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The post-orgasmic prolactin increase following intercourse is greater than following masturbation and suggests greater satiety

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Abstract

Research indicates that prolactin increases following orgasm are involved in a feedback loop that serves to decrease arousal through inhibitory central dopaminergic and probably peripheral processes. The magnitude of post-orgasmic prolactin increase is thus a neurohormonal index of sexual satiety. Using data from three studies of men and women engaging in masturbation or penile–vaginal intercourse to orgasm in the laboratory, we report that for both sexes (adjusted for prolactin changes in a non-sexual control condition), the magnitude of prolactin increase following intercourse is 400% greater than that following masturbation. The results are interpreted as an indication of intercourse being more physiologically satisfying than masturbation, and discussed in light of prior research reporting greater physiological and psychological benefits associated with coitus than with any other sexual activities.

Keywords: Prolactin; Sexual behavior; Trials; Intercourse; Masturbation

1. Introduction

In addition to its role in lactogenesis, plasma prolactin has other functions, including reflecting inversely central dopaminergic activity. The postorgasmic rise in prolactin appears to reflect sexual satiety produced by a negative feedback loop: the more sexually satiated one is following sex, the greater the relief, and the greater the drop in sexual tension and desire (Krüger et al., 2002). This prolactin effect is specific to orgasm, and does not occur following non-orgasmic sexual arousal (Krüger et al., 2003). The post-orgasmic plasma prolactin increase appears to offset the central dopamine effects during arousal and orgasm, and also may have peripheral inhibitory effects (Krüger et al., 2002). In addition to the phasic effects of brief prolactin increases, there are sexual inhibitory effects of baseline prolactin levels: in a group of older men, unstimulated serum prolactin levels were strongly inversely ($r = -0.75$) related to the men's frequency of sexual intercourse (Weizman et al., 1983).

A growing research literature has demonstrated that penile–vaginal intercourse differs from other sexual behaviors in many ways, including associations with indices of better physical and psychological function in both sexes. For example, in healthy young adults, frequency of intercourse but not of other sexual activities is associated with better cardiovascular autonomic function (Brody, 2006; Brody and Preut, 2003) and with slimness (Brody, 2004). In a clinical trial, high-dose ascorbic acid supplementation (ascorbic acid potentiates dopamine's inhibitory effect on prolactin release) increased intercourse but not other sexual behavior frequency (Brody, 2002). For women, frequency of intercourse (but not of other sexual activities) is associated with greater ability to identify their emotions (Brody, 2003), and their consistency of orgasm during intercourse (but not during other sexual activities) is associated with better concordance of subjective and genital indices of sexual arousal (Brody et al., 2003). There was less vaginal atrophy in postmenopausal women having penile–vaginal intercourse at least thrice monthly than in those having

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intercourse less than 10 times annually; in contrast, masturbation showed no protective effect (Leiblum et al., 1983). Studies have also found that women's frequency of masturbation (but not intercourse) was associated with past or present depression (Cyranowski et al., 2004; Frohlich and Meston, 2002), and also found that depressed women reported a more intense desire for masturbation, less sexual pleasure and less sexual satisfaction than did nondepressed women (Frohlich and Meston, 2002).

The present report uses data from three prior studies of the prolactin responses of men and women to coitus or masturbation (and to the respective control conditions) (Exton et al., 1999, 2001; Krüger et al., 1998) to examine the prolactin response as a function of specific sexual activity. Those three reports did not compare differences between sexual behaviors. Because the post-orgasmic prolactin response is an objective physiological index of sexual satiety, the post-orgasmic prolactin response can be used to compare the effects of orgasm from coitus to the effects of orgasm from other sexual behaviors. Given the previous findings of intercourse but not other sexual behaviors being associated with better psychological and physiologic function (Brody, 2003, 2004, 2006; Brody and Preut, 2003; Brody et al., 2003, 2000; Cyranowski et al., 2004; Frohlich and Meston, 2002; Leiblum et al., 1983), it was hypothesized that intercourse would produce a greater post-orgasmic prolactin increase than would masturbation, reflecting greater physiological satiety.

2. Methods

2.1. Participants

Participants were recruited via an advertisement at the Hannover Medical School. Participants passed a general medical examination, which included the exclusion criteria of medication use (other than oral contraception), overweight, suspicion of drug or alcohol abuse, or any indication of sexual dysfunction or of endocrine or psychological disorders. All participants were clearly comfortable with the idea of sexual activity in the laboratory. Only exclusively heterosexual persons participated. After a complete description of the procedures, written informed consent was obtained. Participants were asked to refrain from any sexual activity, alcohol, or drug use for at least 24 h before laboratory sessions. Women were examined during the early- to mid-follicular phase of their menstrual cycle. There were no dropouts. Data from all subjects from the three studies was included. Complete data was available for 19 men and 19 women (nine men and 10 women in the intercourse group, 10 men and nine women in the masturbation group). The mean ages of the subjects did not differ between studies ($M = 26.2$). About 75% of the participants were students at the Hannover Medical School, and the remainder were other graduate students. Further details are available elsewhere (Exton et al., 1999, 2001; Krüger et al., 1998). All studies were conducted at the Hannover Medical School. The studies were approved by the Hannover Medical School Ethics Committee and conducted in accordance with the Declaration of Helsinki.

2.2. Materials and procedure

The masturbation condition involved masturbation in private while watching an erotic film. The control condition involved no sexual activity, and the viewing of a nonsexual documentary film. In both conditions, physical activity was the minimum required for the task.

The penile–vaginal intercourse condition involved viewing an erotic film together, followed by the measured partner lying passively supine on a bed, with their partner active on top of them until the measured partner had an intercourse orgasm. The control condition involved silently watching a nonsexual documentary film with their partner (without physical contact). In both conditions, physical activity on the part of the measured subject was the minimum required for the task (thus, comparable to the masturbation studies).

Orgasm was determined by the presence of all three of the following indicators: (1) self-report immediately after orgasm (via an intercom), (2) self-report confirmation at the end of the laboratory session, and (3) the detection of the characteristic post-orgasmic rise in prolactin (Krüger et al., 2003). Subjective orgasm ratings and other hormonal assays were available for the masturbation but not for the coital sessions, thereby precluding any comparisons of those other variables.

An intravenous cannula was inserted into a brachial vein 30 min before the start of each session. After the session began, blood was collected using a pump from the other end of the tube (in another room) at 1 ml/min every 10 min for 60 min. For the purpose of this analysis, only the changes from the second baseline to the last post-orgasmic measurement (and the analogous control condition times to be used as a covariate as described below) were examined. Blood was collected into EDTA tubes, centrifuged at 4 °C, and stored at −70 °C until assayed (in a laboratory of the Department of Endocrinology, Hannover Medical School) with a commercially available immunoradiometric kit (Prolactin-MAIAclone, Biodata S.p.A., Rome, Italy). The inter- and intra-assay variation was substantially below 10% in all cases. Further details are available elsewhere (Exton et al., 1999, 2001; Krüger et al., 1998).

2.3. Design

To allow comparisons between studies, as well as to control for individual responses to the control condition, a two-way analysis of variance (ANOVA) was used. The dependent variable was the final post-orgasmic prolactin value minus the second baseline value; the independent variables were sexual activity (intercourse versus

masturbation) and biological sex; and the covariate was the final prolactin control value (comparable in timing to the final post-orgasmic value) minus the second control baseline value.

3. Results

There was a significant main effect of type of sexual activity ($F(1, 33) = 5.0, p < .05$), but no main ($F(1, 33) < 0.1$, $p > .95$) or interaction ($F(1, 33) < 0.1$, $p > .95$) effects of sex differences. The post-orgasmic prolactin changes from baseline (adjusted for response to the control conditions) were (ng/ml): male intercourse $M = 15.62$, S.E. = 6.33; male masturbation $M = 3.05$, S.E. = 5.36; female intercourse $M = 15.71$, S.E. = 5.55; female masturbation $M = 3.06$, S.E. = 5.87.

Table 1 presents the course of prolactin levels as a function of condition (sexual or control), type of sexual activity, time, and biological sex.

Table 1
Course of prolactin levels as a function of condition, sexual activity, time, and biological sex

Biological sex	Sexual activity	Time (min)	Condition	Prolactin *M* (ng/ml)	Prolactin S.E. (ng/ml)
Male	Intercourse	10	Sexual	7.141	2.274
			Control	6.989	0.641
		20	Sexual	6.458	2.386
			Control	6.833	0.636
		30	Sexual	7.093	2.434
			Control	6.233	0.681
		40	Sexual	9.130	3.255
			Control	5.867	0.709
		50	Sexual	11.616	7.216
			Control	5.544	0.698
		60	Sexual	11.323	7.105
			Control	5.267	0.698
	Masturbation	10	Sexual	5.370	2.157
			Control	5.590	0.609
		20	Sexual	5.080	2.264
			Control	5.220	0.603
		30	Sexual	5.220	2.310
			Control	5.160	0.646
		40	Sexual	6.340	3.088
			Control	4.930	0.672
		50	Sexual	7.410	6.846
			Control	4.760	0.662
		60	Sexual	6.860	6.740
			Control	4.650	0.662
Female	Intercourse	10	Sexual	14.717	2.157
			Control	7.530	0.609
		20	Sexual	16.007	2.264
			Control	7.870	0.603
		30	Sexual	16.501	2.310
			Control	8.030	0.646
		40	Sexual	22.001	3.088
			Control	8.090	0.672
		50	Sexual	36.752	6.846
			Control	7.910	0.662
		60	Sexual	37.211	6.740
			Control	8.010	0.662
	Masturbation	10	Sexual	9.811	2.274
			Control	7.678	0.641
		20	Sexual	9.767	2.386
			Control	7.978	0.636
		30	Sexual	10.067	2.434
			Control	8.167	0.681
		40	Sexual	13.244	3.255
			Control	8.267	0.709
		50	Sexual	18.389	7.216
			Control	8.111	0.698
		60	Sexual	18.889	7.105
			Control	8.178	0.698

4. Discussion

For both sexes, penile–vaginal intercourse produced a substantially greater (adjusted for response to control conditions, the increase was about five times as great) post-orgasmic prolactin increase than did masturbation. The characteristic post-orgasmic prolactin increase reflects sexual satiety produced by a negative feedback loop (Krüger et al., 2002, 2003). The results imply that for both men and women, there is a neuroendocrine indication of greater satiation following an intercourse orgasm than following a masturbation orgasm.

It is interesting to consider these results in light of the finding that women who are orgasmic by both intercourse and by other means report that intercourse orgasms are more satisfying (Davidson and Darling, 1989). The results are also consistent with evolutionary pressures, in which the one potentially reproductive sexual activity would be expected to be more physiologically rewarding than other sexual activities.

The results are also consistent with the growing literature on penile–vaginal intercourse differing from other sexual behaviors, notably with regard to intercourse being associated with indices of better physical and psychological function (Brody, 2002, 2003, 2004, 2006; Brody and Preut, 2003; Brody et al., 2003, 2000; Cyranowski et al., 2004; Frohlich and Meston, 2002; Leiblum et al., 1983). The results raise the possibility that at least part of the means by which intercourse becomes associated with better physical and psychological function involves the mechanism of intercourse orgasm resulting in greater phasic peripheral prolactin increases. These greater phasic peripheral prolactin increases likely reflect some combination of coitus producing (relative to other sexual activity): (1) greater physiological sexual excitation provoking a greater homeostatic countervailing force (for example, greater central nervous system dopaminergic activity would be offset by greater prolactin increases (Krüger et al., 2002)) and (2) more complete orgasmic release and satiety. Better regulation of central neurotransmission might be expected to result in better psychophysiological function. Thus, the far greater prolactin response caused by penile–vaginal intercourse orgasm (compared to that caused by masturbation orgasm) implies one psychobiological mechanism for the multiple findings of intercourse but not other sexual behaviors being associated with better psychological and physiological function (Brody, 2002, 2003, 2004, 2006; Brody and Preut, 2003; Brody et al., 2003, 2000; Cyranowski et al., 2004; Frohlich and Meston, 2002; Leiblum et al., 1983).

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