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The Health Benefits of Sexual Expression

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ABSTRACT

Objective: Sexual activity is a fundamental human function with short-term and long-term emotional, social, and physical benefits. Yet within healthcare, sexuality has been marginalized and many HCPs are unaware of its beneficial implications for immediate and long-term health.

Methods: To challenge this assumption we combined the data that already had been collected by the authors with an extensive search of articles on the various health benefits of sexual activity. The results of this process are displayed according to short-term, intermediate-term, and long-term benefits with some explanation about potential causal relationships.

Results: For the time being, it cannot yet be proved that “good sex promotes good health” since good health also favors good sex.

Conclusions: Despite lacking such convincing evidence, the article concludes with recommendations for the relevant professions. The balance of research supports that sexuality anyhow deserves greater attention among HCPs and that sexuality research needs better integration within health research.

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Introduction

For many decades the primary cultural, academic, and medical discourses on sexuality have been dominated by concerns about risk, danger, sin, and shame (Diamond, 2006; Fine & McClelland, 2006; Russell, 2005). Sexuality has long been a site for social control and the exercise of power and authority (Foucault, 1980). The power to control and regulate human sexuality has been wielded by governments, religious leaders, parents, and broader community members, but in our contemporary era, the fields of *health and medicine* hold particular sway. Health-oriented approaches to sexuality have yielded undeniable benefits in the modern age, including wider availability of effective contraception, effective diagnoses, and treatment of sexually transmitted infections, safer abortion, broader knowledge and treatment of sexual dysfunction, broader knowledge and prevention of sexual violence, and more accurate sexuality education. Despite these advances, the healthcare profession still views

sexuality through the lens of *its problems* rather than *its possibilities*.

A clear example can be seen in pregnancy care. Whereas in normal pregnancies sexuality doesn't get attention, sexual activity recommendations in complicated and high-risk pregnancies almost exclusively focus on restrictions or complete abstinence (“pelvic rest”), without addressing sexual behavior elements that are allowed or recommended (MacPhedran, 2018).

Preventing sexually transmitted infections, unintended pregnancies, and sexual violence are laudable goals, but the *absence* of dysfunction is not the same as the *presence* of thriving. That is clearly described in the WHO definition, the most relevant sentence reading: “Sexual health is a state of physical, emotional, mental and social well-being about sexuality; it is not merely the absence of disease, dysfunction or infirmity. Sexual health requires a positive and respectful approach to sexuality and sexual relationships, as well as the possibility of having pleasurable and

safe sexual experiences, free of coercion, discrimination, and violence” (WHO, 2017).

The next step for health-oriented approaches to sexuality is to understand and optimize the *benefits* of sexual activity and expression, and to integrate such benefits into our model of healthy human functioning (see Diamond & Huebner, 2012).

Methods

To provide an overview of older and recent research on this topic, we started with existing texts of the authors on the health benefits of sexual activity (Diamond & Huebner, 2012; Gianotten, 2020; Gianotten et al., 2007). We proceeded to search the existing literature on the benefits of sexual activity. To that end, we looked for peer-reviewed articles published over the past decade that specifically focused on links between sexual behavior and health indicators or health outcomes. We aimed to review the highest quality articles published both in the psychological research area and in the medical research area. We further tried to pay attention to the full range of short-, intermediate-, and long-term health benefits of sexual activity, including the underlying biological mechanisms through which sexual activity could confer mental and physical health benefits.

Critical to our approach is an expansive view of “sexual expression,” “sexual health,” and “normal sexuality.” One of the longstanding weaknesses of medical/health research on sexuality has been its focus on a limited range of activities, particularly penile-vaginal intercourse among male-female dyads (and penile-anal intercourse among male-male dyads). This limited focus partly stems from the specific health risks associated with these activities but also reflects cultural assumptions about what “counts” as sexual activity. These assumptions do not represent the true diversity of sexual expression (Kleinplatz & Diamond, 2013) and do not capably represent the experiences of individuals in same-gender dyads or individuals with diverse forms of gender expression (such as transgender individuals). A truly accurate and representative approach to the health benefits of sexuality would include the full range of dyadic and solo sexual activities, from

cuddling and stroking to arousal and orgasm. The existing literature reviewed below does not represent this diversity (and this remains a critical direction for future research) but provides a starting point and a motivational “push” for greater integration of the health benefits of sexuality. It also bears noting that existing studies cannot definitively establish causal pathways from positive sexuality to health. This is partly because there are quite a few ethical and methodological snags in such required studies. The links between sexuality and health are likely bidirectional: positive sexual expression may benefit health and good health may facilitate positive sexual expression. Despite these shortcomings, we hope that our review supports broader research on these fundamental questions.

We have organized our review around three *time scales* relevant to the notion of sexual health benefits; short-term, intermediate-term, and long-term. An example of a short-term benefit is the increased pain threshold for a short period after female genital stimulation (Whipple & Komisaruk, 1985). An example of an intermediate-term benefit is the postponement of natural menopause (and the accompanying hypoestrogenism) in women with more frequent sex (Arnot & Mace, 2020). Examples of long-term benefits are the decreased risk for prostate cancer in men who over the decades have ejaculated more frequently (Rider et al., 2016), increased longevity in men who continued with sexuality, and increased longevity in women who have had a more satisfying sexual life (Palmore, 1982). Organizing our review in this fashion reflects the methodological foci of existing research, but also proves relevant for medical/health practitioners seeking to augment health at different stages of the life course, and within different time frames. Sexuality is preeminently an area where biological, psychological, and social (especially relationship) aspects interact with each other. That is the familiar “BPS model” for HCPs. Although psychological and relationship effects of sexuality have relevant short- and intermediate-term effects, we have nevertheless chosen (in the context of the limited space in this article), to address psychological and relationship aspects mainly in the long-term section.

Before proceeding, it bears noting that for most studies, “sexual activity” is typically operationalized as penile-vaginal intercourse in male–female couples. The lack of attention to the full range of diverse sexual practices, and their experience in sexually diverse and gender-diverse populations (such as same-sex couples and/or transgender individuals) is a notable weakness of the present literature. Hence, readers should presume that references to “sexual activity” in the following sections refer predominantly to heterosexual penile-vaginal intercourse unless otherwise specified.

Short-term benefits

Many of the most obvious benefits of sexual activity and expression occur during or immediately after the sexual act. One example is the increased pain threshold after direct genital stimulation (Whipple & Komisaruk, 1985). With such stimulation, women show an immediate increase in their tolerance for pain.

The following sections consider the specific biological and behavioral mechanisms through which such effects may operate. In some cases, it is difficult to disentangle specific effects of sexual activity from associated phenomena, such as affectionate touch, which is known to have powerful beneficial effects on its own, such as cardiovascular relaxation (Triscoli et al., 2017). Interpersonal touch not only promotes well-being and emotion-regulation but also facilitates neurocognitive processes underlying flexible goal-directed behavior (i.e., cognitive control) (Saunders et al., 2018). Hence, when considering the studies assessing short-term benefits of sexuality, we must remain mindful of the fact that positive sexual experiences often include an array of overlapping beneficial phenomena. Successively attention will be paid to pleasure, pain reduction, sleep improvement, and improved function of the immune system (the last one with also intermediate-term benefits). This is followed by an explanation of the role of three of the major intervening hormones: oxytocin, testosterone, and cortisol.

Pleasure

Perhaps the most obvious and distinctive short-term benefit of sexual activity is sexual pleasure.

Sexual pleasure has been defined as “physical and or psychological satisfaction and enjoyment one derives from any erotic interaction,” which may include solo or partnered behavior as well as cognitive experiences of sex, such as fantasies (Philpott et al., 2006, p. 23). The distinction between solo and partnered activity is critical, given that most published research focuses on the experience of pleasure within penile-vaginal intercourse. Yet non-penetrative sexual acts, such as oral and manual stimulation are quite common (Fortenberry et al., 2010; Herbenick, Reece, Sanders, et al., 2010; Herbenick, Reece, Schick, et al., 2010a, 2010b), especially among sexually diverse and gender-diverse populations (i.e., those who engage in sexual activity with the same gender or multiple genders, and those whose gender expressions do not concord with the sex to which they were assigned at birth). For some individuals, these behaviors may be more pleasurable than penetrative sexual activities (Frederick et al., 2018).

Sexual pleasure is not only subjectively rewarding but it has been linked to overall well-being (Ford et al., 2019), and some have gone so far as to state that sexual health is defined by one’s ability to experience sexual pleasure (Edwards & Coleman, 2004). Pleasure is a beneficial outcome of sexual behavior but it is also motivated engagement in sexual behavior. Many people state that the main reason for engaging in sex is to obtain physical pleasure (e.g., Ford et al., 2019; Philpott et al., 2006). Because pleasure is both a motivator for sexual behavior and a positive outcome, we cannot identify the direction of pleasure-related benefits, but Boul et al. (2009) noted that pleasure and its associated positive emotions functioned to reinforce sexual behavior and to enhance self-esteem, resulting in a beneficial cycle. Hence, identifying “the chicken and the egg” in this process might not matter, once it becomes established.

An additional complication, more frequently discussed by psychologists than by medical and health professionals, is the difficulty of defining and measuring as complex a phenomenon as sexual pleasure, along with similarly complex phenomena, such as sexual desire and sexual satisfaction (Brotto & Smith, 2014). Orgasm is one of the most frequently assessed indices of sexual pleasure, but it is not the

only one, and few studies have attempted to determine whether different forms of sexual pleasure, experienced under different circumstances, have unique health consequences. The following section addresses some of the potential biological mechanisms through which the effects of sexual pleasure, sexual activity, and physical contact might be conferred.

Pain reduction

For most individuals, pain can interfere with sexual pleasure. Yet the flip side is that sexual activity can be used as a strategy for reducing pain sensations. One study (Hambach et al., 2013) investigated headache patients who had experience with sexual activity during an attack. In migraine patients, 60% reported an improvement of their migraine during sexual activity (within 70% of them moderate to complete relief), and 33% reported worsening. In cluster headache patients, 37% reported improvement of their cluster headache during sexual activity (within 91% of the improvements moderate to complete) and 50% reported worsening. Some patients, in particular male migraine patients, have effectively used the sexual activity as a therapeutic tool (Hambach et al., 2013). Sexuality might alleviate pain by providing a source of distraction, but there might be additional pathways. One study found that pressure stimulation of the anterior vaginal wall and self-stimulation of the clitoris had an analgesic effect, reaching maximum effect with orgasm (Whipple & Komisaruk, 1985). Endorphins might also explain the pain-reducing effect of sexual activity (Odent, 1999), along with oxytocin. Women with higher oxytocin levels have a higher pain threshold (Grewen et al., 2008). Muscle relaxation might contribute to the pain-reducing effects of sexual activity: Clinical practice in patients with multiple sclerosis and research in patients with spinal cord injury show that sexual vibration and orgasm can produce reductions in spasm and muscle relaxation that last for several hours (Alaca et al., 2005).

Among women, orgasm and masturbation may help to reduce pain associated with menstruation (Ellison, 2000). In the case of endometriosis menstrual pain can decrease by the aforementioned

sexuality-induced increase in pain threshold. When dysmenorrhea is the result of premenstrual uterine cramps, the uterine contractions of orgasm will open the cervical canal, push out blood and clots, and reduce menstrual cramps and backache (Masters & Johnson, 1966).

Sleep improvement

It is well-known that quality sleep is beneficial for both psychological and physical health, and sex may promote health through sleep-related pathways. Studies have found links between good sex and good sleep, but the causal direction is unclear. For example, individuals with disturbed sleep report a decline in sexual activity and function (Lee & Tetley, 2019), yet it is not clear which phenomenon (disrupted sleep or disrupted sexual activity) is primary. Certainly, the physiological after-effects of sexual activity may promote high-quality sleep (physical activity followed by muscle relaxation; elevated oxytocin level and consequent stress-reduction; elevated prolactin level after orgasm; lowered cortisol after orgasm).

Empirical evidence (and conventional wisdom) suggests that sexual activity followed by orgasm facilitates sleep, although laboratory studies have not verified this causal hypothesis (Brissette et al., 1985). Masturbation regularly seems to be included in the list of sleep-inducing maneuvers. In an American study, 32% of 866 women who reported masturbating in the previous three months did so to help them fall asleep (Ellison, 2000). In an Australian study among >750 men and women, more than 50% indicated improved sleep quality after masturbation to orgasm, with no gender difference. After sex with a partner, the sleep benefits were higher in men, which could be explained by the gender gap in orgasm frequency (Lastella et al., 2019).

Improved immune system function

Partnered sexual activity is a risk factor for lowered immunity in women with depressive symptoms, but a possible resilience factor for men with depressive symptoms (Lorenz & van Anders, 2014). Students who had sexual intercourse once or twice a week had IgA levels 30 percent higher

than those who were abstinent (Charnetski & Brennan, 2004). IgA is an antibody that serves as a first-line defense against most invading pathogens. Yet interestingly, more frequent sexual activity (3–4×/week rather than two times per week) was not associated with increased IgA. Importantly, these might be interpreted as “relationship” effects rather than “sexual” effects. Studies of sexual activity in coupled and single individuals suggest that sexual activity is most strongly associated with well-being in *coupled* individuals, and among coupled individuals, those who were happiest were those reporting sex 1–2 times a week (Muise et al., 2016). Hence, one possibility is that “sex 2 times a week,” in this study, is serving as a proxy for having a stable and satisfying relationship, which offers several emotional benefits associated with effective immune system functioning (Fagundes et al., 2011; Kiecolt-Glaser et al., 2010). Studies focusing specifically on other forms of sexual activity have found that in men, masturbation was followed by a transient increase in the absolute number of leucocytes, in particular killer cells, that can be seen as a boost of the immune system (Haake et al., 2004). Kissing, which in the Western world remains a nearly ubiquitous part of sexual expression, appears to alleviate allergic symptoms by decreasing allergen-specific IgE production (Kimata, 2006).

Here follows a simple explanation of the role of three major intervening hormones: oxytocin, testosterone, and cortisol.

Oxytocin

Changes in oxytocin represent short-term effects of sexual activity that may contribute to its benefits. Oxytocin is a neuropeptide hormone from the hypothalamus. It is best known for its role in social and parenting behaviors, including lactation and labor. Oxytocin also plays a role in mammalian reproductive behaviors, including pair bonding (Veening et al., 2015). Intimate touching, such as caressing, massage (both the active and the passive element of it), and breast stimulation all stimulate an increase in oxytocin. Numerous studies show that oxytocin increases during sexual arousal (Gimpl & Fahrenholz, 2001) and orgasm

(Carmichael et al., 1987). These increases not only have sedating effects but also increase interpersonal trust (Kosfeld et al., 2005; van Anders et al., 2013), confer anti-stress, antidepressant, and anxiolytic benefits (Scantamburlo et al., 2007), and immunologic and anti-inflammatory effects (Carter et al., 2020).

Some scholars have interpreted these effects to suggest that some of the primary benefits of close human relationships (including parent-infant bonds and adult attachment bonds) may be conferred by oxytocin release, and this may contribute to the health benefits of sexuality (Uvnäs-Moberg, 2004)

Testosterone (T)

Testosterone has many direct and indirect sexual implications. It is a key element for sexual desire in both men and women, with direct sexual effects on arousability and sexual fantasies and indirect sexual effects *via* mood and energy, but with also clear gender differences (van Anders, 2012). In women, T has been positively linked to solitary desire, and masturbation frequency was implicated in this association. However, T was negatively correlated with dyadic desire in women (but only when cortisol and perceived social stress were controlled). In men, no significant correlations were found between T and desire. Men showed higher desire than women, but masturbation frequency rather than T influenced this difference (van Anders, 2012). Sexual contact and even sexual thoughts can increase T-level (Dabbs & Mohammed, 1992; Goldey & van Anders, 2011; van Anders et al., 2013). Cuddling can sometimes be experienced as sexual, which may lead to an increase in T, but cuddling can also be experienced and appraised as nurturing rather than sexual, and nurturant experiences can cause a decrease in T (van Anders et al., 2013).

Cortisol

Cortisol is relevant in stress and immunity, specifically, chronically elevated levels of cortisol can be detrimental to both physical and psychological health. While there is limited information on the relationship between actual sexual behavior and cortisol, some research has dealt with the

relationship between cortisol and various forms of arousal. Alley et al. (2019) found steady declines in cortisol across an experimental induction of sexual arousal (via auditory stimuli). Many others have found similar patterns of decline during various forms of arousal (Exton et al., 2000; Hamilton et al., 2008; Heiman et al., 1991). In parallel, intimate behaviors, such as skin touching (hugging, massage, stroking) also appear to decrease cortisol levels, although not investigated about sexuality (Woods et al., 2009). While research in this area is limited, some findings suggest that sexual behavior and associated intimacy can decrease cortisol levels, potentially blunting the negative effects of chronic stress hormone exposure (Young et al., 2004).

Intermediate-term benefits

Preconception and conception

Sexologists entering obstetrics and fertility are usually surprised about the lack of recommendations centered on sexual activity. For example, there is no substantive integration of sexuality information into preconception care. Yet some studies suggest the value of such an integration. Several studies found that an ample period of exposure to the semen of the future father (i.e., intravaginal ejaculation without condoms or oral ejaculation) is associated with a decrease in various forms of preeclampsia (Saftlas et al., 2014). There is emerging evidence that, after contact at intercourse, seminal fluid provokes an adaptive immune response in the woman's genital tract, which in the longer term facilitates healthy pregnancies (Robertson & Sharkey, 2016). A condomless sexual intercourse period of 6 months is associated with less preeclampsia and less abnormal uterine activity (situations that can result in small for gestational age babies (Woods et al., 2009; Kho et al., 2009). Without yet identifying specific causal roles for semen exposure, these studies seem to indicate that HCPs in fertility care should pay more attention to the role of preconception sexual activity for post-conception outcomes. Infertility care could also benefit from more attention to the quality of sexual interactions. Beyond the obvious fact that more frequent

sex increases the chances for conception, the *quality* of sex may also matter. In a current Dutch-Belgian project on subfertility, structured attention is paid not only to frequency and other aspects of sexuality but also to enhanced sexual pleasure (Dancet et al., 2019). Regular sexual activity also supports successful implantation of the embryo later in the luteal phase, perhaps because sexual activity positively influences the humoral immunity by which the emerging embryo is accepted, despite being a "foreign invader" (Lorenz et al., 2017).

Pregnancy

Sexual activity during pregnancy poses no risk to the pregnancy or the baby, and in fact, healthy pregnant women (23–26 weeks) who engaged in sexual activity more than once a week were found to have a significantly reduced risk of subsequent preterm delivery (Read & Klebanoff, 1993). Again, it is not clear whether sexual activity itself played a causal role, or whether other factors (such as the availability of a well-functioning romantic relationship) may have contributed.

Women who engaged in penile-vaginal intercourse or who experienced orgasms without intercourse in late pregnancy had a reduced risk of preterm delivery (Reamy et al., 1982; Sayle et al., 2001), and continued engagement in penile-vaginal intercourse is associated with reduced risk for post-date pregnancy and reduced need for induction of labor at 41 weeks (Tan et al., 2006). Some of the benefits of sexual activity during pregnancy may be mediated by its relationship effects: Heterosexual couples who reported enjoying sexual activity during pregnancy evaluated their relationships more positively 4 months after delivery, and evaluated their relationship as more stable 3 years after the delivery, compared to couples who reported less mutual sexual enjoyment (Heinig & Engfer, 1988). Again, questions of causation are difficult to establish. Although mutual sexual enjoyment may promote relationship functioning after pregnancy and childbirth, it is also possible that well-functioning couples may be more motivated to engage in sexual activity, and may find these interactions more enjoyable.

Several aspects of sexual stimulation can have a function to induce labor and to keep the child-birth process going. Among them are nipple stimulation (with increased oxytocin), massage (with increased oxytocin), vaginal penetration (with increased oxytocin by the Ferguson reflex), intravaginal, oral, or anal ejaculation (with increased prostaglandin E2), genital stimulation (with increased endorphins), and orgasm (can be strong and tonic in the last part of pregnancy) (Kavanagh et al., 2005).

Influencing mood/depression

Young US women who engaged in intercourse without condoms were found to be less depressed than women who had no intercourse and then women who always or usually used condoms (Gallup et al., 2002). The difference could not be explained by the duration of the relationship. The authors of that article wondered if semen has antidepressant properties. It will not surprise that this article about condomless sex raised concerns and was heavily criticized (Prokop et al., 2014). The fact that condomless sex is indeed associated with increased risks for some couples should not be a reason not to inform about the potential benefits for other couples. In that discussion, the essential question faded into the background. Ejaculate contains many substances that are easily absorbed by the vaginal wall, especially in highly aroused women (Levin, 2007). Three of those substances (testosterone, DHEA, and zinc) are relevant to depression.

Testosterone has antidepressant properties (McHenry et al., 2014). The free testosterone level (i.e., testosterone's bioavailable fraction) in seminal plasma is 3–4× higher than in male blood (Asch et al., 1984).

DHEA has antidepressant properties (Peixoto et al., 2018). Seminal plasma contains DHEA and 7OH-DHEA in amounts that are close to the concentration in blood (Pohanka et al., 2002).

Zinc is related to depression. Women who meet the RDA (recommended dietary allowance) for zinc have significantly lower odds of depression (Li et al., 2017). According to NIH, the daily zinc requirement for a woman is 8 mg. An average

ejaculate contains 0.55 mg of zinc (Owen & Katz, 2005), which is ±7% of a woman's RDA for zinc.

A US group investigating work-life enrichment looked also at sexuality (Leavitt et al., 2019). Married, employed women and men engaging in sex at home reported the following day increased positive affect at work, both in terms of job satisfaction and job engagement. Whereas engaging in sex appeared to create mood-driven positive outcomes the following day, work-related strains appeared to inhibit sex. One study found that physical affection or sexual behavior in heterosexual couples significantly predicted next-day reductions in negative mood and stress, and next-day increases in a positive mood. Notably, the same effects were not detected for masturbatory orgasm (Burleson et al., 2007). Another study of US women exposed them to a training program for improving their orgasm capacity, and those women who successfully finished the program showed reduced levels of depression (McVey, 1997).

Sexual function self-maintenance

“Use it or lose it” is as appropriate for sexual function as it is for muscles and many other systems in the body. Age-related declines in partnered or solo sexual activity are associated with reduced sexual potency (Koskimäki et al., 2008). In men, for example, extended absence of erection (such as occurs after radical surgery for pelvic cancer) can produce anoxemia and disturbed nitric oxide metabolism, which can permanently damage the cavernous tissue necessary for erectile function (Tal, 2017). Post-menopausal women who continue to be sexually active, show less vaginal atrophy and higher levels of androgens and gonadotropins (Leiblum et al., 1983). Women who are more sexually active also show slower transitions to menopause and the accompanying hypoestrogenism (Arnot & Mace, 2020).

Importantly, the quality of sexual activity matters: Although lack of estrogen is frequently held responsible for dyspareunia in the peri- and post-menopausal phase, studies suggest that when sexual activity is accompanied by high levels of sexual arousal, there is rarely dyspareunia (van Lunsen & Laan, 2004).

Long-term health benefits

Sex as physical exercise

Some articles deal with exercise to improve sexual function in men and women (Fergus et al., 2019). What about the other way round? Knowing that various forms of exercise or physical activity diminish the incidence and the damage of conditions like diabetes, obesity, cardiovascular and cerebrovascular problems, the question rises if sexual activity could “count” as physical activity. The more physically active forms of solo or joint sexuality can indeed be seen as exercise and accordingly have the potency to positively influence cardiovascular and cerebrovascular health. Inevitably that will raise the “Chicken & egg question: What is first?” A dilemma comparable to the discussion of some decades ago when proponents claimed “Exercise benefits health,” while opponents claimed that “Good health creates the opportunity for exercise.” By now the medical community is convinced of the health benefits of exercise. The typical energy expenditure during penile-vaginal intercourse is ~ 85 kcal or 3.6 kcal/min and seems to be performed at a moderate intensity in young healthy men and women (Frappier et al., 2013). Even without muscular activity, sexual arousal activates circulation. To a variable degree, it can be accompanied by changes in heart rate, blood pressure, and peripheral vascular responses. Orgasm is always accompanied by a rise in heart rate (20–80 beats/min), systolic blood pressure (25–120 mmHg), and diastolic pressure (25–50 mmHg) (Bancroft, 2009). In both men and women, the cardiovascular response during intercourse tends to have higher peak heart rate and blood pressure values. These parameters tend to rise slowly throughout intercourse, peaking for a short period at or around orgasm, and then quickly return to baseline, usually within 1 or 2 min (Bancroft, 2009).

Since physical activity is recognized as an important lifestyle factor delaying the development of atherosclerosis and cognitive decline, it may be appropriate and beneficial to include regular sexual activity in health recommendations, especially for people disinclined to pursue other forms of exercise. That appears safe. In a group of cardiology outpatients (aged 41–70)

circulation parameters were compared between a treadmill stress test and sexual intercourse at home. The duration of sexual activity was almost three times longer than the participant’s exercise treadmill duration. However, the amount of cardiac work during usual sexual activity was approximately half the maximal treadmill exercise. The maximum heart rate and blood pressure during sexual activity was $\sim 75\%$ of that attained during maximum treadmill stress testing (Palmeri et al., 2007).

Overall functioning and longevity

Two large-scale observational studies representative of the US and the British population looked into the relationship between sexuality and general health. The US study, with over 3000 people, found that sexual activity, quality of sexual life, and interest in sex were positively associated with health in middle age and later life (Lindau & Gavrilova, 2010). The British study covered over 15,000 participants (Field et al., 2013), and found that in both sexes, reduced sexual activity and reduced sexual satisfaction were associated with limiting disability, depressive symptoms, chronic airways disease, and difficulty walking up the stairs because of a health problem. Although neither of these studies establishes a causal role for sexual activity, one US longitudinal study found that greater initial frequency of sexual intercourse was associated with a lower annual death rate in men 25 years later, and self-reported enjoyment of intercourse predicted lower mortality among women (Palmore, 1982).

A Swedish longitudinal study of nearly 400 70-year old Swedes found that early cessation of sexual intercourse was associated with higher mortality 5 years later (Persson, 1981). A longitudinal American population-based study on older men and women looked into the links between partnered sexuality and cardiovascular risk in later life (Liu et al., 2016). Men reported more partnered sexual activity, and more enjoyable activity, than did women. Men reporting partnered sex once a month had less elevated C-Reactive Protein (a marker of systemic inflammation, which is associated with cardiovascular disease as well as many other disease conditions) than did men without

partnered sex. Yet this study also found that more frequent partnered sex in men (but not women) was positively related to later risk of cardiovascular events, suggesting that the mechanisms linking sexual activity to cardiovascular health are complex and gender-differentiated.

A longitudinal study of over 900 Welsh middle-aged men found that men with two or more acts of intercourse per week had (in a 10-yr follow up) a 50% lower risk of dying than men who engaged in sex less than once a month (Davey Smith et al., 1997). It is not clear from this study whether intercourse is singularly beneficial, or whether it is the overall experience of arousal and orgasm that is beneficial (in which case solo masturbation could convey the same effects). A potential link between sexual activity and mortality risk was also found in a US longitudinal research on >15,000 men and women with an average age of 39 years (Cao et al., 2020). More frequent sexual activity was associated with lower all-cause mortality in a dose-response manner. Specifically, cardiovascular and cancer death rates were lower for those who had sex at least 52 times a year compared to those who had sex once a year or not at all (Cao et al., 2020). A longitudinal study of over 2400 Taiwanese men and women above age 65 showed that sexually active men, women, and couples had lower mortality and less stroke over 14 years (Chen et al., 2007).

Age-related conditions and diseases

Cognitive decline and dementia are associated with diminished sexual behavior in older persons (Hartmans et al., 2014; Momtaz et al., 2013). Yet older people who are not demented and who continue to engage in sexual activity have better overall cognitive functioning (Hartmans et al., 2014). The English Longitudinal Study of Aging also explored associations between sexual activity and cognition in adults aged 50–89, finding that regular sexual activity was linked to slower cognitive decline, as assessed by scores on tests of memory and executive function (Wright et al., 2019). Especially here more research is needed to clarify *a causal relationship direction*. With respect to prostate cancer, studies have found that frequent ejaculations are associated with

reduced prostate cancer risk. A large US-based study showed that more frequent ejaculation had a beneficial role in the etiology of prostate cancer, particularly in lower-risk cancer (Rider et al., 2016). Among the explanations for the protective role of frequent ejaculation is the clearing out of carcinogenic substances from the prostate and also less formation of cancer-promoting intraluminal crystalloids (Jian et al., 2018). That fits with the much lower prevalence of prostate cancer in gay men (Boehmer et al., 2011). Gay men have a substantially higher frequency of solo and joint sexual activities than heterosexual men (Dodge et al., 2016). Although that research did not explicitly address ejaculation, one may safely assume that the great majority of gay and straight male sexual encounters will end with ejaculation.

Regular ejaculation appears a preventive factor in the development of chronic non-bacterial prostatitis. That prostatitis syndrome is seen in men who for religious or personal reasons avoid intercourse and masturbation (Yavaşcaoğlu et al., 1999).

Happiness and satisfaction as an individual and a couple

In committed female-male relationships, several dimensions of sexual functioning (e.g., sexual desire, arousal, orgasm) are associated with the sexual satisfaction of individuals. At the interpersonal level, greater sexual satisfaction is consistently found to occur with greater relationship satisfaction, quality of communication, and stability (Pascoal et al., 2018). Individuals in enduring committed romantic relationships have longer, healthier, and happier lives than unmarried individuals (Diamond & Huebner, 2012). In a study in long-term committed relationships in five different countries, researchers examined the relationship between sexual functioning and relationship satisfaction. In both genders, sexual functioning was a strong predictor of relationship satisfaction (Heiman et al., 2011).

Some of the relationship effects of sexual functioning may be attributable to the benefits of sexuality for individual well-being. An American study of 16,000 adults found that individuals reporting more sexual activity reported more

overall happiness (Blanchflower & Oswald, 2004). In young married women, it was found that both masturbation and positive partnered sexual experiences may increase self-esteem and that some of these effects may involve heightened body image and self-acceptance (Hurlbert & Whittaker, 1991). A British study of over 15,000 participants found that reduced sexual activity and sexual satisfaction were associated with depressive symptoms (Field et al., 2013). In a representative sample of partnered older people in England, continuing sexual desire, activity, and functioning were associated with higher subjective well-being (Lee et al., 2016). In a multi-country study, sexual satisfaction in males was found to relate to more frequent sexual intercourse and to relate inversely to depressive symptoms (Nicolosi et al., 2004). Again, causal relationships are difficult to discern, but some studies suggest that better sex may directly influence subsequent mood.

Conclusion and recommendations for the future

The overall impression of our search is that an increasing amount of elements of sexual action and interaction appears to favor physical and mental health. We guess that many more health benefits will be found when sexuality and intimacy are more taken for granted in studying people. The most pressing unanswered question for research on sex and health concerns the direction of causation: Does sex truly enhance one's health, individual well-being, and relationship functioning, or do healthy and happy individuals with strong relationships end up having more sex? Do the benefits that have been identified for sexual activity apply to all individuals (and all forms of sexual expression) equally? The fact that we do not yet know the specific answers to these questions should not prevent us from increasing the basic level of sexuality education among HCPs and encouraging them to include healthy sexual functioning among their target health endpoints, for both healthy individuals and those struggling with medical conditions (Field et al., 2013). Despite lacking convincing evidence that good sex benefits health, the balance of research supports that sexuality anyhow deserves greater

attention among HCPs and that sexuality research needs better integration within health research. Implementing that, we conclude this article with a set of recommendations for various groups of professionals.

- Young individuals deserve in their education the message that sexuality is a normal and healthy part of life. In search for a healthy sexual future, they must navigate cultural messages that both idealize and demonize sexual functioning, and we need approaches that communicate the obvious risks of sexual behavior (such as pregnancy and sexually transmitted infections) alongside the benefits of sexual behavior as a basic form of human health and happiness (see Ballonoff Suleiman et al., 2015). Public health and educational approaches that adopt this approach will be best suited to help individuals make satisfying sexual choices that align with their values, that promote positive relationship functioning, and that promote overall well-being over the life course.
- Sexuality education with the full range of bio-psycho-social aspects should be an integral part of the curriculum of all healthcare professionals (including nurses, midwives, and physiotherapists)
- HCPs in obstetrics should integrate aspects of sexual behavior in their preconception care. Included explicitly recommending a minimum of 6 months paternal semen exposure before trying to conceive (Kho et al., 2009).
- HCPs in fertility should proactively integrate sexuality in their advice. Included detailed information on the sexual physiology of “how to conceive,” and on the long-term influence of this process on the sexual relationship (Dancet et al., 2019).
- Since the determination of a patient's sexual orientation is important to guide appropriate healthcare, we recommend HCPs who deal with chronic diseases and impairments ask about sexual orientation (Haider et al., 2017).
- All sexual information in the context of disease, aging, or medical intervention is relevant for the patient's or couple's sexual well-being, but is not mentioned by the HCP, reinforces the taboo on communicating sexuality. So, when it appears needed, we recommend mentioning sexual

activities and their benefits, including solo and joint masturbation. Such information is better not communicated as explicit advice (“Try this or that!”). To prevent running the risk of virtually entering the patient’s bedroom it’s better to use a detour (“Some patients in the same situation tried such-and-so. In some of them that worked very well!”).

- Be aware that in many medical conditions, it could help patients and the couple when HCPs convey the message to them: “If you like sexuality and intimacy, it is wise to continue with that since we know that it is good for health!”
- Understanding and communicating the health benefits of sexuality can help to motivate staff and fellow physicians to proactively address sexual functioning, and to avoid scenarios in which a “sexless” existence is deemed a relatively harmless by-product of aging and disease.
- HCPs with responsibility for long-term or permanent hospitalized patients are urged to consider The Declaration of Sexual Rights of the World Association for Sexual Health, which says that “Everyone has the right to the highest attainable level of health and well-being in relation to sexuality, including the possibility of pleasurable, satisfying and safe sexual experiences” (WAS, 2014).

Researchers in sexuality and sexual medicine should move part of their attention from sexual dysfunctioning as a result of diseases to the pleasurable aspects of sexuality and intimacy and their possible benefits for physical and mental health. They are encouraged to further elucidate the influence of different sexual acts on short-, intermediate-, and long-term outcomes and be aware that people will define sex drastically differently across gender, sex, orientation, and more.

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