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THE NATURE OF HUMAN ORGASM: A CRITICAL REVIEW OF MAJOR TRENDS

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ABSTRACT. *This critical review presents a synthesis of the available theoretical and empirical literatures on human orgasm. Findings from both normal and clinical human populations are included. Two major trends in the literature, the dichotomization of biological and psychological perspectives and the assumption of gender differences, are highlighted. A new multidimensional model of the psychological experience of orgasm is described with a view to furthering a biopsychological approach applicable to both sexes. Clinical applications of this new model are discussed.* © *2001 Elsevier Science Ltd. All rights reserved.*

KEY WORDS. Orgasm, Sex difference, Biopsychosocial, Model, Human.

> Rockets, Earthquakes, Fireworks, full-excursion pelvic thrusting, the final engorgement of the late plateau phase, and the high mountaintop of love of which poets sing: The orgasm, what else? (Tisdale, 1994, October, p. 77)

This tongue-in-cheek quotation suggests the diversity of approaches taken within the scientific and popular literature to characterize the complex nature of human orgasm. Despite numerous efforts, orgasm remains the most poorly understood of the sexual responses (Bancroft, 1989; Rosen & Beck, 1988), and attempts to propose a universally accepted definition of ''orgasm'' have met with little success. Examples of definitions and brief descriptions, included in Table 1, illustrate concepts typical of existing perspectives. The inconsistency even within each perspective is striking, reflecting the disagreement on the importance of different mechanisms (Rosen & Beck, 1988) and a lack of integration. Many definitions depict orgasm quantitatively as a ''peak'' state that may not differentiate orgasm adequately from a high state of sexual arousal.

Table 1 further highlights two trends within the general literature: (1) a dichotomization of the biological and psychological perspectives with an emphasis

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TABLE 1. Definitions/Brief Descriptions of Orgasm

Researcher(s)	Definition	Gender
Primarily biological perspective		
Campbell and Petersen (1953)	Neurohormonal reaction of smooth muscle organs and contraction of homologues of ejaculatory muscles	Female
Ellis (1938)	Release of nervous forces (detumescence)	Both
Fox (1976)	Changes in blood pressure/respiratory rate/heart rate; changes in muscular tension/genitopelvic contractions; hormonal changes; vocalizations	Both
Glenn and Kaplan (1968)	Spastic vaginal contractions occurring at highest tension level	Female
Kaplan (1974)	Reflexive sensory–motor response involving genitopelvic contractions	Female
Kinsey et al. (1948, 1953)	Explosive discharge of neuromuscular tension at the peak of sexual response	Both
Kline-Graber and Graber (1975)	Reflexive sensory–motor response to sexual stimulation	Female
Masters and Johnson (1966)	Release of vasoconcentration and myotonia from sexual stimulation	Both
Mould (1980)	Reflexive clonic contractions of pelvic/abdominal muscle groups	Female
Reubens (1982)	Involuntary reflex action accompanied by uterine/vaginal contractions	Female
Sherfey (1972)	Stretch-reflex release of genitopelvic muscular vasocongestion	Female
Primarily psychological perspective		
Alzate and Londoño (1984)	Subjective perception of the most intense point in a series of increasingly pleasurable sensations elicited by sexual stimulation	Female
Davidson and Davidson (1980)	Altered state of consciousness	Both
Newman et al. (1982)	Sensory expression of emission/ejaculation	Male
Raboch and Barták (1983)	Subjective statement of having reached a distinct sensorial climax during intercourse	Female
Singer (1973)	Climactic release from tension	Female
Terman (1951)	Climax of intense feeling followed by quietude and relief	Female
Tuckwell (1989)	Pleasurable event usually associated with ejaculation	Male
Wallin (1960), Wallin and Clark (1963)	Climax of intense feeling followed by feeling of relief and relaxation	Female
Integrated biopsychological perspective		
Alzate (1985a)	Psychic phenomenon, a sensation (cerebral neuronal discharge) elicited by the accumulative effect on certain brain structures of appropriate stimuli originated in the peripheral erogenous zones	Both

TABLE 1. Continued

Researcher(s)	Definition	Gender
Bancroft (1989)	Complex experience of genital changes, changes in skeletal muscle tone/semi-voluntary movements, cardiovascular/respiratory changes, somatic sensory experiences, altered consciousness	Both
Bentler and Peeler (1979)	Complex experience with emotional/mental/physical components	Female
Hite (1976, 1981)	Sudden, intense sensation just prior to genitopelvic contractions	Both
Reich (1973)	Orgastic potency: capacity to surrender to flow of biological energy; capacity to discharge the damned-up [sic] sexual excitation through involuntary, pleasurable convulsions of the body	Both
Schiavi and Segraves (1995)	Acme of sexual pleasure with rhythmic contraction of perineal/reproductive organs, cardiovascular, and respiratory changes, release of sexual tension	Both

on the former; and (2) a presumption of gender differences with an emphasis on female orgasm. The purpose of this review is to discuss these trends through a comprehensive review of two major topics: (1) the fundamental events of normative orgasm and their underlying mechanisms; and (2) variation in the normative orgasm response. We provide an overview of the biological literature but focus more on the psychological literature to stress the need for further progress in psychological research. In presenting both the biological and psychological literature, this review will also inform clinical psychologists about a broad range of potential factors influencing human orgasm as a biopsychosocial experience and thereby aid in conceptualizing and assessing orgasm disorders. Finally, we outline a multidimensional descriptive model of the orgasm experience and discuss future empirical directions and clinical applications. The literature presented focuses primarily on human data from normal and clinical samples; unless specified, data from animal research are not included.

FUNDAMENTAL MECHANISMS OF HUMAN ORGASM

The Biological Perspective of Human Orgasm

The bulk of the research on human orgasm has focused on the physiological changes occurring during orgasm. Besides other early accounts (Ellis, 1938; Fox & Fox, 1971; Kinsey, Pomeroy, & Martin, 1948; Kinsey, Pomeroy, Martin, & Gebhard, 1953; Reich, 1973), the most widely cited descriptions of orgasm are those by Masters and Johnson (1966). From laboratory observations of male and female sexual responses, these investigators described whole-body and genitopelvic changes. These whole-body changes (e.g., tachycardia, elevated blood pressure, the ''sex flush'') have been corroborated (e.g., Abramson & Pearsall, 1983; Bohlen, Held, Sanderson, & Patterson, 1984; Krüger, et al., 1998; Littler, Honour, & Sleight, 1974; Nemec, Mansfield, & Kennedy, 1976). Other descriptions of behavioral events of varying intensity (Kinsey

et al., 1948, p. 160–161) suggest that the orgasm response is not limited to the genitopelvic region, but these descriptions were based on third-person observations of preadolescent boys. Body rigidity, muscle spasms, hyperventilation, sweating, vocalizations, rocking pelvic motions, and shuddering have been reported elsewhere (Hite, 1976).

Most of the research has focused on genitopelvic phenomena. Masters and Johnson (1966) observed genitopelvic and anal muscle contractions initially occurring at 0.8-second intervals and then tapering off with longer intercontractile intervals. Others (Bohlen, Held, & Sanderson, 1980; Bohlen, Held, Sanderson, & Ahlgren, 1982; Gerstenberg, Levin, & Wagner, 1990) have found similar anal contractile patterns. Average contractile duration was 16.7 seconds in females and 25 seconds in males (cf. Bohlen et al., 1980; Bohlen et al., 1982; Carmichael, Warburton, Dixen, & Davidson, 1994). While some have noted that subjective markers of orgasm (perceived onset, termination) corresponded to physiological markers (Carmichael et al., 1987; Carmichael et al., 1994), others did not find precise agreement (e.g., Bohlen et al., 1980, 1982; Gerstenberg et al., 1990; Masters & Johnson, 1966). This implies that the subjective experience of orgasm is not completely dictated by the absolute presence or absence of muscle contractions but may be more related to contractile qualities such as strength and frequency.

The biological capacity for multiple orgasm in women appears to be upheld, though there are individual differences (Masters & Johnson, 1966; Sherfey, 1972; cf. Amberson & Hoon, 1985; Bohlen, Held, Sanderson, & Boyer, 1982; Darling, Davidson, & Jennings, 1991; Hite, 1976). While male orgasm is usually followed by a refractory period, male multiple orgasm with and without ejaculation has been described in a few uncontrolled self-report studies (Dunn & Trost, 1989; Hite, 1981; Robbins & Jensen, 1978). Kinsey et al. (1948) reported the occurrence of multiple orgasm in just over 55% of pre-adolescent males but in substantially fewer adult males, about 3% of men over the age of 30. Male multiple orgasm was reportedly observed in one laboratory study (Robbins & Jensen, 1978), but only a single subject was involved, and results were difficult to interpret. Operational definitions of multiple orgasm vary greatly (Amberson & Hoon, 1985; Dunn & Trost, 1989; Robbins & Jensen, 1978), and so interpretations about findings are difficult to make.

Physiological Mechanisms of Orgasm

Male orgasm and ejaculation. In addition to reviews that include animal-based research (e.g., Benson, 1988; deGroat & Booth, 1980; Newman, Reiss, & Northup, 1982), a neurochemical feedback model of male orgasm was developed by Tuckwell (1989). However, by far the most widely cited model of male orgasm was described by Masters and Johnson (1966). These investigators equated male orgasm with two phases of ejaculation: the *emission* phase, in which sperm and seminal fluid from the vas deferens, seminal vesicles, and prostate gland are expelled into the prostatic urethra, causing it to expand; and the *ejaculation* phase, in which the semen is ejected via contractions of the prostatic urethra and the bulbocavernosal and ischiocavernosal muscles.

Separate neurophysiological control mechanisms involving the autonomic and somatic nervous systems appear to exist for emission and ejaculation (e.g., Benson, 1988; deGroat & Booth, 1980; Dieckmann, Huland, & Gross, 1992; Newman et al.,

1982; Overstreet & Blazak, 1983; Recker & Tscholl, 1993; Schiavi & Segraves, 1995). In addition, primarily clinical findings support a distinction between not only emission and ejaculation, but also ejaculation and orgasm (e.g., Alexander, Sipski, & Findley, 1993; Brackett et al., 1998; Brindley, Sauerwein, & Hendry, 1989; Coleman, Listiak, Braatz, & Lange, 1985; Levine, Zachary, & Gottlieb, 1993; Maas et al., 1998; Recker et al., 1996; Rosenbaum & Pollack, 1988; Seftel, Oates, & Krane, 1991; Shafik, 1995; cf. Yang & Bradley, 1998). Yet, genitopelvic processes are typically discussed only to the extent that they effect ejaculation (e.g., Gil-Vernet, Alvarez-Vijande, Gil-Vernet, & Gil-Vernet, 1994; Kollberg, Petersén, & Stener, 1962). The common use of ''ejaculation'' as an umbrella term for emission, ejaculation, and orgasm reflects a prevailing reductionist view of male orgasm within the literature.

Female orgasm. While some researchers believed that female orgasm facilitates sperm retention (e.g., Baker & Bellis, 1993; Fox & Fox, 1967; Fox, Wolff, & Baker, 1970; Singh, Meyer, Zamborano, & Hurlbert, 1998), the physiological changes seen are generally not ascribed functions other than as a sexual response. Masters and Johnson (1966) noted that the anterior third of the vagina becomes vasocongested during arousal to form the orgasmic platform. Female orgasm consists of contractions of the orgasmic platform and the uterus, though the latter has rarely been measured (cf. Fox et al., 1970). Vasocongestion may not return as quickly to baseline after female orgasm as male orgasm (Geer & Quartararo, 1976; Gillan & Brindley, 1979; Henson, Rubin, & Henson, 1982; Seeley, Abramson, Perry, Rothblatt, & Seeley, 1980; cf. Laan & Everaerd, 1998), providing one possible biological basis for the greater female capacity for multiple orgasm.

Clitoral stimulation is the primary source of sensory input for triggering orgasm; even during coitus alone, indirect or direct clitoral stimulation may occur (e.g., Darling et al., 1991; Hite, 1976; Masters & Johnson, 1966; Mould, 1980; Shafik, 1993; cf. Graber & Kline-Graber, 1979b). On the other hand, evidence suggests that vaginal stimulation is a less likely orgasm trigger (cf. later discussion on clitoral versus vaginal orgasm): (1) Clitoral and vaginal orgasms appear biologically indistinguishable; and (2) the relative insensitivity of the vaginal barrel makes it an unlikely erogeneous zone (e.g., Fisher, 1973; Kinsey et al., 1953; Masters & Johnson, 1966; Sherfey, 1972). The majority of women indicate that clitoral stimulation is important for achieving orgasm. Fisher (1973) reported that on average, 63% of sampled women reached orgasm through clitoral stimulation followed by intercourse, and another 35% through clitoral stimulation before or after their partner's coital orgasm. Women rated clitoral stimulation as at least somewhat more important than vaginal stimulation in achieving orgasm; only about 20% indicated that they did not require additional clitoral stimulation during intercourse, and 12% considered vaginal stimulation more important than clitoral stimulation (Fisher, 1973, p. 214–216). Hite (1976) found that while 95% of women regularly reached orgasm through masturbation, only 26% reported having coital orgasm regularly without additional clitoral stimulation, 19% rarely reached orgasm through intercourse, and 24% never attained orgasm through intercourse. In some self-report studies (e.g., Adams, Haynes, & Brayer, 1985; Clifford, 1978; Gebhard, 1966; Loos, Bridges, & Critelli, 1987; Raboch & Barták, 1983; Raboch & Raboch, 1992), substantial percentages of women reported coital orgasm, but these studies generally did not inquire about concurrent clitoral stimulation occurring during intercourse.

Models of female orgasm typically involve the reduction of genitopelvic vasocongestion through a reflexive neuromuscular negative-feedback loop (Graber, 1981; Mould, 1980; Perry & Whipple, 1982; Sherfey, 1972). Findings from studies of spinal-injured women implicate different neural pathways within this loop, many of which are similar to those in men (e.g., Bauer, Gelernt, Salky, & Kreel, 1983; Brindley & Gillan, 1982; Gillan & Brindley, 1979; Komisaruk & Whipple, 1995; Ladas, Whipple, & Perry, 1982; Perry & Whipple, 1981, 1982; Sipski, 1998; Sipski, Alexander, & Rosen, 1995). Orgasm has been reported with complete spinal injury, radical pelvic surgeries, and even clitoral/vulval damage (Lightfoot-Klein, 1989; Newman, Randolph, & Parson, 1992; Schover & von Eschenbach, 1985; Sipski & Alexander, 1993; Sipski et al., 1995; Whipple, Gerdes, & Komisaruk, 1996; cf. Beric & Light, 1993). However, assessment of spinal lesions is typically indirect, and more precise measures of neuropathy and lesion characteristics would be desirable.

Biochemical influences. In addition to studies of normal samples, drug effects on sexual functioning observed in predominantly correlational and/or uncontrolled clinical reports have provided indirect evidence concerning the biochemistry of orgasm (see Buffum, 1986; Ellison, 1998; Lane, 1992; Meston & Gorzalka, 1992; Segraves, 1988, 1989, 1995, 1998 for reviews).

Neurotransmitter systems. Available research on neurotransmitters has looked at the role of the cholinergic, adrenergic, and dopaminergic systems. There is conflicting evidence for an inhibitory role of cholinergic mechanisms (e.g., Jani & Wise, 1988; Pollack, Reiter, & Hammerness, 1992; Wagner & Levin, 1980) and more consistent evidence for the facilitatory role of the peripheral adrenergic (e.g., Benson, 1988; Buffum, 1986; Fairburn, et al., 1982; Mitchell & Popkin, 1982, 1983; Segraves, 1988) and central dopaminergic systems (e.g., Ashton & Rosen, 1998; Metz, Pryor, Nesvacil, Abuzzahab, & Koznar, 1997; Shen & Hsu, 1995; Walker et al., 1993). The central serotonergic system may play an inhibitory role (e.g., Balon, Yeragani, Pohl, & Ramesh, 1993; Ellison, 1998; Labbate, Grimes, Hines, Oleshansky, & Arana, 1998; Lane, 1997; Segraves, 1988, 1989, 1995), though some conflicting evidence exists (e.g., Ashton, Hamer, & Rosen, 1997; Meston & Gorzalka, 1992; Montejo-Gonzalez et al., 1997). Most drugs thought to impact primarily on one neurotransmitter system more likely affect multiple, interconnected systems through complex, non-linear actions not yet completely understood. Effects can also change over time as the neurotransmitter system accommodates, for example, through changes in receptor density. Problems in generalizing data from clinical samples to normal populations, especially data from uncontrolled small-scale or case studies, further limit conclusions about the role of particular neurotransmitters.

Hormonal systems. Evidence for the role of particular hormones in orgasm is equivocal. For example, a positive association found between testosterone or dihydrotestosterone level and orgasm in both men and women (e.g., Burris, Banks, Carter, Davidson, & Sherins, 1992; Clopper, Voorhess, MacGillivray, Lee, & Mills, 1993; Davis, 1998a, b; Fox, Ismail, Love, Kirkham, & Loraine, 1972; Kraemer, et al., 1976; Mantzoros, Georgiadis, & Trichopoulos, 1995; Pirke & Kockott, 1982) may be mediated by increased sexual desire and activity (Knussman, Christiansen, & Couwenbergs, 1986; Moss, Panzak, & Tarter, 1993). Female orgasm frequency was not related to fluctuations in androgen levels throughout the menstrual cycle (Van

Goozen, Wiegant, Endert, Helmond, & Van de Poll, 1997). Peak orgasm frequencies have been reported just prior to ovulation, when estradiol and testosterone levels peak (Cutler, Garcia, & McCoy, 1987; Dennerstein, Burrows, Wood, & Hyman, 1980; Matteo & Rissman, 1984; Udry & Morris, 1968, 1970, 1977), but different measures of menstrual phase do not always correspond (Udry & Morris, 1977). Potential confounds (e.g., mood/energy fluctuations, partner- versus female-initiated activity as measures of sexual interest, constraints on sexuality during menstruation) must also be considered in interpreting a pre-ovulatory peak in orgasm frequency.

The impact of oxytocin has been of considerable interest (cf. Campbell & Petersen, 1953; Carter, 1992; Fox & Knaggs, 1969; Ivell, Balvers, Rust, Bathgate, & Einspanier, 1997). Oxytocin may work, possibly synergistically with sex hormones, to facilitate muscle contractions during orgasm (e.g., Anderson-Hunt & Dennerstein, 1994; Carmichael et al., 1987, 1994; Murphy, Checkley, Seckl, & Lightman, 1990; Murphy, Seckl, Burton, Checkley, & Lightman, 1987; Ogawa, Kudo, Kitsunai, & Fukuchi, 1980), but generally this mechanism has not been directly evaluated beyond correlational designs. Murphy et al. (1990) did find a link between orgasm pleasure and oxytocin level by reducing oxytocin level with naloxone, an opiate antagonist, but this finding could be due to concurrent changes in endorphin levels (cf. Goldstein & Hansteen, 1977; Mintz, O'Hare, O'Brien, & Goldschmidt, 1974; Mirin, Meyer, Mendelson, & Ellingboe, 1980).

Central nervous system (CNS) involvement. Few studies of CNS events during orgasm have been conducted beyond small-scale EEG (Cohen, Rosen, & Goldstein, 1976; Graber, Rohrbaugh, Newlin, Varner, & Ellingson, 1985; Mosovich & Tallaferro, 1954) and neuroimaging studies (Barak, et al., 1996; Tiihonen et al., 1994). Evidence for right-hemisphere involvement has been found (Cohen et al., 1976; Tiihonen et al., 1994; cf. Graber et al., 1985), and specifically for the right prefrontal cortex (Tiihonen et al., 1994) or right frontal–temporal or subcortical septal areas (Heath, 1972; Warnecke, 1976). These are generally uncontrolled correlational studies, though Cohen et al. (1976) did investigate CNS activity associated with faking orgasm and use of the nondominant hand during self-stimulation. The clinical studies (e.g., Barak et al., 1996; Heath, 1972) are confounded with extreme disease and medication effects. Contemporary imaging technologies like PET and MRI would be useful in further exploring the role of subcortical structures like the limbic system as well as surface brain involvement.

Discussion of the biological perspective. The enormous body of literature cited makes apparent the complexity of human orgasm as a multi-level biological response. Yet the lack of integrative research and emphasis on reflexive genitopelvic mechanisms makes it difficult to see how different systems interact to generate the response. Measuring concurrent genitopelvic, whole-body, and CNS events may provide a more reliable index of the orgasm response and allow evaluation of reciprocity of mechanisms across different levels.

Much of the interest has focused on female orgasm as a pleasurable sexual response and identifying the physiological structures that will trigger it. Male orgasm, on the other hand, has been equated with the physiological marker of ejaculation. In the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV; American Psychiatric Association, 1994), ''orgasm'' and ''ejaculation'' appear to be interchangeable in the diagnostic features of Male Orgasmic Disorder. Yet, the

information reviewed suggests that a distinction should be made between ejaculation as *the most visible, reliable concomitant of male orgasm* versus as *defining male orgasm.* At this point, it seems premature to treat male and female orgasm a priori as two completely different responses based on the presence or absence of ejaculation.

The Psychological Perspective of Human Orgasm

While contributing enormously to our understanding of the orgasm as a *physiological response*, the biological perspective has been insufficient for explaining orgasm as a *sexual experience.* The latter requires not only physiological involvement but subjective awareness/labeling of the physiological response as ''sexual'' (Rosen & Beck, 1988). This can be illustrated by analogy to pain, another psychophysiological phenomenon. For example, ''pain'' comprises the *experience* of a cut in the skin and not the cut itself (Melzack & Torgerson, 1971). Similarly, ejaculation and pelvic contractions require the perception of these events as erotically pleasurable to be ''orgasmic'', otherwise we might accord them with as much desirability as we would a sneeze. Yet, it has only been recently that significant attention been given to the psychology of orgasm, and this literature remains less well developed in comparison to the biological literature.

The subjective experience of orgasm. Even researchers with a primarily biological perspective of orgasm have offered some description of the psychological experience. Kinsey et al. (1948) distinguished between the physiological (orgasm) and the psychic (orgastic pleasure) aspects of orgasm. Masters and Johnson (1966) tied the subjective orgasm experiences to physiological events: Emission is associated with a feeling of ejaculatory inevitability, whereas ejaculation involves contractile sensations and pleasure associated with seminal volume; female orgasm includes a sensation of stoppage, followed by a suffusion of warmth from the pelvic area to the body, and finally pelvic throbbing. Masters and Johnson's descriptions, though, were generalizations from anecdotal reports and do not reflect the variability observed in the literature.

More recent work suggests a multidimensional nature to orgasm beyond the perception of physiological events. Davidson (1980) developed a classification including the perception of physiological events (e.g., general muscular sensations, localized physical sensations) and general mood changes (e.g., release of tension; altered states of consciousness, involving exteroceptive/interoceptive changes, alterations in sense of space, time, and identity, strong emotions, and motor-output changes [Davidson & Davidson, 1980, p. 292]; cf. Swartz, 1994, on the ''absorbed state''). In an unpublished doctoral dissertation on female orgasm involving ratings of descriptive phrases from 318 women, Warner (1981) evaluated a model using separate factor analyses of items thought to reflect physical and affective dimensions. Analyses yielded six physical scales (Release, Throbbing, Continued Arousal, Vaginal Sensation, Sudden Cessation, Non-Genital) and four affective scales (Evaluative, Depressed, Unresponsive, Almost). The Depressed, Unresponsive, and Almost scales may not comprise components of the orgasm experience per se but may be an artifact of Warner's requesting participants to convey their ''peak physical experiences'' rather than orgasm experiences. Because they remain exploratory, Davidson's and Warner's models need further study, but both illustrate a reciprocal nature to cognitive and sensory events within the orgasm experience (Davidson, 1980).

Other research indirectly supports a multidimensional approach. Almost all of this research focuses on the female orgasm experience. Studies have examined numerous dimensions: latency, intensity, duration, quality, and variance of these aspects over time; receptivity and anticipation level; ease in achieving orgasm and number of orgasms; pervasiveness of the orgasm and satisfaction during/after orgasm; altered-consciousness experiences; and release of tension and degree of post-orgasmic exhaustion (e.g., Butler, 1976; Fisher, 1973; Hite, 1976; Kinsey et al., 1953; Sholty, et al. 1984). Findings described by Masters and Johnson (1966) have been observed: feeling of inevitability; suspension of sensation followed by explosive pleasure radiating throughout the pelvic area; and finally tension and warmth throughout the entire body (Clifford, 1978; Hite, 1976). Post-orgasm feelings include happiness, love, relaxation, and satisfaction (Fisher, 1973; Hite, 1976). Some studies have revealed that, relative to measured duration of pelvic contractions, subjective duration of orgasm tended to be lower. In Levin and Wagner's study, average reported duration (12.2 seconds) was less than half of the objectively measured duration (26.0 seconds) (Levin & Wagner, 1985). However, whether this reflects changes in consciousness during orgasm versus an inability to keep accurate track of time while attention is focused elsewhere needs to be assessed.

Comparing male and female orgasm experiences. Masters and Johnson (1966) stated that ''[t]here is...variation in...the female orgasmic experience, while the male tends to follow standard patterns of ejaculation reaction...'' (p. 6). Few studies have looked at the psychological experience of male orgasm probably because of the predominant reductionist view of male orgasm. However, the scant research comparing male and female orgasm experiences demonstrates striking similarity between male and female accounts and suggests that male orgasm experiences are not completely determined by ejaculatory events. In the studies of Vance and Wagner (1976) and Proctor, Wagner, and Butler (1973), medical students, obstetrician–gynecologists, and psychologists were unable to differentiate between descriptions of orgasm written by male and female students. One study found that seminal volume was not related to pleasure (Gerstenberg et al., 1990), though orgasm with ejaculation may feel different from non-ejaculatory orgasm (Hite, 1981). Prepubertal boys also experience orgasm despite absence of ejaculation (Kinsey et al., 1948).

Psychological correlates of the orgasm experience. Despite their primarily biological orientation, Masters and Johnson (1966) stated that ''[f]emale orgasm...remains a potpourri of psychophysiological conditions and social influence'' (p. 133). In fact, some investigators have suggested that psychological mechanisms alone can induce female orgasm. In one laboratory-observation study, no significant differences were observed in heart rate, pupil diameter, and systolic blood pressure between orgasm induced by genital stimulation versus imagery (Whipple, Ogden, & Komisaruk, 1992). All subjects, though, were asked to induce orgasm first through genital stimulation and then through imagery, and so carry-over of residual arousal may confound the latter imagery condition. Levin and Wagner (1987) observed one woman who claimed to have achieved orgasm without exhibiting any vaginal changes, but the subject later admitted to stopping short of orgasm. Approximately 30% of female subjects have reported nocturnal orgasm (Henton, 1976; Wells, 1983, 1986) similar to waking orgasm (Wells, 1983) but occurring without apparent genital stimulation. Likewise in spinal-injured patients, reports exist of orgasm imagery while

dreaming (Money, 1960), orgasm separate from ejaculation (Phelps et al., 1983), and descriptions similar to those from intact subjects (Bregman & Hadley, 1976). It is not clear from Money's findings whether patients' reported orgasm imageries represent ''true'' orgasm experiences (Money, 1960). Because extent of neuropathology or spinal injury is typically assessed indirectly, whether the lack of afferent genitopelvic input was actually complete is also uncertain.

Demographic factors. Demographic factors such as sex (e.g., Laumann, Gagnon, Michael, & Michaels, 1994), age (e.g., Hoon & Hoon, 1978; Laumann et al., 1994; Sholty et al., 1984), decade of birth (Kinsey et al., 1948), religion, ethnicity, marital status (Laumann et al., 1994), and educational, professional, and social standing (e.g., Fisher, 1973; Kinsey et al., 1953; Laumann et al., 1994) have been associated with frequency of orgasm during masturbation and sex with a partner. Men uniformly achieve orgasm more consistently than do women (Laumann et al., 1994). However, Laumann et al. found that only 75% of men, and not 100% as might be expected, reported always attaining orgasm with their partner, while 29% of women indicated this. This is an interesting finding if the presumption is accepted that men's goal of sexual activity with the partner generally is orgasm. Higher orgasm rates have generally been observed with older age (excluding geriatric individuals) and higher educational standing. Black compared to white and Hispanic samples and religious conservative samples compared to those without religious affiliation reported lower rates. However, Laumann et al. also observed some discrepancy in findings concerning education and religion when comparing masturbatory orgasm with orgasm attained through sex with a partner. They attributed this to the presence of other confounding demographic variables. Sexual attitudes and mores and associated cohort or social-desirability effects may partly explain findings, i.e., those who report higher orgasm rates may have generally more liberal views of sexuality and sexual behavior.

Psychosexual factors. Many psychological factors examined concern level of sexual adjustment or functioning. High female coital orgasm frequency or consistency was related to more initiation of and active participation during sexual activity by women, as well as a high degree of sexual responsiveness and awareness of biological arousal (e.g., Adams et al., 1985; Fisher, 1973; Hoon & Hoon, 1978; Hurlbert, 1991; Hurlbert, Apt, & Rabehl, 1993; Singh et al., 1998), higher masturbatory/coital rates and overall sexual-activity rates (e.g., Fisher & Osofsky, 1967; Huey, Kline-Graber, & Graber, 1981; Hurlbert & Whittacker, 1991; Raboch & Raboch, 1992; Singh et al., 1998; Terman, 1951), post-orgasm satisfaction and relief (e.g., Fisher, 1973; Wallin & Clark, 1963; Waterman & Chiauzzi, 1982), and satisfaction with sex life (Haavio-Mannila & Kontula, 1997). While erotophilia/erotophobia has not been significantly associated with frequency of female orgasm (Hurlbert et al., 1993) or premature ejaculation (Grenier & Byers, 1997), low orgasm consistency was associated with greater sex guilt (Davidson & Moore, 1994; Kelly, Strassberg, & Kircher, 1990); improvement in orgasm rates may be related to decreased sexual guilt and increased sexual experimentation (Fisher, 1973; Kinsey et al., 1951; Myers, Kilmann, Wanlass, & Stout, 1983; Sholty et al., 1984). This mechanism may underlie a facilitative effect of moderate alcohol use on female orgasm frequency and pleasure (Klassen & Wilsnack, 1986; Malatesta, Pollack, Crotty, & Peacock, 1982), in that expectations about alcohol effects on sexuality may reduce sociocultural inhibitions on female sexuality (e.g., Frank & Lang, 1990; Klassen & Wilsnack, 1986). On the other hand, deleterious

alcohol effects have been found with male orgasm (Malatesta, Pollack, Wilbanks, & Adams, 1979; Mandell & Miller, 1983; cf. Crenshaw & Goldberg, 1996) and heavy drinking (Gavaler et al., 1993, 1994; Klassen & Wilsnack, 1986).

The quality of sexual stimulation, including use of coital fantasy during masturbation (Fisher, 1973; Lentz & Zeiss, 1983–1984) and varied sexual activity and extended foreplay (Myers et al., 1983; Singh et al., 1998; Swieckowski & Walker, 1978; Waterman & Chiauzzi, 1982), appears to facilitate the female orgasm experience. However, some have noted that varied activity interferes with orgasm achievement (Hoon & Hoon, 1978; Masters & Johnson, 1966); instead, uninterrupted pressure, rhythmic stimulation, and external genital friction are required to build the necessary muscular tension (de Bruijn, 1982; Kinsey et al., 1951). Effectiveness of stimulation may depend on ''stage'' of the sexual encounter (e.g., beginning of foreplay versus after prolonged period of foreplay) as well as sexual context (solitary masturbation versus sex with a partner) and quality of the emotional relationship with the partner. Self-reported orgasm characteristics themselves, such as duration of orgasm and strength of vaginal or muscle spasms, were associated with reported orgasm strength, satisfaction (Fisher, 1973; Kinsey et al., 1951), and consistency (e.g., Bohlen et al., 1980; Bohlen et al., 1982; Carmichael et al., 1987, 1994).

Relationship factors. Partner variables within the sexual context, such as sexual compatibility, partner involvement, and female orgasm occurring before or simultaneously with partner orgasm, were associated with higher female orgasm frequency and satisfaction (Darling, Davidson, & Cox, 1991; Singh et al., 1998). Bisexuals and lesbian women were more likely than heterosexual women to describe orgasm as ''strong'' (Bressler & Lavender, 1986), but group differences in sexual activity may account for this finding. General relationship variables such as marital satisfaction, happiness, and stability have been reliable predictors of orgasm consistency, quality, and satisfaction (e.g., Dunn & Trost, 1989; Gebhard, 1966; Hurlbert, 1991; Hurlbert & Apt, 1994; Hurlbert et al., 1993; Lightfoot-Klein, 1989; Lunde, Larsen, Fog, & Garde, 1991; McCabe, 1997; Robbins & Jensen, 1978; Sholty et al., 1984; Singh et al., 1998). However, because of the correlational designs, it is not clear whether a close relationship (1) directly enhances the subjective and emotional qualities of orgasm, (2) indirectly enhances orgasm by facilitating communication and thereby promoting optimum sexual behavior, or (3) indirectly enhances orgasm by reducing inhibitions/anxiety. Psychosexual adjustment and sexual openness prior to the relationship may also facilitate relationship strength and likelihood of orgasm.

The role of early experiences. Women who report low rates of orgasm may show only limited increases in orgasm rates over time (Fisher, 1973; Raboch & Raboch, 1992; cf. Hite, 1981). The evidence concerning whether longer foreplay or coitus can increase orgasm frequency in this group is also conflicting (Gebhard, 1966; Huey et al., 1981; Kinsey et al., 1951; Leff & Israel, 1983). On the other hand, having pre-marital sexual and orgasm experiences is linked with higher orgasm frequency (e.g., Darling et al., 1991; Fisher, 1973; Raboch & Barták, 1983; Raboch & Raboch, 1992). Together, these findings are consistent with ''priming'' theories of female orgasm capacity involving early sexual learning and conditioning (Kinsey et al., 1951; Mead, 1955). Mead (1955) theorized that sociocultural differences in female orgasm capacity reflect a *potential* for orgasm dependent on sociocultural learning: In sexually liberal cultures, highly varied, diffuse foreplay develops this potential by promoting bodily receptivity

to sexual stimulation. However, to our knowledge, no empirical evaluation of this theory has been conducted. Cross-cultural differences could alternatively reflect sociocultural willingness to report intimate behavior and the psychosexual impact of internalized norms concerning appropriate sexual behavior (or nonbehavior).

Parental influences and childhood experiences have been correlated with female orgasm (Fisher, 1973, 1980; Newcomb, 1984; Raboch & Raboch, 1992; Terman, 1951). Fisher (1973, 1980) theorized that because women with low orgasm responsiveness may have difficulties with separation/loss, orgasm is threatening because it entails a brief loss of object attachments. However, his theory is not clearly supported by his retrospective data, as none of his subjects exhibited clinical levels of neuroticism or psychopathology. The role of child-abuse history in later orgasmic dysfunction is conflicting (Becker, Skinner, Abel, & Chichon, 1986; Becker, Skinner, Abel, & Treacy, 1982; Fromuth, 1986; Mackay et al., 1991; Tsai, Feldman-Summers, & Edgar, 1979). Childhood sexual abuse was associated with reported orgasm disorders in female (Feinauer, 1989; Kaplan & Green, 1995; Kinzl, Mangweth, Traweger, & Biebl, 1996) and male samples (Kinzl, Mangweth, Traweger, & Biebl, 1995). However, one study found that female students reporting childhood or adult sexual abuse did not differ from non-abused students on rates of anorgasmia (Bartoi & Kinder, 1998). Different operational definitions of abuse may partly account for the inconsistent findings.

Attitudes and personality factors. Early psychoanalytic theory linked female psychosexual adjustment to the capacity to experience vaginally rather than clitorally induced orgasm. Women who require clitoral stimulation for orgasm may be perceived as somewhat (but not pathologically) less mature than women who attain coital orgasm (Taublieb & Lick, 1986; Wilcox & Hager, 1980). Low orgasm-consistency or anorgasmic females report relatively more self-blame attributions (Loos et al., 1987), repressed emotions and control needs (Bridges, Critelli, & Loos, 1985; Fisher, 1973), more conservative attitudes (Derogatis, Fagan, Schmidt, Wise, & Gilden, 1986), and greater dependency, apprehensiveness, and negativity (Davidson & Moore, 1994; Terman, 1951). Primary anorgasmic women have been found to be more stable, naive, shy, and less sexually well adjusted than situationally anorgasmic women (Welsher, 1981). In most of these studies, however, scores were within the normative range. Attitudes towards masturbation, extraversion, and neuroticism may influence female orgasmic responsiveness indirectly through their impact on sexual behavior (Bentler & Peeler, 1979). Overall, associations between female orgasm response and psychopathological adjustment have not been supported (Fisher, 1973; Raboch & Raboch, 1992; cf. Davidson & Moore, 1994; Kelly et al., 1990). The few studies of male orgasm and ejaculation found a correlation with self-actualization (Waterman & Chiauzzi, 1982; Waterman, Chiauzzi, & Gruenbaum, 1979), depression, and sensation seeking (Husted & Edwards, 1976).

Discussion of the psychological perspective. Psychologically based research thus far has been relatively unsystematic, and the dearth of empirically evaluated psychological models is surprising given that achieving orgasm is meaningful for most individuals because of its pleasurable, erotic qualities. Further studies of qualitative models of the orgasm experience should receive attention, as frequency measures are an insensitive index of orgasm functioning. Qualitative models can facilitate investigation of how different factors impact on specific aspects of the subjective orgasm experience. For example, experiences of immersion or loss of awareness during orgasm suggest the

need to look at the association between cognitive–attentional mechanisms and cortical and subcortical events.

The impact of psychosocial variables like quality of the relationship or sexual context on specific psychological aspects of orgasm could also be better investigated. Identifying how different components of the orgasm experience themselves interrelate would also be possible (e.g., the impact of emotional experiences on orgasm intensity and satisfaction).

Bancroft (1989) and Kinsey et al. (1951) both suggested that changes in perceptual capacity during orgasm may preclude introspective self-report. However, inspection of self-report data (e.g., Vance & Wagner, 1976) indicates that within the limits of language, people appear to be aware of and able to report their experiences. The problem may lie in generating systematic language to convey such a complex experience. Data are typically retrospective and obtained using idiosyncratically developed, inadequately described and/or validated measures. Findings thus form a hodgepodge of experiences that are difficult to interpret or generalize across studies. There is an urgent need for a universally accepted, standardized self-report instrument. Except for the Peak of Sexual Response Questionnaire for women (Warner, 1998), none of the instruments in the compendium of sexuality-related measures (Davis, Yarber, Bauserman, Schreer, & Davis, 1998) or elsewhere comprehensively evaluates qualities of orgasm beyond attainment rates, general intensity/satisfaction, and other basic variables.

The necessary reliance on self-report methods for investigating psychological phenomena does pose some problems. Self-report data on personal issues such as sexuality are subject to distortions related to memory and retrospective reporting, demand characteristics, self-deceptive enhancement, and impression-management biases (Meston, Heiman, Trapnell, & Paulhus, 1998; Triveldi & Sabini, 1998). Two excellent reviews of methodological factors influencing self-report of sexual behaviors (Catania, Binson, Van Der Straten, & Stone, 1995; Weinhardt, Forsyth, Carey, Jaworski, & Durant, 1998) suggest ways to decrease the probability of response biases. Most studies also employed correlational designs, which yield valuable information but preclude statements of causal direction of effects. Generalizability of findings from some studies, including well-known studies by Kinsey et al. (1948, 1953), Masters and Johnson (1966), and Hite (1976, 1981), is limited by sampling problems. Laumann et al. (1994) presents an excellent discussion of sampling issues and advocated the use of probability sampling methods in sex research.

The study of the orgasm experience appears to have been influenced by assumptions surrounding the identification of female sexuality with psychological experience versus male sexuality with physical performance. Almost all of the literature cited has focused on female orgasm, with very few comparisons to male orgasm. However, male orgasm, outside of the ejaculatory processes, appears to encompass a phenomenology similar to that of female orgasm. Certainly further comparative studies are warranted.

The Biopsychological Perspective of Human Orgasm

Sex research on issues such as premature ejaculation (e.g., Grenier & Byers, 1995, 1997; Metz et al., 1997; Rowland, 1998; Rowland & Slob, 1995; Strassberg, Kelly, Carroll, & Kircher 1987; Strassberg, Mahoney, Schaugaard, & Hale, 1990), erectile dysfunction (e.g., Rosen & Leiblum, 1992), and dyspareunia (e.g., Binik, Meana,

Khalifé, & Berkely, 1999) has moved towards a biopsychosocial perspective. Orgasm functioning as a biopsychosocial phenomenon is further illustrated through a brief discussion of aging and medical illness and their biopsychosocial concomitants.

Aging. Aging involves a variety of physiological and psychosocial changes that can impact on orgasm functioning (Masters & Johnson, 1966; Schover & Jensen, 1988). The physiological findings cited are based on self-report. As far as we know, there have been no studies specifically measuring in detail either the physiological events of orgasm or the qualitative experience of orgasm in aging individuals.

Some of the physiological changes occurring in women that may affect orgasm relate to the peri-menopausal (between onset of irregularity of menses and menopause) and menopausal periods (complete cessation of menses). These milestones are associated with decreased levels of estrogen and progesterone, consequent shrinkage and atrophy of the vaginal and uterine epithelium, and diminished lubrication. Latency to orgasm may become longer, and orgasm is shorter and less intense (Schover & Jensen, 1988). Lower rates of female orgasm have also been noted (Bottiglioni & De Aloysio, 1982; Hällström, 1977; Laumann et al., 1994).

In men, testosterone production, sexual desire, penile sensitivity, and erectile capacity tend to decline with age. Latency to erection and to ejaculation increases, ejaculation is typically less forceful, and length of the refractory period becomes extended. However, there is wide variation. Reductions in testosterone levels may actually be quite modest, and medical conditions such as hormonal changes or vascular disease rather than age more likely underlie erectile dysfunction in aging individuals (Schover & Jensen, 1988). In one sample of 319 Swedish men ages 50 to 80 (Helgason et al., 1996), 83% reported orgasm through intercourse or masturbation less than once a month or more; of those who engaged in intercourse or masturbation, a total of 89% attained orgasm often or always/nearly always. Furthermore, 43% of relatively healthy men reported no decrease in orgasmic pleasure.

Furthermore, despite continued sexual desire, the aging population typically faces sociocultural taboos and stereotypes concerning asexuality, negative images of sexual behavior in the aged, and implicit or explicit environmental sanctions against sexual expression (Schover & Jensen, 1988). Potential psychosocial losses (e.g., attractiveness, gender roles and activities [e.g., career] contributing to self-image, the partner), the consequent process of restructuring self-image, and higher rates of isolation, loneliness, depression, and poverty may also negatively impact on orgasm. Frequency of orgasm in older individuals appears to be related to marital satisfaction and previous sexual functioning and adjustment (e.g., Hällström & Samuelsson, 1990). Overall, the physiological changes seen with aging do not necessarily result in dramatic declines in desire and capacity for orgasm. Psychosocial factors may mediate variability in orgasm functioning in aging individuals.

Medical illness. The physical sequelae unique to different diseases and disorders as well as the side effects of treatments like surgery or drug therapy can impact on orgasm response. Such physiological factors include hormonal and vascular abnormalities, neurological disease, damage to genital structures, medication side effects, and pain (Schover & Jensen, 1988). Across different diseases, reduction in orgasm frequency, greater difficulty in achieving orgasm, changes in orgasm sensation, and ejaculatory dysfunction are typically observed, though findings vary (e.g., Alexander et al., 1993 [spinal cord injury]; Anderson & Elliott, 1994 [cancer]; Balon et al., 1993

[antidepressant drug effects]; Binik & Mah, 1994 [end-stage renal disease]; Ellenberg, 1980, 1984 [diabetes]; Hartmann et al., 1999 [testicular cancer]; Rhodes, Kjerulff, Langenberg, & Guzinski, 1999 [hysterectomy]; Schover, Thomas, Lakin, Montague & Fisher, 1988 [multiple sclerosis]; Segraves, 1995, 1998 [psychotropic drug effects]). Psychological and psychosocial stressors associated with medical conditions and their treatments and that can affect orgasm functioning include the following: problems with emotional adjustment and coping; anxiety, depression, and anger; loss of control; fear of death; adoption of the ''patient role''; changes in body image; self-monitoring; rejection by the partner; social and psychosocial losses; difficulties in communicating sexual issues and initiating sexual activity; and dependency on others (e.g., Bullard, 1988; Schover & Jensen, 1988).

Biopsychological models of orgasm. Efforts to integrate psychological and biological data on orgasm have not progressed much beyond model development. Two models (Bancroft, 1989; Davidson, 1980) feature a psychological conceptualization of orgasm as an altered state of consciousness. Bancroft (1989) combined this concept with the physiological and subjective events described by Masters and Johnson (1966) and further proposed two possible CNS mechanisms: (1) The intensity of CNS mechanisms may generate the altered-consciousness state and influence the intensity of spinal events; alternatively, (2) the relative prominence of central inhibitory and excitatory CNS events may mediate orgasm intensity and duration of the refractory period.

Davidson's *bipolar hypothesis* is based on the distinction between emission and ejaculation (Davidson, 1980). Neural substrates of emission send efferent impulses ''downwards'' to trigger emission and ''upwards'' to produce sexual satiety, a refractory period, and a loss of arousal that do not, however, constitute a real orgasm response (Davidson, 1980, p. 302). In contrast, ejaculatory substrates generate impulses downwards to trigger pelvic-muscle contractions and upwards to produce ''true orgasm'' that involves an altered state of consciousness with no refractory period. Both substrates collectively form the ''organ of orgasm'', the location and nature of which were not specified. The model in principle is applicable to female orgasm, as the latter involves the same pelvic-muscle contractions seen during ejaculation (Davidson, 1980). The model can also account for the capacity for multiple orgasm in women, because female orgasm ostensibly does not involve emission and hence a refractory period.

Discussion of the biopsychological perspective. Davidson's and Bancroft's models provide plausible foundations for biopsychological models of orgasm (Davidson, 1980; Bancroft, 1989). However, both models have limitations. Davidson's bipolar hypothesis is based only on uncontrolled anecdotal data concerning male multiple orgasm and has not yet been empirically evaluated. Little information is given on the ''organ of orgasm'', the brain regions associated with sexual satiety, or why the altered state of consciousness depends upon localized genitopelvic processes. A similar lack of information is apparent concerning the CNS mechanisms theorized by Bancroft. Neither model addresses the role of psychosocial, environmental, and interpersonal factors in effecting variability in the orgasm experience. As the causal role of these intertwining factors is not yet clear, it may indeed prove difficult to integrate them fully at this point. Bancroft did attribute control over orgasm to brain mechanisms, whereas Davidson suggested spinal control mechanisms. Bancroft's theory would thus more readily incorporate the influence of psychological and psychosexual stimuli on

orgasm experiences. The preceding brief discussion on aging and medical illness suggests that such influences should be considered.

VARIABILITY OF HUMAN ORGASM

The previous discussion emphasizes the potential for variability in the orgasm response and suggests that identifying a ''typical response pattern'' of orgasm may be overly simplistic. Several typologies of orgasm have been formulated to address this issue, but only in female orgasm. The major typologies are biological in nature, emphasizing the belief in multiple female erogeneous zones and their neurophysiological underpinnings (Graber, 1981; Komisaruk & Whipple, 1995; Perry & Whipple, 1981, 1982).

Physiologically Based Typologies of Orgasm

The anatomically based typology which has drawn the most attention, *clitoral* versus *vaginal orgasm*, was based on Freud's theory (Freud, 1949) that females must transfer the ''erotogenic'' zone from the clitoris to the vagina to achieve psychosexual maturity (see Sherfey, 1972; Singer, 1973). Contemporary interpretations of the typology generally do not include psychopathological connotations but emphasize the purported existence of multiple physiological triggers of female orgasm. The lack of reliable physiological data for this typology is striking; most of the evidence is based on uncontrolled, retrospective self-report. Orgasm attained through clitoral stimulation tended to be more localized and intense, sharper, and more satisfying physically; coital orgasm tended to be more diffuse and ''whole-body'' or ''deeper'', with throbbing feelings, and stronger, longer lasting, and more satisfying psychologically (Butler, 1976; Clifford, 1978; Fisher, 1973; Hite, 1976; Kline-Graber & Graber, 1975). However, wide variation in reported sensations is also evident (e.g., Butler, 1976). Whereas Glenn and Kaplan (1968) and Gillespie (1969) advocated identifying both the anatomical area stimulated and the perceived location of orgasm, others have concluded that strength and degree of orgasm gratification are not related to either variable (Butler, 1976; Clifford, 1978; Fisher, 1973; Leff & Israel, 1983; Myers et al., 1983; cf. Latorre, 1979).

Another typology of female orgasm by Singer (1973) includes the following orgasm types: *vulva*, identified by orgasmic platform contractions and induced by coital or noncoital activity; *uterine*, identified by biological indices of emotion (apnea) and a lack of orgasmic-platform contractions and induced by cervical jostling from deep coital thrusting; and *blended*, identified by elements of both. Komisaruk and Whipple (1995) suggested that the vagus nerve provides an afferent pathway for vaginal or cervical stimulation to trigger female orgasm. This typology, though, has not yet received extensive empirical investigation. Measuring the emotional components of orgasm while being observed in the laboratory may be difficult. In one small study of women with complete spinal injury, subjective and objective evidence of orgasm occurrence was observed with vaginal and cervical stimulation (Whipple et al., 1996). Neither genitopelvic nor descriptive measures of the subjective orgasm experience were taken, however, and whether the changes observed reflect an orgasm response or can be explained by some other mechanism (e.g., dysreflexic response, cognitively induced phenomena) is unclear. Findings from other self-report (Sholty et al., 1984)

and physical studies (Alzate, 1985a; Alzate & Londoño, 1984; Fox & Fox, 1969; Hoch, 1980; Kinsey et al., 1953) concerning the effect of cervical stimulation are conflicting.

Comparison of sexual outcomes with total (uterus and cervix removed) and subtotal hysterectomy (cervix left intact) is of interest because preservation versus excision of the cervix may provide a test of Singer's typology (Singer, 1973). Retrospective studies of total hysterectomy have found lower post-operative orgasmic capacity (e.g., Bellerose & Binik, 1993; Bernhard, 1992; Nathorst-Böös & von Schoultz, 1992; Singer, 1973; Zussman, Zussman, Sunley, & Bjornson, 1981), but findings from prospective studies are conflicting (Kilkku, Grönroos, Hirvonen, & Rauramo, 1983; Rhodes et al., 1999; Virtanen et al., 1993; Zussman et al., 1981). Whether post-surgical changes are found may depend on time since surgery. Prospective studies also compare post-operative functioning with pre-operative rather than pre-morbid orgasm functioning. Better control for concurrent oophorectomy (removal of the ovaries) would further enhance interpretability of findings.

Other physiological triggering mechanisms. Reports exist of orgasm triggered through breast stimulation (e.g., Masters & Johnson, 1966), imagery (Whipple et al., 1992), and, in spinal-injured patients, stimulation of erogeneous zones above the injury (Bérard, 1989; Whipple et al., 1996). The role of the pubococcygeus (PC) muscles (Kegel, 1952; Kline-Graber & Graber, 1975) has also been investigated. In a correlational study of anorgasmic, coitally-anorgasmic only, and orgasmic women, the orgasmic group showed the highest sustained PC muscle strength (Graber & Kline-Graber, 1979a), suggesting that PC-muscle condition is important in female orgasm. Causal direction is uncertain, however. Other studies have found no effect on orgasm rates of using Kegel exercises to strengthen the PC muscles (Chambless et al., 1982; Chambless et al., 1984; Freese & Levitt, 1984; Roughan & Kunst, 1981; Sultan & Chambless, 1982; Trudel & Saint-Laurent, 1983), but many of these studies were not well controlled. Even if Kegel exercises led to a reliable increase in orgasm frequency in normal or clinical samples, whether the effect is due, for example, to stronger PC muscles, reduced fear of having orgasm due to improved urinary continence and hence lower likelihood of urinary leakage during orgasm, or some other mechanism would still need to be ascertained.

The Grafenberg spot (G-spot) and female ejaculation. The G-spot was first described in 1672 by a Dutch physician, Regnier de Graaf (see Sevely & Bennett, 1978), and then by Grafenberg (1950) as an erogeneous zone on the anterior vaginal wall that expels urethral ejaculate at orgasm (see Alzate & Hoch, 1986; Belzer, 1984; Ladas et al., 1982; Sevely & Bennett, 1978; Zaviacic & Whipple, 1993; cf. Ann, 1997). Glandular structures, Skene's paraurethral glands, have been observed that are thought to be related to the G-spot and female ejaculation. These structures surround the urethra and are believed to be prostatic homologues (e.g., Sevely & Bennett, 1978; Tepper, Jagirdar, Health, & Geller, 1984; Zaviacic & Whipple, 1993), though Bancroft (1989) noted similar structures around the male urethra as well. Markers of prostatic tissue have been found in urethral tissue samples (e.g., Dodson, Cliby, Keeney, Peterson, & Podratz, 1994; Dodson, Cliby, Pettavel, Keeney, & Podratz, 1995; Pollen & Dreilinger, 1984; Sloboda, Zaviacic, Jakubovsky, Hammar, & Johnsen, 1998; Tepper et al., 1984; Zaviacic, 1985; Zaviacic, Sidlo, & Borovsky, 1993). However, only two studies (Pollen & Dreilinger, 1984; Zaviacic, 1985) included male prostatic tissue for comparison, and none of the other studies included comparative urethral tissue samples from

males. The markers have also been found in breast, ovarian, and pancreatic cells (Sloboda et al., 1998; Zaviacic & Ablin, 1998).

In self-reports and laboratory observations, about 66% of subjects reported an erotically sensitive area around the 11:00–1:00 position of the anterior vaginal wall (e.g., Davidson, Darling, & Conway-Welch, 1989; Hoch, 1980, 1986; Perry & Whipple, 1982; Weijmar Schultz, van de Wiel, Klatter, Sturm, & Nauta, 1989). Swelling of this area and orgasm occurs with stimulation (Addiego et al., 1981; Alzate, 1985a,b; Alzate & Londoño, 1984; Goldberg et al., 1983), possibly mediated via the pelvic nervous pathway (Perry & Whipple, 1982). While some have noted concurrent urethral ejaculation (Bullough et al., 1984; Darling, Davidson, & Conway-Welch, 1990; Zaviacic et al., 1984), the G-spot, Skene's glands, and female ejaculation are not necessarily linked (Addiego et al., 1981; Bullough et al., 1984; Zaviacic & Whipple, 1993).

Self-reported appearance (Darling et al., 1990; Davidson et al., 1989) and laboratory observation of female ejaculate (Goldberg et al., 1983) suggest wide variation. In one study, ejaculate samples self-collected by subjects were biochemically more similar to male ejaculate than urine (Belzer, Whipple, & Moger, 1984), though self-collected samples may have been contaminated with partner's semen. In another laboratory-observation study of a single female subject, fluid collected during orgasm also differed biochemically from urine (Addiego et al., 1981); in contrast, Goldberg et al. (1983) found no differences with samples obtained in the laboratory. Standardized procedures for collecting samples without contamination have yet to be developed, and differences between ejaculate samples and vaginal secretions have not been assessed. The relationship between the G-spot and female ejaculation and differences between G-spot orgasm and more typically attained orgasm also need to be further addressed.

Psychologically Based Typologies of Orgasm

Levin (1981) believed that variations in orgasm are due to psychological differences. However, in comparison to biologically based typologies, very little research attention has been devoted to possible psychological typologies of orgasm. Some of Hite's female subjects reported *emotional orgasm*, characterized by an intense emotional peak and feelings of closeness, yearning, or exaltation (Hite, 1976). The resemblance to Singer's concept of uterine orgasm in terms of the emotional component is notable (Singer, 1973). Bentler and his colleagues found evidence involving two (Bentler & Peeler, 1979) and later three dimensions (Newcomb & Bentler, 1983) of female orgasmic responsiveness: *masturbatory*, *partner-present/non-coital*, and *coital*. These dimensions are influenced by psychological variables like attitudes towards masturbation, extraversion, and neuroticism. This typology is limited to heterosexual activities in which women experience orgasm.

Evidence for different types of male orgasm. The little uncontrolled self-report data available on male orgasm suggest typologies comparable to the clitoral–vaginal distinction and independent of ejaculatory sensations. Hite's male subjects indicated that while masturbatory orgasm was more intense and localized, coital orgasm was more pleasurable and satisfying (Hite, 1981). Some subjects also reported pleasurable ''dry'' orgasms without ejaculation; conversely, ejaculation alone is not necessarily pleasurable (Hite, 1981; Kinsey et al., 1948), as evidenced by what is referred to clinically as anhedonic ejaculation (Garippa, 1994; Williams, 1985). Other reports

described orgasm from anal penetration or prostate massage as generally ''deeper,'' more global and intense, longer lasting, and associated with feelings of ecstasy (Hite, 1981, p. 439, 537).

Discussion of Variability in Human Orgasm

Currently, attempts to account for variability in the orgasm response have taken a limited categorical, anatomically based approach. The focus on genitopelvic triggers (e.g., clitoris versus vagina) implies, for example, that female orgasm is solely a physiological event mechanistically dependent on stimulation of genitopelvic parts and that ''clitoral'' versus ''vaginal'' orgasms are very different entities. This approach indicates little about characteristics of the orgasm experience itself. Much of the evidence for the validity of these typologies involves uncontrolled self-reports without concurrent psychophysiological corroboration.

While typologies traditionally define different forms of a particular construct, the concept of a ''typology'' is particularly useful when it can also identify the fundamental features of that construct across the different forms. An approach to modeling the psychological orgasm experience such as Davidson's and Warner's (Davidson, 1980; Warner, 1981) can do both by either (1) portraying dimensions both collectively defining all orgasms and unique to each ''type'' of orgasm, or (2) indicating the same dimensions for all orgasms but revealing relative differences in intensity within these dimensions for different orgasms.

A MULTIDIMENSIONAL MODEL OF THE SUBJECTIVE ORGASM EXPERIENCE

In our view, a new multidimensional descriptive model and methodology are required to systematically investigate both the essential characteristics of and variability in the orgasm experience. We have developed and evaluated a multidimensional descriptive approach and measure for these purposes. Our approach is similar to the that of Melzack and Torgerson (1971), who proposed three dimensions in a multidimensional framework of the pain experience: the *sensory*, *evaluative*, and *affective*. The sensory dimension represents sensations arising from physical events such as cuts in the skin (e.g., spatial qualities, punctuate and incisive pressure, thermal qualities), the evaluative dimension represents the ''subjective overall intensity of the total experience'' (mild to excruciating), and the affective dimension represents ''tension, fear, and autonomic properties'' (e.g., fright, exhaustion) (Melzack & Torgerson, 1971, p. 51). As indicated, each dimension encompasses different qualities that can be conveyed by adjectives.

The two-dimensional descriptive models of the orgasm experience by Davidson (1980) and Warner (1981) are not unlike Melzack and Torgerson's model (Melzack & Torgerson, 1971; cf. Heiman, 1998). We propose that a three-dimensional model similar to Melzack and Torgerson's can be used to portray the core constructs of the orgasm experience. The *sensory* dimension of the orgasm experience would encompass the perception of physiological events (e.g., contractile sensations, muscle tension/release, thermal sensations). The *evaluative* (nonphysical) dimension would concern evaluations of the orgasm experience, including relatively neutral (e.g., intensity) and positive and negative appraisals (e.g., pleasure, satisfaction, pain). The *affective* (nonphysical) dimension would involve the positive and negative emotions

felt during or immediately after orgasm (e.g., elation, intimacy/love). As in the pain experience, each dimension would comprise different components. This model distinguishes these qualities from location of sensations or sexual activity and so provides a framework for describing any orgasm experience.

The distinction between the evaluative and affective dimensions is less obvious than the difference between the affective and sensory dimensions but may be illustrated as follows: The evaluative dimension addresses the basic question, ''How does the orgasm feel?'', whereas the affective dimension addresses the question, ''How does the person feel during the orgasm?'' Some components may embody elements of both, as suggested by Davidson's and Warner's models, and we would expect a relatively strong relationship between the two dimensions (Davidson, 1980; Warner, 1981). In addition to conceptual considerations, confirmatory factor analysis may be helpful in determining via an exploratory empirical manner whether a particular component reflects more evaluative versus affective characteristics. Nonetheless, we believe that each of these two dimensions conveys qualities more distinct to itself than common to the other. We also suggest that distinguishing the two dimensions results in a more powerful model by permitting investigations of the impact of one dimension on the other, for example, how emotional intimacy (e.g., that may be present during sex with one's partner versus a casual sexual encounter) contributes to intensity and satisfaction of the orgasm experience.

Research on the Three-Dimensional Model

A theoretical model was first constructed as a standard and guide during exploratory analyses. Adjectives were collected from the available self-report literature (e.g., Hite, 1976, 1981; Masters & Johnson, 1966; Vance & Wagner, 1976) and grouped semantically to form possible theoretical components. These components were then considered semantically to represent a particular dimension. Fig. 1 presents the resulting theoretical model of the dimensions with their respective components and representative adjectives. The dimensions also interrelate. The model suggests that all orgasm experiences involve all three dimensions but can vary along these dimensions. In applying the model to explain variation across experiences, subjective ''typologies'' of orgasm would be defined in terms of relatively greater ''sensory'' versus ''affective'' qualities. Different orgasms would also differ on evaluative qualities such as intensity and pleasure.

We have conducted studies evaluating applicability of the model to both male and female orgasm (Mah & Binik, 2000a,b). To do this, we developed an adjective-rating measure, the McGill–Mah Orgasm Questionnaire, in which individuals are asked to rate a set of adjectives on a 0 to 5 scale according to how well each adjective describes their orgasm experiences. In the first study, 523 female and 365 male university students were asked to rate the adjective set twice to describe their orgasm experiences attained through solitary masturbation and sex with a partner.

To develop a working baseline model, exploratory factor analyses of adjective ratings were conducted to identify components of the psychological orgasm experience, using the theoretical model as a guide in evaluating the conceptual adequacy of the extracted components. The components were then linked to one of the three dimensions according to the theoretical model, and the resulting three-dimensional model was evaluated using confirmatory factor analyses to test whether it provided a plausible model of the reported experiences.

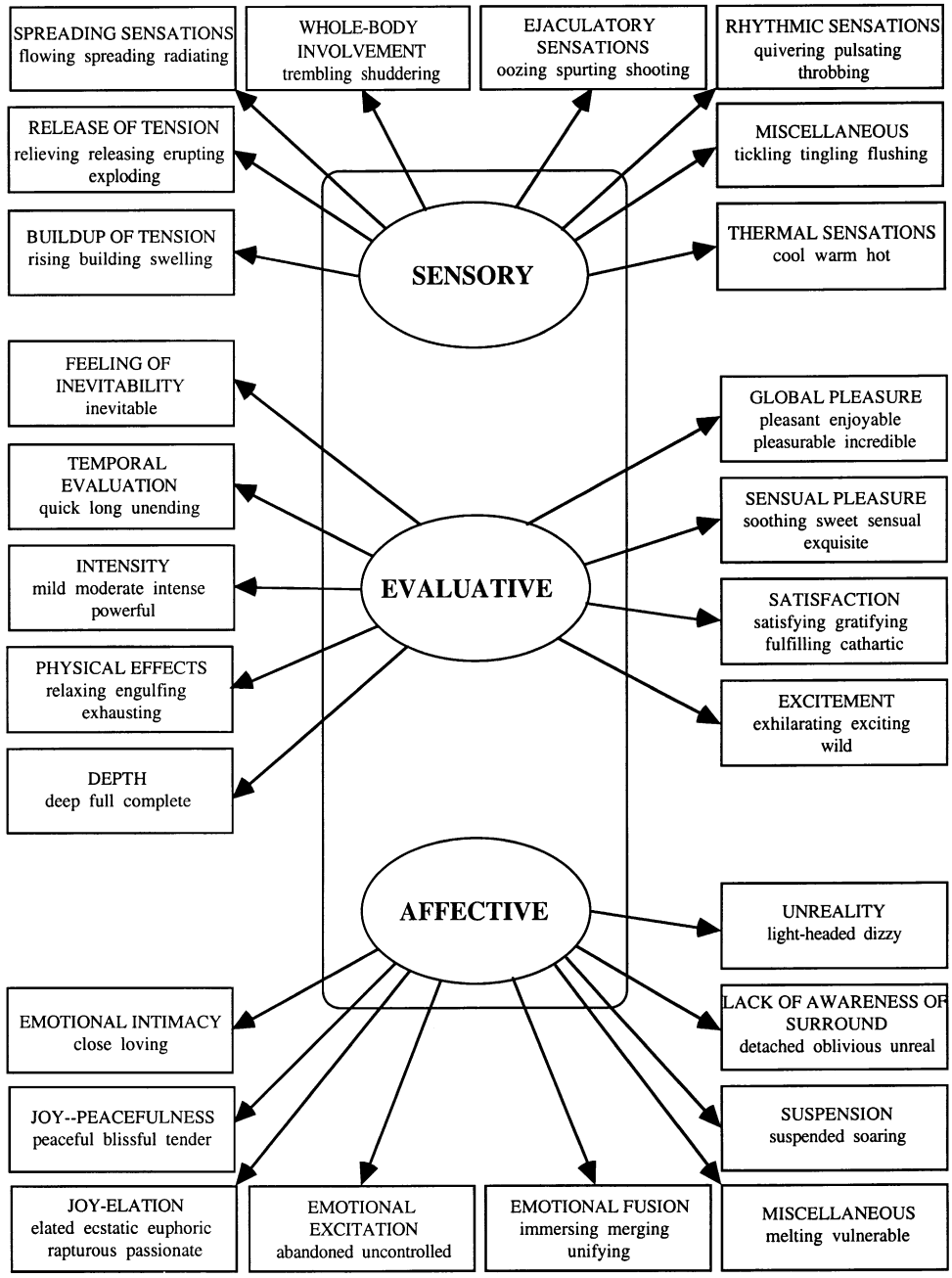

FIGURE 1. Theoretical three-component structure of the psychological experience of orgasm with respective subcomponents and representative adjectives.

In addition to good internal consistency of the adjective set, results demonstrated the adequacy of the three-dimensional model as a representation of the subjective orgasm experience. Both male and female orgasm could be described by the same core constructs of the model, suggesting that male and female orgasm experiences

encompass common qualities. Observed variation in scores on particular components provided further evidence for construct validity: (1) Scores on one component that could convey ejaculatory sensations were significantly higher for men than women; and (2) orgasm attained through sex with a partner was associated with significantly higher scores on the affective components than orgasm attained through solitary masturbation. A second study was conducted in which 503 women and 295 men completed the McGill–Mah Orgasm Questionnaire to describe orgasm achieved either through solitary masturbation or sex with a partner. Again, good internal consistency of the adjective set was observed, and the model adequately described the orgasm experience. The same pattern of variation in scores on components was also observed. Hence, evidence from this cross-validation study supported the utility of both the three-dimensional model in describing and the McGill–Mah Orgasm Questionnaire in measuring different orgasm experiences between sexes.

Empirical Directions

Validity of the three-dimensional model. The model in Fig. 1 shows the core constructs of the psychological experience of orgasm (see Mah & Binik, 2000a,b for empirically evaluated models). Future studies with non-student samples can enhance the model by identifying and assessing other potentially substantive constructs of the orgasm experience. Additions to the model can identified either by empirically testing theoretical constructs or by using a purely empirical exploratory method to uncover possible constructs. In either case, empirical validation and cross-validation of these constructs are necessary steps.

Other validity studies can widen the different contexts in which individuals have reported experiencing orgasm, e.g., comparing intercourse with sexual activity with a partner but without intercourse (cf. Newcomb & Bentler, 1983), imagery (cf. Whipple et al., 1992), breast stimulation (cf. Masters & Johnson, 1966), and G-spot stimulation (cf. Sevely & Bennett, 1978). Data from a wider range of different orgasm experiences can help better define the core concept of ''orgasm''. The model can be also used to investigate relationships between particular model components/dimensions and interpersonal and cultural factors such as partner involvement in sexual activity and endorsement of sociosexual norms on the subjective orgasm experience. For example, it would be interesting to compare both men and women who engage in casual sex versus those who are in committed relationships and whether this is associated with dominance during orgasm of sensory experiences (i.e., with casual sex) versus affective experiences (i.e., with sex within a committed relationship).

Future studies using the three-dimensional model of the subjective orgasm experience will also ideally adopt a biopsychosocial approach involving concurrent objective (e.g., anal contractions, cf. Bohlen et al., 1980; Bohlen et al., 1982; heart and respiration rate; hormonal assay; CNS activity) and subjective measures (e.g., intensity ratings via a dial indicator) while sexual stimulation is occurring. Immediately after orgasm, participants would be asked to complete the adjective-rating questionnaire. Associations between particular objective measures and theoretically related components of the model would provide concurrent validity information. For example, strength of objectively measured genitopelvic contractions should be more associated with ratings on components conveying contractile sensations than with other sensory-type components. Experimental studies using the biopsychosocial

paradigm can investigate the impact of variables like presence versus absence of visual sexual stimulation on particular model constructs such as orgasm intensity and pleasure.

Clinical Applications

Our multidimensional model and the adjective-rating measure have important potential applications within the clinical field. Clinical issues surrounding the orgasm experience are of interest. In the DSM-IV (American Psychiatric Association, 1994), absence of orgasm following normal sexual excitement and causing marked distress or interpersonal difficulty merits a diagnosis of sexual dysfunction in both women (Female Orgasmic Disorder) and men (Male Orgasmic Disorder). While these clinical entities in part reflect social norms about ''normal'' sexuality, they also underline the importance of orgasm in human sexuality.

However, the current lack of a standardized, detailed means of assessing changes in the subjective orgasm experience, coupled with the lack of a detailed conceptualization of orgasm difficulties beyond triggering of physiological events and the prevalence of basic, ''all-or-nothing'' assessments (e.g., is orgasm present or not? How often? Is orgasm satisfying or not? How intense is it?), may obscure understanding of why these changes have occurred. This in turn would make tailoring of effective treatment plans more difficult. For example, because of the lack of a standardized measure, there have been no studies investigating the impact of desire and arousal problems on the experience of orgasm. Comparing score profiles on the three-dimensional model to normative or premorbid profiles can be a potentially efficient screening and diagnostic method for clinical use.

Thus, score profiles obtained with the McGill–Mah Orgasm Questionnaire would be expected to distinguish between orgasm difficulties secondary to medical (e.g., neuropathic processes) versus psychosocial issues (e.g., marital or sexual dissatisfaction). As an example, men whose orgasm has been affected by drugs or medication with sexual side effects, those with chronic medical conditions such as diabetes in which neuropathy may affect sexual functioning, and those who are undergoing difficulties within relationships may all present with difficulties in orgasm. Using the measure, men with physiologically based difficulties might demonstrate lower ratings on components conveying contractile sensations and lower intensity ratings, but relatively little change in affective component scores. Unique components such as pain experiences may also be present. Men with psychosocial issues like relationship difficulties might show lower ratings on components conveying emotional intimacy.

In addition, some of the research on hysterectomy outcomes suggest some benefits in medical, psychosocial, and sexual outcomes for subtotal over total hysterectomy, but the lack of a measure of orgasm experiences has made it difficult to understand the impact of hysterectomy on orgasm functioning. Pre–post comparison of orgasm experiences using a standardized questionnaire would help in evaluating the sexual outcomes of genitopelvic surgeries like hysterectomy. With the measure, we can test the hypothesis suggested by Singer's typology of female orgasm, that preservation of the cervix with subtotal hysterectomy will result in higher ratings on the evaluative-type components (i.e., more intense, satisfying orgasm experience) compared to total hysterectomy (Singer, 1973). Such findings would support the utility of the model and the McGill–Mah Orgasm Questionnaire in sexual assessment as part of quality-of-life evaluations in clinical populations.

CONCLUSION

We hope that the development of multidimensional models and measures will encourage new work on the psychology of orgasm which can then be integrated into biopsychosocial models. Within the biopsychosocial context, such models will allow us to go beyond merely the ''full engorgement of the late plateau phase'' to a better understanding and appreciation of the ''rockets, earthquakes, and fireworks'' of human orgasm.

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