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## Puberty and Adolescent Sexuality

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### Introduction

The sexuality of young people is a continuous fascination to the popular imagination as well as in sexuality research. The fascination contains a mixture of anxiety and nostalgia that clouds the self-evident observation that each adult – over a sexual lifetime spanning 50 years or more – extends the sexual adolescent that emerged with puberty. However, connecting the sexuality of early adolescence with elements of adult sexuality is difficult, despite a huge literature on adolescent sexuality. The sexuality of adolescents is not only seen as immature, but as being qualitatively distinct from the sexuality of adults. Exploration of the motivational and functional components of sexuality critical to understanding of adult sexuality – sexual desire, sexual arousal, and sexual function – is almost entirely missing. As a result, critical lacunae exist in understanding the continuum of sexuality development through the lifespan. The purpose of this review, then, is to summarize research on the pubertal antecedents of four hallmarks of adult sexuality: sexual desire; sexual arousal; sexual behaviors; and, sexual function. Only adolescents' sexual behaviors receive significant research attention, with an almost obsessive interest in the timing and behavioral content of young people's sexual experience.

### Linking adolescent and adult sexuality

An immediately obvious question is whether “adolescent” and “adult” sexualities are distinct and discontinuous developmental entities. Much of psychological, medical, and epidemiological research cleanly demarcates adolescent and adult sexuality, with many elements of sexual experience assumed to be inappropriate for adolescents and preserved for adults. From this perspective, sexual experiences such as coitus are seen as fundamentally transformative, marking an irreversible status boundary between adolescence and adulthood. The broad social, cultural, and religious investments in the meanings of words like ‘virgin’ is an example of this perspective. Because sexuality is seen as a domain requiring adult maturity to experience and express, adolescent sexuality is portrayed – even in ostensibly objective research – as tentative, experimental, confused, inept, and innately dangerous (Schalet, 2004). Indeed, a substantial research literature addresses adolescent sexuality as an expression of “risk-taking” requiring broad social efforts to suppress or control (J. D. Fortenberry, 2003). The control of adolescent sexuality seems to be the point of much of the debate over the content of American sex education which is often skewed toward

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abstinence, pregnancy, and STI, with little or no mention of masturbation, sexual pleasure or orgasm (Koyama, Corliss, & Santelli, 2009; Mary A. Ott & Santelli, 2007; Santelli, 2008)

An alternative view (one taken in this review) is that the essential elements of adult sexuality are identifiable in early adolescence and are relatively continuous through the sexual lifespan. Key elements of sexual anatomy are fixed during puberty. Changes in sexuality from earlier to later adulthood leave this anatomy essentially intact. The hormonal underpinnings of sexuality also remain relatively intact from puberty through late adulthood. Although the subjective interpretations of the experiences of sexuality almost certainly change over the life-course, physiologic components such as sexual arousal and orgasm do not.

The foundations for linkage of adolescent and adult sexuality are depicted in Figure 1. The model shows (in modified form) four domains of the sexual response cycle – sexual desire, sexual arousal, sexual function, and sexual behaviors that are well-developed in adult sexuality research. Evidence supports both linear and circular organization of these elements adults (Hayes, 2011) but their inter-relationships are virtually unexplored within the sexual lives of adolescents. These are aspects of adolescent sexuality open to new research within existing ethical and regulatory bounds that do in fact separate adolescent from adult sexuality.

### Sexual Desire

Clinical emphasis on desire in association with adult sexual dysfunctions suggests potential value in exploration of the ontogeny of desire during puberty and early adolescence. Sexual desire is a difficult concept to pin down, even for adults. Desire is a motivational state that generates increased attention to sexual stimuli, and variable subjective and physiologic arousal (Basson & Schultz, 2007). The distinction of sexual desire and sexual arousal is not clear (Graham, Sanders, Milhausen, & McBride, 2004) and it may be that such distinctions are misleading (Meana, 2010). Recognition and expression of desire may be a central element in development of sexual self-efficacy during adolescence, especially among adolescent women (Deborah L. Tolman, 2012). However, desire as a motivational state develops in concert with increased capacity for self-regulation of other appetitive behaviors (Georgiadis & Kringelbach, 2012). Tolman refers to this developmental tension of sexual motivation and sexual control – from the social-psychological perspective of a feminist scholar – as ‘dilemmas of desire’ (D. L. Tolman, 2002). From a neural development perspective, this may map to increased reactivity to social stimuli associated with pubertal changes in sensitivity to gonadal steroids in key brain areas (Ernst, Romeo, & Andersen, 2009; Romeo, Richardson, & Sisk, 2002).

Because the elements of sexual desire in adolescence are incompletely delineated, three aspects of desire especially relevant to sexual development during adolescence are discussed: sexual cognitions, objectified desire *by* others, and objectified desire *for* others (Figure 1). The discussion of adolescent sexual behaviors (as reflections of adolescent sexuality) is extended beyond the usual review of coitus to address other partnered behaviors as well as masturbation and abstinence.

**Sexual Cognitions**—Cognitive markers of sexual desire emerge during early puberty, including identifiable sexual thoughts and sexual attractions. About 25% of young adults report “thinking a lot about sex” as 11–12 year olds (both boys and girls) (Larsson & Svedin, 2002). Based on reports of fourth- and fifth grade (ages 9–11 years) American boys and girls, 16% reported self-relevant sexual thoughts (Butler, Miller, Holtgrave, Forehand, & Long, 2006). In a sample of Spanish boys and girls, about 6% of 9–10 year old boys reported sexual fantasies, increasing to 66% among 13–14 year olds. Among girls, 15% of

13–14 year olds reported fantasies, with none reported by 9–10 and 11–12 year olds (Arnal & Llario, 2006). Prospective studies suggest that sexual cognitions become evident over a short period of time, perhaps as little as 3 months (Mary A. Ott & Elizabeth J. Pfeiffer, 2009). If expressed interest in sex is a marker of sexual desire, less than 2% of 9–10 year old boys express an interest in having sexual intercourse, but this proportion is 12% among 13–14 year olds. This proportion is 2% or less for girls (Arnal & Llario, 2006). Adult men have more frequent sexual cognitions than women, but these differences may be small and more related to erotophilia (Fisher, Moore, & Pittenger, 2012) and this sort of study has not been done in adolescents.

The hormonal and neural organizational basis for the emergence of sexual cognitions is unclear. Affective brain centers – for example, the nucleus accumbens and amygdala – play key roles in social information processing brain networks that are extensively reorganized during puberty (Nelson, Leibenluft, McClure, & Pine, 2005). These brain regions have large populations of gonadal steroid receptors and are linked to changes in sexual behavior (Ernst et al., 2009; Romeo et al., 2002). Total testosterone modestly correlates ( $r=0.28$ ) to sexual fantasies in pubertal boys, but does not predict fantasies in models that include onset of spontaneous nocturnal ejaculations and age (Campbell, Prossinger, & Mbzivo, 2005). Testosterone is also associated with frequency of sexual thoughts in young women (Udry, Talbert, & Morris, 1986). Testosterone – presumably acting through androgen receptors in the limbic system and other brain areas – likely is also associated with changes in social information processing associated with romantic and sexual cognitions (Ein-Dor & Hirschberger, 2012; Raznahan et al., 2010).

Other evidence of sexual cognitions among younger adolescents comes from research focused on sexual abstinence. Attitudes and behavioral intentions around sexual abstinence and other sexual behaviors appear early in adolescence (Arnal & Llario, 2006; M. A. Ott & E. J. Pfeiffer, 2009), often expressed in concert with cognitions about sexuality and sexual behavior (Masters, Beadnell, Morrison, Hoppe, & Gillmore, 2008). Younger adolescents define abstinence as a normal element of a continuum that uses “developmental readiness” as a standard for motivated decisions about shifting from sexually abstinent activity to sexual activity (M. A. Ott, Pfeiffer, & Fortenberry, 2006). Many adolescents’ definitions of abstinence include masturbation as well as partnered sexual interactions (Byers, Henderson, & Hobson, 2009; Planes et al., 2009). Stronger attitudes about abstinence are associated with increased likelihood of abstinence over time, and high levels of intentions to engage in sexual activity are associated with increased levels of sexual activity (Masters et al., 2008). This suggests that adolescents’ sexual cognitions reflect choices about sexual behavior, and supports conceptualizing abstinence as a sexual behavior.

**Others as objects of desire**—A hallmark of sexuality development is awareness of sexual interest in other people. This emergent awareness may originate in neuro-endocrine changes of adrenarche and pubarche (Ellis & Essex, 2007; Graber, Nichols, & Brooks-Gunn, 2010; Herdt & McClintock, 2000; Oberfield & White, 2009). About 25% of parents of 10–12 year olds report substantial interest in other sex people by their children. The common cultural nostalgia about adolescent sexuality is often linked to “crushes,” referring to unreciprocated attraction, feelings and fantasies for another (Bowker, Spencer, Thomas, & Gyorkoe, 2012). Crush is originally slang but a more technical term does not seem to be in contemporary usage. Emotionally intense or quasi-romantic crushes may be an early manifestation of the objectification of others that is not explicitly sexual but is part of the development of the partnered substrates of sexuality (Hearn, O’Sullivan, & Dudley, 2003). Among 511 American 6<sup>th</sup>, 7<sup>th</sup>, and 8<sup>th</sup> graders, 56% reported at least one current crush, with larger proportions of girls (61%) than boys (48%) (Bowker et al., 2012).

**The self as an object of desire**—The complementary aspect of desire for others is the “desire to be desired” and the perception that one is desired. Structural and functional brain changes associated with puberty fundamentally transform the network of brain regions involved in understanding others through perceptions of their underlying mental states (Blakemore, 2012; Forbes & Dahl, 2010). The interpersonally obvious signs puberty – linear growth, increased weight, facial hair development, breast development – contribute to attractiveness to others and are temporally accompanied by increased bodily self-awareness during early adolescence. Objectification associated with increased body dissatisfaction, especially with advanced pubertal development, is especially characteristic of girls (Lindberg, Grabe, & Hyde, 2007). Girls’ with more advanced puberty have both lower body image satisfaction and higher depression scores, but those with platonic rather than romantic involvement with boys have greater body image satisfaction (Compian, Gowen, & Hayward, 2004). Objectification occurs in social and cultural frameworks as well as by potential romantic and sexual partners. Sexualized images of women and girls are prevalent in mainstream media, with some evidence linking objectification to sexual behavior outcomes such as earlier age at first coitus (American Psychological Association, 2010; Lerum & Dworkin, 2009; Pearson, Kholodkov, Henson, & Impett, 2012).

Body satisfaction and body self-esteem, both general and in association with genitals and sexual contexts, are associated with better sexual function among older adolescents and adults (Schick, Calabrese, Rima, & Zucker, 2010; Schooler & Ward, 2006; Woertman & van den Brink, 2012; Yamamiya, Cash, & Thompson, 2006). Attractiveness – especially facial attractiveness – is an important element in the formation of the dyadic relationships that structure adolescents’ partnered sexual interactions. Substantial attention is given to attractiveness and body image characteristically associated with adolescent development (Tovee, Maisey, Emery, & Cornelissen, 1999) with visual cues especially important aspects of arousal in men (Kuhn & Gallinat, 2011). In terms of facial cues, adolescents prefer symmetric, more feminine faces in both males and females, and this preference increases with both age and stage of pubertal development (Saxton et al., 2010). Adolescents’ judgments of facial attractiveness are less concordant than adults, but more concordant than attractiveness judgments of children (Saxton, Caryl, & Roberts, 2006). It unclear how these changes are influenced by continued brain development, by experience, or by interplay of both.

Genital appearance is intrinsic to both clinical and social understanding of the sexual meaning of puberty (Biro & Dorn, 2005). Despite wide variation in normal appearance, media images of genitals – especially of women – suggest movement to a standard of beauty of a hairless vulva with thin, non-protruding labia (Byers, 2001, 2005). Large proportions (up to 70%) of both adult and adolescent women report partial or complete removal of pubic hair (Lloyd, Crouch, Minto, Liao, & Creighton, 2005; Schick, Rima, & Calabrese, 2011). This emerging standard of “normal” appears to be associated with increased requests for genital cosmetic surgery among young women (Bercaw-Pratt et al., 2012).

## Sexual Arousal

The hormonal, neuropsychological, interpersonal, and physiologic attributes of adult sexual arousal likely are capacitated during puberty and early adolescence (C. T. Halpern, 2006). However, direct evidence is lacking for the timing and pace for sexual arousal development. Detailed self-report instruments, experimental erotic stimulus-response paradigms, sensitive genital monitoring technology, and various neuroimaging techniques – extensively used in studies of sexual arousal in adults (Rosen, Weigel, & Gendrano, 2007) – are unlikely to find application to the study of early adolescents, although there is little evidence of potential harm in such participation (Kuyper, de Wit, Adam, & Woertman, 2012). Thus, systematic,

developmentally-structured research – however limited – into pubertal and early adolescent sexuality requires cautious integration of information drawn from a variety of limited sources (Romero et al., 2007). One place to begin is with understanding of young adolescents' awareness of sexual arousal, their interpretation of arousal, and their response to arousal.

**Arousal awareness, interpretation, and response**—Most data about awareness of feelings of sexual arousal draw from retrospective reports of young adults. The word 'arousal' is absent in these studies, so the cited data refer to 'excitement' or similar words. Sexual stimulation in solitary activities was 24.5% for young men and 6.6% for young women, reporting on memories from 11–12 years of age (Larsson & Svedin, 2002). Remembered sexual excitement in partnered activities at ages 6–10 was 5.3% of young men and 2.1% of young women. By ages 11–12 years, these proportions were 10.5% and 5.7% for men and women, respectively (Larsson & Svedin, 2002). Based on these data, however, we do not know if arousal refers to erection in boys and vaginal lubrication in girls. A review of six published diary-based studies of a single cohort of adolescent women showed that greater sexual interest on a given day was associated with sexual activity on that day, whether the behavior was first lifetime coitus, coitus, fellatio, cunnilingus, anal intercourse, or coitus during menses (J. Dennis Fortenberry & Hensel, 2011). This shows that young women's sexual behavior often matches levels of sexual interest reported on the same day.

Sexual arousal summarizes the complex psychological and physiologic activation associated with sexual stimuli (Levin, 2002). Many models of adult sexual response assume that sexual desire generates sexual arousal but these models may be less accurate reflections of the link between desire and behavior for women (Graham et al., 2004). Our cultural mythology (exemplified in the phrase "raging hormones") suggests that adolescence is a time of innate, hormonally-mediated sexual arousal. Contemporary neuropsychological data supplements this perspective, suggesting a developmental imbalance in dual brain systems associated with sensation-seeking and behavioral control (Steinberg et al., 2008).

An important limitation of direct self-report of sexual arousal by early adolescents is knowing how inquiries about sexual experiences are interpreted (De Graaf & Rademakers, 2011; Rademakers, Rademakers, & Straver, 2003). Among 8- and 9-year old children, almost half (14/31) could not label 'exciting' body parts on a drawing (Rademakers et al., 2003). It is possible that genital response is not necessarily sexual at all. Spontaneous nocturnal ejaculations occur without explicit genital stimulation, with an average age of onset of 12.5 years, but are only modestly correlated with testosterone levels (Campbell et al., 2005). Exercise-induced orgasm – in the absence of sexual arousal or direct genital stimulation – is relatively common in adult women, many of whom report onset during early adolescence (Debby Herbenick & Fortenberry, 2011). As a response to that publication, we have received a number of communications from men reporting similar experience of exercise and orgasm, often with first experiences in early adolescence (unpublished data).

## Sexual Behavior

**Abstinence**—Abstinence is often defined as refraining from oral, vaginal, and anal partnered sexual behaviors. However, no single definition exists for what is and is not abstinence and a range of sexual interactions such as kissing and mutual genital touching are included in many young people's definitions of abstinence (Byers et al., 2009; Planes et al., 2009). Young adolescents' sexual abstinence is distinct from the sexual abstinence of younger children (De Graaf & Rademakers, 2011; Rademakers et al., 2003). This distinction is based on emergence of conscious sexual identities, motivations and desires during early and middle adolescence (Reynolds & Herbenick, 2003). These emerging identities,



motivations and desires manifest in various non-coital sexual behaviors that reflect decisions to avoid coitus (Uecker, Angotti, & Regnerus, 2008), suspend sexual activities after a sexual initiation (Rasberry & Goodson, 2009) or delaying first coitus until a perception of 'right time' and 'right person' (Martino, Elliott, Collins, Kanouse, & Berry, 2008). Framing abstinence as a behavior chosen within the context of sexual motivations and desires creates a developmentally appropriate framework for adolescent sexuality, separated from social, cultural and religious issues of chastity, virginity and non-virginity (Buhi, Goodson, Neilands, & Blunt, 2011).

**Masturbation**—Masturbation is the second most prevalent of adolescent sexual behaviors (J. Dennis Fortenberry et al., 2010). Masturbation remains subject to substantial stigma and religious condemnation, but contemporary medicine holds masturbation to be developmentally normal, and health-neutral if not health-enhancing. No data prospectively date the ages and contexts of onset of masturbation, nor the substantial gender differences reported among adults (Oliver & Hyde, 1993; Petersen & Hyde, 2010). Rates of 8.3% (9–10 year old boys), 46.7% (11–12 year old boys), and 87.3% (13–14 year old boys) are reported, but no girls under 13 reported masturbation and the rate was only 19% among 13–14 year old girls (Arnal & Llario, 2006). Retrospective studies suggest average ages of 13 and 15 years for men and women, respectively (Pinkerton, Bogart, Cecil, & Abramson, 2002). The prevalence of masturbation in the past three months increases with age among adolescent men: about 43% of 14 year olds report masturbation in the past 90 days compared to 67% of 17 year olds (Robbins et al., 2011). In contrast, the percentages of 14 and 17 year old women reporting masturbation in the past 90 days are quite similar at about 36% for both ages (Robbins et al., 2011). Lifetime prevalence of masturbation, however, continues to increase into young adulthood, with prevalence highest among those aged 25–34 (Gerressu, Mercer, Graham, Wellings, & Johnson, 2008). The magnitude of underreporting of masturbation is not established but may be substantial (C. J. T. Halpern, Udry, Suchindran, & Campbell, 2000).

The hormonal changes of masturbation and masturbation-induced orgasm in adults include sustained increases in prolactin and FSH, but change in testosterone is variable (Kruger et al., 1998). Studies of older women show correlations of testosterone and the relaxation, soothing, and peaceful qualities of masturbation-associated orgasm. Estrogen correlated with the flooding and spreading qualities of masturbation-associated orgasm (van Anders & Dunn, 2009). It is unclear if similar masturbation is associated with similar hormonal changes during early adolescence.

The perspective that masturbation is developmentally "normal" in adolescence raises the question of whether masturbation is a developmental phase of sexuality subsequently supplanted by various forms of partnered sex. However, rates of masturbation remain high over the lifespan, especially among men (D. Herbenick et al., 2010; Kontula & Haavio-Mannila, 2002). This suggests the possibility that masturbation serves important functions in individual sexuality and in reproductive health, and that these functions are not dependent on partnered sexual behavior (Das, 2007; Das, Parish, & Laumann, 2009; Gerressu et al., 2008; Kontula & Haavio-Mannila, 2002; Robinson, Bockting, & Harrell, 2002). Masturbation may serve different functions among adults: men may use masturbation as a substitute for partnered sex while women use masturbation as an extension of their sexual repertoire (Bancroft & Graham, 2011; Gerressu et al., 2008). Knowing more of the trajectories of both solo and partnered sexual behaviors from adolescence into adulthood would be useful in understanding the role of masturbation in sexual health of adolescents and adults.

Masturbation is substantially associated with the use of sexually explicit material (Hald 2006). Contemporary adolescents have access to a variety of sexually explicit media (e.g., television, internet, chat lines, books, magazines) with exposures often beginning at age 14 or earlier (Ybarra and Mitchell 2005; Štulhofer, Buško et al. 2010). Timing of pubertal development is associated with increase in use of sexually explicit media among boys (Skoog, Stattin et al. 2009; Lofgren-Mårtenson and Månsson 2010). Adolescents often intentionally choose media for sexual content (Bleakley, Hennessy et al. 2011).

One form of contemporary sexually explicit media – “sexting” – involves the transmission of sexual text, nude or sexual photographs (or both) via cellular smart phones (Weiss and Samenow 2010). Up to 28% of adolescents report sexting (O’Keeffe, Clarke-Pearson, Council on, & Media, 2011; Royer, Keller, & Heidrich, 2009) engaging in sexting is more likely among adolescents who have begun dating and are having penile-vaginal intercourse (Royer et al., 2009). Some jurisdictions interpret sexting as child pornography, and prosecute as such (Ostrager 2010). Sexting may play in adolescent relationships, where adolescents with attachment anxiety (and in a relationship) are more likely to use texts as a form of sexual propositioning (Weisskirch & Delevi, 2011).

Associations of masturbation and adolescent brain development have received very little research attention, with most studies directed toward explanations for increases in partnered sexual risk-taking thought to be generally characteristic of adolescence (Johnson, Blum, & Giedd, 2009). A more contemporary perspective on the changes in the adolescent brain is that reward-seeking peaks in mid-adolescence and impulsivity declines during adolescence into young adulthood (Steinberg et al., 2008). These changes are associated with active refinement of prefrontal and subcortical regions related to goal-directed behavior (Giedd et al., 2010). Imaging studies show that differences in cortical sub-systems associated with visio-spatial perception (typically more advanced in male adolescents) are associated with functional polymorphisms in the androgen-receptor gene (Raznahan et al., 2010). Thus, aspects of brain development could explain the substantial gender differences in masturbation rates that emerge during adolescence and remain a characteristic gender difference throughout the sexual lifespan (Oliver & Hyde, 1993; Petersen & Hyde, 2010).

**Partnered Sex**—Partnered sexual behaviors become prominent during mid- and late adolescence. These behaviors include sexual kissing, breast and genital touching, partnered masturbation, fellatio, cunnilingus, penile-vaginal intercourse, and penile-anal intercourse. Other partnered behaviors such as sexual exchange via electronic media (e.g., phone sex, “sexting”), and shared viewing of sexually explicit media also emerge during this time. The essential element of this aspect of adolescent sexuality is the sexual dyad. The nature and content of the dyadic relationship defines a substantial perspective on social attitudes, motivations, and outcomes (e.g., STI, pregnancy) of adolescents’ sexual relations. A substantial body of literature addresses these issues among adolescents with different-sex partners, but fewer data pertain to sexual behaviors within same-sex dyads.

Pubertal changes in testosterone are a causal factor in the timing of sexual initiation and the frequency of sexual activity among adolescent males (C. T. Halpern, Udry, & Suchindran, 1998). In young women, testosterone is correlated with increases in sexual interest and sexual activity (C. T. Halpern, Udry, & Suchindran, 1997). When adolescents are grouped by pubertal timing (defined as “early,” “average,” and “late maturers”), early maturing boys were youngest to report dating and to have sexual intercourse, followed by average and late maturers. Among girls, late maturers were slower to date and have sexual intercourse, but early maturers showed no difference from average maturers. Age of maturation was significantly lower for those reporting all heterosexual behaviors for both sexes (Lam, Shi, Ho, Stewart, & Fan, 2002).

**Forms of Partnered Sexual Relationships:** Sex plays a complex role in the formation and maintenance of several types of dyadic relationships, and serves different functions in relationships with different partners. Even within partnerships, the relational, recreational and reproductive functions of sex vary in relevance and salience at different times. Sexual factors predominate in some relationships: exchange of sex for money, drugs or rent, or single encounters with poorly known partners are examples. A common term for such encounters – one-night stand – is still widely used, but terms such as “casual partners,” “hook-ups” or “friends with benefits” are also commonly used. Up to half of adolescents in some studies report having sex outside of a dating context, but many choose partners who are friends or ex-girlfriends and/or boyfriends (Manning, Giordano, & Longmore, 2006). Studies of college students show that the sexual behavior content of these short-term relationships is highly varied, with a substantial proportion not involving penile-vaginal or penile-anal intercourse (Epstein, Calzo, Smiler, & Ward, 2009).

For many adolescents, sexual activity occurs within the context of an established relationship characterized by terms indicating relative commitment and exclusivity (e.g., friend, boyfriend/girlfriend or fiancée) (Manning, Flanigan, Giordano, & Longmore, 2009). In the past, many sexual relationships occurred in dating relationships with a subsequent marriage partner, and dating relationships remain important contexts for adolescents’ sexual activity (Giordano, Manning, & Longmore, 2010; Manning, Giordano, Longmore, & Hocevar, 2011). Serial romantic and sexual relationships - serial monogamy - represent a temporal sequence of sexual relationships characterized by commitment and sexual exclusivity, not necessarily leading to marriage or cohabitation.

Partnered, non-coital sexual behaviors such as kissing, non-genital touching, and genital touching are also common adolescent sexual behaviors that often precede first sexual intercourse (O’Sullivan, Cheng, Harris, & Brooks-Gunn, 2007). The prevalence of oral sex has also become more common in recent years, perhaps in response to a greater emphasis on the value of virginity and media popularized “risks” associated with sexual intercourse. Oral sex, in particular, also allows for sexual learning that emphasizes exchange, physical intimacy and pleasure, as well as “safer” sexual behaviors (Halpern-Felsher, Cornell, Kropp, & Tschann, 2005). To the extent that non-coital sexual behaviors provide opportunity to experience partnered arousal, sexual agency and sexual control, oral sex is likely an important part of the development of healthy sexuality during adolescence and young adulthood (Galinsky & Sonenstein, 2011; Horne & Zimmer-Gembeck, 2005).

Coitus is viewed in both popular and professional dialogue as the *sine qua non* of sexual development. Many societies develop separate language and social status for adolescents before and after an initial vaginal sexual experience. However, the range and meanings of sexual behaviors available to adolescents suggest the need for a more nuanced perspective. For example, a recent daily diary study showed no difference in daily mood on days before and after first coitus (Tanner, Hensel, & Fortenberry, 2010). Assessment of data from Demographic and Health Surveys in 64 developing countries led to the conclusion that boys and girls aged 14 and younger are universally “too young” to make safe and consensual transitions to partnered sexual activity that includes coitus; that 15–17-year-olds may or may not be too young, depending on their circumstances; and that 18-year-olds are generally “old enough” (Dixon-Mueller, 2008).

Data from the National Survey of Sexual Health and Behavior (NSSHB) provided age-specific rates of a range of sexual behaviors of more than 800 adolescents aged 14–19 years (J. Dennis Fortenberry et al., 2010; D. Herbenick et al., 2010). Vaginal intercourse was a rare event for the majority of 14–15 year olds with 90% of males and 88% of females never having engaged in such sex. Among 16–17 year olds, vaginal sex occurred more frequently.



However, only approximately one-third of males and females in this age group reported ever having vaginal sex. Among 18–19 year-olds, 63% of males and 64% of females reported vaginal sex at least once during their lifetime.

Anal sex, and especially receptive anal sex, was a low occurring behavior among most adolescents. For instance, among 18–19 year-old males, lifetime prevalence rates of receptive and insertive anal sex were 4% and 10%, respectively. Among adolescent women, anal sex was also a very low occurring event and was endorsed at a rate of 4% among 14–15 year-olds and 7% among 16–17 year-olds. Higher rates of anal sex were reported among 18–19 year-old adolescent females, with over 20% having experienced anal sex at least once during their lifetimes (D. Herbenick et al., 2010).

## Sexual Function

Subjective aspects of sex acts are clearly important elements of adults' sex (Meston & Buss, 2007) but are virtually unaddressed in the research literature about adolescent sexuality, sexual behavior, and sexual consequences. Adolescents identify pleasure as an important motivation for sex, although young women place less emphasis on pleasure than young men (Latka, Kapadia, & Fortin, 2008). Research on sexual pleasure among adolescents largely addresses perceptions of the effects of condom (or contraceptive) use on pleasure (Higgins, Hoffman, Graham, & Sanders, 2008). Even young adolescent men without coital experience mention interference with pleasure as a negative aspect of condom use (Rosenberger, Bell, McBride, Fortenberry, & Ott, 2010). Sexual pleasure has also emerged – because of the potential lubricating qualities of vaginal microbicides – as an important element of microbicide acceptability, even for young women (Tanner et al., 2009).

No data obtained from adolescents less than age 18 years of age address physiologic or psychological correlates of orgasm. The average age of retrospectively-reported first orgasm is 13 years and 17 years of age for men and women, respectively (Reynolds & Herbenick, 2003). These data refer in part to orgasm from masturbation but demonstrate that the capacity for orgasm is present in adolescence. About 10% of adolescent women report orgasm with first heterosexual coitus (Raboch & Bartak, 1983). Among 18–24 year old Swedish women, 26% reported that first orgasm occurred in association with penile-vaginal intercourse, and an additional 25% from cunnilingus or partner masturbation (Fugl-Meyer, Oberg, Lundberg, Lewin, & Fugl-Meyer, 2006). In a national Australian survey, 84% of 16–19 year old men, and 52% of women reported an orgasm at their most recent sexual encounter (Richters, Visser, Rissel, & Smith, 2006). General individual characteristics – autonomy, general self-esteem, and empathy – are related to sexual health outcomes like frequency of orgasm, and liking to give/receive oral-genital sex (Galinsky & Sonenstein, 2011). Taken together, these recent research findings suggest that maturation, sexual learning and experience are associated with generally positive changes in sexual health through adolescence into young adulthood.

One aspect of the subjective experience of partnered sex is pain, especially among young women. Pain is often mentioned (both as an expectation and an experience) in association with first coitus. However, a substantial proportion (about 53%) of young women ages 14–17 years report some degree of pain with most recent penile-vaginal intercourse (JD Fortenberry, unpublished data), and remains prevalent (about 33% of women) even with increasing age and coital experience (Landry & Bergeron, 2011). Young women continue to have coitus for a variety of reasons including being perceptive of their partner's sexual needs, and because coitus is considered to be an affirmation of being a normal woman, irrespective of pain or discomfort (Jones & Furman, 2011; Meier & Allen, 2009).

## Conclusion

No other period of the lifespan is sexuality at such a period of developmental change. While elements of sexuality and sexual interest are observable in children, the reorganization of the hormonal, anatomic, and neuropsychological substrates of sex during early adolescence is profound. Likewise, adolescence brings into play detailed and complex rules governing sexual display, sexual interaction, mating, and reproduction.

A major objective of this review is to enlarge a perspective on adolescent sexuality to incorporate elements such as sexual desire, sexual arousal, and sexual function, as well as sexual behaviors. Insights from better understanding of these diverse aspects of sexuality provide a foundation for better understanding of healthy adolescent sexuality development. These insights may also give basis to a perspective of the continuities in sexuality development over the lifespan. As 'sexual health' becomes a more relevant defining paradigm within public health, we may better understanding approaches to supporting healthy sexual experience while minimizing the adverse consequences of sexual trauma, unplanned pregnancy, and sexually transmitted infections (Fenton, 2010).

By making the linkage of adolescent to adult sexuality, I am not suggesting that adolescence is a perfect mirror of the adult. Among other issues, many of the tools of contemporary research are unlikely to be useful in the study of adolescent sexuality. For example, laboratory-based studies of sexual arousal – using visual erotic stimuli – are unlikely to be conducted with adolescent research participants in the foreseeable future. However, thoughtful use of existing and new research should provide a strong empirical basis from which public policy, public health practice and clinical services can be developed that will enhance adolescent health and well-being while preventing disease and adverse consequences.

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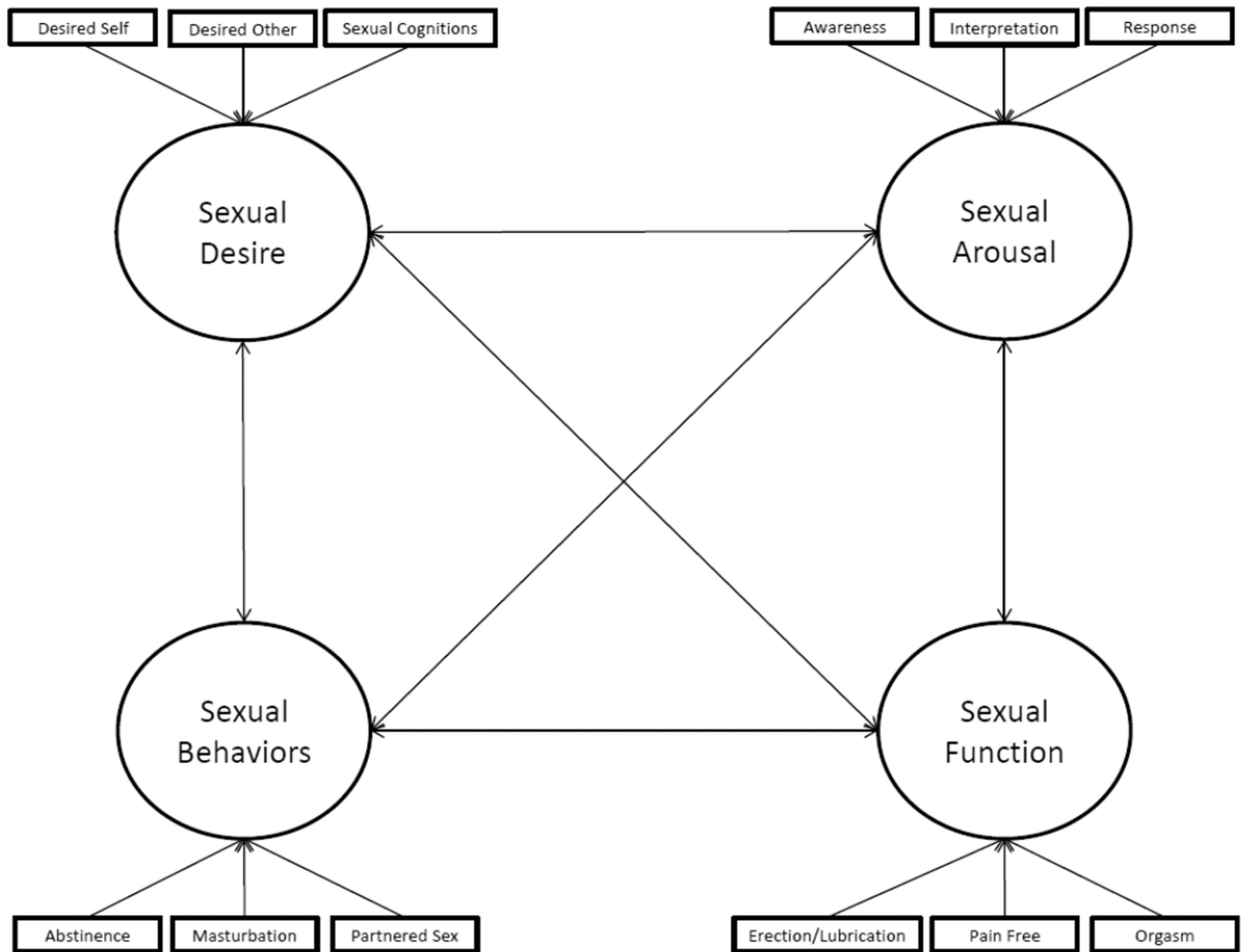
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### Highlights

- Reviews puberty and adolescent sexuality from the perspective of key aspects of adult sexuality
- Key aspects include sexual desire; sexual arousal; sexual behaviors; and sexual function
- The intention is to provide a framework for better understanding of trajectories of sexual development from adolescence through the adult lifespan.



**Figure 1.**  
A framework for thinking about puberty and adolescent sexuality