.

HIV-Related Symptom Severity

Four of 18 studies considered whether an indicator of HIV-related symptom severity was relevant to general sexual functioning. Two studies agreed that lipodystrophy was relevant to general sexual dysfunction. Yet there was no replication between studies with regard to other HIV symptoms and side effects. It may be that some specific symptoms and side effects influence sexual function, while others do not, and that general measurement of symptom or side effects severity are too insensitive to consistently detect this effect. Specifically, there was some agreement between the French and Italian studies that the presence of lipodystrophy was relevant to sexual dysfunction (Bouhnik et al., 2008; Trotta et al., 2008). A USA female sample study concluded that a relationship existed between less severe HIV-related symptomatology and greater sexual wellbeing (Bova & Durante, 2003). Moreover, perception of general worsening of physical symptoms was concluded to be relevant in an Italian mixed gender study (72% male) (Trotta et al., 2008). Yet, high medication side effects in the Italian study (Trotta et al., 2008) and the intensity of HIV symptoms in the USA study (Nokes et al., 2011) were concluded not to be relevant.

Disease Progression

Factors related to disease progression were examined in four of 18 studies. Conclusions are inconsistent with regard to stage of illness and AIDS defining illness status. It is likely that general ill health is relevant to sexual dysfunction, rather than an illness stage or the presence of an age defining illness in particular. Specifically, the presence of AIDS defining illness was concluded to be relevant to sexual dysfunction in a mixed gender USA study (n = 1217) (Nokes et al., 2011), and a US study of men with asymptomatic HIV (Newshan, Taylor, & Gold, 1998). Yet an Italian metabolic clinic study concluded that AIDS defining illness status was not relevant to general sexual functioning (Guaraldi et al., 2007). Further, a French mixed gender study concluded that CDC stage was not relevant (Bouhnik et al., 2008).

Other non-HIV Related Physical Health Factors

Fourteen of twenty-two studies investigated whether other non-HIV related physical health factors were relevant to general sexual functioning. The quality of all but two of these papers were rated as good to strong (>60%). Physical health was examined as a general factor and was concluded to be consistently relevant to general sexual functioning in a female sample (Agaba et al., 2017) and two mixed gender studies (Naik et al., 2015; Shacham et al., 2017). The calculable effect sizes indicated general physical health had a small effect. Studies that examined specific aspects of physical health reached inconsistent conclusions, with little replication between studies. An individual's physical health is likely determined by a multitude of contributing idiosyncratic factors. Therefore, examining physical health as a general factor appears to be the most fitting way of

investigating its relationship with general sexual functioning, as opposed to focusing on specific aspects of general physical health that may be relevant to some individuals and not others.

Specifically, alcohol was examined in three female sample studies. A Nigerian female sample study concluded that alcohol use was relevant to general sexual dysfunction (Agaba et al., 2017). Yet, an American study (Wilson et al., 2010) and a European study (Florence et al., 2004) both concluded that alcohol was not relevant. Cultural or socio-economic factors may explain these differences.

Other non-HIV physical health factors examined in female samples were not replicated across studies. Individual factors concluded to be relevant were: changes in body shape (Wilson et al., 2010), low testosterone (Muthiah et al., 2016), no history or current use of injection drugs (Bova & Durante, 2003) and being either overweight or obese (Oyedokun et al., 2014). The presence of other specific physical health factors such as chronic health issues (Oyedokun et al., 2014) and sex hormones (Luzi et al., 2009) were concluded not to be relevant. Similarly, early menarche, current contraceptive use, history of hypertension were concluded not to be relevant (Agaba et al., 2017).

In male sample studies, specific general health factors examined yielded similarly inconsistent results. A UK mixed gender study (66% male) concluded that comorbidity was not associated with sexual function (Nokes et al., 2011). Yet, absence of a specific comorbidity, Hepatitis C, was concluded to be relevant to overall sexual function in an Italian metabolic clinic study (Guaraldi et al., 2007). A US study concluded that normal testosterone levels were associated with better sexual functioning (Newshan et al., 1998); however, an Italian study (Guaraldi et al., 2007) and a Spanish study (Collazos et al., 2002) formed no such conclusion. In addition, the Spanish study concluded that metabolic disturbance, and alcohol use were not relevant (Collazos et al., 2002).

Psychosocial Factors

Seventeen of twenty-two studies investigated whether psychosocial factors were relevant to general sexual functioning. Thirteen of these were rated good to strong in terms of quality (>60%). Types of psychosocial factors examined were: psychological, relational and body image.

Psychological Factors

Sixteen of seventeen studies examined at least one psychological factor. Depression was consistently found to be associated with general sexual dysfunction, as was psychological distress (a conglomerate measure of anxiety and depression symptoms). Calculable effect sizes suggested depression had a medium effect size, and distress was small to medium. Other more specific psychological factors were concluded to be relevant in individual studies, but not replicated across studies. The only psychological factor examined which was concluded not to be relevant was current psychoactive medication use.

Depression was found to be relevant to general sexual dysfunction in each of the nine studies in which it was examined,

including: a US study with a small sample ($n = 20$) (Rose, Peake, Ennis, Pereira, & Antoni, 2005), a UK female sample study (Lambert et al., 2005), a study that scanned medical notes for references to sexual dysfunction (Colson et al., 2002), a UK male sample study (Cove & Petrak, 2004), an Australian male sample study (Mao et al., 2009), a USA mixed gender sample study (Shacham et al., 2017), a second USA mixed gender sample study (Nokes et al., 2011) and two female sample correlational studies (Florence et al., 2004; Naik et al., 2015). Moreover, measures of general psychological distress (anxiety and depression symptoms) were concluded to be relevant in three studies, including a Nigerian female sample study (Oyedokun et al., 2014), a USA female sample correlational study (Bova & Durante, 2003) and a male metabolic clinic study (Guaraldi et al., 2007). Other psychological factors found to be relevant in single studies were: experiencing an ongoing stressful event (Oyedokun et al., 2014), intrusive thoughts about HIV (Rose et al., 2005), history of sexual abuse (Lambert et al., 2005), irritability (Florence et al., 2004) and anxiety (Florence et al., 2004). Current psychoactive medication use was concluded not to be relevant in two studies (Bouhnik et al., 2008; Collazos et al., 2002).

Relational

Of the 17 studies that investigated psychosocial factors, only two studies considered relational factors. Not having disclosed status to others, and recent stigma and discrimination were found to be relevant. The Nigerian female sample study considered relational factors such as not having disclosed HIV status and experience of stigma, and concluded that these were relevant to general sexual dysfunction (Oyedokun et al., 2014). The French study also demonstrated that two relational factors were relevant to general sexual function, namely knowing more than four others with HIV, and having experienced discrimination due to HIV-positive status in the past 12 months (Bouhnik et al., 2008). Having experienced discrimination within one's lifetime was found not to be relevant, as was having experienced the death of a partner (Bouhnik et al., 2008).

Body Image

Three of the 17 studies that considered psychosocial factors concluded that body image was relevant to general sexual functioning. The authors of an Italian study of women concluded that body changes interfering with every-day habits, dissatisfaction with body image and changes in attitudes toward the body were relevant (Luzi et al., 2009). The USA study found reduced distress about changes to body and appearance to be relevant (Nokes et al., 2011), and this was supported by the French study which also found "perceptions of side effects as disturbing" to be relevant (Bouhnik et al., 2008).

Outcome 2. Sexual Satisfaction (five studies)

Five of the included studies examined factors associated with sexual satisfaction among PLWH. Three of these studies were quality rated as good to strong (>60%) (De Ryck, Van Laeken, Nostlinger, Platteau, & Colebunders, 2012; Peltzer, 2011;

Rodriguez-Diaz, Jovet-Toledo, Ortiz-Sanchez, Rodriguez-Santiago, & Vargas-Molina, 2015), and two were rated 25% (Lazar et al., 2014; Rojas Castro, Le Gall, Andreo, & Spire, 2010).

Demographic Factors

Four of these five studies (De Ryck et al., 2012; Peltzer, 2011; Rodriguez-Diaz et al., 2015; Rojas Castro et al., 2010) examined demographic factors. Odds ratios for these demographic factors suggest a 30–60% increase in the odds of experiencing sexual dissatisfaction. Older age was concluded to be relevant to sexual dissatisfaction (adjusted odds ratio (AOR):1.6, $p = .022$) (Rojas Castro et al., 2010) and unemployment was concluded to be relevant in two studies (AOR: 0.44, $p = .024$) (Peltzer, 2011) (AOR: 1.5, $p = .045$) (Rojas Castro et al., 2010). Further higher education was found relevant to satisfaction in one study (unadjusted beta = 1.33, $p = .001$) (Rodriguez-Diaz et al., 2015).

HIV Parameters and Treatment-Related Factors

Three of five studies examined HIV parameters and treatment-related factors. Taken together, we suspect that biological markers themselves are not associated with sexual satisfaction, but are indirectly associated via general physical health. Specifically, not knowing how HIV was acquired (AOR: 0.29, $p = .001$) (Lazar et al., 2014), and taking medications against HIV-related opportunistic infections (AOR: 2.5, $p = .03$) (Peltzer, 2011) were concluded to be relevant. The French study concluded that no HIV parameters (CD4, viral load, etc.) were relevant (study reported p values as >0.05 only, effect size calculation was not possible) (Rojas Castro et al., 2010).

Other non-HIV Health Factors

Three studies also investigated whether other non-HIV related health factors were relevant to sexual satisfaction. It is premature to draw conclusions based on this small number of studies investigating disparate factors. Having a severe disability was concluded to be relevant to sexual satisfaction in a Romanian study (AOR: 0.47, $p = .04$ – consistent with a relevant effect) (Lazar et al., 2014). Condom use was concluded to have no relationship with sexual satisfaction in two mixed-gender community-based studies conducted in Europe (OR: 0.96, $p = .893$) (Peltzer, 2011; Rojas Castro et al., 2010). General quality of life (AOR: 1.08, $p = .664$) (Peltzer, 2011) was not relevant in a South African study.

Psychosocial Factors

All five studies investigated at least one psychosocial factor. Taken together, these studies concluded that higher psychological distress was relevant to sexual dissatisfaction. Importantly, the level of connection with others, both intimate partners, and the support of a broader community were also relevant.

Regarding psychological factors, greater self-efficacy was concluded to be relevant to sexual satisfaction (AOR: 1.36,

$p = .001$) (Lazar et al., 2014), while internalized stigma (AOR: 1.4, $p < .001$) and fewer symptoms of depression were relevant to sexual satisfaction (AOR: 1.12, $p = .013$) (Peltzer, 2011). Depression was also concluded to be relevant to sexual dissatisfaction in a male sample study conducted in Europe (AOR: homosexually active men 2.15, $p < .01$, heterosexual men 2.86, $p = .06$) (De Ryck et al., 2012). Adjusted odds ratios suggest that depression has a greater than two-fold effect on sexual satisfaction compared to self-efficacy and stigma.

Regarding interpersonal and relational factors, being in a relationship was concluded to be relevant to sexual satisfaction (AOR: 7.6, $p < .001$) (Lazar et al., 2014). Conversely, being celibate (AOR:3.03, $p = .01$) (Lazar et al., 2014), not having a regular sexual partner (unadjusted beta value -1.196) (Rodriguez-Diaz et al., 2015; Rojas Castro et al., 2010), low frequency of sex with casual partners (AOR:3.0, $p = .01$), and past experience of discrimination by a partner (AOR:0.3, $p < .001$) (Rojas Castro et al., 2010) were each concluded to be relevant to sexual dissatisfaction. Of note, the HIV status of one's sexual partner was not relevant in two European community studies (AOR:0.52, $p = .087$) (Peltzer, 2011) (study reported p values as >0.05 only, effect size calculation was not possible)(Rojas Castro et al., 2010) and one study of MSM in Puerto Rico (Rodriguez-Diaz et al., 2015) (study reported p values as >0.05 only, effect size calculation was not possible). Further, knowing at least one person who had disclosed HIV-positive status publicly (AOR:2.23, $p = .04$) (Lazar et al., 2014) was concluded to be relevant to sexual satisfaction. Lacking social support (AOR: 2.38, $p < .001$) (Peltzer, 2011) and isolation (AOR: 2.5, $p < .001$) (Rojas Castro et al., 2010) were concluded to be relevant to sexual dissatisfaction. Adjusted odds ratios suggested that presence of partner or other social support have a strong impact on sexual satisfaction in comparison to other investigated factors.

Discussion

This systematic review aimed to provide an up-to-date synthesis of factors relevant to general sexual functioning (outcome one) and sexual satisfaction (outcome two). Regarding outcome one, we found consistent evidence that general physical health, depression, body image and psychological distress (a conglomerate measure of common anxiety and depression-related symptoms) were relevant to general sexual dysfunction. That is, these factors were found to be relevant each time they were investigated in three or more studies. There were some inconsistent conclusions regarding older age as an associated factor; however, as multiple studies which sampled older aged participants found this association, we conclude that older age is relevant to general sexual dysfunction. There were inconsistent conclusions for the following factors: CD4, viral load, HIV symptom severity, HIV disease progression and time since diagnosis. We suggest that the reason for these inconsistencies is that these factors have indirect effects on general sexual functioning via general physical health, rather than having direct effects. There was evidence for anxiety and a few relational factors; however, a lack of research on such factors means these findings have not been replicated across studies. Regarding outcome two, only five studies examined

sexual satisfaction. Based on available evidence, age, unemployment, and a collection of non-replicated psychosocial factors were relevant. There was inconsistent evidence regarding HIV parameters and treatment factors, and we again suspect that these have indirect effects on sexual satisfaction via general physical health. That demographic factors, such as unemployment and less education, were found relevant to sexual dissatisfaction is intriguing and we suspect that, rather than unemployment itself being relevant, it is the additional barriers to living well faced by those who are unemployed or have low education that impact on other aspects of quality of life such as intimate connections with others and sexual satisfaction. To promote both general and sexual quality of life, health professionals supporting PLWH should therefore address not only general physical health (and the HIV specific factors likely to be influencing general physical health, namely CD4, viral load, HIV symptom severity and HIV disease progression), but also depression, body image and psychological distress.

General physical health, depression, body image and psychological distress have been established as factors relevant to sexual difficulties regardless of HIV status (McCabe et al., 2016). Yet the prevalence and intensity of sexual difficulties are greater among HIV-positive people when compared with HIV negative people (Denis & Hong, 2003; Lamba et al., 2004; Shacham et al., 2017), and therefore further exploration of why this difference exists is required. It may be that living with HIV confers greater risk of experiencing poor general health, depression, poor body image and psychological distress. Notably, rather than objective indicators of physical health, PLWH's subjective perceptions of their health and bodies, such as body dissatisfaction and changing attitudes to the body were found relevant. This suggests that how PLWH interpreted or made meaning around their physical health or physical appearance had an impact on their sexual well-being. For example, it is possible that the stigma and discrimination associated with living with HIV negatively affects self-concept and self-image, including body image, rather than objective changes in the body itself. This would mean that decreasing prevalence of objective changes in the body with HIV, namely lipodystrophy (Price et al., 2015), will not result in a corresponding decrease in body image difficulties with HIV, unless psycho-social aspects of body image, including HIV stigma and discrimination are also addressed. Current research is required to ascertain how body image may be related to sexual well-being with HIV in the current era. It is likely that experiences which are unique to HIV, such as HIV-related stigma, undue fear of transmission of HIV to another person during sex or fear of rejection by a sexual partner upon disclosure of HIV status, contribute to sexual dysfunction. While valuable work has been conducted which applies feminist and sexual rights theory from a sociological perspective to the sexual well-being of women with HIV (Carter et al., 2017), there is currently a lack of psycho-social models of sexual well-being specific to HIV. Future research is required to both explore anxiety and relational factors, and build theoretically plausible models of general sexual functioning and sexual satisfaction specific to HIV for female, homosexual male and heterosexual sub-populations.

For example, a qualitative study using grounded theory methodology would be an appropriate next step to explore factors relevant to sexual functioning of PLWH, and understand how such factors fit together. The emerging diagrammatic model could then be used to guide future quantitative research, as well as the development of evidence-based psycho-social interventions to promote sexual-wellbeing of PLWH.

This systematic review used a well-developed search strategy across multiple databases. Yet, it is limited as all included studies used convenience sampling, treatment center studies were over-represented and non-significant results were often not included. Further, there was no consideration within the included studies of sexual wellbeing from an intersectional perspective, which accounts for sex, gender, ethnicity and sexual orientation. Such research is needed to further understand this topic. The use of non-validated methods of measuring sexual outcomes was common among the included studies. Such non-validated measurement makes comparison between studies challenging as, while each used the word sexual dysfunction to describe their measurement, without psychometric validation of the measure it is not certain that the same concept was being measured. Moreover, there are issues with the available psychometrically validated questionnaires which suggest they may not be accurately measuring sexual functioning and satisfaction. As examples, the IIEF is biased toward the male partner being the penetrative partner, and therefore may incorrectly measure a gay male who is exclusively the receptive partner as experiencing sexual dysfunction (Coyné et al., 2010) and women who are sexually inactive are scored on the FSFI as experiencing dysfunction without consideration of whether they might be content to be inactive (Rosen et al., 2000). Future research is needed to develop HIV specific-validated questionnaires for sexual life which overcome these issues.

None of the studies in this review explicitly defined their outcome variable, either sexual dysfunction or sexual satisfaction. However, these concepts are defined and described by the authors of the validated outcome measures used in the studies. In general, sexual dysfunction was operationalized as difficulties in sexual life, and sexual satisfaction was defined as contentment in sexual life as defined by the respondent. Moreover, none of the included studies defined differences between sex as a biological concept and gender as socially constructed roles. There is undoubtedly variation between studies in the conceptualization of these sexual outcome variables and gender, as well as errors in measurement, such as receptive gay male partners being defined as experiencing dysfunction because they are not having penetrative sex as described above. Therefore, our synthesis of study findings based on sexual outcomes incorporates these conceptualization and measurement issues, which should be kept in mind when reading this review. [See Carter et al. (2017) for a review and critical analysis of these conceptualization and measurement issues.]

Future studies should therefore: i) use a combination of community and treatment center-based recruitment, ii) use established validated outcome measures, iii) base research on HIV specific models of sexual functioning, and iv) use statistical methods which account for other variables. By

conducting more theory driven research on the sexual well-being of PLWH to isolate the processes and factors by which sexual dysfunction is more prevalent and intense among PLWH, health professionals can better address these difficulties in order to promote better sexual functioning, and quality of life of PLWH.

Conclusion

This systematic review concludes that, with regard to general sexual dysfunction, older age, general physical health, depression, body image and psychological distress are relevant factors. From the limited available evidence on sexual satisfaction, age, unemployment, and psychosocial factors are relevant. Overall, anxiety and relational factors were under-researched. Future research is required to build theoretical models of sexual well-being specific to PLWH.

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