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RESEARCH METHODS IN MOTIVATION SCIENCE

Developing a Causally Valid Picture-Story Measure of Sexual Motivation: II. Effects of Film Clips

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Replicating and extending previous work by Hinzmann et al. (in press), the present research aimed at validating a picture-story measure of sexual motivation, termed need for sex (*n* Sex). In two experimental studies (*N*s = 154 and 171) with repeated-measures design, we showed that (a) *n* Sex is sensitive to experimental manipulation of sexual motivation via film clips, (b) that this effect is mediated by increased subjective arousal as an indicator of a motivational process, and (c) that the part of *n* Sex variance that is sensitive for experimental manipulation is also the one accounting for variations in a behavioral criterion (key pressing and viewing time measures of relative preference for erotic over nonerotic pictures). These effects emerged specifically when film clips portrayed sex positively, but not when they showed sex with embarrassing or threatening consequences. As a dispositional measure, *n* Sex correlated positively with self-report measures of sexual desire and behavior. But it did not feature the sex difference associated with these measures and retained incremental validity above and beyond them for behavioral criterion measures.

Keywords: thematic apperception, sexual motivation, picture-story measure, content coding, validation

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Sexual motivation is a fundamental propellant of behavior, grounded in well-described neurobiological circuits and endocrine dynamics (Ågmo & Laan, 2022; Georgiadis et al., 2012; Janssen, 2007). It affects physiology, affect, attention, and cognition (e.g., Hoffmann, 2017; Toates, 2009) and contributes to functional and dysfunctional sexual behavior (Ågmo, 2007). However, the measurement of sexual motivation can be challenging (e.g., Pfaus, 2007). In particular, assessment of sexual motivation and behavior per self-report is fraught with demand characteristics, self-presentational issues, defenses, introspective limitations, and other problems (Wiederman, 2002). The consistent difference between women and men in self-reports of sexual desire and behavior (women report less than men) illustrates this point (e.g., Frankenbach et al., 2022). Some researchers, therefore, question the validity of questionnaire measures of sexual motivation and behavior in general (e.g., Ågmo, 2007, p. 57; Le Moëne & Ågmo, 2019). Other researchers have suggested that validity should be defined in causal terms, as sensitivity of a measure to experimentally induced variations in the measurement target (see Borsboom et al., 2004; McClelland, 1958, 1987). Viewed from this perspective, it is indeed striking that none of the measures of sexual motivation featured in a recently published comprehensive handbook has been validated by manipulating motivation (see Fisher et al., 2011). It would therefore be desirable to develop a measure of sexual motivation that is sensitive to causal effects of motivational states and that may bypass some of the problems associated with self-reports. This is what we set out to do in the present work.

Our research builds on and continues earlier work by Hinzmann et al. (in press). They introduced a new picture-story exercise (PSE; see McClelland et al., 1989) measure of sexual motivation, termed need for sex,[1] or *n* Sex (see Murray, 1938), including motive-specific picture cues and a comprehensive coding manual that allows coders to attain high levels of coding reliability. Hinzmann et al. (in press) based their approach on an incentive motivation model that holds that incentives elicit in the individual a central motive state, a set of brain processes that promote goal-directed behavior in relation to the incentives, and whose level depends on organismic boundary factors (Ågmo & Laan, 2022; Bindra, 1974, 1978; Toates, 1986). Incentives can be innate, such as any kind of stimulus that inherently generates sexual pleasure (e.g., genital stimulation), or learned, such as stimuli that have become associated with sexual pleasure (e.g., sights, sounds, smells, situations). From the incentive motivation perspective, sexual motivation equals an individual's responsivity to sexual incentives; that is, it corresponds to the individual's sexual central motive state

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Inquisit testing scripts, data, SYSTAT analysis code, JASP files, documentation videos, supplemental documents, and updates are available on https://osf.io/e6guq/. The coding system and associated materials are available on https://osf.io/vf8cb/.

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[1] In using the term "need," we stick to the McClelland/Atkinson research tradition of using this label to denote a specific measurement method (content coding of picture stories) and a particular view of motives resulting from it, involving specific types of incentives, behaviors, and (in)accessibility to conscious introspection (McClelland et al., 1989; Schultheiss, 2001). We expressly do not use the term to indicate a deficit state or to assign a specific importance to sexual motivation relative to other types of motivation.

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(Ågmo & Laan, 2022). Incentives and central motive states interact in a positive feedback loop, with incentives increasing the central motive state and the central motive state in turn sensitizing the individual for incentives (Ågmo, 1999). There are two consequences of this view with regard to sexual motivation. One is that if sexual incentive cues are held constant, one can gauge an individual's current central motive state from the degree of her or his response to these fixed incentive cues. The other is that the central motive state can be increased through exposure to sexual incentives.

Hinzmann et al. (in press) made use of both of these aspects of incentive motivation theory. They used a measurement approach that gauges responses (sex-related imagery in imaginative stories) to fixed stimuli (i.e., PSE picture cues; e.g., a man and a woman in underwear engaged in a pillow fight) somewhat suggestive of sex to infer the strength of the central motive state. And they incrementally varied exposure to sexual incentives, and hence changes in the central motive state, using a 2 × 2 design. The first design factor varied within subjects whether participants wrote stories to four PSE pictures each during a *baseline* or a *priming* phase. The second factor varied between subjects whether, during the priming phase, participants were exposed to erotic (*sexual motivation arousal*) or neutral incentive primes (*control*) before each PSE picture. In two studies with 86 and 113 participants, Hinzmann et al. found that experimentally varied arousal of sexual motivation led to specific increases in story imagery related to positive goal anticipation (fantasy and arousal); instrumental activity (general, seduction, kiss, remedial), block (person), goal attainment (positive, negative), interpersonal attraction, promiscuity, and erotic atmosphere. The sum score of the identified coding categories increased from baseline to priming in the erotic-prime group (meta-analytic $d = 0.39$), but not in the control-prime group (meta-analytic $d = -0.14$) and hence featured causal validity as envisaged by Borsboom et al. (2004) and McClelland (1958, 1987).

Moreover, Hinzmann et al. (in press) argued that for a measure to be a valid measure of *motivation*, it does not suffice to demonstrate its sensitivity to experimental manipulation—problems of circularity would loom. It is equally important to show that experimentally elicited changes in the measure are mediated by changes in a relevant *indicator* of the targeted process. Hinzmann et al. focused on affect, a hallmark of motivation in incentive theories generally (see Berridge, 2004; Toates, 1986) and in theories of sexual motivation specifically (see Ågmo & Laan, 2022; Hardy, 1964). They documented a mediating role of affect in their second study, using a combination of subjective (arousal) and psychophysiological measures of affect. For the latter, they employed facial electromyography (EMG) over the corrugator and zygomatic muscles, involved in frowning and smiling, respectively. Previous research indicates that whereas corrugator activation and deactivation is a valid measure of both negative and positive affect, respectively, zygomatic activation specifically reflects positive affect (see, for instance, Bradley et al., 2001; Larsen et al., 2003). Thus, participants in the erotic-prime condition injected more sexual imagery into their stories because they responded with positively tinged arousal to the primes, compared to their own baseline levels and to control participants. Finally, Hinzmann et al. argued that for a measure to have predictive validity, one needs to show that the portion of its variance that is sensitive to experimental manipulation is also the one that accounts for variance in a representative *criterion*. To demonstrate the criterion validity of their *n* Sex measure, they had participants in their second study work on a key-press task that allowed them to increase or decrease viewing time for erotic or nonerotic pictures by pressing an up or a down key. Mediation analysis indicated that *n* Sex assessed during the priming phase of the experiment relayed the effect of experimental manipulation to the behavioral criterion (relative viewing time and key presses for erotic vs. nonerotic pictures). Hinzmann et al. termed this validation approach the EMMIC framework, for experimental manipulation, measure, indicator, and criterion (see also Schultheiss et al., in preparation, and demonstrated that a PSE *n* Sex measure developed in this manner represents a promising approach to the valid assessment of sexual motivation.

In the present research, we aimed to advance the validation of the *n* Sex measure by replicating and extending Hinzmann et al.'s work within the EMMIC validation framework in the following ways: First, Hinzmann et al. used series of briefly flashed primes before the presentation of PSE picture cues in the sexual-arousal and control conditions. This is a relatively subtle procedure that may leave room for larger arousal effects with stronger stimuli. We, therefore, decided to use film clips of 2–3 min duration before each PSE picture during the experimental manipulation phase to elicit stronger arousal effects. Film clips have been used frequently and successfully in previous research with PSE-based motive measures (e.g., Wirth & Schultheiss, 2006) and on human sexual motivation (e.g., Both et al., 2004; Goldey & van Anders, 2016).

Second, contemporary theories of sexual motivation often conceptualize net sexual motivation as resulting from the interplay of sexual appetitive motivation (excitation) and avoidant motivation (inhibition; resulting, for instance, from a fear of the consequences of sexual activity; see Bancroft et al., 2009; Toates, 2009). In the present research, we therefore tested whether presenting sexual activity either in a positive way (positive arousal) or in a manner that is associated with aversive consequences (negative arousal) would also lead to different imagery "signatures" in the stories that participants write, ideally yielding separate scores for sexual appetitive motivation and inhibition. The comprehensive coding system described by Hinzmann et al. is well suited for this purpose, because it features coding categories reflecting appetitive (e.g., positive goal anticipation) and avoidant (e.g., negative goal anticipation, negative goal attainment, negative affect, blocks in person and the world) story themes. We explored whether these would differentiate between positive and negative sexual arousal.

Third, Hinzmann et al. found experimental manipulation effects on subjective and psychophysiological measures of affect only in their second study, in which they used measures of subjective arousal, facial EMG, and pupillometry, and indicator arousal in response to sexual incentives (Rieger et al., 2015). They did not obtain it in their first study, in which they used more general measures of subjective affect only (hedonic tone, energization, tension). We, therefore, tested whether the specific effect of sexual arousal on feelings of arousal and on psychophysiological measures could be replicated and whether such effects would differ between positive and negative sexual arousal. In doing so, we proceeded on the notion that although psychophysiological and other measures of affect are not generically linked to sexual motivation, they may represent a specific indicator in the presence suitably specific incentives (see Richter & Slade, 2017) and should also be related to sexual thought content as captured with the PSE.

Another important aspect in which our present research differs from Hinzmann et al.'s is that we assessed affect not repeatedly, in response to multiple pictures, but more continuously during

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four film clips in the case of psychophysiological measures and before and after the experimental manipulation in the case of subjective measures. Apart from these variations, we aimed to replicate Hinzmann et al.'s original studies as closely as possible to allow meaningful comparisons between studies and arousal approaches. Thus, we employed the same PSE picture sets, writing instructions, and coding system and we also used the same key-press task criterion measure introduced in the earlier research.

Overview of the Studies and Hypotheses

Our overall goal in this research was identifying those aspects of sexual imagery that are consistently sensitive to experimental manipulation of motivational states and for which a mediating effect of affective changes as a core indicator of a motivational process can be obtained. In addition, we wanted to show that sexual imagery identified in this manner has predictive utility for a behavioral criterion precisely because it transmits the effect of experimental motive arousal on the criterion. In two preregistered studies, one conducted in the laboratory (https://aspredicted.org/blind.php?x=W5M_7F5) and the other, due to the restrictions of the COVID pandemic, online (https://aspredicted.org/blind.php?x=KFT_JC6), we tested the following hypotheses[2]:

1. Experimental manipulation (arousal of sexual motivation) effect on the measure (thematic content changes; EM → M)

We expected positive and negative sexual arousal conditions, but not a control condition, to elicit an overall increase in sexual themes in PSE stories and hence to establish causal validity for the measure. We expected this overall increase to be stronger in the positive than in the negative arousal condition, because in the latter sexual inhibition was expected to counteract sexual excitation more than in the former. Moreover, we expected the negative *n* Sex categories to increase more in the negative, and the positive *n* Sex categories to increase more in the positive condition, relative to the other arousal condition.

2. Experimental manipulation effect on the indicator (affective changes; EM → I)

We expected motivational arousal conditions, relative to the control condition, to lead to changes in subjective and physiological affect measures. Specifically, we expected an increase in subjective arousal, hedonic tone, and pupil size in the positive arousal condition and an increase in subjective arousal, pupil size, and corrugator activation in the negative arousal condition. We expected arousal conditions to elicit changes in zygomatic activation, too, but did not prespecify the direction of these effects. Previous research has demonstrated the sensitivity of these measures of affect to sexual incentives (e.g., Bradley et al., 2001; Chivers et al., 2010; Mass et al., 2009; Rieger et al., 2015; Samson & Janssen, 2014).

3. The indicator mediates the experimental manipulation effect on the measure (EM → I → M)

We expected those measures of affect that both picked up experimental manipulation effects and were associated with changes in thematic content to mediate the effect of motivational arousal on *n* Sex.

4. Experimental manipulation effect on behavioral criterion (EM → C)

We expected motivational arousal, relative to the control condition, to elicit relatively more effort, reflected in key presses and viewing time, to view erotic pictures than to view nonerotic pictures. We expected this effect to be stronger in the positive arousal than in the negative arousal condition.

5. Changes in the measure mediate experimental manipulation effect on criterion (EM → M → C)

We expected changes in *n* Sex from baseline to motivational state manipulation to mediate the effect of motivational arousal on effort to view erotic pictures (relative to nonerotic pictures).

In addition, although we did not specify this in our preregistrations, we also explored the PSE *n* Sex measure's convergence with questionnaire measures of sexual motivation and behavior, the sexual inhibition and excitation scales (SIS/SES; Janssen et al., 2002) and the revised sociosexuality orientation inventory (SOI-R; Penke & Asendorpf, 2008). Given previous findings documenting statistical independence between PSE-based and self-report measures of motivation (e.g., Köllner & Schultheiss, 2014), we did not expect strong positive correlations between the two types of sexual motivation measures. However, because we did not base our *n* Sex measure on a requirement of minimal variance overlap with self-report measures, neither did we rule out a degree of convergence. We did expect, however, that the PSE *n* Sex measure would show incremental criterion validity above and beyond self-reported sexual motivation. We also explored associations between *n* Sex and participant gender and sexual orientation.

Method

We obtained approval for both studies from the Institutional Review Board of Friedrich-Alexander University, Erlangen, Germany.

Participants

Study 1

Between August 2020 and February 2021, we tested 154 participants (64% women; $M_{age} = 21.31$, $SD = 3.50$), of which 82% self-

[2] Hypotheses presented here deviate from the preregistration in the following ways: We set the criterion for including word count as covariate to a significant Time × Condition interaction, but did not consider main effects as grounds for controlling word count. We dropped one hypothesis (H10 in Study 1, H7 in Study 2) related to the approach-avoidance task after it became clear to us that this measure may be unsuitable for testing an association between *n* Sex and behavior (see Janson et al., 2022; Phaf et al., 2014). We erroneously used the word "moderate" instead of "mediate" for the affect-mediation hypothesis in the preregistration. For Study 2, we could test H4 and H5 (key-press task performance) only for key presses, not viewing time. We replaced the subjective tension measure referred to in H6 (both studies) with subjective arousal. We summarized H7, H8, and H9 (Study 1) as Hypothesis 2 here. We did not test and report results for H12 (Study 1) and H9 (Study 2), which refers to an analysis of simple counts of sexual words. In Study 2, H8 was misspecified and superfluous (the EM → M → C path is already specified in H5). Finally, although our preregistrations were based on null-hypothesis significance testing, we switched to Bayesian analyses wherever we could. We did this because Bayesian analyses (a) provide intuitively meaningful information for whether the observed results are more probable under the null or the alternative hypothesis, (b) allow the direct quantification of a probability for the null hypothesis, and (c) allowed us to directly quantify the strength of the cumulative evidence across both studies (see Ly et al., 2019).

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identified as students enrolled in various majors at FAU and regional colleges. Eighty-six percent were born in Germany, 2% each in Russia and Turkey, and the remainder came from various other countries. They were recruited via ads posted in print on the FAU campus and digitally on social media and admitted to the study, which was advertised as a study on movies and story writing and conducted at the Human Motivation and Affective Neuroscience Laboratory of FAU. The sample was predominantly heterosexual, with 65% self-identifying as exclusively heterosexual, 24% as predominantly heterosexual, 8% as bisexual, 1% as predominantly homosexual, and 2% as exclusively homosexual. Forty-six percent reported being in a relationship.

Study 2

Between November 2020 and March 2021, 204 participants were recruited via ads posted on social media and admitted to the study, which was advertised in the same manner as Study 1 and conducted online. Of these participants, six dropped out after giving informed consent and another 27 dropped out before completing the PSE. This left 171 (71% women; $M_{\text{age}} = 25.29$, $SD = 4.59$) participants who had given informed consent and completed the PSE section of the study (we note below where N for specific measures deviates from this number). Of these participants, 68% self-identified as students enrolled in various majors at FAU and regional colleges. Eighty-five percent were born in Germany, 2% each in Russia, Ukraine, and Austria, and the remainder came from various other countries. The sample was predominantly heterosexual, with 77% self-identifying as exclusively heterosexual, 17% as predominantly heterosexual, 3% as bisexual, 2% as predominantly homosexual, and 2% as exclusively homosexual. Sixty-five percent reported being in a relationship.

Design

In both studies, participants were randomly allocated to an Experimental Manipulation (positive arousal, negative arousal, control) × Time (T1: baseline, T2: motivational state manipulation) design, with the first factor varied between and the second within participants. In addition, PSE Sequence (AB, BA) was varied between participants and orthogonally to the other design factors to balance the allocation of PSE sets A and B to T1 and T2. Dependent variables were (a) sexual imagery in PSE stories, (b) affective responses (subjective; in Study 1 also EMG and pupil size), and (c) relative preference for erotic versus nonerotic stimuli on the key-press task (number of key presses; in Study 1 also viewing time). Per our preregistration, we aimed for a minimum of 50 participants per cell of the experimental manipulation factor. Our goal was to capture in each of the sexual arousal conditions an expected within-group increase corresponding to $d = 0.70$ (based on an in-house synthesis of effect sizes obtained in previous motivational arousal studies by other researchers) with a probability of 80% at $p < .01$, two-sided. In the control condition, we expected d to approximate 0.

Experimental Manipulation

On each trial of the motivational state manipulation phase, participants first focused on a fixation cross for 12 s, then watched a film clip, then saw a PSE picture for 10 s, and finally wrote a story about the picture. This was repeated four times, with four different movie clips and PSE pictures. Movie clips had a fixed sequence while PSE pictures were randomly assigned within PSE sets to the four trials.

Positive Arousal

We chose four consecutive clips from a movie showing a heterosexual couple having consensual and pleasurable oral sex and penile–vaginal intercourse (clip durations in min:s—6:03, 3:02, 3:04, 3:01). Prior research has shown this movie to reliably elicit subjective and genital arousal in women and men alike (e.g., Wang et al., 2022).

Negative Arousal

We chose the following four clips and presented them in the given sequence because they showed sexual activity, but with unpleasant outcomes. An excerpt from "Shame" (McQueen, 2011) showed a man trying to have sex with a woman, but being unable to perform the act (6:03). An excerpt from "American Pie" (Weitz, 1999) showed a young woman letting her boyfriend enter her room and engaging in sexual foreplay. This is interrupted by her father entering and her boyfriend having to hide and ultimately flee the room (3:00). An excerpt from "Cat People" (Schrader, 1982) showed a naked woman becoming intimate with a naked man. In the next scene, she gets up from the bed where he lies with closed eyes, goes to the bathroom, finds blood on her body, and smears it across her lips (2:59). An excerpt from "Gone Girl" (Fincher, 2014) showed an encounter between a man and a woman involving conversation, kissing, brief fellatio, followed by sex and the woman killing the man during the act by slitting his throat (2:30).

Control Condition

We selected the following four clips and presented them in the sequence given because they were nonsexual, but engaging to watch and physically exciting. An excerpt from "Point Break" (Bigelow, 1991) showed men jumping from a plane and opening their parachutes only at the very last moment (6:00). A second excerpt, found on the internet, showed women skateboarding in half-pipes in a skateboard park (2:39). An excerpt from "Point Break" (Core, 2015) showed a group of men wingdiving from a mountain and flying across forests and gorges in a mountainous range (3:00). An excerpt from a snowboarding film showed a group of women snowboarding down a mountain (2:49).

Measures

n *Sex*

We used the picture cues described in Hinzmann et al. (in press; see the online supplemental materials for descriptions) in the present research, with the PSE sets of eight each employed in Hinzmann et al.'s Studies 1 and 2 assigned to the present Studies 2 and 1, respectively, and divided evenly into sets A and B within each study in the same manner as in the earlier studies. We administered the PSE with standard instructions and procedures described in Schultheiss and Pang (2007). Two trained coders who were blind to participants' experimental condition assignment later coded stories for n Sex imagery based on the coding system described in Hinzmann et al. (in press). The coding system is available at

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https://osf.io/vf8cb/. In brief, the coding system features specific coding categories and rules for the following general domains:

- *need* (e.g., "She wanted to have sex with him"),
- *goal anticipation* (positive and negative; e.g., "They both looked forward to a hot night between the sheets," "He was unsure whether it was a good idea to have sex"),
- *instrumental activity* (positive and negative; e.g., "They were getting undressed," "She feigned a headache to avoid having to go further with him"),
- *blocks* (person and world; e.g., "She was too tired for sex," "They were discovered by her dad"),
- *goal attainment* (positive and negative; e.g., "They had sex," "They did not sleep with each other"),
- *affect* (positive and negative; e.g., "She enjoyed it," "He felt guilty the entire time"),
- *miscellaneous other imagery* (e.g., mention of sexual attraction, erotic atmosphere).

See Table S1 in the online supplemental materials for an overview. We used scores averaged across coders for all analyses.

Affect

Subjective Affect. In both studies, we assessed changes in subjective affect with the sentence lead "Right now, I feel …" and word pairs rated on 7-point scales. Hedonic tone was represented by the word pair *happy–sad* taken from the hedonic tone scale of the University of Wales Mood Adjective Check List (Matthews et al., 1990). Arousal, whose German equivalent—*Erregung*—is somewhat biased to mean sexual arousal, was represented by the word pair *aroused–unaroused*. Subjective affect was assessed twice, once at the beginning of the study (T1) and once after motivational state manipulation (T2). In Study 2, 170 participants completed both affect assessments.

Objective Affect. In Study 1 only, we obtained objective affect measurements via EMG over the corrugator and zygomatic muscles and via pupillometry while participants watched movie clips during the experimental manipulation phase.

Electromyography. Participants' facial skin was cleaned with alcohol and rubbed with a conductive EMG gel (Nuprep), keeping impedances below 10 kΩ. Electrodes were filled with electrode paste (OneStep Cleangel) and then attached to the left side of the face, over the zygomaticus major ($n = 152$) and the corrugator supercilii ($n = 153$) muscle regions (Fridlund & Cacioppo, 1986). Ground was placed on the upper half of the forehead. Raw EMG signals were recorded with an MP150 BIOPAC system at a sampling rate of 1,000 Hz. Using AcqKnowledge 5.0, raw EMG data were filtered at a band pass of 28–500 Hz plus a notch filter at 50 Hz, followed by signal rectification. EMG signal was extracted into 1 s bins and later averaged first within and then across fixation baseline and movie clips (full duration) to provide overall baseline and movie measures of EMG activity.

Pupil Diameter. Pupil diameter was recorded using a Tobii TX300 eye tracker, at a sampling rate of 120 Hz. Because only two testing cubicles were equipped with an eye tracker, pupil size could be assessed in 80 participants only. Blinks and other events that caused the device to lose pupil and corneal reflection were cleaned from raw data. Similar to EMG data, pupil diameter measurements were extracted into 1 s bins and averaged first within and then across fixation baseline and movie clips (full duration) to provide overall baseline and movie measures of pupil diameter.

Behavioral Criterion

We administered the key-press task, which is described in Hinzmann et al. (in press) and requires participants to watch erotic and nonerotic pictures in alternating order for 4 min. Participants could increase or decrease by 0.25 s steps the preset presentation time of 4 s for each picture by pressing an up or a down key. Thus, both the number of up (positive sign) or down (negative sign) key presses and the overall resulting viewing time, calculated separately for erotic and nonerotic stimuli, could be used as measures of preference for erotic and control stimuli. Due to a programming problem in the web version of the key-press task, viewing time data are available for Study 1 only, whereas key-press data are available for both studies. In Study 2, 169 participants completed the key-press task.

Self-Reported Sexual Motivation

Sexual Inhibition/Excitation Scales. We used the German-language adaptation (Turner et al., 2013) of Janssen et al.'s (2002) SIS/SES measure with standard instructions described in the original publication. The measure consists of a six-item scale assessing sexual excitation (SES; example item: "When I start fantasizing about sex, I quickly become sexually aroused") and two four-item scales assessing sexual inhibition due to a concern with performance failure (SIS1; example item: "If I am distracted by hearing music, television, or a conversation, I am unlikely to stay aroused.") and due to a concern with the consequences of sex (SIS2, example item: "If I can be seen by others while having sex, I am unlikely to stay sexually aroused."). Participants responded on a Likert scale with gradations labeled *not at all applicable* (1), *not applicable* (2), *applicable* (3), and *very applicable* (4). Scale reliability coefficients (Cronbach's α) were 0.73 and 0.79 for SES, 0.40 and 0.46 for SIS1, and 0.58 and 0.73 for SIS2 in Studies 1 and 2, respectively. We created scale scores by averaging across scale items. In Study 2, 167 participants completed this measure.

Sociosexual Orientation Inventory-Revised. We used Penke and Asendorpf's (2008) revised German-language version of Simpson and Gangestad's (1991) original measure, with instructions taken from the revised version. The SOI-R differentiates at the scale level with three items each between behavior (sample item: "With how many different partners have you had sex within the past 12 months?"), attitude (sample item: "Sex without love is OK"), and desire (sample item: "In everyday life, how often do you have spontaneous fantasies about having sex with someone you have just met?"). Participants recorded their responses on nine-point Likert scales whose gradation labels varied by scale (see Penke & Asendorpf, 2008, for details). After recoding of negatively keyed items, scale reliability coefficients (Cronbach's α) were 0.83 and 0.79 for behavior, 0.86 and 0.82 for attitude, 0.84 and 0.87 for desire, and 0.84 and 0.85 for the full nine-item measure in Studies 1 and 2, respectively. We created scale scores by averaging across scale items. In Study 2, 167 participants completed this measure.

Procedure

We collected all data with Inquisit Desktop 5.0 in Study 1 and Inquisit Web 6.2 in Study 2, with participants in Study 1 working on all tasks in individual cubicles with closed doors that provided privacy and participants in Study 2 working on their computers at home. All instruments were presented in German. Both studies started with participants providing informed consent, which informed them that during the course of the study, they might encounter sexual or sports-related stimuli and videos. In Study 1 only, experimenters then prepared participants for EMG assessment as described above. Next, baseline (T1) subjective affect was assessed. In Study 1 only, participants collected a saliva sample in parallel for later hormone assaying (not part of the results reported here). Participants then worked on the PSE, first under baseline conditions (T1), without the presentation of film clips, and then under experimental conditions (T2), while in Study 1 only, their facial EMG and pupil size were being assessed. Afterward, they again completed a measure of their current affective state (T2) and then worked on the key-press task. Participants subsequently completed other measures not related to the hypotheses and results reported here and in Study 1 collected a second saliva sample. After filling out a questionnaire probing for demographic information and their sexual orientation (in Study 2, $n = 168$), they filled out the SIS/SES and SOI-R questionnaires, and were debriefed and paid €25 for their participation. To facilitate replication of individual findings or the entire studies described here, all Inquisit scripts as well as a video illustration of the procedure employed in Study 1 are available for download from https://osf.io/e6guq/.

Statistical Analyses

We conducted all statistical analyses using SYSTAT 13.00.05 and JASP 0.17.1, using Bayesian analyses in the latter software whenever possible.

Results

Experimental Manipulation Effects on Word Count

As shown in Table 1, across both studies participants wrote more during the experimental manipulation phase than at baseline. For Study 1, a Bayesian repeated-measures analysis of variance (ANOVA) for word count (T1 and T2) that also included the factors condition and PSE sequence and their two-way interactions suggested that the best-fitting model included the Time × Condition effect, although it barely exceeded the anecdotal range of evidence, $BF_M = 4.84$, and was not much better than the second best model, which only included the factor Time, $BF_M = 2.29$. Analysis of individual effects indicated that there was evidence only for the time effect, $BF_{\text{Inclusion}} = 8.94 \times 10^{+6}$, but not for Condition, $BF_{\text{Inclusion}} = 1.91$, or for the Time × Condition interaction, $BF_{\text{Inclusion}} = 0.30$.

Likewise, for Study 2, a Bayesian repeated-measures ANOVA suggested that the best-fitting model included only the Time effect, $BF_M = 10.24$. Individual-effects analysis again indicated that there was evidence only for the time effect, $BF_{\text{Inclusion}} = 6.54$, but not for Condition, $BF_{\text{Inclusion}} = 0.31$, or for the Time × Condition interaction, $BF_{\text{Inclusion}} = 0.53$. We therefore concluded that across both studies there was no compelling effect for differential changes in word count in the experimental conditions and did not control for word count in subsequent analyses.

Experimental Manipulation Effect on the Measure (EM → M)

Across both studies, we devised *n* Sex scores in a principled manner to explore which specific combination of *n* Sex coding categories captures the effect of experimental manipulation of sexual motivation best, but also in such a manner that the mediating effect of affective changes on motive score change is strongest and thus indicate that the resulting score reflects a genuine motivational process. To do so, we created the following scores using the notation of logical AND (overlap between two sets) and OR (total of two sets; see Table S1 in the online supplemental materials for details):

a. A priori: As a benchmark against which we could compare empirically derived scores, we calculated a priori *n* Sex as the sum of all *n* Sex coding categories, excluding negative categories (i.e., negative goal anticipation, negative instrumental activity, block, negative affect; see Hinzmann et al., in press).
b. A priori negative: a benchmark score consisting only of negative *n* Sex categories.
c. EM AND: Only those categories that turned out to be sensitive to experimental manipulation in both studies. We operationalize sensitivity here and below as the combination of (a) a score increasing by more than one percentage point in the positive arousal group relative to the baseline, but (b) not decreasing more than one percentage point in the negative arousal group and (c) the positive-arousal increase being at least two percentage points greater than the percentage increase in the control group (see Table S1 in the online supplemental materials). This combination of criteria served to ensure that a coding category showed specific sensitivity to arousal manipulations, with emphasis on the positive-arousal condition representing the most straightforward type of sexual motivation arousal, while excluding general increases unrelated to arousal. Note that this algorithm did not capitalize on *decreases* in the control condition.
d. EM OR: All categories that were sensitive to experimental manipulation either in Study 1 or in Study 2.
e. Affect: We ranked averaged bipartial *r*s (after *r*-to-*z* transformation and weighting for sample size) from both studies, taken from Table S1 in the online supplemental materials, and selected the top 12, which represented a third of all coding categories.
f. Affect AND EM AND: Overlap between EM AND and Affect.
g. Affect AND EM OR: Overlap between EM OR and Affect—this was identical to Affect and will therefore not be considered further.
h. Affect OR EM AND: Total of EM AND and Affect.
i. Affect OR EM OR: Total of EM OR and Affect.

As Table 1 and Table S2 in the online supplemental materials show the positive arousal manipulation consistently increased *n* Sex scores (except a priori negative scores) from T1 to T2 in both studies, with *d*s varying between 0.35 and 0.46. In contrast, the negative arousal manipulation had a negative effect on *n* Sex score changes (except a priori negative scores) in Study 1, with *d*s varying

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Table 1

Effects of Experimental Manipulation on n *Sex Imagery in Studies 1 (*$n_{positive}$*: 52;* $n_{negative}$*: 52;* $n_{neutral}$*: 50) and 2 (*$n_{positive}$*: 58;* $n_{negative}$*: 54;* $n_{neutral}$*: 59) for Score Composites Defined A Priori, Based on the Overlap (EM AND) of Experimental Manipulation Effects, or Based on the Overlap Between Positive Associations With Affect and Experimental Manipulation Effects (Affect AND EM AND)*

		Study 1						Study 2							
		T1		T2				T1		T2					
Variable	Arousal condition	*M*	*SD*	*M*	*SD*	*d*	*BF*	*M*	*SD*	*M*	*SD*	*d*	*BF*	Meta *d*	EU *BF*
Word count	Positive	334	104	365	122	0.40	6.28_{10}	373	90	377	99	0.07	0.16_{10}	**0.23**	**1.01_{10}**
	Negative	362	102	389	109	0.56	137.35_{10}	391	119	401	123	0.13	0.23_{10}	**0.34**	**31.59_{10}**
	Control	384	97	429	120	0.64	525.19_{10}	374	117	404	133	0.50	78.80_{10}	**0.55**	**$41{,}384.97_{10}$**
	d_{P-C}	−0.45		−0.53				−0.01		−0.23					
	d_{N-C}	−0.22		−0.35				0.14		−0.03					
	$BF_{10\ P-C}$	2.02		4.79				0.20		0.39					
	$BF_{10\ N-C}$	0.36		0.82				0.25		0.20					
	Meta d_{P-C}							**−0.22**		**−0.37**					
	Meta d_{N-C}							**−0.03**		**−0.18**					
	EU $BF_{10\ P-C}$							**0.40**		**1.87**					
	EU $BF_{10\ N-C}$							**0.09**		**0.16**					
A priori	Positive	7.52	4.66	9.59	6.18	0.41	14.40_{+0}	3.67	3.66	6.06	6.44	0.35	7.60_{+0}	**0.37**	**109.44_{+0}**
	Negative	8.31	5.30	7.18	5.06	−0.21	0.06_{+0}	4.25	4.78	5.25	5.24	0.17	0.53_{+0}	**−0.02**	**0.03_{+0}**
	Control	7.20	4.70	6.93	5.87	−0.05	0.12_{+0}	3.70	3.50	3.70	3.46	0.00	0.14_{+0}	**−0.02**	**0.02_{+0}**
	d_{P-C}	−0.07		0.44				−0.01		0.46					
	d_{N-C}	0.22		0.05				0.13		0.35					
	$BF_{+0\ P-C}$	0.28		3.61				0.19		5.87					
	$BF_{+0\ N-C}$	0.62		0.25				0.38		1.81					
	Meta d_{P-C}							**−0.04**		**0.45**					
	Meta d_{N-C}							**0.17**		**0.20**					
	EU $BF_{+0\ P-C}$							**0.05**		**21.19**					
	EU $BF_{+0\ N-C}$							**0.24**		**0.45**					
EM AND	Positive	4.05	2.96	5.72	4.30	0.46	31.96_{+0}	1.86	2.24	3.79	4.95	0.39	15.05_{+0}	**0.42**	**481.00_{+0}**
	Negative	4.46	3.44	3.64	2.77	−0.16	0.06_{+0}	2.16	2.54	2.73	3.39	0.17	0.52_{+0}	**0.01**	**0.03_{+0}**
	Control	4.28	3.36	3.49	3.76	−0.20	0.07_{+0}	2.06	2.18	1.49	1.80	−0.15	0.05_{+0}	**−0.17**	**0.00_{+0}**
	d_{P-C}	−0.07		0.56				−0.09		0.62					
	d_{N-C}	0.05		0.05				−0.04		0.46					
	$BF_{+0\ P-C}$	0.16		13.41				0.14		54.05					
	$BF_{+0\ N-C}$	0.26		0.25				0.24		5.75					
	Meta d_{P-C}							**−0.08**		**0.59**					
	Meta d_{N-C}							**0.00**		**0.26**					
	EU $BF_{+0\ P-C}$							**0.02**		**724.81**					
	EU $BF_{+0\ N-C}$							**0.06**		**1.44**					
Affect AND EM AND	Positive	3.94	2.91	5.49	4.03	0.44	25.32_{+0}	1.75	2.13	3.58	4.90	0.38	13.05_{+0}	**0.40**	**330.43_{+0}**
	Negative	4.25	3.38	3.35	2.63	−0.26	0.06_{+0}	2.03	2.47	2.43	3.21	0.12	0.35_{+0}	**0.05**	**0.02_{+0}**
	Control	4.15	3.31	3.36	3.76	−0.20	0.07_{+0}	1.92	2.08	1.36	1.66	−0.27	0.05_{+0}	**−0.23**	**0.00_{+0}**
	d_{P-C}	−0.07		0.55				−0.08		0.61					
	d_{N-C}	0.03		−0.00				0.05		0.42					
	$BF_{+0\ P-C}$	0.17		11.42				0.15		45.77					
	$BF_{+0\ N-C}$	0.24		0.21				0.25		3.75					
	Meta d_{P-C}							**−0.08**		**0.58**					
	Meta d_{N-C}							**0.04**		**0.21**					
	EU $BF_{+0\ P-C}$							**0.03**		**522.69**					
	EU $BF_{+0\ N-C}$							**0.06**		**0.79**					

Note: Bold values represent meta-analytical estimates. *d*: Cohen's *d*, as assessed with JASP 0.17.1. *Meta d*: Cumming's unbiased *d*, meta-analytically combined via ESCI (Cumming, 2011), using single-group calculation for within-group contrasts and two-group calculations for between-group contrasts. Row BF_{+0}: *arousal condition > neutral condition.* ESCI = exploratory software for confidence intervals; P–C = positive arousal–control contrast; N–C = negative arousal–control contrast; EU *BF* = evidence-updated (replication) Bayes factor (see Ly et al., 2019). Column BF–BF_{+0}: T2 > T1. BF_{10}: T2 ≠ T1.

between −0.26 and −0.10, but a positive effect on *n* Sex score changes in Study 2, with *d*s ranging from 0.12 to 0.19. Participants in the control condition of both studies showed a slight to moderate decrease in *n* Sex scores (except a priori negative scores) from T1 to T2, with *d*s ranging from −0.27 to −0.01.

Table 1 also shows that the a priori benchmark score, which was created before sensitive categories were identified, performed rather well in both studies, with good discrimination of positive sexual arousal both vis-à-vis the baseline (T1) and relative to control participants' postmanipulation scores. It had satisfactory intercoder agreement, as estimated by Shrout and Fleiss's (1979) intraclass correlation coefficient (ICC). In Study 1, ICC (2, *k*) was 0.96, 95% CI [0.95; 0.97] for T1 and 0.97, [0.96; 0.98] for T2. In Study 2, it was 0.97, [0.96; 0.98] for T1 and 0.98, [0.97; 0.98] for T2.

However, many of our additional scores based on sensitivity criteria outperformed the a priori score, and the EM AND score and the Affect AND EM AND score performed best overall within and across studies. Not surprisingly, Affect AND EM AND, which in both studies represents the overlap between sensitivity to experimental manipulation and positive covariation with affective changes, yielded lower mean scores than EM AND, which is based only on across-study manipulation sensitivity. Moreover, the former scores had slightly worse distributional properties than the latter (Study 1: EM $\mathrm{AND_{T1}}$ $M = 4.26$, $SD = 3.24$, skewness = 0.91; Affect AND EM $\mathrm{AND_{T1}}$ $M = 4.11$, $SD = 3.19$, skewness = 0.93; Study 2: EM $\mathrm{AND_{T1}}$ $M = 2.02$, $SD = 2.31$, skewness = 1.46; Affect AND EM $\mathrm{AND_{T1}}$ $M = 1.89$, $SD = 2.22$, skewness = 1.57). We, therefore, decided to conduct all further analyses with the EM AND score due to its better differentiation and distributional properties and refer to it in the following as optimized *n* Sex score because it best captures the effect of experimental manipulations on PSE *n* Sex imagery. This score, too, had satisfactory intercoder agreement. In Study 1, ICC (2, *k*) was 0.95, 95% CI [0.93; 0.96] for T1 and 0.97, [0.96; 0.98] for T2. In Study 2, it was 0.96, 95% CI [0.95; 0.97] for T1 and 0.98, [0.97; 0.99] for T2.

A Bayesian repeated-measures ANOVA for the a priori score that included the factors time, condition, and PSE sequence and their two-way interactions suggested that the best-fitting model included the Time × Condition and Time × PSE Sequence effects both in Study 1, $BF_M = 17.16$, and in Study 2, $BF_M = 14.10$. The analysis of individual effects indicated that in Studies 1 and 2 there was evidence both for the Time × Condition effect, $BF_{\mathrm{Inclusion}} = 11.97$ and 5.03, respectively, and the Time × PSE-Sequence effect, $BF_{\mathrm{Inclusion}} > 1{,}000$ (all other $BF_{\mathrm{Inclusion}} < 3$). For the predicted Time × Condition effect, the evidence-updated (EU) $BF_{\mathrm{Inclusion}}$ was 60.21 (see Ly et al., 2019), suggesting very strong support for the existence of an interaction effect across both studies.

When we repeated this analysis for the EM AND score, the best-fitting model was again one that included the Time × Condition and Time × PSE Sequence effects both in Study 1, $BF_M = 7.65$, and in Study 2, $BF_M = 88.53$. Regarding individual effects, there was strong evidence only for the Time × Condition effect in Study 1, $BF_{\mathrm{Inclusion}} = 51.85$ (all other $BF_{\mathrm{Inclusion}} < 3$) and, in Study 2, evidence for Time × Condition, $BF_{\mathrm{Inclusion}} = 94.59$, and Time × PSE Sequence effects, $BF_{\mathrm{Inclusion}} = 109.79$. For the predicted Time × Condition effect, the EU $BF_{\mathrm{Inclusion}}$ was 4,904.49, suggesting extremely strong support across studies for the interaction.

Across both studies, negative arousal elicited no clear-cut specific and consistent increase in *n* Sex categories that would have allowed us to empirically derive an *n* Sex score capturing imagery reflecting a fear or avoidance motivational state (see Table S1 in the online supplemental materials). Likewise, creating a sexual avoidance motivation score based on a priori assumptions (see negative a priori score in Tables S1 and S2 in the online supplemental materials) did not show specific sensitivity to the negative-arousal manipulation that consistently went beyond the level of anecdotal evidence. We, therefore, did not pursue this aspect of our first hypothesis further.

Experimental Manipulation Effect on the Indicator (EM → I)

Table 2 shows that both positive and negative experimental arousal had consistent positive effects on subjective arousal in both studies. Control participants also increased in their reported arousal, but not to the same extent. Moreover, they had lower postmanipulation arousal compared to participants in the positive arousal condition (both studies) and negative-arousal participants (Study 1). A Bayesian repeated-measures ANOVA for arousal that included the factors Time and Condition and their two-way interaction suggested that the model with the interaction was the best-fitting one in Study 1, $BF_M = 23.91$, and the second-best in Study 1, $BF_M = 1.96$ (the model that included Time only performed best). Evidence for the Time × Condition effect was strong in Study 1, $BF_{\mathrm{Inclusion}} = 26.08$, and equivocal in Study 2, $BF_{\mathrm{Inclusion}} = 1.76$ (EU $BF_{\mathrm{Inclusion}} = 45.90$). For the predicted Time × Condition effect, the EU $BF_{\mathrm{Inclusion}}$ was 45.90, suggesting strong support across studies for the interaction.

Experimental manipulations had no consistent effects on hedonic tone changes across studies (see Table 2). This observation was confirmed by Bayesian repeated-measures ANOVA: the null model performed best in both studies, $BF_M > 4.57$.

In Study 1, experimental arousal conditions elicited corrugator activation increases to a greater extent than the control condition (Table 2). However, results from a Bayesian repeated-measures ANOVA suggested that the model that included only the Time factor represented the data best, $BF_M = 13.15$.

Zygomatic activation decreased in all groups from before to after the movie manipulation, but with no differential effect of experimental condition. Bayesian repeated-measures ANOVA suggested that the model that included only the Time factor represented the data best, $BF_M = 7.81$.

Pupil size changed differentially across conditions, with positive-arousal and control participants both showing a decrease and negative-arousal participants showing an increase. The best-performing model in a Bayesian repeated-measures ANOVA was the one that included the Time × Condition interaction, $BF_M = 2.97 \times 10^{14}$. Evidence for the specific Time × Condition effect was conclusive, $BF_{\mathrm{Inclusion}} = 1.83 \times 10^{14}$.

Indicator Mediates Experimental Manipulation Effect on Measure (EM → I → M)

To test whether experimentally elicited affective changes mediate the effect of experimental manipulation on *n* Sex score changes, we chose subjective arousal as our focal indicator of affect. Arousal was the only affect measure available for both studies that picked up a meaningful and consistent differential effect of experimental conditions.

We first ascertained that changes in felt arousal indeed predicted changes in *n* Sex by running Bayesian regression analyses in which we entered optimized *n* Sex (T1) and arousal at T1 and T2 as predictors. Across both studies, there was strong evidence for arousal at T2 being a unique predictor of optimized *n* Sex at T2 (see Table 3), indicating that arousal increases covaried with *n* Sex increases. In Study 1, bipartial correlations of optimized *n* Sex at T2, controlling for T1, and affect measures at T2, controlling for T1, were .01 for pupil size, .04 for corrugator, .03 for zygomatic, and .11 for hedonic tone. When we dropped participants in the negative-arousal condition from analyses, coefficients (*n*) were 0.22 (52), 0.14 (100), −0.00 (100), and 0.14 (102), respectively; all $ps > .05$. When we repeated this regression for other *n* Sex score variants, the resulting models

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Table 2

Effects of Experimental Manipulation on Subjective (Arousal, Hedonic Tone) and Psychophysiological Measures of Affect (Corrugator, Zygomatic, Pupil Size)

	Study 1						Study 2							
	T1		T2				T1		T2					
Variable	*M*	*SD*	*M*	*SD*	*d*	*BF*	*M*	*SD*	*M*	*SD*	*d*	*BF*	Meta *d*	EU *BF*
Arousal														
Positive	2.31	1.35	4.04	1.97	1.01	$1.14 \times 10^{7}_{+0}$	2.78	1.36	4.26	1.64	0.71	$26{,}634.80_{+0}$	**0.84**	$\mathbf{3.04 \times 10^{11}}_{+0}$
Negative	2.12	1.17	3.62	1.37	0.99	$7.27 \times 10^{6}_{+0}$	2.76	1.18	3.50	1.59	0.51	124.13_{+0}	**0.73**	$\mathbf{9.02 \times 10^{8}}_{+0}$
Control	2.40	1.47	3.04	1.64	0.47	34.56_{+0}	2.74	1.46	3.47	1.61	0.50	118.19_{+0}	**0.48**	$\mathbf{4{,}084.65}_{+0}$
d_{P-C}	−0.07	0.55					0.02	0.49						
d_{N-C}	−0.22	0.38					0.01	0.02						
$BF_{+0\ P-C}$	0.17	11.94					0.22	8.31						
$BF_{+0\ N-C}$	0.11	2.06					0.21	0.22						
Meta d_{P-C}							**−0.02**	**0.51**						
Meta d_{N-C}							**−0.10**	**0.19**						
EU $BF_{+0\ P-C}$							**0.04**	**99.22**						
EU $BF_{+0\ N-C}$							**0.02**	**0.45**						
Hedonic tone														
Positive	4.88	1.11	5.06	1.23	0.19	0.64_{+0}	4.81	1.32	4.76	1.34	−0.04	0.11_{+0}	**0.07**	$\mathbf{0.07}_{+0}$
Negative	5.40	1.05	5.06	1.21	−0.39	0.04_{+0}	4.72	1.38	4.67	1.35	−0.06	0.11_{+0}	**−0.22**	$\mathbf{0.00}_{+0}$
Control	5.24	1.19	5.06	1.28	−0.18	0.07_{+0}	4.86	1.26	4.93	1.23	0.12	0.35_{+0}	**−0.03**	$\mathbf{0.03}_{+0}$
d_{P-C}	−0.31	−0.00					−0.04	−0.13						
d_{N-C}	0.15	−0.00					−0.11	−0.21						
$BF_{+0\ P-C}$	0.09	0.21					0.17	0.12						
$BF_{+0\ N-C}$	0.40	0.21					0.14	0.10						
Meta d_{P-C}							**−0.16**	**−0.07**						
Meta d_{N-C}							**0.01**	**−0.11**						
EU $BF_{+0\ P-C}$							**0.02**	**0.03**						
EU $BF_{+0\ N-C}$							**0.06**	**0.02**						
Corrugator														
Positive	0.00149	0.00087	0.00181	0.00132	0.48	0.04_{-0}								
Negative	0.00148	0.00103	0.00181	0.00127	0.67	41.06_{+0}								
Control	0.00153	0.00085	0.00160	0.00096	0.15	0.19_{10}								
d_{P-C}	−0.05	0.21												
d_{N-C}	−0.06	0.30												
$BF_{-0\ P-C}$	0.21	0.30												
$BF_{+0\ N-C}$	0.17	0.50												
Zygomaticus														
Positive	0.00176	0.00117	0.00150	0.00123	−0.90	1.34_{10}								
Negative	0.00179	0.00106	0.00162	0.00075	−0.83	0.26_{10}								
Control	0.00179	0.00154	0.00160	0.00094	−0.79	0.37_{10}								
d_{P-C}	−0.02	−0.16												
d_{N-C}	0.00	0.17												
$BF_{+0\ P-C}$	0.19	0.15												
$BF_{+0\ N-C}$	0.21	0.21												
Pupil size														
Positive	4.39	0.54	4.08	0.64	−0.96	0.05_{+0}								
Negative	4.40	0.78	4.74	0.85	1.69	$1.58 \times 10^{7}_{+0}$								
Control	4.22	0.53	3.89	0.50	−1.72	$2.77 \times 10^{6}_{10}$								
d_{P-C}	0.31	0.34												
d_{N-C}	0.27	1.21												
$BF_{+0\ P-C}$	0.79	0.88												
$BF_{+0\ N-C}$	0.66	860.75												

Note. Bold values represent meta-analytical estimates. Study 1—for positive arousal negative arousal, and control groups, respectively, *n*s are 52, 52, 50 for arousal and hedonic tone, 52, 52, 48 for corrugator and zygomatic, and 26, 28, 26 for pupil size. Study 2—*n*s are 58, 54, 58 for arousal and hedonic tone. Meta *d*: Cumming's unbiased *d*, meta-analytically combined via ESCI (Cumming, 2011), using single-group calculation for within-group contrasts and two-group calculations for between-group contrasts. Row BF_{+0}: *arousal condition* > *neutral condition.* ESCI = exploratory software for confidence intervals; P–C = positive arousal–control contrast; N–C = negative arousal–control contrast; EU *BF* = evidence-updated (replication) Bayes factor (see Ly et al., 2019). Column *BF*–BF_{+0}: T2 > T1. BF_{-0}: T2 < T1. BF_{10}: T2 ≠ T1.

were inferior relative to the one with the optimized (EM AND) *n* Sex score (see Tables S3–S8 in the online supplemental materials).

In the second step, we conducted mediation analyses with JASP's SEM mediation module and ML estimation of bias-corrected bootstrap confidence intervals with 1,000 replications.

Table 3
Posterior Summary of Coefficients From a Simultaneous Bayesian Regression of Optimized n *Sex at T2 on Subjective Arousal (T1, T2) and Optimized* n *Sex at T1*

	Study 1					Study 2					
			95% credible interval					95% credible interval			
Variable	*B*	*SD*	Lower	Upper	$BF_{\text{Inclusion}}$	*B*	*SD*	Lower	Upper	$BF_{\text{Inclusion}}$	EU $BF_{\text{Inclusion}}$
Constant	4.30	0.27	3.77	4.78	1.00	2.67	0.27	2.17	3.22	1.00	1.00
Arousal T1	−0.26	0.25	−0.77	9.58×10^{-3}	2.36	−0.11	0.18	−0.55	0.13	1.09	2.57
Arousal T2	0.64	0.18	0.32	1.02	212.63	0.64	0.17	0.37	1.02	472.43	1.01×10^5
n Sex T1	0.35	0.08	0.20	0.51	2,423.26	0.34	0.13	0.10	0.64	30.36	73,570.17
			$BF_M = 7.06$, $R^2 = .231$					$BF_M = 3.16$, $R^2 = .152$			

Note. EU $BF_{\text{Inclusion}}$ = evidence-updated (replication) Bayes factor (see Ly et al., 2019).

We specified optimized *n* Sex at T2 as outcome, arousal at T2 as mediator, dummy-coded experimental condition (dummy 1 coding for positive arousal and dummy 2 for negative arousal) as predictor and PSE sequence, arousal (T1) and optimized *n* Sex (T1) as confounders. As shown in Table 4, the effects of positive arousal and, in Study 1, also of negative arousal led to increased *n* Sex scores via increases in subjective arousal. Compared to models using other *n* Sex score compositions (see Tables S9–S15 in the online supplemental materials), this mediation model performed best.

Experimental Manipulation Effect on Behavioral Criterion (EM → C)

Bayesian repeated-measures ANOVAs with key-press task (erotic, nonerotic) as within-subjects measure did not yield evidence for Experimental Manipulation × Measure effects on key presses in either study; rather, in both studies, the null model received the best support ($BF_M > 5.44$), whereas there was evidence against the model containing the interaction term ($BF_M < 0.06$). When we repeated the same analysis for the viewing time measure available only in Study 1, the best-supported model was the one for a main Measure effect, $BF_M = 6.90$; support for the model containing the interaction term was equivocal, $BF_M = 1.39$. Thus, there was no evidence to support a direct effect of the experimental manipulation on the criterion measure.

Mediation Effect of Measure on Behavioral Criterion (EM → M → C)

We first tested whether changes in optimized *n* Sex were associated with key-press task performance by regressing erotic minus nonerotic difference variables for key presses and viewing time on *n* Sex at T1 and T2, using a Bayesian approach. As shown in Table 5, key-press task measures were positively and uniquely predicted by optimized *n* Sex both at T1 and T2, indicating that relative preference for erotic stimuli over other stimuli is associated both with higher dispositional *n* Sex (i.e., T1) and with experimentally manipulated *n* Sex changes (T2).

Next, we ran mediation analyses following the procedure described above, with relative key press performance (erotic minus nonerotic) as outcome, optimized *n* Sex at T2 as mediator, dummy-coded experimental condition as predictor, and *n* Sex (T1) and PSE sequence as confounders. As shown in Table 6, experimental condition had an indirect effect on key-press task performance via *n* Sex at T2. Confidence intervals indicated that the indirect effect excluded zero only for the positive arousal condition in Study 1, but for both the positive and the negative arousal conditions in Study 2.

Convergent and Incremental Validity

To examine the overlap of *n* Sex with other measures, we created dispositional *n* Sex scores, separately for a priori and optimized

Table 4
Mediation Analyses for the Experimental Manipulation → Indicator (Affect T2) → Measure (Optimized n *Sex T2) Path*

	Study 1				Study 2			
		95% CI for *B*				95% CI for *B*		
Contrast Arousal condition	*B*	LL	UL	*SE B*	*B*	LL	UL	*SE B*
	Direct effects of conditions							
Positive	1.88***	0.44	3.24	0.65	2.09***	0.84	3.45	0.63
Negative	−0.17	−1.49	0.92	0.63	1.18	0.30	2.19	0.62
	Indirect effects via subjective arousal							
Positive	0.63*	0.18	1.39	0.25	0.49*	0.17	1.04	0.22
Negative	0.44*	0.12	1.03	0.21	0.02	−0.29	0.37	0.16
	Total effects							
Positive	2.52***	1.09	3.73	0.64	2.58***	1.39	4.14	0.64
Negative	0.27	−0.87	1.37	0.64	1.20	0.28	2.21	0.64

Note. Contrasts represent dummy-coded variables, with positive (negative) arousal = 1 and all others = 0. Background confounders: optimized *n* Sex T1, arousal T1, PSE sequence. Delta method standard errors, bias-corrected percentile bootstrap confidence intervals with 1,000 replications, maximum likelihood estimator.
* $p < .05$. *** $p < .001$.

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Table 5

Posterior Summary of Coefficients from Simultaneous Bayesian Regressions of Key-Press Task Variables (Indicating Relative Preference for Erotic Over Nonerotic Pictures) on Optimized n *Sex (T1 and T2)*

	Study 1					Study 2					
			95% Credible Interval					95% Credible Interval			
Variable	B	SD	Lower	Upper	$BF_{\text{Inclusion}}$	B	SD	Lower	Upper	$BF_{\text{Inclusion}}$	EU $BF_{\text{Inclusion}}$
Key presses											
Constant	−7.68	2.17	−11.88	−3.61	1.00	−0.66	0.39	−1.44	0.14	1.00	1.00
n Sex T1	2.56	0.74	1.19	4.00	174.04	0.54	0.19	0.17	0.93	47.89	8,334.78
n Sex T2	2.42	0.63	1.22	3.61	511.41	0.16	0.13	0.00	0.39	2.90	1,483.09
	$R^2 = .196$, $BF_M = 55.87$					$R^2 = .104$, $BF_M = 5.33$					
Viewing time											
Constant	−0.52	0.30	−1.05	0.10	1.00						
n Sex T1	0.29	0.11	0.00	0.47	36.18						
n Sex T2	0.29	0.09	0.12	0.47	129.44						
	$R^2 = .242$, $BF_M = 258.95$										

Note. EU $BF_{\text{Inclusion}}$ = evidence-updated (replication) Bayes factor (see Ly et al., 2019).

scores, by residualizing T1 raw scores for T1 word count and PSE set and converting residuals to *z* scores. We thus removed effects of narrative fluency and picture set on the scores. As Table 7 shows, resulting *n* Sex scores had positive, small-to-medium-sized correlations with SOI behavior and desire as well as SES, but less so with attitudes toward sex (SOI attitude) and none with scales assessing avoidance (SIS1, SIS2). Unlike questionnaire measures of sexual motivation and behavior, which were frequently associated with gender in both studies, *n* Sex had negligible variance overlap with gender in both samples.

To examine incremental validity of *n* Sex above and beyond self-reported sexual motivation, we regressed key press difference scores (erotic minus nonerotic; both studies) and key-press task viewing time difference scores (Study 1) on optimized *n* Sex, SES, and SOI-R simultaneously, using a Bayesian approach. In all three analyses, the model that included all three predictors performed best, $BF_M > 3.83$. For the key press criterion, higher *n* Sex was robustly and uniquely associated with key pressing for erotic stimuli—Study 1: $B = 1.10$, 95% Credible Interval [0.56; 1.69], $BF_{\text{Inclusion}} = 424.69$ and Study 2: $B = 0.68$, [0.00; 1.40], $BF_{\text{Inclusion}} = 4.78$; EU $BF_{\text{Inclusion}} = 2{,}030.02$. Likewise, higher baseline *n* Sex uniquely predicted longer viewing times for erotic stimuli in Study 1, $B = 9.27$, [5.22; 13.09], $BF_{\text{Inclusion}} = 2{,}211.84$. Findings for AP scores were similar.

Discussion

The objective of our present research was to advance the assessment of sexual motivation, or *n* Sex, via a story-writing method by replicating and extending recent work by Hinzmann et al. (in press). In doing so, we conducted two studies and employed an EMMIC validation framework, aiming to show that (a) *experimental manipulation* of sexual motivation via film clips leads to changes in its *measure* (i.e., *n* Sex), (b) that these changes in *n* Sex are mediated through changes in affect as an *indicator* of motivation (assessed subjectively and, in Study 1 only, also via psychophysiological

Table 6

*Mediation Analyses for the Experimental Manipulation → Measure (*n *Sex T2) → Criterion (Key Presses for Erotic Relative to Nonerotic Pictures) Path*

Contrast	Study 1				Study 2			
		95% CI for B				95% CI for B		
Arousal condition	B	LL	UL	SE B	B	LL	UL	SE B
Direct effects of conditions								
Positive	−0.15	−1.61	1.23	0.73	−2.11*	−4.24	−0.06	0.97
Negative	−1.29	−2.72	0.17	0.70	−1.23	−2.94	0.51	0.95
Indirect effects via *n* Sex (T2)								
Positive	0.61*	0.19	1.37	0.27	0.72*	0.16	1.42	0.34
Negative	0.07	−0.20	0.41	0.16	0.33	0.07	0.87	0.22
Total effects								
Positive	0.46	−0.89	1.83	0.71	−1.39	−3.45	0.42	0.95
Negative	−1.22	−2.70	0.32	0.72	−0.90	−2.57	0.91	0.96

Note. *n* Sex scores represent optimized scores (EM AND). Contrasts represent dummy-coded variables, with positive (negative) arousal = 1 and all others = 0. Background confounders: *n* Sex T1, PSE sequence. Delta method standard errors, bias-corrected percentile bootstrap confidence intervals with 1,000 replications, maximum likelihood estimator.
$^{*}p < .05$.

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Table 7

Correlations Between n *Sex (T1, A Priori and Optimized, Residualized for Word Count and PSE Sequence), Self-Report Measures of Sexual Motivation (SIS/SES; SOI-R Including Subscales), and Gender and Sexual Orientation (Below Diagonal: Study 1, Above Diagonal: Study 2)*

Variable	1	2	3	4	5	6	7	8	9	10	11
1. AP *n* Sex	—	$.88^{+}$	$.26^{+}$	$-.01^{o}$	$-.08^{o}$	.14	.19	$.12^{o}$	.19	$.06^{o}$	$-.02^{o}$
2. AND *n* Sex	$.88^{+}$	—	$.28^{+}$	$.02^{o}$	−.15	.17	.17	.15	$.20^{+}$	$-.02^{o}$	$.02^{o}$
3. SES	$.27^{+}$	$.21^{+}$	—	$.07^{o}$	$-.27^{+}$	$.44^{+}$	$.31^{+}$	$.65^{+}$	$.59^{+}$	$-.27^{+}$	$.05^{o}$
4. SIS1	$.04^{o}$	$.06^{o}$	$-.06^{o}$	—	$.29^{+}$	$.03^{o}$	$.00^{o}$	$-.03^{o}$	$.00^{o}$	$.02^{o}$	.14
5. SIS2	$.05^{o}$	.13	$-.09^{o}$	.20	—	$-.29^{+}$	-0.26^{+}	$-.27^{+}$	$-.35^{+}$	$.10^{o}$	−.16
6. SOI attitude	$.01^{o}$	$-.05^{o}$	$.27^{+}$	$-.06^{o}$	−.20	—	$.50^{+}$	$.49^{+}$	$.87^{+}$	$-.34^{+}$	$-.02^{o}$
7. SOI behavior	$.10^{o}$	$.08^{o}$	.21	.16	$-.21^{+}$	$.43^{+}$	—	$.31^{+}$	$.73^{+}$	−.15	$-.04^{o}$
8. SOI desire	$.23^{+}$	.16	$.55^{+}$	$.06^{o}$	$-.24^{+}$	$.36^{+}$	$.31^{+}$	—	$.76^{+}$	$-.48^{+}$	$-.00^{o}$
9. SOI-R	.14	$.07^{o}$	$.45^{+}$	$.05^{o}$	$-.28^{+}$	$.84^{+}$	$.71^{+}$	$.72^{+}$	—	$-.42^{+}$	$-.03^{o}$
10. Gender	$-.01^{o}$	$.04^{o}$	$-.09^{o}$	$.05^{o}$	$.22^{+}$	−.15	−.18	$-.30^{+}$	$-.27^{+}$	—	$.10^{o}$
11. Orientation	$-.10^{o}$	−.16	$-.02^{o}$	$-.02^{o}$	$-.05^{o}$	$.09^{o}$	$-.05^{o}$	$.11^{o}$	$.07^{o}$	$.28^{+}$	—
M (*SD*) Study 1	0.00 (1.00)	0.00 (1.00)	2.66 (0.51)	2.28 (0.46)	2.96 (0.59)	5.89 (2.49)	2.49 (1.64)	3.86 (1.94)	4.08 (1.55)	0.64 (0.48)	1.43 (0.68)
M (*SD*) Study 2	0.00 (1.00)	0.00 (1.00)	2.52 (0.58)	2.42 (0.50)	2.97 (0.68)	5.64 (2.46)	2.85 (1.77)	3.53 (2.01)	4.01 (1.66)	0.71 (0.46)	1.35 (0.78)

Note. For gender, male was coded 0 and female 1. For Study 1, $N = 154$. For Study 2, $N = 171$ for *n* Sex measures, $N = 168$ for gender and sexual orientation, and $N = 167$ for all other measures. SIS/SES = Sexual Inhibition Scales/Sexual Excitation Scale ; SIO-R = Sociosexual Orientation Inventory Revised.
$^{+}$ $BF_{10} > 3$. ^{o} $BF_{10} < 1/3$, for $r \neq 0$.

measures), and (c) that changes in *n* Sex transmit the effect of experimental sexual arousal on a behavioral *criterion* (i.e., key-pressing for viewing time changes associated with erotic or nonerotic pictures).

Across both studies, we found replicable evidence in support of our first hypothesis that the picture-story measure of *n* Sex is sensitive to experimental arousal of motivation. Compared to participants in the control condition, participants in the positive sexual arousal condition consistently showed increases in *n* Sex above baseline with a medium effect size. This was the case for an *n* Sex score representing coding categories which we had identified a priori; that is, without knowledge of the outcome of our studies. Not surprisingly, it was even more so the case for an *n* Sex score composition that considered only those categories that turned out to be sensitive to positive arousal in both studies (optimized *n* Sex score). This score partially overlapped with the score Hinzmann et al. derived in their previous work, sharing the categories arousal as positive goal anticipation, kissing as instrumental activity, and positive and negative goal attainment. It also featured categories not contained in Hinzmann et al.'s score (e.g., need; positive goal anticipation: expectation) and left out others that were part of this earlier score (e.g., instrumental activity: general, seduction).

We note however, that some of the categories of Hinzmann et al.'s optimized *n* Sex score were sensitive to positive arousal in at least one of our studies (e.g., positive goal anticipation: fantasy; instrumental activity: general, seduction) and vice versa (e.g., positive goal anticipation: expectation). These differences are unlikely to stem from variations in intercoder reliability, which was good to excellent in their research and in ours, or PSE picture sets, which were identical across both sets of studies. They are more likely to be due to different experimental manipulations and samples. Thus, recommendations for a final valid *n* Sex measure may require additional research sorting out which categories are sensitive across most studies, samples, and methodological variations. Like Hinzmann et al. before us, we, therefore, refrain from making such a recommendation at the present stage of research. The optimized score we derived in the present studies provides a good "local" solution, striking an acceptable balance between sensitivity to experimental manipulation and score distribution properties relative to other possible score composition approaches we tried out.

We failed to empirically derive a *n* Sex score that is specifically sensitive to the negative arousal condition. Although the Hinzmann et al. (in press) coding system features categories that we had deemed promising for picking up effects of an avoidance aspect of sexual motivation, none of them was consistently and specifically sensitive to the negative arousal condition across both studies. Likewise, an a priori negative *n* Sex score consisting only of negative categories showed only hints of a negative arousal effect in Study 2, but not in Study 1 (see the online supplemental materials). Further exploratory analyses employing a somewhat relaxed criterion for category selection likewise did not lead to meaningful results.

In terms of affect, the negative arousal condition had strong effects on subjective (arousal, hedonic tone) and objective measures (corrugator, pupil size), compared to the control condition, suggesting that it had an emotional impact. Still, it may be the case that the film clips we presented in the negative-arousal condition were unsuitable for eliciting a fear of the possible negative consequences of sexual activity. They were also more heterogeneous in terms of form and content than the clips used in the positive arousal condition, which were all excerpts from the same film. Alternatively, a concern for avoiding sex was elicited, but failed to register in participants' picture stories, either because relevant telltale imagery was not covered by our coding system or because a preponderance of sexual inhibition over excitation is reflected in an overall *absence* of sexual imagery in fantasy. The latter argument would be consistent with Schultheiss and Köllner's (2021) argument that low scores on a PSE targeting a particular motive indicate an avoidance of the incentive at the core of the motive (see also below). The decrease in *n* Sex, both for a priori and optimized scores we observed in Study 1 in the negative-arousal condition would be consistent with this explanation. However, the slight increase of these scores in Study 2 is not or may suggest that for the second sample, excitatory effects were slightly stronger than inhibitory effects in this condition. To resolve this issue, more research with more specifically tailored arousal of a concern about the negative consequences of sex may be necessary.

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Across both studies, we also found replicable evidence for our second and third hypotheses, namely, that experimental conditions have an effect on affect and that changes in affect mediate the effect of experimental motivational arousal on changes in the *n* Sex measure. Focusing on the optimized *n* Sex score and subjective arousal, the only affect measure that was sensitive to experimental manipulations *and* that had been administered in both studies, we not only found increases in *n* Sex to be consistently associated with increases in how aroused participants felt. We also obtained replicable evidence for an indirect effect of positive arousal (and in Study 1 also of negative arousal) on *n* Sex changes via changes in subjective arousal. Thus, participants who had been exposed to motivational arousal injected more sexual imagery into their stories precisely because they also felt more (sexually) aroused. This finding is important, because it provides direct evidence for the idea that the *n* Sex measure picks up variations in a *motivational* process. Conversely, it cannot be explained solely via other mechanisms, such as verbal priming through the film clips. (This explanation is particularly unlikely because there was virtually no talking going on in the film clips shown in the positive-arousal condition.)

The consistent affect-based mediation effect moreover replicates the one reported by Hinzmann et al. (in press; Study 2) for a subjective arousal measure based on self-assessment manikin ratings and using a priming manipulation with picture stimuli. Like in that earlier research, we failed to observe consistent effects of experimental motivational arousal on a hedonic-tone measure, but saw an increase of corrugator activity in the sexual-arousal conditions. But unlike that earlier research, in Study 1 zygomatic activation decreased across all conditions and pupil size did not increase in the positive-arousal condition—it increased only in the negative-arousal condition.[3] While the experimental effects on corrugator and pupil size support our argument that our arousal manipulation was successful in triggering affective changes associated with motivation, we also note that differences between Hinzmann et al.'s earlier research and our present work may be due to the different modes of arousal and method of measuring affective responses. Hinzmann et al. used static pictures and assessed affective responses to them separately after the arousal manipulation and within a time frame of seconds, whereas we used dynamic film clips >2 min in each case and averaged affective responses across the changing content presented in each clip directly during the experimental manipulation phase. Perhaps for those reasons, psychophysiological indicators of affect are less comparable between their and our study, and subjective judgments may represent a more comparable, integrative measure of affect across different methods of sexual motivation arousal.

We obtained no evidence for our fourth hypothesis, which concerned direct experimental manipulation effects on a behavioral criterion (relative preference for erotic vs. nonerotic stimuli on the key-press task). We explain our lack of support for our hypothesis with the temporal distance between experimental arousal of sexual motivation during the PSE task and the subsequent assessment of key-press task performance, after an interspersed assessment of subjective affect. Strong direct effects of the experimental manipulation on the key-press task may have decayed too much to be statistically detectable by the time this task was administered.

More importantly, however, increases in optimized *n* Sex predicted a stronger preference for erotic relative to nonerotic stimuli on the key-press task, as assessed via key presses (and in Study 1 also via viewing time) across both studies. And consistent with our fifth hypothesis, confidence intervals for the indirect path of experimental manipulation → *n* Sex changes → key-press task performance excluded zero for the positive arousal condition in both studies and for the negative arousal condition in Study 2, too. These findings suggest that the variance portion of optimized *n* Sex that is sensitive to effects of experimentally elicited changes in sexual motivation is also the one that accounts for variations in a behavioral criterion of sexual motivation. This interpretation is consistent with the observation that optimized *n* Sex measured at T1, before the experimental manipulation, also explains unique portions of variance in key-press task performance. After all, it too consists of thematic imagery that is causally valid in the sense of reflecting effects of experimental manipulation of sexual motivation.

Our exploratory analyses regarding *n* Sex's associations with other measured variables revealed the following. First, in Study 2 somewhat more so than in Study 1, baseline optimized *n* Sex showed small-to-medium positive associations with self-report measures of sexual desire, attitudes, and behavior (SES, SOI-R). But only the SES scale showed evidence of consistently converging with optimized *n* Sex by Bayesian standards. However, self-report measures of sexual motivation consistently captured well-known sex differences, with women reporting less sexual desire and behavior than men. In contrast, optimized *n* Sex did not in either study. We interpret this as an indication that *n* Sex as a more procedural, contextualized measure of sexual motivation (Schultheiss, 2007; Schultheiss & Schultheiss, 2014) may be less fraught with self-presentational issues than direct self-report is. Second, despite its slight, but consistent variance overlap with self-report measures of sexual motivation and behavior (SES, SOI-R), it remained in both studies a unique incremental predictor of key-press task performance after holding variations on these measures' scores constant. Third, *n* Sex had no systematic associations across studies with self-report measures of sexual inhibition (SIS1, SIS2). Given the low internal reliability of these measures, however, this finding should not be interpreted as conclusive evidence for the idea that *n* Sex is not affected by inhibitory tendencies within individuals' sexual motivation system. For one, self-report may not be a particularly valid approach toward assessing sexual inhibitions (e.g., Wiederman, 2002), particularly if they operate automatically (Toates, 2009). Another reason is that we suspect optimized *n* Sex—in conjunction with PSE pictures that suggest sexual themes—to already represent a sensitive measure of the balance between sexual excitation and inhibition. According to this logic, individuals high in *n* Sex are those with more excitation than inhibition and who therefore readily respond to such situational cues with sexual imagery. Conversely, individuals low in *n* Sex are those who avoid writing about sexual themes, despite the thematic opportunity provided by the pictures. Participants' responses to the picture *(Un)dressing*, which shows a man standing behind a woman, with this hand touching the zipper of her dress, may illustrate this point. Many participants view this picture as one in which the pair undresses and engages in foreplay or sexual activity, leading to high *n* Sex scores in their stories. Others, however, state

[3] Although our findings for pupil size resemble effects Hinzmann et al. (in press) obtained with luminance-equated picture stimuli, we caution that the strong effects we obtained for pupil size in the present studies may be due, in part, to luminance differences between the film clips used in the different conditions.

that the man has helped the woman to get dressed and both are heading out for a concert or dinner. As a result, no *n* Sex imagery can be scored in such stories. While other interpretations may also be valid, it is difficult not to see an element of thematic avoidance of the sexual cues inherent in the picture in the latter stories.

Limitations and Future Directions

Key findings from hypothesis tests, such as the sensitivity of *n* Sex scores to experimental manipulation as well as mediation effects for affect as an indicator of motivation and behavioral preference for erotic pictures as a criterion, replicated with remarkable similarity in effect sizes and frequently received strong support from Bayesian tests. Nevertheless, we also note some shortcomings of our present research. One weakness is its one-item, bipolar measurement of subjective affect. Nevertheless, findings closely resemble those of Hinzmann et al.'s Study 2, which were obtained with multiple measurements of subjective affective responses to priming stimuli.

Another weakness is the between-study difference in the motivational pull of the picture sets. The picture set we used in Study 1 elicited overall higher amounts of sexual imagery than the one we used in Study 2. Hinzmann et al., using the same picture sets in their studies 2 and 1, respectively, reported similar differences, which points to systematic variations of picture sets for the elicitation of motivational imagery (for picture cue effects observed in the context of other motive measures, see, for instance, Schönbrodt et al., 2021). We see this as the main explanation for the considerably lower *n* Sex scores and slightly lower effect sizes for experimental manipulation effects on *n* Sex scores observed in our Study 2 relative to Study 1. We do think that it is a methodological virtue to systematically vary picture sets across experimental arousal methods (priming in Hinzmann et al.; film clips in the present study; audio stories in a forthcoming paper) to be able to gauge the independent contributions of these design factors to the validity of the measure. However, it will be important to examine, at the conclusion of this series of studies, which picture cues are most sensitive to experimental arousal effects and should therefore be used in future research.

A third shortcoming of the present research is the shift from a more controlled laboratory experiment in Study 1 to a less controlled online experiment in Study 2 due to the COVID pandemic. This shift also forced us to sacrifice psychophysiological measurements originally planned for this latter study and did not allow us to properly assess viewing time for the key-press task. This may have contributed to the slightly weaker findings from Study 2, despite overall slightly better statistical power, compared to Study 1. At the same time, our findings from Study 2 represent a proof of principle: Validation research for a PSE-based motive measure can be done online, too, with the high degree of standardization that the programming of experimental procedures affords.

A fourth shortcoming is the choice of our indicator measures. Although affect in general, assessed either subjectively or objectively, is a meaningful marker of motivational processes, a more specific objective marker of *sexual* motivation would have been genital responses. But this would require the assessment of penile tumescence and vaginal blood flow via relatively intrusive measures and thereby restrict the pool of individuals willing to participate in such a study. We, therefore, stuck to the affect measurement approach established by Hinzmann et al. (in press), a decision that is justifiable with the convergence of genital and subjective arousal measures (e.g., Chivers et al., 2010). We suggest, however, that future validation work for the *n* Sex measure should investigate its relation to genital arousal as a more specific indicator within the EMMIC validation framework.

A final shortcoming is the restricted ecological validity of laboratory tests of sexual motivation and related behaviors. As a critical next step, we, therefore, aim to test if the *n* Sex measure predicts people's actual sexual behavior in everyday life.

Conclusion

Our present research replicated and extended earlier work by Hinzmann et al. (submitted), providing replicable evidence across two studies that a picture-story measure of *n* Sex is sensitive to experimental manipulations of sexual motivation. It demonstrated that experimentally elicited changes in *n* Sex are mediated by affect as an indicator of motivation and in turn mediate the effect of arousal on a behavioral criterion measure. We also used this study to explore which combination of *n* Sex coding categories is particularly suitable as a causally valid measure of sexual motivation. We were unable to find thematic content in stories that specifically and consistently picks up experimentally elicited sexual inhibition. However, although *n* Sex shows slight overlap with some self-report measures of sexual desire and behavior, it predicted behavior above and beyond those measures and was not susceptible to the gender bias associated with self-report. These validity characteristics of *n* Sex make it a promising measure for future research on sexual motivation.

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