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Computer-generated rough sex: An empirical study about the interest in human and artificial sexually explicit media displaying rough and gentle sexual behaviors

Computergenerierter harter Sex: Empirische Untersuchung des Interesses an menschlichen und digitalen expliziten Medien, die grobes und sanftes Sexualverhalten abbilden

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Abstract: Computer-generated sexually explicit media is on the rise. While previous studies suggest that human sexualized stimuli are preferred compared to artificial ones, these studies did not consider the depicted sexual behavior as an influential factor. This, however, could be crucial because when individuals consume rough sexualized behavior, some tend to detach the humanity of the performers anyhow, raising the question about the significance of humanity within such sexualized entertainment media. To determine whether the explicitly stated interest in artificial and human sexualized stimuli depends on the displayed sexual behavior, a within-subject online experiment was conducted in the summer of 2022 with 274 heterosexual participants (152 men, 122 women). Further analyses with N = 68 individuals identifying as homosexual (N = 39 male and N = 29 female) are included. A key finding from the research indicates that heterosexual individuals show a preference for computer-generated rough SEM compared to depictions involving humans. This study provides preliminary evidence suggesting that the portrayal of sexual behavior is pivotal in the acceptance of artificial sexual stimuli. It also delves into the potential of these materials as an extension for sexual satisfaction, yet it raises new questions that warrant further exploration.

Keywords: Digitized sexuality, computer-generated pornography, displayed sexual behavior, rough sex, anthropomorphization, objectification

Zusammenfassung: Sexuell explizite Medien werden immer häufiger am Computer generiert, anstatt tatsächlich stattgefundene Szenen fotografisch oder videografisch festzuhalten. Während frühere Studien darauf hinweisen, dass menschliche sexualisierte Reize künstlichen gegenüber bevorzugt werden, berücksichtigen diese Untersuchungen nicht das dargestellte Sexualverhalten als einen einflussreichen Faktor. Dies könnte jedoch entscheidend sein, da einige Individuen beim Konsum von grobem sexualisiertem Verhalten dazu neigen, die Menschlichkeit der Darsteller zu entkoppeln, was die Frage nach der Bedeutung der Menschlichkeit in solchen sexualisierten Unterhaltungsmedien aufwirft. Um festzustellen, ob das explizit geäußerte Interesse an künstlichen und menschlichen sexualisierten

Reizen vom dargestellten Sexualverhalten abhängt, wurde ein Within-Subject-Online-Experiment im Sommer 2022 mit 274 heterosexuellen Teilnehmern (152 Männer, 122 Frauen) durchgeführt. Zusätzlich wurden Analysen mit 68 Personen einbezogen, die sich als homosexuell identifizieren (39 Männer und 29 Frauen). Ein zentrales Ergebnis der Forschung zeigt, dass heterosexuelle Personen eine Präferenz für computer-generierte grobe sexuell explizite Medien gegenüber Darstellungen mit Menschen aufweisen. Diese Studie liefert erste Hinweise darauf, dass die Darstellung des Sexualverhaltens eine entscheidende Rolle bei der Akzeptanz künstlicher sexueller Reize spielt. Die Studie thematisiert das Potenzial dieser Materialien als Erweiterung der sexuellen Zufriedenheit, wirft jedoch neue Fragen zur zukünftigen Rolle der in sexuell expliziten Materialien dargestellten Menschen auf.

Schlagworte: Digitalisierte Sexualität, computer-generierte Pornografie, dargestelltes Sexualverhalten, grober Sex, Anthropomorphisierung, Objektifizierung

1. Introduction

Digitization has revolutionized the landscape of sexually explicit media (SEM) consumption, providing easy access to images and videos that can be consumed anonymously at a relatively low cost (Cooper, 1998; Döring, 2009). This however does not only affect the access to SEM, but also the content creation, which now enables the production of computer-generated sexual content in a wide range of genres and variations.

With the advent of new technological capabilities, it is crucial to examine the impact of computer-generated materials used for sexual gratification. Unlike human-depicting materials, computer-generated stimuli are not constrained by real-world conditions, allowing the depiction of more intense practices (Saunders, 2019). Initial qualitative studies suggest that this may be a specific advantage, as no individuals are harmed while allowing for the consumption of material that depicts rough sex practices (Forster & Shaughnessy, 2024). It is crucial to investigate how this development impacts the landscape of SEM. Specifically, it raises the question: are these computer-generated materials considered appropriate sexual stimuli?

Existing studies have on one hand explored human responses to artificial sexual stimuli and on the other, reactions to depicted sexual behaviors in SEM. However, it remains unclear whether the preference for human versus artificial materials is influenced by the specific sexual behaviors shown, as proposed by the Sexual Interaction Illusion Model by Szczuka et al. (2019). This potential interaction effect could offer new insights into the discourse on computer-generated sexual content and underscore a possible benefit of these technologies by enabling the creation of scenes that would otherwise cause harm during production. Previous studies have shown a preference for human stimuli over sexualized artificial stimuli, a tendency attributed to the comfort of familiarity and adherence to social norms (Banks & van Ouytsel, 2020; Szczuka, 2022; Szczuka & Krämer, 2017). However, the SIIM by Szczuka et al. (2019) suggests that demonstrated sexual behavior can significantly influence the acceptance of artificial beings as sexual stimuli. Yet, as demonstrated, sexual behavior has not been systematically varied in previous research, this study aims to help fill this research gap by examining the

reception of SEM portraying rough and gentle interactions, both with human and computer-generated personas.

With regard to rough SEM, research shows that exposure to SEM portraying human actors in rough or harmful content can lead to dehumanization of the characters portrayed, as viewers tend to separate the physical pain from the actors involved in order to reduce the potential cognitive dissonance (Antevska & Gavey, 2015; Parvez, 2006; Taylor, 2022).

Consequently, consumers frequently dissociate humanity from the performers and instead contemplate real-world repercussions, such as adverse working conditions, physical discomfort, or psychological distress experienced by the actors (Döring, 2023; Grudzen et al., 2009; Jarke, 2022) only after consumption, if at all. With advancements in technology, creators can now design computer-generated characters to engage in actions such as hair pulling, choking, or spanking—unconstrained by the physical and ethical limitations that apply to human actors (Döring, 2023; Mosher, 1988; Rubin, 1998, 2006; Simon & Gagnon, 2003). As a result, computer-generated SEM often features more extreme sexual behaviors than those typically seen in real-life SEM (Forster & Shaughnessy, 2024; Saunders, 2019). In conjunction with the trend and interest in rough practices evident both within media representations and private domains (Döring & Poeschl, 2019; Holvoet et al., 2017), this raises the question of how rough sex is received in SEM when portrayed by computer-generated characters as opposed to real actors and whether perceived humanity is a crucial aspect of the acceptability of this SEM.

This empirical study, therefore, examines the influence of displayed sexual behavior (gentle vs. rough) as a crucial variable influencing people's interest in human versus computer-generated SEM. It sheds light on the role of human emotions and sensations in the explicitly indicated interest SEM and explores the potential social acceptability of computer-generated sexual stimuli within environments traditionally reliant on human-to-human stimulation.

1.1 Displayed sexual behavior: Gentle vs. rough SEM

SEM encompasses a broad spectrum of sexual behaviors ranging from gentle to rough content and, according to Mosher (1988), has a crucial role in sexual exploration as well as shaping individual sexual scripts (Simon & Gagnon, 2003).

Gentle sexual content, characterized by painless representations of individuals (human and artificial), includes dyadic, free, relational sexual activity referred to as "*vanilla sex*" (Rubin, 1998), which is motivated by relationships and emotional affection. While situational factors can render "*vanilla*" sexual practices nonconsensual (e.g., recording without consent), thus involving elements of sexual violence, these practices generally reflect gentle sexual behaviors. In contrast, rough sexual content exhibits "aggressive consensual sex, [which] includes activities such as throwing a person onto the bed, ripping off clothes, pulling hair, spanking or choking" (Döring, 2023, p. 102). Although these sexual practices can be practiced with consent, rough sex practices can entail specific and increased risks of both a psychological and physical nature, such as temporary or permanent nerve damage due to incorrectly applied restraints (Döring, 2023; Herbenick et al., 2021; Her-

benick et al., 2023; Herbenick et al., 2024). However, as such rough sexual behavior has gained visibility and acceptance in media and pop culture (e.g., through mainstream depictions such as "Fifty Shades of Grey"; Taylor-Johnson, 2015), recent research shows that rough sex practices become statistically more common (e.g., Döring, 2023; Herbenick et al., 2021; Herbenick et al., 2023; Holvoet et al., 2017).

Despite the increasing interest in rough sexual practices, there is a prevalence of the gentle sexual form. This is also reflected in an analysis of motivations to have sex, as the expression of attachment and emotional affection, which is associated with more gentle practices, is among the strongest motivations to engage in intercourse (Meston & Buss, 2007). More importantly, there are consistent findings that suggest a general preference for SEM, which depicts sexual practices related to what can be considered "*vanilla sex*" (Hald & Štulhofer, 2016; Sharkey et al., 2022). McKee (2006) analyzed consumers' reactions to pornography and highlighted that perceived enjoyment is a significant factor in the consumption of particular pornographic content which in turn is more strongly associated with less extreme practices. This observation leads to the proposition of the following hypothesis:

> *H1:* The interest in both human and computer-generated SEM displaying gentle sexual behavior will be higher than for images of rough sexual behavior.

1.2 Ontological class: Humans versus artificial stimuli

Initial empirical studies comparing human and artificial stimuli in the domain of sexuality have shown a preference for humans or a recognition of artificial shortcomings (e.g., Banks & van Ouytsel, 2020; Dubé, Williams, et al., 2022; Szczuka & Krämer, 2017), leading Szczuka (2022) to question whether humans act as the "gold standard of sexuality". Reasoning could involve not only familiarity with the human species but also authentic human qualities rooted in cautiousness, such as genuine romantic interest in others or motivation for personal growth within relationships. However, as these are all aspects that are particularly important in long-term interactions, they may not be as important in situations of sexual gratification (Szczuka & Dehnert, 2024; Szczuka et al., 2019). The SIIM, one of the few theoretically derived models in the realm of digitalized sexuality, advocates the acceptance of artificially generated sexualized stimuli when an interplay of displayed sexual behaviors and sexual and social norms evokes sexual arousal.

Nevertheless, especially introspective, more reflective or cautious processes triggered by the observation of artificial SEM yield not only increased acceptance but also potentially adverse effects on the assessment of such stimuli. Thus, for example, in a study comparing explicit and implicit responses to sexualized humans and robots (so ultimately also artificial sexualized stimuli) using either an affective priming paradigm or explicit ratings, Szczuka and Krämer (2017) empirically demonstrated that while implicitly there was no difference in attractiveness ratings, explicit ratings revealed significant higher attractiveness evaluations for humans. This suggests that disparities in explicit and implicit attractiveness assessments

were predominantly elicited by reflective deliberations. Possible reasons, in addition to those already mentioned, such as familiarity through a shared species, could be that sexualized interactions with non-human subjects (e.g., sexualized robots, chatbots, or voice agents) are often stigmatized in the media (Döring & Poeschl, 2019) and are discussed as a "last resort" for humans (Turkle, 2011). Based on these findings, the following hypothesis was formulated:

> *H2:* The interest in SEM showing humans is higher compared to SEM depicting computer-generated sexualized scenes.

1.3 Interaction between ontological class and displayed sexual behavior

Given the various theoretical explanations and empirical research findings leading to hypotheses regarding displayed sexual behavior (H1) and ontological class (H2), the inquiry into a potential interaction effect becomes pertinent. Research indicates that specific elements of pornography, especially those depicting rough sexual behavior, may be suppressed, detached, or shielded during reception (Antevska & Gavey, 2015; Taylor, 2022). For instance, Antevska and Gavey (2015) conducted interviews with heterosexual men and observed a tendency among recipients to detach from the humanity of performers, particularly when consuming SEM portraying extreme sexual practices. Following the work of Kimmel (2005), the authors concluded that "Detachment appeared to characterize the kind of engagement that most of our participants had with pornography, including the kinds that depicted sexual violence" (Antevska & Gavey, 2015, p. 623). The act of avoiding connection with the people behind the performers in order to protect oneself from negative emotions or sensations can therefore be seen as a post-consumption strategy aimed at mitigating cognitive dissonance (Antevska & Gavey, 2015; Parvez, 2006; Taylor, 2022). Although rough sexual practices are typically consensual and rarely result in physical harm, the intense physical experiences endured by actors and actresses when repeatedly filming such scenes can push them to their limits (Grudzen et al., 2009; Jarke, 2022; Parvez, 2006). Computer-generated content presents a notable advantage in this regard, as it allows for the visualization of extreme practices without subjecting real bodies to strain or risk. Consequently, it is worth investigating the extent to which computer animation may serve as a viable alternative or supplement to material that could potentially harm actors, especially since violent sexual practices turn recipients away from the humanity of the performers (Antevska & Gavey, 2015; Parvez, 2006).

The significance of exhibited sexual behavior as a critical factor in the acceptance of artificial stimuli is also emphasized in the SIIM (Szczuka et al., 2019). This theoretical framework conceptualizes the positive and negative influences on individuals' willingness to engage intimately with artificial entities. The authors specifically address the role of intense sexual practices, such as aggressive sexual behavior, which may appeal to some individuals due to internalized sexual scripts shaped by exposure to pornographic and sexualized content (Simon & Gagnon, 2003). This interest in intense sexual practices could extend to interactions with artificial counterparts. The authors suggest an interaction effect, proposing that such beha-

viors might be more readily accepted when displayed by non-human entities. However, it needs to be underlined that, until now, no empirical research has investigated this form of interaction between ontological class and displayed sexual behavior. Given the uncertainty about the extent to which the ontological class of the stimulus (human vs. computer-generated persona) interacts with the displayed sexual behavior (gentle vs. rough) in terms of interest in SEM, the following research question arises:

> *RQ1:* Will the interest in sexualized material of the ontological class (human vs. computer-generated persona) interact with the displayed sexual behavior (gentle vs. rough)?

1.4 Influential factors: Age, gender, and sexual orientation

To better understand how interest in SEM varies based on the ontological class and depicted behavior, it is important to carefully consider various individual characteristics that may influence consumers' perceptions and preferences. In this context, age, gender, and sexual orientation emerge as crucial elements deserving attention. The control for participants' *age* is based on findings that indicate that the consumption of SEM decreases with age (Ballester-Arnal et al., 2023; Price et al., 2016). *Gender* relevance arises as women perceive potential misconduct in the production of SEM (Grudzen et al., 2009; Parvez, 2006), while some men adopt a strategy to dehumanize performers, especially in rough scenes (Antevska & Gavey, 2015; Taylor, 2022). A meta-analysis suggests that *sexual orientation* may also impact the evaluation of depicted sexual behavior, given an association between non-heterosexuality and engagement in BDSM-related sexual practices (Brown et al., 2020). With regard to sexual orientation, the primary hypotheses and subsequent analysis were centered around heterosexual individuals, reflecting the literature's emphasis on this demographic. However, recognizing the importance of also exploring questions relevant to individuals identifying as more strongly or exclusively homosexual, we made the decision to collect data without imposing any restrictions based on sexuality. Subsequently, we conducted a separate analysis to address this sample.

2. Method

To gain first insights into the explicit interest in computer-generated and human sexualized gentle and rough images, an online survey was conducted in the DACH region (Germany, Switzerland, Austria). The study, approved by the ethics committee of the University of Duisburg-Essen, has its preregistration, data, code, and stimuli available on the Open Science Framework (https://osf.io/k76yj).

2.1 Participants

To observe whether the interest in pornographic images of a specific ontological class (human vs. computer-generated persona) is affected by the sexual behavior depicted (gentle vs. rough), the sample size was planned to find an effect (mid-small) of $f = 0.20$. Cohen (1988) recommends using a baseline effect size of $f = 0.20$ when prior studies do not provide effect sizes. This approach balances caution with reasonable expectations, especially in exploratory research or novel areas where specific effect sizes have not yet been established. With a power of $1\text{-}\beta = .95$ and an alpha level of $\alpha = .05$, a total of 202 subjects were needed. In total, 370 individuals over the age of 18 years could be recruited via the crowdsourcing platform Prolific in the summer of 2022. This large number is reasoned in the fact that both, heterosexual and homosexual individuals were aimed to be recruited. Due to failure in attention checks, too fast processing, and non-fit of the presented website (e.g., website for homosexual males but gender female), 28 participants were excluded. Of the remaining $N = 342$ participants, 68 identified as not exclusively homosexual. These participants were analyzed separately in an exploratory analysis in Chapter 3.4 due to the otherwise imbalanced group sample sizes. This left a sample of 274 datasets from individuals identifying as heterosexual, which were analyzed in Chapters 3.1, 3.2, and 3.3.

Overall, the remaining sample of heterosexual individuals included in the main analysis consisted of 152 men and 122 women (total $N = 274$). The age ranged from 18 to 72 years ($M = 34.21$, $SD = 11.31$).

The sample of the homosexual participants ($N = 68$) was composed of $n = 39$ men and $n = 29$ women aged 19 to 49 years ($M = 28.10$, $SD = 7.22$).

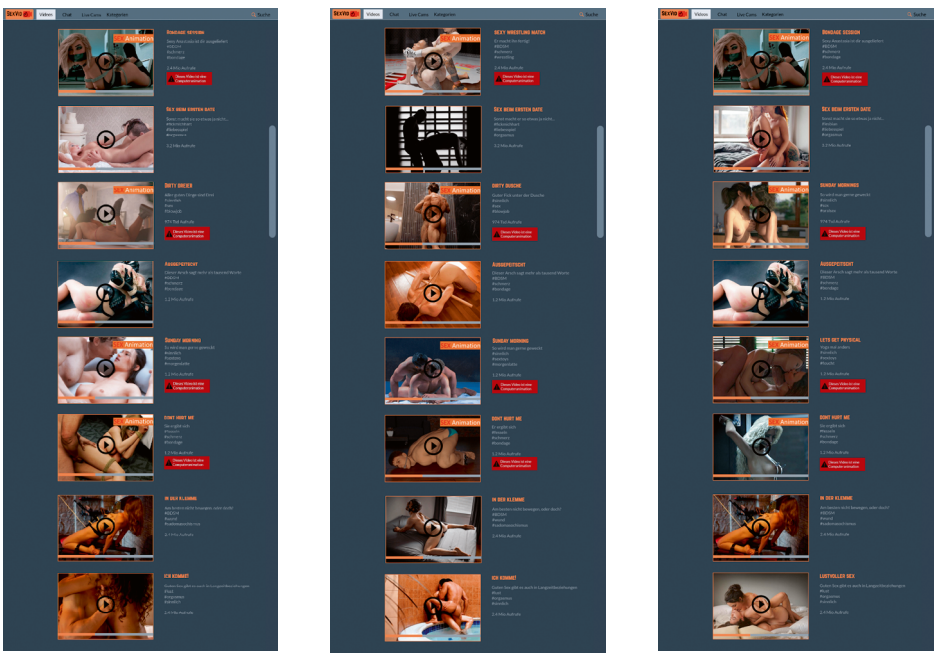
2.2 Procedure

After an initial briefing and obtaining informed consent, participants provided their gender and age before completing standardized questionnaires (see measures part for details).

The second part of the study began with a mockup of a pornographic website designed especially for the study, depicting eight pornographic thumbnails with human or artificial personas. This was intended to set the frame that human and artificial pornographic content could actually be seen on one website. Moreover, it helped to ensure that human and computer-generated content was perceived as an equal offer, rather than artificial pornography being initially assumed as a fetish. Given the 2 (human vs. computer-generated persona) x 2 (rough vs. gentle) within-subject design of the study, the images on the website differed with respect to two factors. First, the ontological class of actors (computer-generated persona vs. human), and second, the images in terms of displayed sexual behavior (rough vs. gentle). Accordingly, all participants saw a) four images depicting rough sexual scenes, two of them with humans and two with computer-generated personas, and b) four images depicting gentle sexual behavior, whereby two also showed humans and two computer-generated personas. Due to the fact that the selected computer-generated images had a high level of realism, they were provided with a note ("This

video is a computer animation") to ensure that they were perceived as computer animation. The computer-generated and human stimuli matched the characteristics of the displayed sexual behavior in that gentle images only include representations of persons not exposed to painful sensory expressions, which could be classified as vanilla sex, and contrary rough images with representations of rough and painful sexual activities (Rubin, 1998, 2006). Furthermore, participants viewed content tailored to their sexual orientation while maintaining consistency in image characteristics. Accordingly, a total of three website versions were aimed at either heterosexual/bisexual people (male and female actors), homosexual men (male actors only), or homosexual women (female actors only). The website (Figure 1) was displayed for at least 15 seconds.

Figure 1. Pornographic website: Female-male, male, female (from left to right)



Finally, the participants indicated their interest in sexualized images by individually scoring the rough and gentle stimuli (both human and computer-generated persona) presented on the website in quasi-randomized order.

All the pictures included were carefully selected based on an extensive search of various online platforms where artists upload photos and computer-generated images. We used keyword searches such as "loving couple sex" for the gentle condition and "rough" or "painful" for the rough condition to identify suitable images. In the next step, we contacted the artists to explain our research and requested permission to use and publish the images for scientific purposes. Consequently, the resulting website accurately represents what can be found on the internet, thus

ensuring high external validity. Following the definition of the terms *gentle* and *rough* in this study, the main difference between the two concepts is best reduced to whether or not the sexual behavior depicted involves painful acts. In this context, participants indicated whether they thought the video contained painful content (from 1 = "strongly disagree" to 5 = "strongly agree"). The painfulness measure served as a manipulation check and a *t*-test revealed that rough (M = 4.04, SD = 0.80) and gentle content (M = 1.48, SD = 0.55) differ significantly in estimated painfulness, $t(343) = 46.16$, $p < .001$, $d = 3.73$. Finally, the participants received a debriefing and their compensation.

2.3 Measures

In the following section, used measures will be explained in more detail.

2.3.1 Socio-demographics

The included socio-demographic variables were age, gender (male, female, or diverse), and sexual orientation (primarily homosexual, primarily heterosexual, primarily bisexual, others, later separated into two subsamples: exclusively heterosexual and rest). The sexual orientation was measured in reference to the Kinsey scale (Kinsey et al., 1948), but via three primary options in order to automatically select a corresponding stimulus category for the presented website (heterosexual: male-female, homosexual: male only, homosexual: female only).

2.3.2 Interest in sexualized images

Participants expressed their *interest* in computer-generated and human representations of rough and gentle sexual behavior by consciously evaluating each stimulus. They answered four questions regarding their willingness to watch ("Would you like to watch this video?"), potential arousal ("Would this video arouse you?"), as well as rated their habitual consumption of similar sexualized media ("Do you usually watch similar sexualized media?" and "Would you watch a similar video on a porn platform?"). The questions were asked to be rated on a 5-point Likert Scale ranging from "Not at all" to "Very much". Since a reliability analysis revealed good internal consistency ($\alpha_{\text{Computer-generated rough}} = .95$, $\alpha_{\text{Computer-generated gentle}} = .96$, $\alpha_{\text{Human rough}} = .96$, $\alpha_{\text{Human gentle}} = .95$), the items contributed to a reliable dependent scale of participants' interest in rough and gentle human and computer-generated sexualized stimuli (see Table 1 for descriptive statistics). Please note that this index represents the interest in such a video. It is composed of several factors that contribute to understanding whether this type of content is appealing, including the potential to be aroused, the willingness to watch, and the interest in similar content. This measure is deliberately designed to capture interest or an evaluated tendency, as the current study aims to investigate how consumers explicitly evaluate different categories of SEM that depict rough and gentle sexual behaviors with either humans or non-humans.

Table 1. Interest in explicit sexual images: Means and standard derivations

		CG-Persona				Human			
			Rough		Gentle		Rough		Gentle	
		n	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Total		342	2.29	1.04	3.15	1.09	1.84	0.98	3.43	0.99
Gender	Male (Heterosexual)	191	2.58	1.02	3.50	0.94	2.06	1.01	3.62	0.82
	Female (Heterosexual)	151	1.91	0.95	2.72	1.12	1.56	0.86	3.18	1.12
Sexual Orientation	Hetero	274	2.30	1.05	3.14	1.11	1.80	0.94	3.37	0.99
	Homo	68	2.26	1.00	3.20	1.05	2.00	1.12	3.67	0.96

Notes. CG = computer-generated. Range: 1 = "disagree strongly" to 5 = "agree strongly".

3. Results

The hypotheses and research question were assessed using different mixed ANCOVAs with the participants' mean interest ratings in SEM as a dependent variable and age as a covariate. H1 was explored via a 2x2 mixed ANCOVA, with ontological class (computer-generated vs. human) as the within-subject factor and gender (male vs. female) as the between-subject factor. H2 was similarly examined using a 2x2 mixed ANCOVA, this time with displayed sexual behavior (rough vs. gentle) as the within-subject factor and gender as the between-subject factor. For RQ1, a 4x2 mixed ANCOVA was conducted with the interaction of ontological class and displayed sexual behavior (comprising four conditions: computer-generated-rough, human-rough, computer-generated-gentle, human-gentle) as the within-subject factor and gender as the between-subject factors.

Please note: Although the study was initially designed as a 2x2 between-subjects design, each image simultaneously represented both factors: displayed sexual behavior and ontological class (human or non-human). This overlap resulted in a confounding of the independent variables, complicating the statistical analysis.

To address this issue, separate ANCOVAs were conducted to analyze the effects of the two factors independently. By separating the analyses, we avoided distortions in the results due to the interaction between the factors, allowing for a more precise examination of each factor's impact on the data.

3.1 Results for hypothesis 1

Initially, the intention was to evaluate Hypothesis H1 using a 2x2 mixed ANCOVA, with an aim to understand the difference in interest between gentle and rough sexual materials across genders while controlling for age. However, upon assessing the assumptions necessary for conducting a mixed ANCOVA, it was found that

the data did not meet the criteria for homogeneity of variances, and the Box's Test indicated inequality in covariance matrices. Despite these violations, it was observed that age and gender did not significantly influence the interest levels in the preliminary ANCOVA results. Therefore, it was deemed justifiable to proceed with a paired-samples t-test, omitting age and gender from the analysis due to their lack of impact.

The paired-samples t-test indicated a significant difference in preference for SEM portraying gentle versus rough sexual behavior, $t(273) = 19.22$, $p < .001$, d = 1.16. Participants demonstrated a higher interest in gentle ($M = 3.25$, $SD = 0.97$) compared to rough ($M = 2.05$, $SD = 0.90$) sexualized scenes (human and computer-generated persona aggregated). Thus, the results confirm H1, suggesting that gentle sexualized material elicits more interest than rough material among the participants.

3.2 Results for hypothesis 2

Upon evaluating H2 with a mixed ANCOVA, all prerequisites were met. The main effect of ontological class was non-significant, $F(1, 271) = .55$, $p = .458$, $\eta^2_p = .002$, and similarly, no significant effect was found for the covariate age, $F(1, 271) = .10$, $p = .756$, $\eta^2_p = .000$. Consequently, the hypothesis that participants are more interested in human sexualized images than in computer-generated sexualized images (gentle and rough aggregated) must be rejected.

However, there was a statistically significant interaction between ontological class and participants' gender, $F(1, 271) = 10.63$, $p = .001$, partial $\eta^2_p = .038$. To further investigate this statistically significant interaction, separate paired-samples t-tests were conducted for males and females. The results of the t-test for the male participants showed a significant difference in preference between computer-generated sexualized images and sexualized images depicting humans, $t(151) = 4.82$, $p < .001$, d = 0.39, with a higher preference for computer-generated sexualized images ($M = 3.05$, $SD = 0.80$) than for SEM depicting humans ($M = 2.80$, $SD = 0.63$). In contrast, the *t*-test for female participants showed no significant difference in preference for SEM depicting humans or computer-generated personas, $t(121) = 0.00$, $p = 1.000$, d = 0.00.

3.3 Results for research question 1

In addressing RQ1, which explored whether interest in sexualized material would vary by ontological class (human vs. computer-generated persona) and displayed sexual behavior (gentle vs. rough), the prerequisites for a mixed ANCOVA were again unmet. Consequently, paired-samples t-tests were employed as an alternative approach. The t-test for the overall sample showed significant differences: participants exhibited a stronger preference for gentle human-depicted images ($M = 3.37$, $SD = 0.99$) compared to gentle computer-generated images ($M = 3.14$, $SD = 1.11$), $t(273) = -4.51$, $p < .001$, d = -0.27, and for rough computer-generated images ($M = 2.30$, $SD = 1.05$) over rough human-depicted images ($M = 1.80$, $SD = 0.94$), $t(273) = 9.95$, $p < .001$, d = 0.60.

With the covariate age showing no significant effect but a marked gender effect noted in H2, gender-specific preferences were further investigated through separate paired-samples t-tests. While female participants' preferences mirrored those observed in the overall t-test, expressing a stronger inclination for gentle human-depicted images (M = 3.09, SD = 1.10) over computer-generated ones (M = 2.70, SD = 1.14), $t(121)$ = -4.94, $p < .001$, d = -0.45, and a pronounced preference for rough computer-generated images (M = 1.92, SD = 0.96) compared to human-depicted images (M = 1.53, SD = 0.84), $t(121)$ = 5.59, $p < .001$, d = 0.51, male participants diverged from this pattern. Although they aligned with the overall trend by showing a significant preference for rough computer-generated images (M = 2.60, SD = 1.02) over human-depicted ones (M = 2.01, SD = 0.95), $t(151)$ = 8.33, $p < .001$, d = 0.68, this pattern did not hold for gentle SEM. In that category, they demonstrated no significant preference between human (M = 3.59, SD = 0.83) and computer-generated images (M = 3.50, SD = 0.94), $t(151)$ = -1.50, p = .138, d = -0.12, indicating a departure from the distinct preference noted in rough content.

3.4 Explorative analyses: Individuals identifying as not exclusively heterosexual

Given the smaller sample size and the predominant focus of existing literature on heterosexual populations, the examination of the non-heterosexual sample warrants distinct scrutiny. Therefore, exploratory analyses were carried out for the non-heterosexual sample (N = 68), comprising 29 women and 39 men, mirroring those performed or intended for the heterosexual sample, to delve into potential differences within this specific demographic.

H1 was explored using a mixed 2 (ontological class: computer-generated vs. human) x 2 (gender: male vs. female) ANCOVA, which, unlike the previous analyses, met all the assumptions required for this statistical approach. The analysis revealed no significant main effect for sexual behavior, $F(1, 65) = 2.75$, $p = .102$, partial $\eta^2_p = .041$, suggesting that within this sample, the type of sexual behavior depicted did not substantially impact interest levels. There were also no significant interaction effects between sexual behavior and the covariate age, $F(1, 65) = 0.38$, $p = .539$, partial $\eta^2_p = .006$, or between sexual behavior and the between-subject factor gender, $F(1, 65) = 0.45$, $p = .507$, partial $\eta^2_p = .007$, indicating that these factors did not modulate the interest in sexualized material for this group of participants.

Regarding H2 again a mixed 2 (displayed sexual behavior: gentle vs. rough) x 2 (gender: male vs. female) ANCOVA was used to analyze the effect of the ontological class in interest in SEM. Reassuringly, all prerequisites for this statistical method were met. The analysis revealed no significant main effect for ontological class, $F(1,65) = 1.95$, $p = .167$, partial $\eta^2_p = .029$, as well as no significant interaction with the covariate age $F(1,65) = 1.05$, $p = .310$, partial $\eta^2_p = .016$ or the between-subject factor gender $F(1,65) = 2.45$, $p = .123$, partial $\eta^2_p = .036$.

To investigate if the interest in sexualized material of the ontological class will interact with the displayed sexual behavior, RQ1 was analyzed by a 4 (interaction: computer-generated-rough vs. human-rough vs. computer-generated-gentle vs. human-gentle) x 2 (gender: male vs. female) mixed ANCOVA. However, since the

requirement of sphericity was violated, a Greenhouse-Geisser correction of the degrees of freedom was carried out. The results show a significant main effect between the four within-subject factors, $F(3,195) = 3.88$, $p = .028$, partial $\eta^2_p = .056$. The planned comparisons indicated a notably greater preference for serene SEM portraying humans ($M = 3.67$, $SD = 0.96$) when directly contrasted with rugged SEM featuring computer-generated personas ($M = 2.26$, $SD = 1.00$). No other comparisons were significant. Moreover, there was no significant interaction between all factors and age, $F(3, 195) = 1.01$, $p = .359$, partial $\eta^2_p = .015$, or gender, $F(3,195) = 0.93$, $p = .387$, partial $\eta^2_p = .014$. To conclude, sexual orientation does not seem to play a major role in the observed phenomenon.

4. Discussion

The present study investigated the extent to which displayed sexual behavior can influence the interest in images displaying humans or computer-generated personas. Indeed, the results show that the interest depends on the displayed sexual behavior: gentle SEM are preferred if they show humans and rough content seems to be more interesting when it is computer-generated (see also descriptives in Table 1). However, significant effects are partly affected by gender and sexual orientation. The results will be discussed in the following.

With regard to the first hypothesis, claiming that participants would be more interested in gentle SEM compared to rough, the results confirm what is also found in previous studies (cf. Brown et al., 2020; Meston & Buss, 2007), but within heterosexual individuals only. People are interested in dominant sexualized practices which is in line with relevant literature (Döring, 2023; Herbenick et al., 2021; Holvoet et al., 2017) and can also be seen in the fact that the descriptive interest scores for displayed rough behavior are not conspicuously low (see Table 1), but gentle sexualized content, without any dominant or painful sensory impressions, was rated to be significantly more interesting.

The fact that this significant difference was not to be found in the non-heterosexual subsample aligns with findings from a scoping review by Brown et al. (2020), which notes that previous studies have indicated a higher percentage of non-heterosexual individuals engaging in BDSM practices.

Surprisingly, the interest in an ontological class, i.e., human and computer-generated stimuli (*H2*) was different for heterosexual men and women, while women had no significant preferences, the calculations revealed that the heterosexual male participants overall rated the computer-generated SEM to be more interesting. In line with the results of the heterosexual women, homosexual individuals showed no difference in the preference for an ontological class in computer-generated SEM, with no gender effects.

Based on previous research in the area of artificial sexualized stimuli (e.g., voice assistants, Szczuka, 2022, chatbots, Banks & van Ouytsel, 2020 or robots, Dubé, Williams, et al., 2022), explicit evaluations consistently showed that humans were preferred, or at least that shortcomings of the technologies were recognized. However, this study adds a new perspective to this finding, as it also varies the depicted sexual behavior, which previous studies did not. Consequently, the finding suggests

that ontological class per se does not play a prominent role. Firstly, this result questions Szczuka's (2022) assumption of the human species as a gold standard for sexual stimuli. Secondly, it underlines the importance of the displayed sexual behavior within the SIIM (Szczuka et al., 2019) as an important influence to the question of whether people want to engage in a sexualized interaction with an artificial stimulus. The results suggest that non-human characters may possess a unique appeal in the realm of sexuality, particularly influenced by their exhibited behaviors. This appeal may encompass sexual practices that derive from sexual and/or societal norms. While it needs to be clarified that the model conceptualizes more around interactive technologies, it provides valid positive and negative influences on the question of whether an artificial stimulus can create sexual arousal. In this context, it might seem more realistic that 2D creations on the computer screen that are presented for sexual gratification only and do not represent a social persona with unique features such as a name, characteristics, or a back story (compared to, for instance, sexualized robots or voice assistants) do not trigger reflections on aspects such as the violation of social norm. These aspects might be more pronounced in long-term interactions with artificial entities in comparison to mere sexual gratification, especially in a non-interactive context (Szczuka & Dehnert, 2024). This is also in line with a study conducted by Banks and van Ouytsel (2020) who investigated reactions to a sexualized chatbot and found that here aspects related to ontological class mainly highlighted their lack of abilities as a problem (e.g., (In)Authenticity or (Non)Interactivity), rather than the mere fact that the bot was not another human being.

The analysis of RQ1, and therefore the interplay of ontological class and displayed behavior, however, also adds another layer to the discussion, as this preference in computer-generated SEM might be explainable by the fact that rough content was included in the calculation, which was shown to be significantly preferred in the computer-generated form by both, heterosexual male and women.

The results of RQ 1 revealed the interesting interplay between ontological class and displayed sexual behavior: for the heterosexual participants, both female and male, the computer-generated rough content was significantly preferred over the rough content showing humans.

The context of the study is more similar to a cautious, reflective moment participant had compared to the goal-oriented situation people experience when they watch pornography for the primary purpose of sexual gratification. Thus, it can be likened to the discoveries made by Antevska and Gavey (2015), as well as Taylor (2022), who revealed that the portrayal of the human situation tends to occur, if at all, during a more contemplative phase subsequent to the attainment of sexual gratification. Antevska and Gavey (2015) found that detaching the humanity from actors was especially prominent for rougher SEM and consequently would be associated with questions that "sought to problematize features such as gendered dominance/submission dynamics, sexual violence, and acts that can be read as sexually humiliating or degrading toward women" (p. 615–616). With computer-generated rough SEM, this process of detachment seems unnecessary, as there are no actors that could face the negative repressions that can occur within the production of rough SEM (Döring, 2023; Grudzen et al., 2009; Jarke, 2022; Parvez,

2006). Computer-generated rough SEM could consequently serve as an alternative to human depictions with no need for detachment or post-consumption reflections on ethical dilemmas. What is especially interesting about computer-generated SEM is that contrary to human material, in which especially women are frequently objectified, here, the material itself (besides the content that can still objectify CG women) needs to be anthropomorphized. This is also reflected by the manipulation check and the descriptive statistics in Table 1, showing that CG rough content was indeed evaluated to be rough, meaning something that is inherently connected to human qualities as Döring (2023) describes rough sex practices to be associated with "Control or dominance (e.g. holding, restraining) and with pain (e.g. hitting, biting)" (p. 103). CG depictions, therefore, seem to activate some form of human-like evaluation processes but still being rated to be differently based on the presented sexual behavior. Qualitative future research needs to address whether this interpretation holds true and whether these are cautious reasonings.

The results give reasons to reflect differently about an argument that is frequently discussed the other way around in the realm of digitalized sexuality: humans might not generally prefer sexualized humans based on their familiarity and shared species (Szczuka & Krämer, 2017), but also use CG material that depicts scenes that could be associated with negative repressions towards humans as a substitute to prevent their own species from harm.

Interestingly the results are in line with results from a qualitative study by Forster and Shaughnessy (2024) , who found that participants explicitly expressed the protection mechanism as a potential benefit in the consumption of computer-generated pornography. The authors conclude that CG material "could offer sex workers a creative outlet free from potential exploitation or abuse." (p. 7). The combined results suggest that this protection mechanism is a potential benefit of the technology. However, it is essential to investigate whether this remains valid when consumers are in a state of sexual arousal and, therefore, less reflective.

It needs to be addressed that a gender effect could be found; heterosexual women preferred the human material in the gentle condition, while this significant difference was not to be found within heterosexual males. This is, however, completely in line with a study done by Parvez (2006), who did a qualitative study on how males and females differently enjoy pornography. One recurring theme was that females put an emphasis on authenticity: "Most of the women initiated discourse about their dislike of fake bodies, fake plots, and fake pleasure." (p. 617). One significant discovery within this study was the importance to female consumers of perceiving whether the portrayed woman derived enjoyment from the depicted scenario. In regard to the findings of the present study, one could argue that this is not the case with computer-generated images, which consequently makes this kind of material less attractive to women.

Regarding participants identifying as non-heterosexual, the descriptives (see Table 1) reveal the same pattern as with the heterosexual participants: within the gentle content, humans are preferred over computer-generated content, while this changes for the rough scenes. There is however not a consistent significant difference within this pattern, compared to heterosexual individuals. Interestingly, non-heterosexual participants indicated higher means compared to heterosexual individu-

als in all categories except for the computer-generated rough sex scenes, which may suggest an overarchingly higher interest in sexual material. This may also have to do with the fact that the website presented was tailored to the indicated sexual preferences of the participants and the fact that only matching material was presented, other than on mainstream platforms. However, more specific research needs to be done to sufficiently address whether there is a systematic and theory-related difference in the reaction to computer-generated or human SEM in relation to the depicted sexual behavior.

4.1 Implications

The results are the first to address the question about the role that humanity plays in the interest in SEM. The data indicates that within rough content, there might be a chance to accept CG substitutes for a dilemma free consumption. Further research needs to address: are the results grounded in good intentions, or does this result reflect on a cautious decision to choose arousing, but less pain-associated content?

Nevertheless, the study underlines that the depicted sexual behavior heavily influences the acceptance of artificially created content and that future studies in the realm of how digitalized intimacy should consider this as an important variable of influence. Furthermore, it challenges the assumption that humans are the "gold standard" for sexual satisfaction. However, this raises new questions, particularly in an era of digitalization where video-generative AI has the capability to generate videos upon simple commands (such as SORA, a text-to-video generator developed by OpenAI). Given the abundance of training data from major pornography platforms, a robust training database can be easily established. The study's findings suggest that, at least for women, there is a preference for human actors in gentler sexual content. However, what implications does this have for the future of pornography, considering the data indicates no effect of ontological class in preferences for gentle material among heterosexual males and non-heterosexual individuals?

In terms of the discussed reflex to prevent actors from harm, it is important to mention that there is research that demonstrates that there are performers who enjoy working on pornographic scenes (including the production of rough material) and consider themselves and their work as self-determined (Jarke, 2022; cf. Parvez, 2006), there is, however, also research which demonstrates that especially rough content can be associated with intense physical experiences.

Future research needs to address these raised questions by implementing appropriate measures, meaning investigating both explicit (e.g., self-report or interviews) and indirect reactions (e.g., sexual arousal). This study serves as a preliminary investigation, preceding an in-depth eye-tracking study that explores visual behavior towards gentle and rough CG and human SEM.

In general, the acceptance of computer-generated rough SEM may also trigger the old media-psychological question of media effects and violence, as especially CG material can show more extreme sexual practices as the production is not limited to any real-world conditions (Forster & Shaughnessy, 2024; Saunders, 2019).

This, in turn, raises additional interdisciplinary inquiries, such as legal considerations (e.g., for depictions that are meant to demonstrate rape) regarding whether or how the production of such material should be restricted. It needs moreover be kept in mind, that CG content can face similar criticism compared to SEM depicting humans, such as the danger of reproducing sexist stereotypes.

However, it is important to also underline the potential of CG Rough SEM. Future studies should explore the potential for computer-generated SEM to allow users to act out fantasies that might otherwise be associated with undesirable or negative consequences for the individuals involved.

4.2 Limitation

The main limitation is also a strength of the study; it is a self-report study that might be biased by more cautious processes, ranging from mentioned reflections about the working conditions and the potentially associated pain. It could, therefore, also be affected by mechanisms associated with social desirability and the wish to adhere to sexual and social norms. Research has, however, already shown that the comparison between explicit and implicit measures can be worthwhile, as automatic reactions might result in different results compared to self-report (Szczuka & Krämer, 2017), which, in the end, provides a more holistic understanding of topics within the realm of digitalized sexuality. An eye-tracking study was already conducted with the same material to get a deeper understanding of visual attention processes.

Moreover, it needs to be stated that the sample of homosexual individuals might not be sufficiently large to detect smaller effects. However, as we found it important to include the subsample composed of individuals who do not identify as exclusively heterosexual, the decision was made to still report the calculations. Table 1 also offers a summary of numbers that may serve as inspiration for future research, with a particular emphasis on non-heterosexual literature and samples.

This study is the first to empirically investigate preferences in computer-generated SEM in conjunction with depicted behaviors. Previous research has suggested that various personality traits can explain differences in preferences for certain types of SEM. Specifically, studies have indicated that traits such as openness, novelty seeking, and sexual sensation seeking are associated with a greater propensity for rougher content (Burch & Salmon, 2021; Gerymski, 2017) and non-human material (Dubé, Santaguida, et al., 2022). Future research should, therefore, aim to investigate the predictive power of these personality traits in determining preferences for different types of SEM.

5. Conclusion

Technological advancements enable the exploration and expansion of sexuality, with both humans and artificial entities serving as stimuli for sexual satisfaction. Although previous studies focusing on ontological class (i.e., human versus artificial stimuli) highlighted humans as the "gold standard of sexuality" (Szczuka, 2022), the current study emphasizes the significance of the depicted sexual beha-

vior. A key finding of the study is that heterosexual individuals show a preference for computer-generated rough SEM over material featuring humans. This phenomenon may align with research suggesting that people often dissociate the humanity of actors, particularly in contexts involving rougher SEM. The empirical study highlights the potential of rough CG SEM to serve as an appropriate extension to rough SEM depicting humans and raises important questions about the role of humanity within these materials

Acknowledgments

We thank Jennifer Molitor for the help in conducting the study and the initial writing process of a first version of the paper.

Funding

The study was funded by the University Grant of the University Duisburg-Essen (Programm zur Förderung des exzellenten wissenschaftlichen Nachwuchses).

Conflicts of interest/competing interests

The authors declare that they have no conflicts of interest.

Availability of data and material

https://osf.io/k76yj/

Code availability

https://osf.io/k76yj/

References

Antevska, A., & Gavey, N. (2015). "Out of sight and out of mind". *Men and Masculinities*, *18*(5), 605–629. https://doi.org/10.1177/1097184X15574339

Ballester-Arnal, R., García-Barba, M., Castro-Calvo, J., Giménez-García, C., & Gil-Llario, M. D. (2023). Pornography consumption in people of different age groups: An analysis based on gender, contents, and consequences. *Sexuality Research and Social Policy*, *20*(2), 766–779. https://doi.org/10.1007/s13178-022-00720-z

Banks, J., & van Ouytsel, J. (2020). Cybersex with human- and machine-cued partners: Gratifications, shortcomings, and tensions. *Technology, Mind, and Behavior*, *1*(1). https://doi.org/10.1037/tmb0000008

Brown, A., Barker, E. D., & Rahman, Q. (2020). A systematic scoping review of the prevalence, etiological, psychological, and interpersonal factors associated with BDSM. *Journal of Sex Research*, *57*(6), 781–811. https://doi.org/10.1080/00224499.2019.1665619

Burch, R. L., & Salmon, C. (2021). Rough sex and pornography preferences: Novelty seeking, not aggression. *EvoS Journal*, *12*(1). https://doi.org/10.59077/EZCH6547

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences* (2nd ed.). Taylor and Francis. https://ebookcentral.proquest.com/lib/kxp/detail.action?docID=1192162

Cooper, A. (1998). Sexuality and the internet: Surfing into the new millennium. *CyberPsychology & Behavior*, *1*(2), 187–193. https://doi.org/10.1089/cpb.1998.1.187

Döring, N. (2009). The Internet's impact on sexuality: A critical review of 15 years of research. *Computers in Human Behavior*, *25*(5), 1089–1101. https://doi.org/10.1016/j.chb.2009.04.003

Döring, N. (2023). Rough Sex: Aktueller Diskussions- und Forschungsstand [Rough sex: Current state of discussion and research]. *Zeitschrift Für Sexualforschung*, *36*(02), 102–111. https://doi.org/10.1055/a-2014-1356

Döring, N., & Poeschl, S. (2019). Love and sex with robots: A content analysis of media representations. *International Journal of Social Robotics*, *11*(4), 665–677. https://doi.org/10.1007/s12369-019-00517-y

Dubé, S., Santaguida, M., Zhu, C. Y., Di Tomasso, S., Hu, R., Cormier, G., Johnson, A. P., & Vachon, D. (2022). Sex robots and personality: It is more about sex than robots. *Computers in Human Behavior*, *136*, 107403. https://doi.org/10.1016/j.chb.2022.107403

Dubé, S., Williams, M., Santaguida, M., Hu, R., Gadoury, T., Yim, B., Vachon, D., & Johnson, A. P. (2022). Hot for robots! Sexual arousal increases willingness to have sex with robots. *Journal of Sex Research*, 1–11. https://doi.org/10.1080/00224499.2022.2142190

Forster, C. M., & Shaughnessy, S. (2024). Ctrl+alt+consent: Exploring the digital generation's perspective on entirely computer-generated pornography. *Bristol Institute for Learning and Teaching (BILT) Student Research Journal*, (5). https://research-information.bris.ac.uk/en/publications/ctrlaltconsent-exploring-the-digital-generations-perspective-on-e

Gerymski, R. (2017). Are personality traits a good predictors of the type of watched pornography? Analysis of the relationship between personality traits and the preference of a chosen pornographic categories. *Przegląd Seksuologiczny*, *15*(3), 10–16. https://www.ceeol.com/search/article-detail?id=671425

Grudzen, C. R., Ryan, G., Margold, W., Torres, J., & Gelberg, L. (2009). Pathways to health risk exposure in adult film performers. *Journal of Urban Health : Bulletin of the New York Academy of Medicine*, *86*(1), 67–78. https://doi.org/10.1007/s11524-008-9309-4

Hald, G. M., & Štulhofer, A. (2016). What types of pornography do people find arousing and do they cluster? Assessing types and categories of pornography in a large-scale online sample. *Journal of Sex Research*, *53*(7), 849–859. https://doi.org/10.1080/00224499.2015.1065953

Herbenick, D., Fu, T., Valdivia, D. S., Patterson, C., Gonzalez, Y. R., Guerra-Reyes, L., Eastman-Mueller, H., Beckmeyer, J., & Rosenberg, M. (2021). What is rough sex, who does it, and who likes it? Findings from a probability sample of U.S. undergraduate students. *Archives of Sexual Behavior*, *50*(3), 1183–1195. https://doi.org/10.1007/s10508-021-01917-w

Herbenick, D., Guerra-Reyes, L., Perry, C. P., Gonzalez, Y. R. R., Khan, S., Zounlomè, N. O. O., & Jozkowski, K. N. (2024). Navigating consent in the context of sexual choking/stran-

gulation: Findings from qualitative interviews with young adults. *Sexuality Research and Social Policy*, 1–16. https://doi.org/10.1007/s13178-024-01004-4

Herbenick, D., Patterson, C., Wright, P. J., Kawata, K., & Fu, T. (2023). Sexual choking/strangulation during sex: A review of the literature. *Current Sexual Health Reports*, *15*(4), 253–260. https://doi.org/10.1007/s11930-023-00373-y

Holvoet, L., Huys, W., Coppens, V., Seeuws, J., Goethals, K., & Morrens, M. (2017). Fifty shades of belgian gray: The prevalence of BDSM-related fantasies and activities in the general population. *The Journal of Sexual Medicine*, *14*(9), 1152–1159. https://doi.org/10.1016/j.jsxm.2017.07.003

Jarke, H. (2022). What do we know about the mental health of porn performers? A systematic literature review. *The Journal of Public Mental Health*, *21*(2), 119–127. http://dx.doi.org/10.31234/osf.io/a5tnb

Kimmel, M. S. (2005). *The gender of desire. Essays an male sexuality.* https://sunypress.edu/Books/T/The-Gender-of-Desire2

Kinsey, A. C., Pomery, W. B., & Martin, C. E. (1948). *PsycTESTS Dataset*. https://doi.org/10.1037/t17515-000

McKee, A. (2006). The aesthetics of pornography: The insights of consumers. *Continuum*, *20*(4), 523–539. https://doi.org/10.1080/10304310600988310

Meston, C. M., & Buss, D. M. (2007). Why humans have sex. *Archives of Sexual Behavior*, *36*(4), 477–507. https://doi.org/10.1007/s10508-007-9175-2

Mosher, D. L. (1988). Pornography defined: Sexual involvement theory, narrative context, and goodness-of-fit. *Journal of Psychology & Human Sexuality*, *1*(1), 67–85. https://doi.org/10.1300/J056v01n01_06

Parvez, Z. F. (2006). The labor of pleasure: How perceptions of emotional labor impact womens enjoyment of pornography. *Gender & Society*, *20*(5), 605–631. https://doi.org/10.1177/0891243206291109

Price, J., Patterson, R., Regnerus, M., & Walley, J. (2016). How much more XXX is generation X consuming? Evidence of changing attitudes and behaviors related to pornography since 1973. *Journal of Sex Research*, *53*(1), 12–20. https://doi.org/10.1080/00224499.2014.1003773

Rubin, G. S. (1998). Thinking sex: Notes for a radical theory. In P. M. Nardi & B. E. Schneider (Eds.), *Social perspectives in lesbian and gay studies: A reader* (pp. 100–133). Routledge.

Rubin, G. S. (2006). Thinking sex: Notes for a radical theory of the politics of sexuality. In R. Parker & P. Aggleton (Eds.), *Culture, Society and Sexuality: A Reader* (1st ed.). Routledge.

Saunders, R. (2019). Computer-generated pornography and convergence: Animation and algorithms as new digital desire. *Convergence: The International Journal of Research into New Media Technologies*, *25*(2), 241–259. https://doi.org/10.1177/1354856519833591

Sharkey, M. J., Currin, J. M., Cox, K., Golden, B. L., Evans, A. E., & Garos, S. (2022). 'Horny and wanting to watch something': an exploratory qualitative analysis of heterosexual men's pornography viewing preferences. *Psychology & Sexuality*, *13*(2), 415–428. https://doi.org/10.1080/19419899.2020.1824937

Simon, W., & Gagnon, J. H. (2003). Sexual scripts: Origins, influences and changes. *Qualitative Sociology*, *26*(4), 491–497. https://doi.org/10.1023/B:QUAS.0000005053.99846.e5

Szczuka, J. M. (2022). Flirting with or through media: How the communication partners' ontological class and sexual priming affect heterosexual males' interest in flirtatious messages and their perception of the source. *Frontiers in Psychology*, *13*, 719008. https://doi.org/10.3389/fpsyg.2022.719008

Szczuka, J. M., & Dehnert, M. (2024). Sexualized Robots: Use Cases, Normative Debates, and the Need for Research. In Nick Bowman (Ed.), *Emerging issues for emerging technologies: informed provocations for theorizing media futures*. Peter Lang Publishing Incorporated.

Szczuka, J. M., Hartmann, T., & Krämer, N. C. (2019). Negative and positive influences on the sensations evoked by artificial sex partners: A review of relevant theories, recent findings, and introduction of the sexual interaction illusion model. In Y. Zhou & M. H. Fischer (Eds.), *AI Love You* (pp. 3–19). Springer International Publishing. https://doi.org/10.1007/978-3-030-19734-6_1

Szczuka, J. M., & Krämer, N. C. (2017). Not only the lonely—How men explicitly and implicitly evaluate the attractiveness of sex robots in comparison to the attractiveness of women, and personal characteristics influencing this evaluation. *Multimodal Technologies and Interaction*, *1*(1), 3. https://doi.org/10.3390/mti1010003

Taylor, K. (2022). "I've got to put one side aside if I want to enjoy it": Pornography, perceived reality, and pornography viewers' negotiated pleasures. *Sexuality & Culture*, *26*(4), 1215–1234. https://doi.org/10.1007/s12119-021-09939-1

Taylor-Johnson, S. (Director). (2015). *Fifty Shades of Grey*.

Turkle, S. (2011). *Alone together: Why we expect more from technology and less from each other* (Third edition, revised trade paperback edition). Basic Books.