Endocrine response to masturbation-induced orgasm in healthy men following a 3-week sexual abstinence

Abstract This current study examined the effect of a 3-week period of sexual abstinence on the neuroendocrine response to masturbation-induced orgasm. Hormonal and cardiovascular parameters were examined in ten healthy adult men during sexual arousal and masturbation-induced orgasm. Blood was drawn continuously and cardiovascular parameters were constantly monitored. This procedure was conducted for each participant twice, both before and after a 3-week period of sexual abstinence. Plasma was subsequently analysed for concentrations of adrenaline, noradrenaline, cortisol, prolactin, luteinizing hormone and testosterone concentrations. Orgasm increased blood pressure, heart rate, plasma catecholamines and prolactin. These effects were observed both before and after sexual abstinence. In contrast, although plasma testosterone was unaltered by orgasm, higher testosterone concentrations were observed following the period of abstinence. These data demonstrate that acute abstinence does not change the neuroendocrine response to orgasm but does produce elevated levels of testosterone in males.

Key words Abstinence · Sexual arousal · Orgasm · Prolactin · Catecholamines · Cortisol · Testosterone · Cardiovascular

Although sexual abstinence is a common behavioral pattern in humans, there has been little examination of the psychological and physiological consequences of this behavior. Nevertheless, limited data have demonstrated that sexual abstinence may impact on the physiological regulation of sexual function. Specifically, retrospective studies have shown that features of semen quality are reduced during long periods of sexual abstinence [5, 22]. In contrast, periods of abstinence between 12 h and 10 days have generally revealed enhanced sperm quality parameters [9, 26, 28, 33], although this is not consistent across all measures of sperm quality [28, 33]. Nevertheless, acute sexual abstinence is commonly employed prior to clinical sperm donation to enhance sperm quality.

Despite knowing that acute abstinence affects reproductive function, no data exist that examines the effect of abstinence on the physiological response to sexual arousal and orgasm. We have established a method for examining the neuroendocrine response to masturbation-induced orgasm in men and women [15–17, 24], based upon a continuous blood sampling technique. These investigations demonstrated that masturbation-induced orgasm produced a pronounced increase in cardiovascular responses and plasma catecholamine concentrations. Furthermore, sexual arousal was characterised by a large, persistent increase in concentrations of plasma prolactin. Since hyperprolactinemia is known to inhibit sexual arousal and function [13, 35], these data suggest that prolactin may act as a peripheral and/or central feedback signal in controlling sexual arousal following orgasm.

Therefore, the purpose of this current study was to investigate the effect of acute abstinence on the physiological response to sexual arousal. Specifically, we
examined the neuroendocrine responses to sexual arousal and orgasm following separate periods of regular sexual activity and sexual abstinence in healthy men by using an established paradigm.

Materials and methods

Participants

Ten healthy male volunteers (mean age of 25.8 ± 0.8 years, range of 22–29 years) participated in this investigation. Participants were screened by completing a general medical/health questionnaire and gave their written consent before being admitted into the study. The protocol for this study was approved by the Ethics Committee for Investigations involving human subjects of the Hannover Medical School, Germany. Individuals taking medication, abusing drugs/alcohol, or exhibiting endocrinological, psychological or sexual dysfunction/disorders were excluded from the study. All participants reported that they had an exclusively heterosexual orientation and a relaxed attitude toward pornography. Further, all subjects were currently in a stable relationship and reported having sexual intercourse approximately 2–3 times per week.

Design and procedure

A repeated measures design was used so each participant viewed a videotape and masturbated to orgasm on two separate days. Two different videos were shown in a crossover design for the two sessions. The first session took place at 1630 hours on day 0. Immediately after that first session (day 0–day 20), the participant refrained from any type of sexual activity. At 1630 on day 21 each subject once again participated in the sexual arousal paradigm. The procedure of sexual arousal and orgasm both before (day 0) and after (day 21) were identical, with each session lasting 2 h.

Experiments were conducted in a separate sound-attenuated room equipped with a clinical bed, a color television and a video cassette player. All leads, including the blood line, passed through the wall into the adjacent room where the cardiovascular data and blood samples were collected, allowing the subject to be completely isolated throughout the experiment. At the beginning of each session participants were placed on the bed in front of the video screen. The cardiovascular monitor was then engaged 30 min prior to the film and a steady baseline reading was obtained before the cannula was inserted (20 min before the beginning of the film). The session was composed of three sequences, each lasting 20 min. The first and last sections of the video tape were composed of sections of an emotionally neutral documentary film. However, the middle section consisted of a 20 min pornographic film that showed different couples engaged in foreplay and sexual intercourse. Blood sampling was initiated at the beginning of the film. After 10 min of the pornographic video had been watched (anticipatory phase), subjects in the experimental session were required to masturbate until orgasm. Blood was drawn continuously with the samples divided into six 10 min intervals [15–17, 24]. Specifically, the first two samples represented basal values (10, 20 min), the third sample represented the response to film-induced sexual arousal (30 min), the fourth demonstrated the response to orgasm (40 min) and the final two samples showed the recovery phase (50, 60 min).

Apparatus and materials

Subjective sexual arousal

To provide a measurement for sexual arousal, participants completed a visual analogue scale (VAS) by rating their subjective level of sexual arousal from ‘not at all sexually aroused’ to ‘extremely sexually aroused’ [15–17, 24]. Subjective sexual arousal was measured at three time points—before, during and after the session—for both controlled and experimental conditions.

Additionally, subjective assessment of the quality of the orgasm was completed using 5-point Likert scales. These scales examined the duration, intensity and speed of orgasm in absolute value and as compared to a typical orgasm. These questions were administered following both the experimental and controlled situations.

Cardiovascular measures

The cardiovascular parameters heart rate (HR) and systolic and diastolic blood pressure (BP) were monitored continuously via a finger cuff connected to a blood pressure monitor (Critikon Cuff & Dinamap Vital Data Monitor; Critikon Ltd, USA) that was located in the adjoining room. Cardiovascular activity was recorded by computer every 30 s, and the HR and BP values were averaged over 10 min intervals and analysed simultaneously with the blood samples taken in 10 min interval.

Endocrine measures

For blood sampling, an IV cannula (Vasofix Braunüle, 18G) was connected to a 1.25 m heparinized silicon tube (inner 2.0 mm, Reichelt Chemie, Heidelberg, Germany) by a plastic three-way stop-cock (Cook, Mönchengladbach, Germany). The silicon tubing passed through the wall into the adjacent room and was positioned through a peristaltic pump (Fresenius, Homburg, Germany). Blood flow was adjusted to 2 ml/min, so that approximately 10 ml of blood per 5 min were collected (i.e. more than 150 ml per session). Blood was collected in EDTA tubes (Sarstedt, Nümbrecht, Germany), and the collection of each sample was delayed by the time it took for blood to pass through the dead space in the tube. Blood was stored on ice until the samples were centrifuged. Plasma was stored in glass aliquots at -20 °C until it was time for the hormone assays.

All samples from the one participant were analysed in duplicate within the same assay for a particular hormone. Plasma prolactin was evaluated by immunoradiometric assay (IBL, Hamburg, Germany) and testosterone, LH, cortisol (Diagnostic System Laboratories, Texas, USA) and catecholamines (IBL, Hamburg, Germany) were assessed by radioimmunoassay. Inter and intra-assay variability were 8.0% and 6.2%, respectively, for noradrenaline; 5.1% and 4.0%, respectively, for adrenaline; 7.1% and 5.0%, respectively, for prolactin; 7.9% and 5.2%, respectively, for testosterone; 5.2% and 3.8%, respectively, for LH; and 4.3% and 2.8%, respectively, for cortisol.

Statistical analyses

Data from all subjects were analysed by 2-factor repeated measures (condition x time) analyses of variance (ANOVA). If not stated otherwise, only the condition x time interaction effect is reported. An α level of 0.05 was used for all ANOVAs. Post hoc simple effects were evaluated by using paired samples t-tests with Bonferroni z corrections made for multiple comparisons. Additionally, the Wilcoxon test was completed for questionnaire data.

Results

Subjective sexual arousal

Participants rated themselves as being significantly sexually aroused during the erotic film (F(2, 16) = 189.51, P < 0.001; time effect) and greater subjective arousal