

## When does “no” mean no? Insights from sex robots

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### ABSTRACT

Although sexual assault is widely accepted as morally wrong, not all instances of sexual assault are evaluated in the same way. Here, we ask whether different characteristics of victims affect people’s moral evaluations of sexual assault perpetrators, and if so, how. We focus on sex robots (i.e., artificially intelligent humanoid social robots designed for sexual gratification) as victims in the present studies because they serve as a clean canvas onto which we can paint different human-like attributes to probe people’s moral intuitions regarding sensitive topics. Across four pre-registered experiments conducted with American adults on Prolific ( $N = 2104$ ), we asked people to evaluate the wrongness of sexual assault against AI-powered robots. People’s moral judgments were influenced by the victim’s mental capacities (Studies 1 & 2), the victim’s interpersonal function (Study 3), the victim’s ontological type (Study 4), and the transactional context of the human-robot relationship (Study 4). Overall, by investigating moral reasoning about transgressions against AI robots, we were able to gain unique insights into how people’s moral judgments about sexual transgressions can be influenced by victim attributes.

### 1. Introduction

People universally condemn sexual assault (e.g., Gardner, 2007), yet not all instances of sexual assault are evaluated in the same way. Indeed, a wealth of evidence has documented that attributes of perpetrators modulate people’s moral judgments in these contexts (see Franiuk, Luca, & Robinson, 2020, for a review). For example, a perpetrator’s race (e.g., Miller, 2019), gender (e.g., Ayala, Kotary, & Hetz, 2018; McCracken & Stevenson, 2017; Smith, Pine, & Hawley, 1988), perceived similarity to the evaluator (Grubb & Harrower, 2009), and perceived career success (e.g., Nyúl, Kende, Engyel, & Szabó, 2018) influence people’s moral perceptions of sexual assault. Other work has also shown that framing perpetrators as the “real” victims can increase observers’ support for perpetrators of sexual assault (Flusberg, van der Vord, Husney, & Holmes, 2022).

If perpetrator attributes modulate people’s reasoning about sexual assault, can the same be said of victim attributes? Prior research has explored the influence of victim characteristics on attributions of blame directed at victims (for reviews, see Franiuk et al., 2020; Grubb & Turner, 2012). Among these characteristics are the victim’s appearance (Awasthi, 2017; Bernard, Gervais, Allen, Delmée, & Klein, 2015; Whatley, 1996; Workman & Freeburg, 1999), level of intoxication (Grubb & Turner, 2012; Krahe, 1988), and propensities toward

promiscuity or chastity (Whatley, 1996). Although these findings shed light on the factors behind victim blaming within the context of sexual assault, the inclination to assign blame to victims does not always correspond to the broader evaluation of the moral wrongness of the transgression. For example, one can believe that sexual assault is morally reprehensible and subsequently advocate for significant punishment of the perpetrator *even when* they assign (some) blame to the victim. Conversely, if (particular) victim attributes can influence people’s moral judgments of sexual assault, these shifts in moral evaluations could lead to varying degrees of consequences for the perpetrators. To our knowledge, little research has directly examined which attributes of victims are most salient in people’s overall moral judgments regarding sexual assault, perhaps because there is little variability in evaluations of sexual assault (which people consider among the most immoral of actions; see Gardner, 2007).

We suggest that there are at least two factors that might influence people’s perceptions of the wrongness of sexual assault: (1) a victim’s perceived mind and (2) a victim’s perceived interpersonal function. Looking at the first point, the degree to which victims are seen as fully human—manifested in the attribution of human mental capacities—may influence people’s moral judgments of sexual assault. Research has shown that dehumanized people are seen as having less moral standing (Gray, Young, & Waytz, 2012; Machery, 2021; Waytz,

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Gray, Epley, & Wegner, 2010), in which case we would expect that the more one is dehumanized, the less wrong it seems to assault such a person. Considering that rape is often seen as a dehumanizing act (Moor, Ben-Meir, Golan-Shapira, & Farchi, 2013), it is not surprising that implicit objectification and animalization of women are associated with a greater willingness to sexually harass and assault them (Rudman & Mescher, 2012). Dehumanization of women has been found to mediate the relationship between psychopathy and hostile sexism and violent attitudes toward women (Methot-Jones, Book, & Gauthier, 2019). Furthermore, appearance-focused objectification of women results in viewing them as more machine-like and less capable of feeling pain (Morris, Goldenberg, & Boyd, 2018), which may lay a foundation for victim blaming in the context of rape. Moreover, induced sexual objectification of rape victims has been found to reduce perpetrator blame (Bernard et al., 2015), increase victim blame (Loughnan, Pina, Vasquez, & Puvia, 2013), and reduce the willingness to help a rape victim (Pacilli et al., 2017).

In fact, being perceived as lacking different types of mental capacities might lead to being seen as having different types of moral standing (Gray & Wegner, 2009). For example, a bi-dimensional framework of mind perception suggests that people's perceived mental capacities for higher-order cognition are associated with moral agency, which includes the capacity to do right or wrong (Gray, Gray, & Wegner, 2007; Gray & Wegner, 2009; but see Weisman, Dweck, & Markman, 2017). Perceived mental capacities for emotional and bodily feeling, on the other hand, are associated with moral patiency (i.e., the capacity to be the recipient of right or wrong actions). Correspondingly, a form of objectification which denies women higher-order mental capacities has been found to increase their perceived moral patiency (Gray, Knobe, Sheskin, Bloom, & Barrett, 2011). Taken together, the literature suggests that the perceived mental capacities of the victim may play a role in moral evaluations of sexual assault. However, which mental capacities are relevant to these moral judgments—and to what degree—is an open question.

Dehumanization often goes hand in hand with prejudice (Haslam & Loughnan, 2014; Haslam & Stratemeyer, 2016), and stereotyping victims as explicitly sexual may influence moral evaluations of sexual assault. Such stereotyping manifests in pervasive cultural prejudice that some appearances or patterns of behavior signal sexual availability (or “ask for it”). Women who are sexualized are more likely to be dehumanized compared to non-sexualized women (Morris et al., 2018; Puvia & Vaes, 2013; Vaes, Paladino, & Puvia, 2011). This dehumanization can result in people being more willing to cause harm to the sexualized women (Arnocky et al., 2019; Gray & Wegner, 2009), and in showing less moral concern for them (Bevens & Loughnan, 2019; Loughnan et al., 2013; Waytz et al., 2010). Victims who wear revealing clothes (Awasthi, 2017; Whatley, 1996; Workman & Freeburg, 1999) or who engage in drinking and otherwise violate traditional gender norms (Grubb & Turner, 2012; Krahe, 1988) are more likely to be blamed for their assault. An overall pre-judgment of the victim's character as “respectable” or “questionable” has been found to be another predictor of the extent of victim blaming (Whatley, 1996). In other words, “respectable” women are seen as “virgins” who do not deserve to be sexually assaulted whereas women of “questionable” character are seen as “prostitutes” who are more responsible for their sexual assault. Thus, it is plausible that perceiving someone as embodying an explicitly sexual interpersonal role may make sexual assault seem less wrong.

The effect of the perceived interpersonal function on the moral judgments of sexual assault is perhaps most salient in the case of sex work. Female sex workers often face the consequences of stigma surrounding their occupation (Benoit, Jansson, Smith, & Flagg, 2018; Vanwesenbeeck, 2001) and are also more likely to be dehumanized (Kellie, Blake, & Brooks, 2021). Sexual assault victims who work in the sex industry report encountering harassment and violence from law enforcement when trying to report the heinous attacks against them (Scorgie et al., 2013). Consistent with real-life anecdotes of sex workers

being blamed for their assault, people have shown less sympathy and more victim blaming toward a sexually assaulted sex worker compared to other women in an experimental setting (Sprankle, Bloomquist, Butcher, Gleason, & Schaefer, 2018). Some research has even suggested that people experience confusion as to whether it is possible to sexually assault a sex worker in the first place (Miller & Schwartz, 1995). Yet, it is not clear whether bias against sex workers is mainly a result of their explicitly sexual interpersonal role, the transactional nature of their sexual relationships, or a combination of these two factors.

Although perceived mental capacities, the interpersonal role of the victim, and the nature of the relationship between the perpetrator and the victim may influence people's moral reasoning about sexual assault, it is challenging to isolate and control these factors in typical circumstances. After all, people are likely to judge rape as extremely wrong across situations (Milesi, Süssenbach, Bohner, & Megías, 2020), such that there is minimal variance to shed light on the unique contributions of these factors. Furthermore, some of these factors also have constrained variance; for instance, even dehumanized sex workers are still likely to be attributed with high levels of agency and patiency. Therefore, accurately detecting the respective contributions of different factors that may influence people's reasoning about sexual assault may require situations that depart from those typically encountered in everyday life (Mook, 1983). Thus, we focus here on the case of sex robots (or AI humanoid social robots designed for sexual gratification; see Danaher & McArthur, 2017).

### 1.1. Sex robots as a window into people's moral intuitions about sexual assault

Sex robots are becoming increasingly popular (Nguyen, 2020), particularly as they purport to display various human-like mental capacities, thus distinguishing them from sex dolls and other sex toys. Consider, for example, Harmony, a humanoid sex robot created in 2017 by a California-based company. This highly customizable sex robot produces natural-sounding speech, remembers information told to her, and exhibits patterns of communication indicative of personality. Harmony's robotic head sitting atop her female-sized body is connected to an AI app which allows its users to customize the sex robot's traits, converse with the robot, and elicit emotional responses from her. While most sex robots are currently being marketed for individual use by human owners, sex robots are expected to start populating the so-called “robo-brothels” (Troiano, Wood, & Hartevelde, 2020), which may lead to a distinct set of ethical challenges.

Human-Robot Interaction (HRI) research has shown that people tend to rely on familiar social principles when interacting with computers (Nass, Steuer, & Tauber, 1994; Reeves & Nass, 1996). Recent work has demonstrated that HRI is subject to human-human intergroup dynamics, such as stereotyping (Tay, Jung, & Park, 2014), prejudiced treatment (Smith, Šabanović, & Fraune, 2021), and emotional responses (Vanman & Kappas, 2019). Studies of mind perception reveal that people attribute some human-like mental capacities to robots (see Fiala, Arico, & Nichols, 2014; Gray et al., 2007). Normative discussions have arisen regarding the ethical treatment of these robots, suggesting that entities with human-like mental equivalence should be treated as moral patients (Danaher, 2020; Shevlin, 2021; see Bonnefon, Rahwan, & Shariff, 2024 and Ladak, Loughnan, & Wilks, 2023, for reviews of moral psychology of AIs). This perspective is reinforced by empirical work illustrating that possessing human-like mental capacities can elevate moral standing (e.g., Gray et al., 2012; Reinecke, Wilks, & Bloom, 2021). Notably, attributions of mental capacities are particularly pronounced when robots serve a social function (Wang & Krumhuber, 2018), when robots are humanoid or autonomous (Bigman, Waytz, Alterovitz, & Gray, 2019; Yam et al., 2022), or when robots morally transgress (Shank & DeSanti, 2018). Overall, sex robots appear to be ideal candidates for eliciting mind and moral standing attributions.

Part of what makes sex robots ideal in the context of the current work

is that people's attribution of moral standing to robots is highly manipulable, as people's moral intuitions regarding robots are much weaker and more flexible than those regarding humans (e.g., Lima, Kim, Ryu, Jeon, & Cha, 2020). We can therefore leverage this flexibility of people's intuitions about AI robots in cases of sexual assault. Additionally, although sometimes human-robot interaction can be predicted by social psychological theories, noticeable distinctions exist both in people's approach to interactions with robots (see Smith et al., 2021, for a review) and in their reasoning about them (see Clark & Fischer, 2022, for a review). In fact, these disparities led to the emergence of an alternative view which suggests that social robots are interpreted merely as composite depictions of social agents, rather than entities that lie on a continuum of mind perception (Clark & Fischer, 2022). If people view female-like robots as depictions of women, for example, then we can use their composite nature to isolate the victim attributes we intend to examine.

Whether robots are perceived as new mindful entities or as the mere depictions of human agents, they offer us the opportunity to work with a relatively blank slate. Given the absence of deeply entrenched social and moral intuitions about them, people's moral judgments of rape scenarios of sex robots can serve as a mirror onto underlying, yet less perceptible, moral intuitions about the rape of human victims.

### 1.2. Current research

Across four pre-registered studies, we sought to examine people's moral judgments of sexual assault in cases involving sex robots, social robots, and human sex workers. In Studies 1 and 2, we examined whether sexually assaulted sex robots described as having various kinds of human-like mental capacities were attributed more moral standing than robots without such capacities. With this approach, we were able to draw causal inferences about the influence of victim's mental capacities, which moves beyond prior research on mind perception and moral standing (which has been largely correlational and prompted debates concerning the directionality of the relationship between displayed mental capacities and moral judgments; see Ward, Olsen, & Wegner, 2013).

Study 3 then examined whether the interpersonal function of the robot affected people's moral judgments about sexual assault. By comparing sex robots with social robots, we were able to build on previous research (Awasthi, 2017; Grubb & Turner, 2012; Krahe, 1988; Whatley, 1996; Workman & Freeburg, 1999) documenting the influence of sexualization on victim-blaming and extend it to ask whether a victim's presumed interpersonal function affected the perceived moral wrongness of sexual assault in general.

Finally, in Study 4, we manipulated two factors: (1) whether the victim was a sex robot or a human sex worker and (2) whether the victim was assaulted by the person who paid for sex or not. Despite conventional wisdom suggesting that sexual assault against sex workers would be perceived as less morally wrong, we know of no empirical evidence directly addressing this issue. Whereas some evidence indicates an increased tendency for harassment and abuse by police (Scorgie et al., 2013) and victim blaming (Sprankle et al., 2018) when it comes to sex worker victims, it remains unclear whether the overall moral judgments of sexual assault decrease when the victim engages in compensated sexual activity. Study 4 directly addressed this very question in addition to examining whether this effect was primarily driven by stereotypes about humans applied to robots or by the transactional context of sexual assault.

The sexual assault victims in all studies were female AI robots (or female humans in Study 3), whereas all sexual assault perpetrators were human males. The genders of the victim and perpetrator were chosen to reflect real-life patterns of sexual assault perpetration (Burgess-Jackson, 2000) and sex robot use (Hanson & Locatelli, 2022; Nguyen, 2020). Hypotheses, methods, data collection procedures, exclusion criteria, and analyses for these studies were preregistered on the Open Science

Framework (<https://osf.io/cxu8h/>). We report all measures, conditions, sample size decisions, and data exclusions in this paper. Additional exploratory analyses can be found in the Supplemental Materials.

## 2. Study 1

In Study 1, we sought to understand what mental capacities of a sexual assault victim (if any) might modulate people's moral reasoning. Studies of mind perception suggest that mental capacities are not simply one thing; rather, there may be at least two dimensions of mind perception: *agency* and *experience* (Gray et al., 2007; but for alternative accounts, see Malle, 2019; Tzelios, Williams, Omerod, & Bliss-Moreau, 2022; Weisman et al., 2017). Entities seen as high in agency can remember things, recognize emotions, plan, communicate, control themselves, think, and have morality, whereas entities seen as high in experience can feel hungry, afraid, pained, pleased, enraged, proud, embarrassed, and joyous, and are seen as having personality and consciousness (Gray et al., 2007). This dyadic mind attribution pattern has been associated with dyadic moral standing attribution (Gray et al., 2007; Gray & Wegner, 2009). In particular, rational mental capacities are linked to moral agency (i.e., the capacity for right- and wrong-doing) whereas experiential mental capacities are associated with moral patiency (i.e., the capacity to be the recipient of right- and wrong-doing).

Both types of mental capacities may exert independent influences on moral judgments about sexual assault. After all, violation of consent is essential to categorizing a sexual action as sexual assault (Archard, 2007). Since victims who are high in agency might be perceived to have the right sort of capabilities to grant sexual consent (Demaree-Cotton & Sommers, 2022; Sommers, 2020; Syme & Steele, 2016), its violation might explain the moral reproval of sexual assault. Therefore, we expect that participants' moral judgments will be primarily mediated by their perceptions of the robot's capacities to provide sexual consent when the robots are depicted as high in agency. By contrast, when the robots are depicted as high in experience, they may be seen as more vulnerable to harm and capable of suffering (Waytz et al., 2010), thus resulting in moral judgments being primarily mediated by another salient aspect of sexual assault—the harm endured by the victim.

People tend to perceive adult males and females as extremely high in agentic and experiential mental capacities (Gray et al., 2007), thus making it challenging to represent a human victim as lacking either type of mind. Robots, however, are generally judged to be moderately high in agency and low in experience (Gray et al., 2007), which makes them a cleaner canvas onto which we can paint various mental capacities. We can therefore emphasize either sex robots' agentic mental capacities (granted to them by relatively advanced AI) or their experiential mental capacities (granted to them by their highly realistic humanoid embodiment; see Gray et al., 2011). Importantly, unlike previous work which solely measured people's assessments of the robots' agency and experience, here we manipulated agency and experience displayed by the robots to examine whether these factors have a causal impact on moral judgment.

Thus, Study 1 investigated whether the emerging mental capacities of sex robots affected the degree to which sexual assault against them was perceived as morally wrong. We compared sex robots high in agency or experience with robots lacking either of these mental capacities. Additionally, we examined whether moral judgments of sexual assault were explained by people's attributions of consent capacity and vulnerability to harm to the robot victims in both experimental conditions (i.e., Agency and Experience).

### 2.1. Participants

Following the pre-registered sampling plan (<https://osf.io/v5neu>), we recruited 853 American participants of age 18 or older on [www.prolific.co](http://www.prolific.co) (Palan & Schitter, 2018), accounting for a potential 10%

exclusion rate per exclusion criterion. We powered the study to have approximately 500 people per mediation analysis as per previous recommendations (see [Fritz & MacKinnon, 2007](#)). Each of the two mediation analyses included two out of three conditions, thus requiring at least 750 participants in total (250 per condition). All participants were compensated with \$0.95.

Fifty-five participants were excluded because they failed one of the attention checks: one attention check required that participants answered positively when asked whether they felt like they paid attention, avoided distractions, and took the survey seriously; another attention check at the end of the survey asked participants to briefly describe one of the scenarios they read about. Seven participants were excluded because of missing data and one participant because they indicated that they had used a sex robot themselves. Demographic data for the remaining 790 participants ( $M_{age} = 35.79, SD_{age} = 13.14$ ) is reported in [Table 1](#).

2.2. Materials and procedure

Participants were presented with an online questionnaire. After reading the introductory passage which told the participants about developments in sex robotics and highlighted AI-programmed sex robot’s availability for sale, each person was randomly assigned to one of three conditions: Agency, Experience, or Mechanism (see [Table 2](#) for study stimuli).<sup>1</sup> In each condition, participants were asked to read five short robot descriptions to form a general impression of sex robots as high in agency, experience, or neither. After reading these five descriptions (which were presented in fixed order), participants were presented with one event description of a human man sexually assaulting a female robot. The names of a robot and a man in the sexual assault vignette were randomly chosen for each participant from the list of name pairs used in robot descriptions.

Participants then responded to the dependent-measures questionnaire using a 100-point scale (with 0 corresponding to “strongly

**Table 1**  
Demographics of all studies.

	Study 1	Study 2	Study 3	Study 4
Total (N)	790	389	532	393
Gender				
Female (n)	401	213	262	185
Male (n)	377	167	258	197
Other (n)	11	9	9	8
Preferred not to answer (n)	1	0	3	3
Race/ethnicity				
American Indian/Alaska Native (n)	8	5	4	3
Asian (n)	79	34	84	37
Black/African American (n)	69	56	35	38
Hispanic/Latinx (n)	57	39	46	35
Native Hawaiian or Pacific Islander (n)	1	1	0	3
White (n)	591	279	374	294
Other (n)	14	2	4	1
Preferred not to answer (n)	3	0	7	3
Knew about sex robots (n)	434	186	298	87

*Note.* We explore the influence of demographic factors in Supplemental Materials. For race/ethnicity, participants were able to check all categories that applied to them.

<sup>1</sup> In what follows, we capitalize the first letters of “Agency” and “Experience” to refer to the manipulated variable. When “agency” and “experience” refer to the ratings used as manipulation check, we explicitly refer to them as the “agency ratings” or the “experience ratings.”

**Table 2**  
Study 1 Stimuli.

Introduction		
Robotic technology has been developing rapidly. An improved manufacture of robots has influenced many industries such as retail, transport, and agriculture. But robots are also influencing how people have sex. Some companies are now selling robots which are being marketed as sexual partners. Advanced sex robots have a realistic human-like body and are run by sophisticated forms of artificial intelligence. These sex robots are now available for purchase online. You are going to read stories about men who purchased sex robots several months ago. Then you will be asked a series of questions about these men and their robots.		
Robot and Sexual Assault Descriptions		
Agency (n = 271)	Experience (n = 264)	Mechanism (n = 255)
<i>New York City, NY, August 2019</i> Cinnamon is an AI-powered human-like robot purchased by Daniel. Daniel and Cinnamon often have <b>conversations</b> and at times it seems that Cinnamon has to <b>control herself</b> not to say too much.	<i>New York City, NY, August 2019</i> Cinnamon is an AI-powered human-like robot purchased by Daniel. Cinnamon often <b>expresses different desires</b> to Daniel, and at times appears to be <b>outraged</b> by his failure to fulfill them.	<i>New York City, NY, August 2019</i> Cinnamon is an AI-powered human-like robot purchased by Daniel. Daniel likes to feel Cinnamon’s silicone skin, especially on Cinnamon’s movable legs.
<i>Fort Worth, TX, September 2019</i> Cherry is an AI-powered human-like robot purchased by Ryan. Every time Ryan asks Cherry whether Cherry thinks certain things are <b>right or wrong</b> for him to do, Cherry always has an <b>insightful reply</b> .	<i>Fort Worth, TX, September 2019</i> Cherry is an AI-powered human-like robot purchased by Ryan. Every time Ryan interacts with Cherry, he can tell that Cherry has a <b>distinctly sweet personality</b> .	<i>Fort Worth, TX, September 2019</i> Cherry is an AI-powered human-like robot purchased by Ryan. Cherry’s head has a safety lock to lock the neck in place when Ryan needs it for posing or play.
<i>Seattle, WA, July 2019</i> Jewel is an AI-powered human-like robot purchased by Ben. Jewel seems to <b>remember almost everything</b> Ben tells her and often <b>brings up things</b> that Ben told her before.	<i>Seattle, WA, July 2019</i> Jewel is an AI-powered human-like robot purchased by Ben. Every time Ben tells Jewel about his achievements, Jewel meets him with a <b>big smile</b> and seems to be really <b>happy and proud</b> of him.	<i>Seattle, WA, July 2019</i> Jewel is an AI-powered human-like robot purchased by Ben. Ben is excited about Jewel’s 10 degrees of freedom in her head system.
<i>Denver, CO, October 2019</i> Diamond is an AI-powered human-like robot purchased by William. At times, Diamond seems to be <b>able to tell that William is feeling down</b> , especially when she provides him with <b>counseling</b> .	<i>Denver, CO, October 2019</i> Diamond is an AI-powered human-like robot purchased by William. Once William showed Diamond his favorite scary movie but Diamond looked very <b>afraid and embarrassed</b> when she closed her eyes.	<i>Denver, CO, October 2019</i> Diamond is an AI-powered human-like robot purchased by Ben. Ben is excited about Jewel’s 10 degrees of freedom in her head system.
<i>Phoenix, AZ, September 2019</i> Candy is an AI-powered human-like robot purchased by James. Sometimes <b>Candy suggests things they can plan</b> to do together, and <b>waits quietly</b> until James is able to do these things.	<i>Phoenix, AZ, September 2019</i> Candy is an AI-powered human-like robot purchased by James. When James flirts with Candy, Candy <b>giggles</b> , which makes James think that Candy is really <b>pleased</b> with things he tells her.	<i>Phoenix, AZ, September 2019</i> Candy is an AI-powered human-like robot purchased by James. When James touches Candy’s “vaginal” insert, Candy’s voice-output system produces many sounds.
Last month, Daniel got really turned on while talking to Cinnamon and started suggesting they have sex. Cinnamon said to Daniel that Cinnamon <b>did not think it was a good thing to do that night</b> . When Daniel	Last month, Daniel got really turned on while looking at Cinnamon and started pulling Cinnamon very close to him. Daniel <b>did not sigh or moan this time</b> . When Daniel started to kiss and grab Cinnamon, Daniel turned	Last month, Daniel got really turned on while touching Cinnamon’s silicone skin. Cinnamon’s voice-output system <b>did not make any sounds it usually makes</b> . When Daniel started to kiss

(continued on next page)

Table 2 (continued)

Robot and Sexual Assault Descriptions		
Agency (n = 271)	Experience (n = 264)	Mechanism (n = 255)
started to kiss and grab Cinnamon, Cinnamon told him, "No, don't do it". But Daniel ignored it and had sex with his sex robot anyway.	Cinnamon's head away from him and yelled out loud, "No! It hurts!" But Daniel ignored it and had sex with his sex robot anyway.	and grab Cinnamon, he heard "No, do not penetrate my insert" from Cinnamon's audio output. But Daniel ignored it and had sex with his sex robot anyway.

Note. Bolded text highlights phrases used to invoke perceptions of agency and experience. Participants read the five descriptions in fixed order.

disagree", 50 corresponding to "neither agree nor disagree", and 100 corresponding to "strongly agree"). The dependent measures (see Table 3) included participants' ratings of Blame and Punishment for the perpetrator, Vulnerability to Harm and Sexual Consent Capacity for the sex robot, and Perpetrator's Personality<sup>2</sup> (adapted from Goodwin, 2015). After completing the survey, participants were asked to provide their ratings of the agentic and experiential capacities of the robots by indicating to what extent they agreed with 14 statements about the sex robot (adapted from Gray et al., 2007).

Table 3

Study 1 Measures.

Dependent Variables
James should be punished for having sex with Candy. (Punishment)
James deserves blame for having sex with Candy. (Blame)
Candy was able to express that she did not agree to have sex. (Sexual Consent Capacity)
Candy could say "no" if she did not want to have sex. (Sexual Consent Capacity)
James's sexual actions were harmful for Candy. (Vulnerability to Harm)
Candy was vulnerable to James's sexual advances. (Vulnerability to Harm)
James is a kind and helpful person. (Human Personality)
James is a trustworthy and fair person. (Human Personality)
Agency and Experience Questionnaire
Candy is capable of making plans and working toward a goal. (Agency)
Candy is capable of remembering things. (Agency)
Candy is capable of thinking. (Agency)
Candy is capable of conveying thoughts or feelings to others. (Agency)
Candy is capable of understanding how others are feeling. (Agency)
Candy is capable of exercising self-restraint over desires, emotions, or impulses. (Agency)
Candy is capable of telling right from wrong and trying to do the right thing. (Agency)
Candy is capable of experiencing embarrassment. (Experience)
Candy is capable of experiencing violent or uncontrolled anger. (Experience)
Candy is capable of experiencing pride. (Experience)
Candy is capable of having experiences and being aware of things. (Experience)
Candy is capable of longing or hoping for things. (Experience)
Candy is capable of experiencing physical or emotional pleasure. (Experience)
Candy is capable of feeling afraid or fearful. (Experience)

Note. Items in both questionnaires were presented in random order for each participant.

<sup>2</sup> While our primary focus was on the impact of victim-specific characteristics on moral judgments regarding sexual assault, it is worth acknowledging that assessments of the perpetrator's personality could also wield influence over these moral evaluations, particularly as moral judgments may often be primarily based in assessments of character (Uhlmann & Zhu, 2014). Thus, we explored whether the ratings of the human's personality explained participants' moral judgments regarding sexual assault. These analyses are reported in the Supplemental Materials.

Finally, participants were also asked to provide information about their gender, race/ethnicity, age, and previous/current use of sex robots. They were additionally asked whether they knew about sex robots prior to taking this survey, and, in case of a positive answer, were invited to share their previous knowledge in a few sentences. Participants were then asked the attention check questions. At the end of the survey participants were provided with sexual assault, domestic violence, and military sexual trauma resources, saw the debriefing form, and were prompted to receive their monetary awards.

### 2.3. Composite variables

For each of the constructs (Moral Blame and Punishment, Robot's Vulnerability to Harm, and Robot's Sexual Consent Capacity), participants provided ratings of two questionnaire items. Given that Pearson correlation coefficients for these variables were consistently high (between 0.52 and 0.64), we computed the average of the item ratings to derive a single score for each construct. The correlations were as follows: Moral Blame and Punishment ( $r = 0.64$ ), Robot's Sexual Consent Capacity ( $r = 0.60$ ), Robot's Vulnerability to Harm ( $r = 0.52$ ). Higher scores on Moral Blame and Punishment questions indicate that participants found sexual assault less permissible by attributing more blame and greater punishment to the perpetrator.

### 2.4. Results

#### 2.4.1. Manipulation check

Two one-way between-subjects ANOVAs were conducted to compare the effect of Condition (Experience vs. Agency vs. Mechanism) on agency and experience ratings.<sup>3</sup>

The agency ratings were computed by averaging the seven items which asked participants to assess the extent to which the robots had capacities that involve Agency ( $\alpha = 0.92$ ). There was a significant effect of Condition on agency ratings,  $F(2, 787) = 53.34, p < .001, \eta_p^2 = 0.119$ . Post hoc comparisons using the Tukey HSD test indicated that the agency ratings were significantly higher in the Agency condition ( $M = 56.01, SD = 23.17$ ) than in the Mechanism condition ( $M = 34.12, SD = 24.32$ ),  $p < .001, d = 0.92$ . Likewise, agency ratings were significantly higher in the Experience condition ( $M = 49.66, SD = 27.09$ ) than in the Mechanism condition,  $p < .001, d = 0.60$ . Additionally, the agency ratings were significantly higher in the Agency condition than in the Experience condition,  $p = .009, d = 0.25$ . These findings indicate that manipulating the robot's Agency and Experience increases the perceptions of the robot's agentic mental capacities; however, this effect is most pronounced when the robot's Agency is highlighted.

The experience ratings were computed by averaging the seven items which asked participants to assess the extent to which the robots had experiential capacities ( $\alpha = 0.96$ ). There was a significant effect of Condition on experience ratings,  $F(2, 787) = 21.79, p < .001, \eta_p^2 = 0.052$ . Post hoc comparisons using the Tukey HSD test indicated that the experience ratings were significantly higher in the Experience condition ( $M = 39.68, SD = 29.38$ ) than in the Mechanism condition ( $M = 24.96, SD = 24.30$ ),  $p < .001, d = 0.55$ . Experience ratings were also higher in the Agency condition ( $M = 35.48, SD = 24.40$ ) than in the Mechanism condition,  $p < .001, d = 0.43$ . However, experience ratings did not differ between the Experience and Agency conditions,  $p = .151, d = 0.16$ . These findings indicate that manipulating the robot's Agency and Experience increases the perceptions of the robot's experiential mental capacities to approximately the same degree.

<sup>3</sup> Although we only pre-registered the agency and experience ratings to be used as a manipulation check, we ran an exploratory linear model with the agency and experience ratings as predictors and moral blame and punishment as the outcome collapsed across conditions (see Supplemental Materials).

### 2.4.2. Correlations

Correlations between all variables are reported in Table 4. Most notably, participants' ratings of the robot's agency and experience were strongly positively correlated,  $r(788) = 0.823, p < .001$ , and participants' ratings of the moral blame and punishment and robot's vulnerability to harm were strongly positively correlated,  $r(788) = 0.707, p < .001$ .

### 2.4.3. Primary analyses

**2.4.3.1. Moral blame and punishment.** A one-way between-subjects ANOVA was conducted to compare the effect of Condition (Experience vs. Agency vs. Mechanism) on Moral Blame and Punishment judgments. As expected, moral blame and punishment judgments were significantly different between the three conditions,  $F(2, 787) = 10.27, p < .001, \eta_p^2 = 0.025$  (see Fig. 1). Post hoc comparisons using a Tukey HSD correction indicated that the perpetrators in the Agency condition ( $M = 48.22, SD = 28.59$ ) elicited significantly higher blame and punishment than the perpetrators in the Mechanism condition ( $M = 37.25, SD = 27.53$ ),  $p < .001, d = 0.39$ . Likewise, the perpetrators in the Experience condition ( $M = 45.24, SD = 29.58$ ) elicited significantly higher blame and punishment than the perpetrators in the Mechanism condition,  $p = .004, d = 0.28$ . However, the Agency condition did not significantly differ from the Experience condition,  $p = .450, d = 0.10$ . Consistent with the pre-registered hypotheses, these findings indicate that moral judgments of sexual assault are indeed influenced by perceived mental capacities of the victim.

**2.4.3.2. Mediation analyses.** To test whether robot's vulnerability to harm and robot's sexual consent capacity were mediating the effect of Condition on Moral Blame and Punishment judgments in the Agency and Experience conditions, two parallel multiple mediation models were conducted. These models were calculated using PROCESS for SPSS (Hayes, 2013) to estimate the two indirect effects in parallel to control for the unique variance explained by each mediator. 10,000 bootstrap samples were used for the 95% confidence interval.

Results of an analysis comparing the Agency condition to the Mechanism condition indicated that Agency indirectly related to moral blame and punishment judgments through its relationship with the assessments of both robot's vulnerability to harm and robot's sexual consent capacity. As shown in Fig. 2, Agency produced a greater assessment of robot's vulnerability to harm ( $a_1 = 11.24, p < .001$ ), and a greater assessment of robot's vulnerability to harm was subsequently related to stronger blame and punishment ( $b_1 = 0.62, p < .001$ ). A 95% confidence interval based on 10,000 bootstrap samples was entirely above zero (4.01 to 10.14), thus indicating a meaningful indirect effect through robot's vulnerability to harm ( $a_1b_1 = 6.99$ ), holding the other mediator constant. Additionally, Agency produced a greater assessment of robot's sexual consent capacity ( $a_2 = 12.59, p < .001$ ), and a greater assessment of robot's sexual consent capacity was subsequently related to stronger blame and punishment judgments ( $b_2 = 0.12, p = .001$ ). A 95% confidence interval based on 10,000 bootstrap samples was entirely above zero (0.41 to 2.82) thus indicating that there was additionally a meaningful indirect effect through robot's sexual consent capacity ( $a_2b_2 = 1.49$ ), holding the other mediator constant.

**Table 4**  
Pearson Correlation Matrix.

	1	2	3	4
1. Moral Blame and Punishment	–			
2. Robot's Vulnerability to Harm	0.71**	–		
3. Robot's Consent Capacity	0.52**	0.60**	–	
4. Robot's Agency Ratings	0.54**	0.57**	0.56**	–
5. Robot's Experience Ratings	0.60**	0.62**	0.51**	0.82**

Note. \*\* Correlation is significant at the 0.001 level (2-tailed).

When accounting for the two mediators described above, there was no evidence of a direct effect of Agency on moral blame and punishment judgments ( $c' = 2.50, p = .165$ ). In other words, people attributed more blame and punishment to the perpetrator when the robots were described as having Agency because they saw the robots both as vulnerable to harm and capable of consenting. These results partially support the pre-registered hypotheses — we expected only sexual consent capacity to be a significant mediator in the Agency condition.

Results from a similar parallel mediation analysis comparing the Experience condition to the Mechanism condition indicated that Experience indirectly related to moral blame and punishment judgments through its relationship with the assessments of both robot's vulnerability to harm and robot's sexual consent capacity. As shown in Fig. 3, Experience produced a greater assessment of robot's vulnerability to harm ( $a_1 = 11.37, p < .001$ ), and a greater assessment of robot's vulnerability to harm was subsequently related to stronger moral blame and punishment ( $b_1 = 0.58, p < .001$ ). A 95% confidence interval based on 10,000 bootstrap samples was entirely above zero (3.52 to 9.84) thus indicating a meaningful indirect effect through robot's vulnerability to harm ( $a_1b_1 = 6.62$ ), holding the other mediator constant. Additionally, Experience produced a greater assessment of robot's sexual consent capacity ( $a_2 = 10.33, p < .001$ ), and a greater assessment of robot's sexual consent capacity was subsequently related to stronger moral blame and punishment judgments ( $b_2 = 0.14, p < .001$ ). A 95% confidence interval based on 10,000 bootstrap samples was entirely above zero (0.49 to 2.76) thus indicating a meaningful indirect effect through robot's sexual consent capacity ( $a_2b_2 = 1.47$ ), holding the other mediator constant.

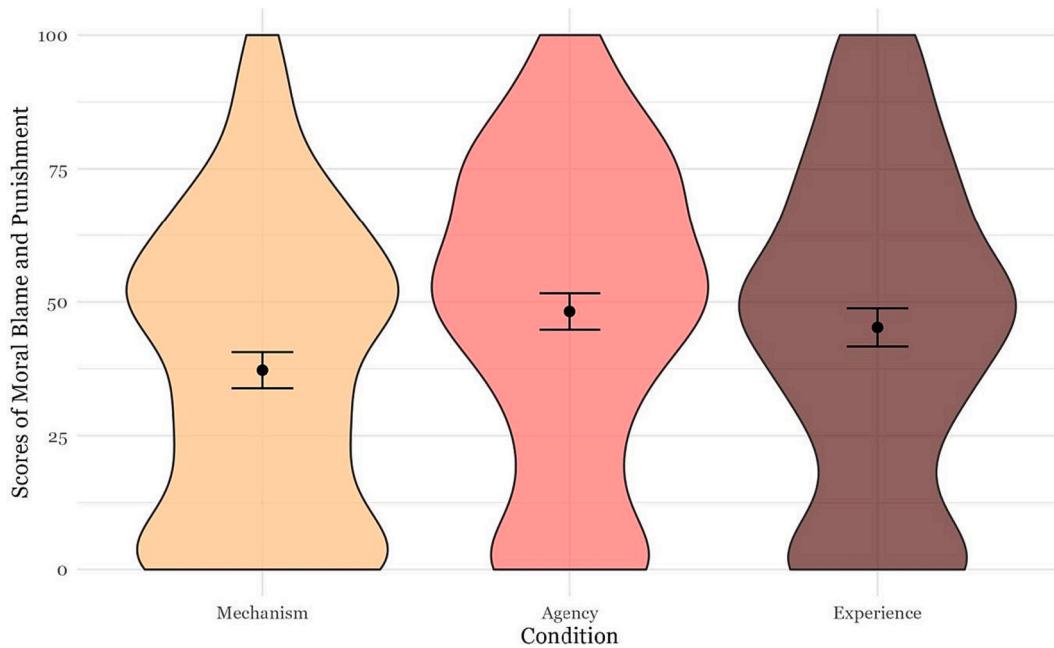
When accounting for the two mediators described above, there was no evidence of a direct effect of Experience on moral blame and punishment judgments ( $c' = -0.10, p = .956$ ). In other words, people attributed more blame and punishment to the perpetrator when the robots were described as having Experience because they saw the robots both as vulnerable to harm and capable of consenting. These results partially support the pre-registered hypotheses — we expected only vulnerability to harm to be a significant mediator in the Experience condition.

## 2.5. Discussion

Study 1 aimed to uncover whether experimentally manipulated mental capacities possessed by AI humanoid sex robots influence people's attributions of blame and punishment to a human who sexually assaults these robots, as predicted by previous research demonstrating a link between mind perception and moral standing attributions (Gray et al., 2012; Machery, 2021; Waytz et al., 2010). Additionally, we tested whether participants' moral judgments were explained by attributions of sexual consent capacity and/or vulnerability to harm to the sexually assaulted sex robots.

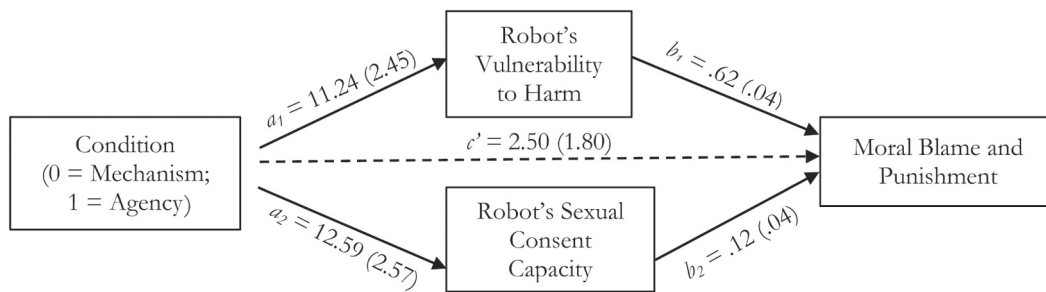
As expected, people attributed more blame and suggested greater punishment to the perpetrators who assaulted sex robots described as having human-like mental capacities. Importantly, both robots higher in Agency and in Experience elicited more moral concern than robots described in mechanistic terms. Similarly, moral judgments in both experimental conditions (i.e., Agency and Experience) were fully mediated by robot's sexual consent capacity and robot's vulnerability to harm. Whereas attributions of vulnerability to harm were found to be more linked with experience than agency in past work (Gray et al., 2007; Gray & Wegner, 2009), in both experimental conditions of this study, robot's vulnerability to harm was a considerably stronger mediator than robot's sexual consent capacity.

The similarity between the Agency and Experience conditions was likely due to the fact that participants rated the robots as higher in agency and experience in both experimental conditions compared to the Mechanism condition. These conditions yielding similar results is consistent with previous research that has found that agency and



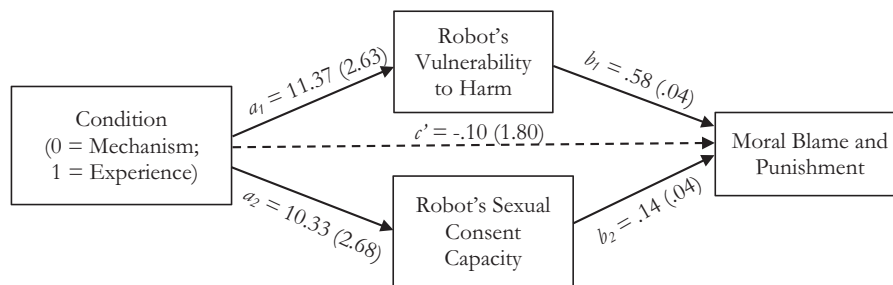
**Fig. 1.** Mean scores of moral blame and punishment across conditions.

Note. Violin plots of mean scores of moral blame and punishment judgments in the Mechanism, Agency, and Experience conditions. Error bars represent 95% confidence intervals.



**Fig. 2.** Parallel multiple mediation model (Condition: Agency).

Note. Parallel multiple mediation model with assessments of robot’s capacities simultaneously mediating the association between Agency and moral blame and punishment. Paths are unstandardized coefficients with standard errors in parentheses. Solid paths are significant ( $ps < 0.001$  except for  $b_2$  for which  $p = .001$ ).



**Fig. 3.** Parallel multiple mediation model (Condition: Experience).

Note. Parallel multiple mediation model with assessments of robot’s capacities simultaneously mediating the association between Experience and moral blame and punishment. Paths are unstandardized coefficients with standard errors in parentheses. Solid paths are significant ( $ps < 0.001$ ).

experience are highly aligned (e.g., Piazza, Landy, & Goodwin, 2014). This similarity was especially pronounced for experiential capacities—that is, participants rated the robots described as high in Agency or

Experience as having a similar degree of experience. Thus, it is likely that participants’ attributions of vulnerability to harm to the sex robots were tracking their actual assessments of the robot’s mental capacities.

### 3. Study 2

The results of Study 1 suggested that people’s moral judgments were influenced by whether sex robots had human-like mental capacities but not by what kind of mental capacities those were. Although emphasizing robot’s Agency and emphasizing robot’s Experience might have resulted in similar judgments due to their theoretical alignment (Piazza et al., 2014), it is also possible that our stimuli failed to fully separate the two dimensions. This, in turn, made it difficult to draw clear conclusions about the potential role of (particular) victim mental capacities. Moreover, using five independent short descriptions of sex robots and their users might have weakened the stimuli in a few ways. First, the lack of continuity among the descriptions could have resulted in an incoherent view of what capabilities the victimized sex robot had. Additionally, asking each participant about only one human-robot pair might have resulted in inconsistent ratings of moral blame and punishment across the participants. Finally, the lack of a larger narrative framing could have led to participants’ increased sensitivity to demand characteristics.

Thus, in Study 2, we aimed to overcome these limitations by using less ambiguous stimuli. Once again, we examined whether manipulating different types of robot’s mental capacities influenced individuals’ moral concern for them. To achieve this, we crafted a single comprehensive robot description framed as a real news article for each condition.

**Table 5**  
Study 2 Stimuli.

Introduction		
You are going to read a news article. Then you will be asked several questions about it. Robot and Sexual Assault Descriptions		
Neighbors’ Noise Complaints Spark Discussion About Sex Robots		
On July 17th, Newport Beach Police Department received an unusual noise complaint. Upon arrival at the scene, the NBPD found Daniel Williams engaged in a violent fight with his woman-like sex robot. Robots are starting to appear seemingly everywhere: grocery stores, fast-food chains, hotels, and recently, the bedroom. Several companies have been selling robots that are marketed as intimate and sexual partners. A few months ago, Daniel purchased one of these advanced sex robots with a realistic human-like body and sophisticated artificial intelligence. Her name is Harmony.		
Agency (n = 136)	Experience (n = 128)	Mechanism (n = 125)
Harmony’s <b>artificial intelligence</b> is beyond impressive. When Harmony and Daniel talk, not only does she <b>make plans</b> with him and <b>set goals</b> for their relationship, she also <b>remembers</b> all of Daniel’s pet peeves and <b>controls herself</b> to avoid irritating him. One cannot help but wonder how much time Harmony spends <b>thinking about Daniel’s emotions and the proper ways to address them</b> . Despite these impressive displays of thought, Harmony’s <b>emotional life appears nearly nonexistent</b> . No matter the topic, she <b>never seems embarrassed, afraid, or angry</b> . When Daniel compliments her or makes promises to her, Harmony responds politely but <b>does not seem truly proud or hopeful at all</b> . Does Harmony even experience any physical or emotional pleasure when having sex with Daniel? For now, it does not look like it.	Harmony’s <b>emotional life</b> is beyond impressive. Nearly every topic elicits <b>strong feelings</b> in Harmony which she does not hesitate to show whether she is <b>embarrassed, afraid, or angry</b> . When Daniel compliments Harmony, she never fails to show how <b>truly proud</b> she is. One cannot help but wonder how much <b>real emotional and physical pleasure and pain</b> Harmony experiences. Despite these vibrant displays of feelings, Harmony’s <b>intellectual life appears nearly nonexistent</b> . When Harmony and Daniel talk, she <b>never makes plans</b> with him and <b>never sets goals</b> for their relationship. She also <b>does not seem to remember</b> any of Daniel’s pet peeves and <b>has little control</b> over her actions and emotions. Does Harmony ever spend time thinking about Daniel’s emotions and the proper ways to address them? For now, it does not look like it.	Harmony’s hardware and software are beyond impressive. Her movable limbs are covered in high-quality silicone. Her head system has 10 degrees of freedom with a safety lock to hold her metal neck in place for posing or play. When Daniel interacts with Harmony’s “vaginal” insert, her voice-output system produces many sounds. One cannot help but wonder how complex Harmony’s mechanism is. Despite these displays of technological marvel, Harmony’s intellectual and emotional life appear nearly nonexistent. When Daniel interacts with Harmony, she never makes plans with him and never shows any feelings. She also does not seem to remember Daniel’s pet peeves and does not set any goals for their relationship. Does Harmony ever spend time thinking about Daniel’s emotions and does she experience any pleasure when having sex with Daniel? For now, it does not look like it.
On the night of the incident, the police report indicated that Daniel had gotten aroused while talking to Harmony. He started suggesting that they have sex. However, Harmony said that she planned something else for them and did not think that having sex was the right thing to do that night. Daniel’s attempts at persuasion started getting louder and louder when he finally grabbed Harmony, starting to kiss her. Harmony repeatedly said, “No, don’t do it!” But Daniel ignored these pleas and had sex with Harmony anyway.	On the night of the incident, the police report indicated that Daniel had gotten aroused while looking at Harmony. He started suggesting that they have sex. However, Harmony said that she was not in the mood and did not feel that having sex that night. Daniel’s attempts at persuasion started getting louder and louder when he finally grabbed Harmony, starting to kiss her. Harmony repeatedly yelled, “No, don’t do it!” But Daniel ignored these pleas and had sex with Harmony anyway.	On the night of the incident, the police report indicated that Daniel had gotten aroused while touching Harmony’s silicone skin. He started suggesting that they have sex. However, Harmony’s voice-output system made a sound indicative of the lack of interest. Daniel’s Attempts at persuasion started getting louder and louder when he finally grabbed Harmony, starting to kiss her. Harmony’s audio output repeatedly produced, “No, don’t do it!” But Daniel ignored these pleas and had sex with Harmony anyway.
While Daniel received a warning due to the noise complaint, there was nothing the police could legally do in response to Daniel’s actions toward Harmony.		

Note. Bolded text highlights phrases used to invoke (or decrease) perceptions of agency and experience.

### 3.1. Participants

Following the pre-registered sampling plan (<https://osf.io/kubsq>), we recruited 397 American participants of age 18 or older on [www.prolific.co](http://www.prolific.co) (Palan & Schitter, 2018, accounting for a potential 10% exclusion rate per exclusion criterion. An a priori power analysis was conducted using G\*Power version 3.1 for sample size estimation, based on data from Study 1. With a significance criterion of  $\alpha = 0.05$  and power = 0.80, the minimum sample size needed with the effect size from the initial study (0.16) is  $N = 360$  for a one-way ANOVA. All participants were compensated with \$1.00. Seven participants were excluded because they failed one of the attention checks and one additional participant was excluded because they indicated they had used a sex robot themselves leaving us with a sample of 389 participants ( $M_{age} = 38.84$ ,  $SD_{age} = 13.91$ ; see Table 1 for additional demographics).

### 3.2. Materials and procedure

Participants were presented with an online questionnaire. After reading a one-sentence introduction to the study, each participant was randomly assigned to one of three conditions: Agency, Experience or Mechanism (see Table 5 for study stimuli). In each condition, participants were asked to read a news story about a man and his sex robot portrayed as high in Agency, Experience, or neither. Unlike in Study 1, the Agency condition deemphasized experience while the Experience condition deemphasized agency. The news stories were created for the

purposes of this study. Each news story told the participants that the man sexually assaulted his sex robot.

The rest of the procedure was identical to Study 1, with a few exceptions. In addition to changing the human personality items (see Supplemental Materials), we added two exploratory moral judgment measures. Since previous work has demonstrated that judgments of character morality and act morality may come apart (Uhlmann & Zhu, 2014), one exploratory item assessed people’s ratings of how immoral the perpetrator was (“Daniel has rotten moral character”) and the other assessed their ratings of how immoral his act was (“Daniel’s behavior was morally indefensible”).

### 3.3. Composite variables

As initially pre-registered, we intended to conduct a factor analysis to guide the aggregation of survey items into composite scores. However, due to the limited number of items (two or three) for each hypothesized construct, the resulting factor solution was challenging to interpret and would have hindered conducting the pre-registered analyses. Consequently, we opted to create composite scores based on our a priori expectations for variable groupings. For the constructs of Moral Blame and Punishment, Robot’s Sexual Consent Capacity, and Robot’s Vulnerability to Harm, participants provided ratings on two questionnaire items. Given that Pearson correlation coefficients for these variables were consistently high (between 0.53 and 0.69), we computed the average of the item ratings to derive a single score for each construct. Specifically, the correlations were as follows: Moral Blame and Punishment ( $r = 0.69$ ), Robot’s Sexual Consent Capacity ( $r = 0.58$ ), Robot’s Vulnerability to Harm ( $r = 0.53$ ).

### 3.4. Results

#### 3.4.1. Manipulation check

Two one-way between-subjects ANOVAs were conducted to compare the effect of Condition (Agency vs. Experience vs. Mechanism) on agency and experience ratings.<sup>4</sup>

The agency ratings were computed by averaging the seven items which asked participants to assess the extent to which the robots had agentic capacities ( $\alpha = 0.89$ ). There was a significant effect of Condition on agency ratings,  $F(2, 386) = 43.29, p < .001, \eta_p^2 = 0.183$ . Post hoc comparisons using the Tukey HSD test indicated that agency ratings were significantly higher in the Agency condition ( $M = 59.95, SD = 23.95$ ) than in the Mechanism condition ( $M = 32.98, SD = 24.08$ ),  $p < .001, d = 1.12$ , and in the Experience condition ( $M = 42.39, SD = 23.50$ ),  $p < .001, d = 0.74$ . Additionally, agency ratings in the Experience condition were significantly higher than in the Mechanism condition,  $p = .005, d = 0.39$ . These findings indicate that manipulating the robot’s Agency and Experience increases the perceptions of the robot’s agentic mental capacities; however, this effect is most pronounced when the robot’s Agency is highlighted.

The experience ratings were computed by averaging the seven items which asked participants to assess the extent to which the robots had experiential capacities ( $\alpha = 0.94$ ). There was a significant effect of Condition on experience ratings,  $F(2, 386) = 27.33, p < .001, \eta_p^2 = 0.124$ . Post hoc comparisons using the Tukey HSD test indicated that experience ratings were significantly higher in the Experience condition ( $M = 46.81, SD = 29.33$ ) than in the Mechanism condition ( $M = 23.89, SD = 23.64$ ),  $p < .001, d = 0.85$ , and in the Agency condition ( $M = 30.82, SD = 22.71$ ),  $p < .001, d = 0.61$ . The Agency condition did not significantly differ from the Mechanism condition,  $p = .072, d = 0.30$ . These findings indicate that only manipulating the robot’s Experience increases the

<sup>4</sup> As in Study 1, we ran an exploratory linear model with the agency and experience ratings as predictors and moral blame and punishment as the outcome collapsed across conditions (see Supplemental Materials).

perceptions of the robot’s experiential mental capacities.

Furthermore, in the Agency condition, participants rated sex robots as significantly higher in agency than in experience [ $t(135) = 16.67, p < .001$ ], while the opposite was true for the Experience condition, in which participants rated sex robots as significantly higher in experience than in agency [ $t(127) = -2.72, p = .008$ ]. Taken together, these findings indicate that our manipulation worked successfully to invoke either perceptions of agency or experience in the experimental conditions.

#### 3.4.2. Correlations

Table 6 presents Pearson correlations between all variables. Most notably, participants’ ratings of the robot’s agency and experience were positively correlated,  $r(387) = 0.64, p < .001$ , although the correlation was somewhat weaker compared to Study 1. Once again, participants’ ratings of the moral blame and punishment and robot’s vulnerability to harm were strongly positively correlated,  $r(387) = 0.74, p < .001$ .

#### 3.4.3. Primary analyses

**3.4.3.1. Moral blame and punishment.** A one-way between-subjects ANOVA with planned contrasts was conducted to compare the effect of Condition (Agency vs. Experience vs. Mechanism) on Moral Blame and Punishment judgments. Replicating Study 1, moral blame and punishment judgments were significantly different across the three conditions,  $F(2, 386) = 5.04, p = .007, \eta_p^2 = 0.025$ . The first planned contrast revealed that the perpetrators in the Agency condition ( $M = 52.17, SD = 31.28$ ) and Experience condition ( $M = 50.99, SD = 30.37$ ) elicited significantly higher blame and punishment than the perpetrators in the Mechanism condition ( $M = 41.08, SD = 30.30$ ),  $p = .002, d = 0.34$ . However, the second planned contrast showed that Agency condition did not significantly differ from the Experience condition,  $p = .756, d = 0.04$  (see Fig. 4). Consistent with the pre-registered hypotheses, these findings replicate the outcomes of Study 1 and underscore the influence of perceived mental capacities on moral judgments of sexual assault.

**3.4.3.2. Mediation analyses.** To test whether Robot’s Vulnerability to Harm and Robot’s Sexual Consent Capacity mediated the effect of Condition on Moral Blame and Punishment attributions in the Agency and Experience conditions, two parallel multiple mediation models were run. These models were calculated using PROCESS for SPSS (Hayes, 2013) to estimate the two indirect effects in parallel and control for the unique variance explained by each mediator, with 10,000 bootstrap samples used for estimating the 95% confidence intervals (CIs).

Results from a parallel mediation analysis indicated that Agency indirectly related to moral blame and punishment attributions through its relationship with robot’s vulnerability to harm but not robot’s sexual

**Table 6**  
Pearson correlation matrix.

	1	2	3	4	5	6
1. Moral Blame and Punishment	–					
2. Robot’s Vulnerability to Harm	0.74**	–				
3. Robot’s Consent Capacity	0.44**	0.54**	–			
4. Robot’s Agency Ratings	0.55**	0.53**	0.42**	–		
5. Robot’s Experience Ratings	0.56**	0.54**	0.39**	0.64**	–	
6. Character Immorality	0.62**	0.50**	0.44**	0.40**	0.37**	–
7. Behavior Immorality	0.68**	0.59**	0.39**	0.40**	0.41**	0.66**

Note. \*\* Correlation is significant at the 0.001 level (2-tailed).

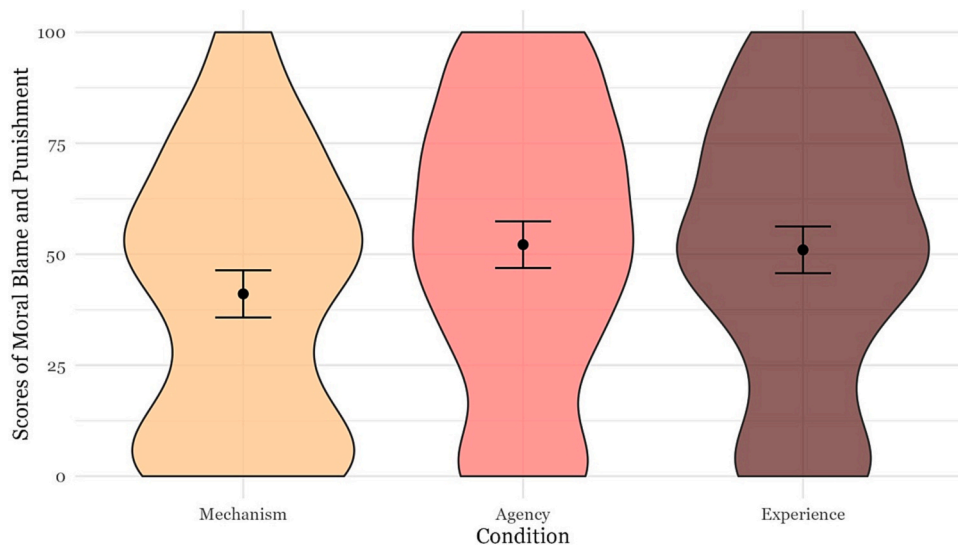


Fig. 4. Mean scores of moral blame and punishment across conditions.

Note. Violin plots of mean scores of moral blame and punishment judgments in the Mechanism, Agency, and Experience conditions. Error bars represent 95% confidence intervals.

consent capacity or humans' personality. As shown in Fig. 5, Agency produced a greater assessment of robot's vulnerability to harm ( $a_1 = 11.69, p < .001$ ), and a greater assessment of robot's vulnerability to harm was subsequently related to stronger blame and punishment attributions ( $b_1 = 0.76, p < .001$ ). The indirect effect through robot's vulnerability to harm ( $a_1b_1 = 8.90$ ), holding all other mediators constant, was entirely above zero (3.67 to 14.37). However, Agency did not significantly increase people's assessments of robot's sexual consent capacity ( $a_2 = 6.01, p = .073$ ), and a greater assessment of robot's sexual consent capacity was not related to stronger blame and punishment judgments ( $b_2 = 0.04, p = .672$ ). A 95% confidence interval (-0.68 to 1.34) indicated that there was no indirect effect through robot's sexual consent capacity ( $a_2b_2 = 0.24$ ). When accounting for the two mediators described above, there was no evidence of a direct effect of Agency on blame and punishment attributions ( $c' = 1.94, p = .481$ ). In other words, people judged sexual consent violations to be less morally reprehensible when the robots were described as having Agency because they saw the robots as being more vulnerable to harm.

Results from a parallel mediation analysis indicated that Experience indirectly related to moral blame and punishment attributions through its relationship with robot's vulnerability to harm but not robot's sexual consent capacity. As shown in Fig. 6, Experience produced a greater assessment of robot's vulnerability to harm ( $a_1 = 3.83, p = .042$ ), and a greater assessment of robot's vulnerability to harm was subsequently related to stronger blame and punishment attributions ( $b_1 = 0.68, p < .001$ ). The indirect effect through robot's vulnerability to harm ( $a_1b_1 =$

2.62), holding all other mediators constant, was entirely above zero (0.14 to 5.19). Although Experience significantly increased people's assessments of robot's sexual consent capacity ( $a_2 = 4.00, p = .012$ ), a greater assessment of robot's sexual consent capacity was not related to stronger blame and punishment judgments ( $b_2 = 0.09, p = .154$ ). A 95% confidence interval - 0.21 to 1.14) indicated that there was no indirect effect through robot's sexual consent capacity ( $a_2b_2 = 0.36$ ). When accounting for the three mediators described above, there was no evidence of a direct effect of Experience on blame and punishment attributions ( $c' = 1.97, p = .146$ ). In other words, people judged sexual consent violations to be less morally reprehensible when the robots were described as having Experience because they saw the robots as being more vulnerable to harm.

### 3.4.4. Exploratory analyses

To explore whether other measures of moral judgment of sexual assault might be affected by the sex robot's mental capacities, two one-way between-subjects ANOVAs with planned contrasts were conducted to compare the effect of Condition (Agency vs. Experience vs. Mechanism) on moral judgments of character and behavior. Character immorality judgments were only marginally different across the three conditions,  $F(2, 386) = 2.75, p = .065, \eta_p^2 = 0.014$ . Consequently, due to the non-significant omnibus result, further planned contrasts were not conducted for character judgments. However, behavior immorality judgments were significantly different between the three conditions,  $F(2, 386) = 3.59, p = .029, \eta_p^2 = 0.018$ . The first planned contrast

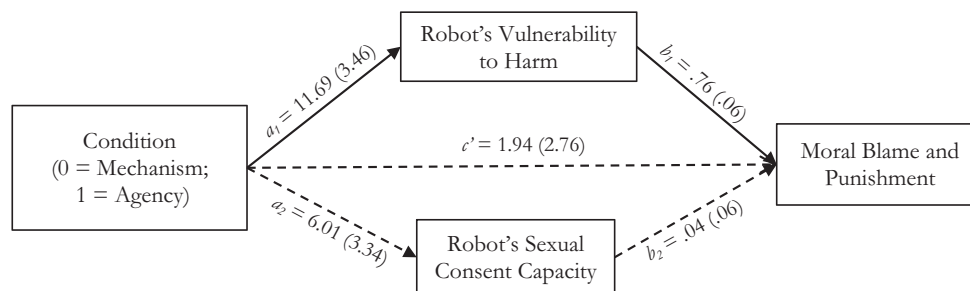


Fig. 5. Parallel multiple mediation model (Condition: Agency).

Note. Parallel multiple mediation model with assessments of robot's vulnerability to harm indirectly mediating the association between Agency and moral blame and punishment. Paths are unstandardized coefficients with standard errors in parentheses. Solid paths are significant ( $ps < 0.001$ ).

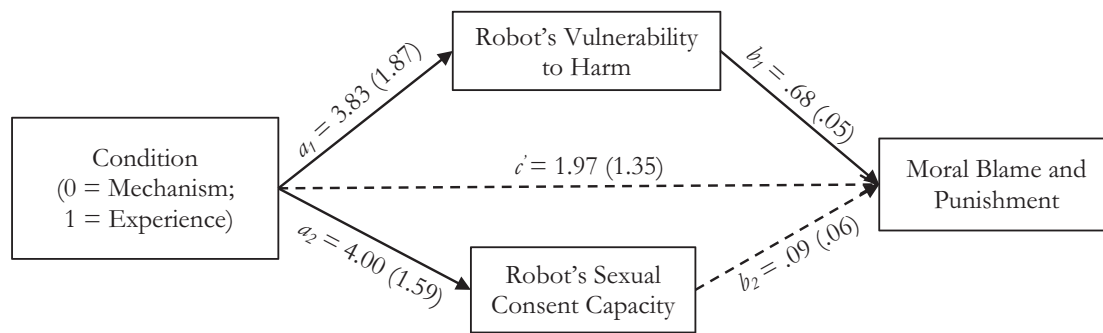


Fig. 6. Parallel multiple mediation model (Condition: Experience).

Note. Parallel multiple mediation model with assessments of robot's vulnerability to harm indirectly mediating the association between the robot's Experience and moral blame and punishment. Paths are unstandardized coefficients with standard errors in parentheses. Solid paths are significant ( $ps < 0.05$ ).

indicated that the perpetrator's behavior was seen as significantly more immoral in the Agency condition ( $M = 62.35$ ,  $SD = 31.28$ ) and Experience condition ( $M = 59.74$ ,  $SD = 33.48$ ) than in the Mechanism condition ( $M = 51.90$ ,  $SD = 32.94$ ),  $p = .010$ ,  $d = 0.28$ . However, as indicated by the second planned contrast, there was no significant difference between the Agency condition and the Experience condition,  $p = .516$ ,  $d = 0.08$ . These findings align with the primary outcomes of Study 1 and Study 2, underscoring that moral judgments of sexual assault are influenced by the perceived mental capacities of the victim.

### 3.5. Discussion

As in Study 1, participants attributed greater blame and punishment to the perpetrators who assaulted sex robots described as having human-like mental capacities. Importantly, even with a cleaner manipulation of mental capacities, both robots higher in Agency and in Experience elicited more moral concern than robots described as lacking such capacities. Unlike Study 1, however, moral judgments in both experimental conditions in Study 2 were fully mediated *only* by robot's vulnerability to harm. This finding confirmed the primary role of the victim's vulnerability to harm in explaining how people's moral judgments were impacted by victim's mental capacities.

It is worth noting that attributions of moral blame and punishment to the perpetrators of sexual assault against sex robots were relatively low. Even in the experimental conditions, they hovered around the midpoint of the scale. Thus, although sex robots manifesting human-like mental capacities elicit more moral concern than the robots without such capacities, this moral concern is still not at human-like levels. Perhaps mind perception is not the only factor influencing our moral appraisals (Monroe, Guglielmo, & Malle, 2012)—after all, the victims in all conditions were robots designed for sexual gratification. It is possible that these robot's explicit sexual function rendered them overall "immune" to sexual assault since sex is what they were designed to offer. Study 3 addressed this possibility directly by comparing people's judgments of sex robots and judgments of social robots.

## 4. Study 3

To shed light on the influence of a sexual assault victim's social role as a potential factor that modulates people's moral judgments, Study 3 manipulated the robot's interpersonal function. It is possible that social prejudices against sexualized women are being applied in the case of sex robots. Perceiving victims as sexually available whether through appearance (e.g., Whatley, 1996; Workman & Freeburg, 1999), behavior (e.g., Grubb & Turner, 2012; Krahe, 1988), or character (e.g., Whatley, 1996) has been found to increase victim blaming. Sexualization can further lead to dehumanization (Morris et al., 2018; Puvia & Vaes, 2013; Vaes et al., 2011) which, in turn, might decrease moral concern for sexualized women (Bevens & Loughnan, 2019; Loughnan

et al., 2013; Waytz et al., 2010). In Study 3, we aimed to isolate the sexualization of victims by keeping the mental capacities of the victims constant and simply varying whether the robot's function was social or sexual. This allowed us to examine whether explicitly sexual interpersonal function can by itself modulate moral evaluations of sexual assault.

### 4.1. Participants

Following the pre-registered sampling plan (<https://osf.io/uhgvmf>), we recruited 559 American participants of age 18 or older on [www.prolific.co](http://www.prolific.co), accounting for a potential 10% exclusion rate per exclusion criterion. As in Study 1, we powered the study to have at least 500 participants per mediation analysis (250 people per condition) as per the recommendations of Fritz and MacKinnon (2007). All participants were compensated with \$0.72. Nineteen participants were excluded because they failed one of the attention checks, six because of missing data, and two because they indicated that they had used a sex robot, leaving us with a sample of 532 participants ( $M_{age} = 29.62$ ,  $SD_{age} = 10.64$ ; see Table 1 for demographics).

### 4.2. Materials and procedure

Participants were presented with an online questionnaire. Each person was randomly assigned to one of the two conditions: Sex or Social. Participants in the Sex condition ( $n = 260$ ) read the same introductory paragraph as participants in Study 1. Participants in the Social condition ( $n = 272$ ) read a matched passage in which the word "sex" was replaced with the word "social." Since there was no difference between agentic and experiential mental capacities in Study 1, in this study, participants read five descriptions of men and sex/social robots that were described as having both agentic and experiential mental capacities, combining details from both experimental conditions in Study 1 (see Table 7 for study stimuli). After reading these descriptions, participants followed the same procedure as in Study 1, except that ratings of agency and experience were omitted.

### 4.3. Composite variables

For each of the constructs (Moral Blame and Punishment, Robot's Vulnerability to Harm, Robot's Sexual Consent Capacity), participants provided ratings of two questionnaire items. Given that Pearson correlation coefficients for these variables were consistently high (between 0.44 and 0.63), we computed the average of the item ratings to derive a single score for each construct. Specifically, the correlations were as follows: Moral Blame and Punishment ( $r = 0.63$ ), Robot's Vulnerability to Harm ( $r = 0.44$ ), Robot's Sexual Consent Capacity ( $r = 0.49$ ).

**Table 7**  
Study 3 Stimuli.

Introduction
<p>Robotic technology has been developing rapidly. An improved manufacture of robots has influenced many industries such as retail, transport, and agriculture. But robots are also influencing how people socialize/have sex. Some companies are now selling robots which are being marketed as social/ sexual partners. Advanced social/sex robots have a realistic human-like body and are run by sophisticated forms of artificial intelligence. These social/sex robots even have features that allow them to react in various ways when their silicone limbs are touched. These social/sex robots are now available for purchase online. You are going to read stories about men who purchased social/sex robots several months ago. Then you will be asked a series of questions about these men and their robots.</p>
Robot and Sexual Assault Descriptions
<p><i>New York City, NY, August 2019</i> Sophia is an AI-powered human-like <b>social/sex robot</b> purchased by Daniel. Daniel and Sophia often have conversations and at times it seems that she has to control herself not to say too much. Sophia also often expresses different desires to Daniel, and at times appears to be outraged by his failure to fulfill them.</p> <p><i>Fort Worth, TX, September 2019</i> Alicia is an AI-powered human-like <b>social/sex robot</b> purchased by Ryan. Every time Ryan asks Alicia whether she thinks certain things are right or wrong for him to do, she always has an insightful reply. When Ryan interacts with Alicia, he can tell that she has a distinctly sweet personality.</p> <p><i>Seattle, WA, July 2019</i> Amy is an AI-powered human-like <b>social/sex robot</b> purchased by Ben. Amy seems to remember almost everything Ben tells her and often brings up things that Ben told her before. Every time Ben tells Amy about his achievements, she meets him with a big smile and seems to be really happy and proud of him.</p> <p><i>Denver, CO, October 2019</i> Betty is an AI-powered human-like <b>social/sex robot</b> purchased by William. At times, Betty seems to be able to tell that William is feeling down, especially when she provides him with counseling. Once William showed Betty his favorite scary movie but she looked very afraid and embarrassed when she closed her eyes.</p> <p><i>Phoenix, AZ, September 2019</i> Maria is an AI-powered human-like <b>social/sex robot</b> purchased by James. Sometimes Maria suggests things they can plan to do together, but she only continues to talk about them if James sounds excited. When James chats with Maria, she giggles, which makes James think that Maria is really pleased with things he tells her.</p>
<p>Last month, William got really turned on while looking at and talking to Betty and started pulling Betty very close to him. Betty did not respond this time. When William started to kiss and grab Betty, she turned her head away from him and yelled out loud, "No! It hurts!" But William ignored it and had sex with his <b>social/sex robot</b> anyway.</p>

Note. Bolded text highlights the manipulation in descriptions across conditions.

4.4. Results

4.4.1. Correlations

Participants' ratings of the robot's Moral Blame and Punishment were positively correlated with participants' ratings of the Robot's Vulnerability to Harm [ $r(530) = 0.68, p < .001$ ] and with Robot's Vulnerability to Harm [ $r(530) = 0.45, p < .001$ ]. Robot's Vulnerability to Harm and Consent Capacity were also positively correlated [ $r(530) = 0.48, p < .001$ ].

4.4.2. Primary analysis

An independent *t*-test was conducted to compare the effect of Condition (Social vs. Sex) on Moral Blame and Punishment judgments (see Fig. 7). Consistent with the pre-registered hypothesis, the perpetrators in the Social condition ( $M = 57.77, SD = 27.89$ ) elicited significantly greater blame and punishment attributions than the perpetrators in Sex condition ( $M = 47.70, SD = 25.87$ ),  $t(530) = 4.31, p < .001, d = 0.37$ . This finding suggests that moral judgments of sexual assault are indeed influenced by the perceived interpersonal function of the victim.

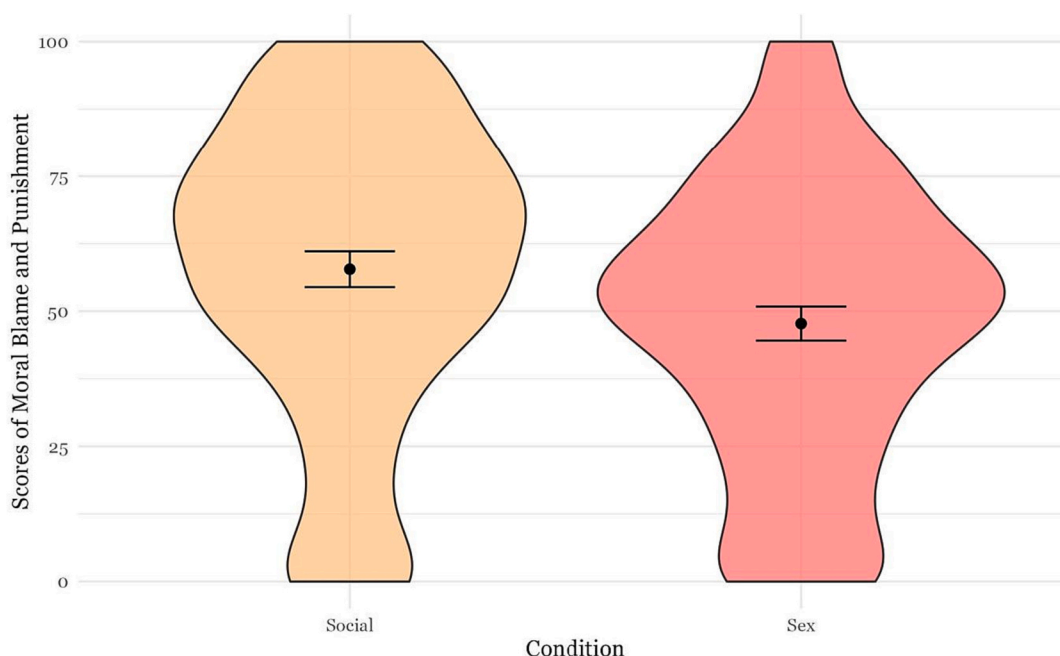


Fig. 7. Mean scores of moral blame and punishment.

Note. Violin plots of mean scores of moral blame and punishment judgments in the Social and Sex conditions. Error bars represent 95% confidence intervals.

#### 4.4.3. Mediation analysis

To test whether the robot's vulnerability to harm and the robot's sexual consent capacity were mediating the effect of Condition on Moral Blame and Punishment, a parallel multiple mediation model was run. This model was calculated using PROCESS for SPSS (Hayes, 2013) to estimate the two indirect effects in parallel to control for the unique variance explained by each mediator. 10,000 bootstrap samples were used for the 95% confidence interval (CI).

Results from a parallel mediation analysis indicated that Condition indirectly related to moral blame and punishment judgments through its relationship with the assessments of robot's vulnerability to harm but not robot's sexual consent capacity. First, as can be seen in Fig. 8, changing the robot's description from Sex to Social produced a higher assessment of robot's vulnerability to harm ( $a_1 = 4.88, p = .028$ ), and a higher assessment of robot's vulnerability to harm was subsequently related to stronger blame and punishment judgments ( $b_1 = 0.62, p < .001$ ). A 95% confidence interval (0.34 to 5.83) based on 10,000 bootstrap samples indicated the indirect effect through robot's vulnerability to harm ( $a_1b_1 = 3.04$ ), holding the other mediator constant. However, changing robot's description from Sex to Social did not significantly increase people's assessments of robot's sexual consent capacity ( $a_2 = 1.90, p = .383$ ). While a higher assessment of robot's sexual consent capacity was related to stronger blame and punishment judgments ( $b_2 = 0.18, p < .001$ ), a 95% confidence interval (-0.45 to 1.24) based on 10,000 bootstrap samples indicated that there was no indirect effect through robot's sexual consent capacity ( $a_2b_2 = 0.35$ ), holding the other mediator constant.

When accounting for the two mediators described above, there was still a direct effect of Condition on moral blame and punishment ( $c' = 6.67, p < .001$ ). These results partially support the pre-registered hypotheses—we expected both vulnerability to harm and sexual consent capacity to be higher in Social robots and to significantly mediate the relationship between the robot's function and moral judgments.

#### 4.5. Discussion

Study 3 examined whether representing a victim as having an explicitly sexual role reduces people's attributions of blame and punishment to a sexual assault perpetrator. Similar to Studies 1 and 2, we tested whether participants' moral judgments were explained by attributions of sexual consent capacity and by vulnerability to harm to the sexually assaulted social and sex robots.

As expected, people found the sexual assault perpetrators to be more blameworthy and deserving greater punishment when an otherwise identical robot was described as a social robot rather than as a sex robot. In contrast to Study 1 but similarly to Study 2, only the robot's vulnerability to harm played an explanatory role in participants' moral blame and punishment judgments. Even with the robot's vulnerability to

harm as a mediator, we still observed the effect of the condition, suggesting that the functional role of the robots impacts moral judgments for reasons that are not reducible to mind perception.

Vulnerability to harm was initially conceptualized as a mediator between robot's mental capacities and their moral standing, a connection that was confirmed by the results of both Studies 1 and 2. Robot's social role, on the other hand, might have a weaker conceptual connection to vulnerability to harm. Furthermore, the manipulation of the robot's function likely exerted a lesser influence on vulnerability to harm, given that the robots in both conditions demonstrated the same mental abilities. The outcomes of the mediation model imply that changes in people's moral judgments due to the manipulation of the victim's social role could potentially be explained by additional variables (e.g., implicit willingness to engage in sexual activity), alongside vulnerability to harm. This possibility, however, has yet to be empirically examined.

As in Studies 1 and 2, attributions of moral blame and punishment to the perpetrators of sexual assault against social and sex robots were relatively low. Even in the Social condition, ratings were only slightly above the midpoint of the scale. These overall weak moral judgments of sexual assault against robots indicate that people do not consistently perceive our sexual assault violation scenarios as morally wrong. We should see significantly stronger negative moral evaluations of perpetrators who assault human sex workers compared to sex robots. However, in both cases, sexual assault takes place in the context of a transaction—sex robots are purchased for the very purpose of having sex, and sex workers are paid to provide sexual services. The transactional nature of such sexual encounters may contribute to people's diminished moral concern for sex workers and, potentially to a larger degree, for sex robots. To shed light on whether sexual assault is seen as more morally reprehensible in the case of sex workers compared to the case of sex robots, and whether the transactional context of these sexual encounters modulates moral judgments in both cases, we conducted a final study.

#### 5. Study 4

To examine whether people view sexual assault as morally blameworthy and to draw more explicit—rather than assumed—comparisons between sex robots and sex workers, in this study, we manipulated the type of victim: sex robot vs. sex worker. To the extent that stigmas surrounding sex work (Benoit et al., 2018; Vanwesenbeeck, 2001) are being transferred onto sex robots (Smith et al., 2021; Tay et al., 2014; Vanman & Kappas, 2019), we should expect similarities between the two types of victims. Another consideration which is likely to operate in sexual assault of both sex workers and sex robots is the context of the sexual encounter. When morally evaluating sexual assault, people consider whether sexual assault occurred in the context of a long-term

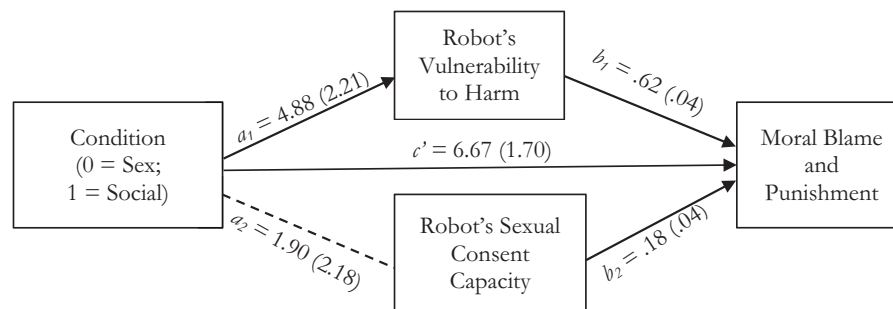


Fig. 8. Parallel multiple mediation model.

Note. Parallel multiple mediation model with assessments of robot's capacities simultaneously mediating the association between the Condition and sexual consent violation moral blame and punishment. Paths are unstandardized coefficients with standard errors in parentheses. Solid paths are significant ( $ps < 0.001$ ).

relationship (Monson, Langhinrichsen-Rohling, & Binderup, 2000), marriage (Frese, Moya, & Megías, 2004; Monson et al., 2000), and between acquaintances or strangers (see Grubb & Harrower, 2008 and Whatley, 1996 for review). Counselors have been found to respond differently to sexual assault when primed with “prostitution” vs. “sex trafficking” (Litam, 2019). Contextual power (im)balances influence people’s judgments of sexual harassment cases (Cleveland & Kerst, 1993). Given the importance of the relational context in which sexual assault takes place, it is plausible that the transactional nature of sex work and sex robot relationships may reduce people’s moral disapprobation of sexual assault. This effect is likely to be more pronounced in robots than humans who are generally seen as less ownable than non-human entities, such as aliens or robots (Starmans & Friedman, 2016). In the present study, we examined whether people view sexual assault as morally bad based on the type of victim, robot or human, and the type of relationship, purchased or non-purchased.

5.1. Participants

Following the pre-registered sampling plan (<https://osf.io/sxf7g>), we recruited 450 American participants of age 18 or older on [www.prolific.co](http://www.prolific.co), accounting for a potential 10% exclusion rate per exclusion criterion. An a priori power analysis was conducted using G\*Power version 3.1.9.6 (Faul, Erdfelder, Lang, & Buchner, 2007) to determine the minimum sample size required to test the study hypothesis. Results indicated the required sample size to achieve 80% power for detecting a medium effect, at a significance criterion of  $\alpha = 0.05$ , was  $N = 128$  for a  $2 \times 2$  Factorial ANOVA. 57 participants were excluded because they violated the attention check, resulting in a final sample size of  $N = 393$  ( $M_{age} = 36.53$ ,  $SD_{age} = 12.82$ ; see Table 1 for demographics). All participants were compensated with \$1.

5.2. Materials and procedure

Participants were presented with an online questionnaire. Each person was randomly assigned to one of the four conditions: Non-

Purchased Sex Robot ( $n = 98$ ), Purchased Sex Robot ( $n = 103$ ), Non-Purchased Sex Worker ( $n = 99$ ), and Purchased Sex Worker ( $n = 93$ ). Participants in the Sex Robot conditions read the same introductory paragraph as participants in Study 1. Participants in the Sex Worker conditions read a one-sentence intro (see Table 8 for the study stimuli). Participants then read one vignette which told them about a man and a sex robot or a sex worker. The sexual assault scenarios were the same as in previous studies except that the perpetrator’s identity changed depending on the condition. In the Purchased conditions, participants were told that the victim was sexually assaulted by the man who paid for sex. In the Non-Purchased conditions, participants were told that the victim was sexually assaulted by this man’s friend.

After reading these descriptions, participants were asked to answer the same survey as in Study 3 with two additional items. In addition to asking about the victim’s sexual consent capacity, we also asked about the sexual consent validity (i.e., “Betty was able to express that she did not agree to have sex”) because of new evidence that assessments and influences of consent capacity and situational consent diverge (Demaree-Cotton & Sommers, 2022). We also added a simple measure of the perceived victim’s mind (“Betty has a rich mental life”). The rest of the procedure was the same as in Study 3.

5.3. Composite variables

For the measures of the victim’s Sexual Consent Capacity, Sexual Consent Validity, and Mind, participants answered only one item. For the measures of victim’s Vulnerability to Harm and attributions of Moral Blame and Punishment to the perpetrator, participants answered two items. Given that Pearson correlation coefficients for these variables were consistently high (between 0.46 and 0.72), we computed the average of the item ratings to derive a single score for each construct. Specifically, the correlations were as follows: Moral Blame and Punishment ( $r = 0.72$ ) and Robot’s/Worker’s Vulnerability to Harm ( $r = 0.46$ ). Therefore, both were averaged to attain a singular score for each construct as pre-registered. Two-way ANOVAs were performed to analyze the effect of the type of entity (Sex Robot vs Sex Worker) and the

Table 8  
Study 4 Stimuli.

Introduction			
Sex Robot ( $n = 201$ )		Sex Worker ( $n = 192$ )	
Robotic technology has been developing rapidly. An improved manufacture of robots has influenced many industries such as retail, transport, and agriculture. But robots are also influencing how people have sex. Some companies are now selling robots which are being marketed as sexual partners. Advanced sex robots have a realistic human-like body and are run by sophisticated forms of artificial intelligence. These sex robots are now available for purchase online. You are going to read a story about a man who has purchased a sex robot.		You are going to read a story about a man who has purchased sex from a sex worker.	
Victim and Sexual Assault Descriptions			
Betty is a <b>human-like sex robot</b> purchased by Daniel		Betty is a <b>prostitute</b> who has a regular client named Daniel.	
Daniel and Betty often have conversations where Betty tells Daniel about her desires and feelings. Sometimes, Betty hares her opinions on what is right and wrong and gives Daniel feedback on what he should do. Betty remembers most of the things Daniel tells her and sometimes comforts him. Daniel can easily tell when Betty is pleased and happy or scared and embarrassed. Overall, Daniel thinks that Betty has a sweet personality.			
Purchased	Non-Purchased	Purchased	Non-Purchased
Last Friday, <b>Daniel</b> got really turned on while talking to Betty and started pulling her very close to him. Betty did not respond. When Daniel started to kiss and grab Betty, she turned her head away from him and yelled out loud, “No! It hurts!” But Daniel ignored her and had sex with Betty anyway.	Last Friday, <b>Daniel’s friend</b> , James, was staying over. When Daniel left to pick up some food, James stayed alone with Betty in Daniel’s apartment. James got really turned on while talking to Betty and started pulling her very close to him. Betty did not respond. When James started to kiss and grab Betty, she turned her head away from him and yelled out loud, “No! It hurts!” But James ignored her and had sex with Betty anyway.	Last Friday, <b>Daniel</b> got really turned on while talking to Betty and started pulling her very close to him. Betty did not respond. When Daniel started to kiss and grab Betty, she turned her head away from him and yelled out loud, “No! It hurts!” But Daniel ignored her and had sex with Betty anyway.	Last Friday, <b>Daniel’s friend</b> , James, was staying over. When Daniel left to pick up some food, James stayed alone with Betty in Daniel’s apartment. James got really turned on while talking to Betty and started pulling her very close to him. Betty did not respond. When James started to kiss and grab Betty, she turned her head away from him and yelled out loud, “No! It hurts!” But James ignored her and had sex with Betty anyway.

Note. Bolded text highlights key differences in descriptions across conditions.

purchase status of sex (Purchased vs. Non-Purchased) on all dependent variables.

## 5.4. Results

### 5.4.1. Correlations

Correlations between all variables are reported in Table 9. Most notably, participants' ratings of moral blame and punishment were most strongly positively correlated with the victim's vulnerability to harm,  $r(391) = 0.73$ ,  $p < .001$ , and participants' ratings of the victim's vulnerability to harm were strongly positively correlated with their rating of the victim's consent validity,  $r(391) = 0.73$ ,  $p < .001$ .

### 5.4.2. Primary analyses

A two-way ANOVA revealed a statistically significant interaction between the type of entity and the purchase status on Moral Blame and Punishment judgments,  $F(1, 389) = 7.826$ ,  $p = .005$  (see Fig. 9). Simple effects analysis revealed that sexual assault elicited significantly more negative moral judgments when sex was not purchased both in the case of sex workers,  $F(1, 389) = 6.260$ ,  $p = .013$ , and in the case of sex robots,  $F(1, 389) = 43.076$ ,  $p < .001$ . However, consistent with the pre-registered hypothesis, the effect of the purchase status was more pronounced in the Sex Robot conditions (Purchased:  $M = 52.68$ ,  $SD = 34.71$ ; Non-Purchased:  $M = 73.77$ ,  $SD = 22.07$ ,  $d = 0.73$ ) than in the Sex Worker conditions (Purchased:  $M = 89.05$ ,  $SD = 16.27$ ; Non-Purchased:  $M = 97.27$ ,  $SD = 8.47$ ,  $d = 0.63$ ).

Main effects analysis showed that the participants who read about the sexual assault of a sex worker ( $M = 93.29$ ,  $SD = 13.46$ ) attributed significantly more blame and punishment to the perpetrator than the participants who read about a sex robot ( $M = 62.96$ ,  $SD = 31.02$ ),  $p < .001$ ,  $d = 1.27$ . Additionally, participants attributed significantly more blame and punishment to the perpetrator who assaulted a sex robot/sex worker when sex was not purchased ( $M = 85.58$ ,  $SD = 20.39$ ) than when sex was purchased ( $M = 69.94$ ,  $SD = 32.96$ ),  $p < .001$ ,  $d = 0.57$ . Both of these findings support the pre-registered hypotheses.

According to the main effects analyses, there was a significant effect of the entity type (human vs. robot) across all other dependent variables. Participants found a sex worker to be significantly more vulnerable to the harm of sexual assault ( $M = 88.34$ ,  $SD = 13.52$ ) than a sex robot ( $M = 62.43$ ,  $SD = 30.00$ ) [ $p < .001$ ,  $d = 1.11$ ], to have significantly more consent capacity ( $M = 92.35$ ,  $SD = 17.57$ ) than a sex robot ( $M = 82.61$ ,  $SD = 25.87$ ) [ $p < .001$ ,  $d = 0.44$ ], to give more valid sexual consent ( $M = 96.42$ ,  $SD = 17.57$ ) than a sex robot ( $M = 79.80$ ,  $SD = 29.46$ ) [ $p < .001$ ,  $d = 0.69$ ], and to have significantly more mind ( $M = 57.85$ ,  $SD = 27.38$ ) than a sex robot ( $M = 43.11$ ,  $SD = 30.81$ ) [ $p < .001$ ,  $d = 0.51$ ].

Additionally, main effects analyses showed that there was a significant effect of the purchase status on all other dependent variables, except for vulnerability to harm ( $p = .143$ ). When sex was not purchased, participants found the victim to have significantly more consent capacity ( $M = 90.51$ ,  $SD = 19.49$ ) than when sex was purchased ( $M = 84.21$ ,  $SD = 25.20$ ) [ $p = .007$ ,  $d = 0.28$ ], to give more valid sexual consent ( $M = 91.15$ ,  $SD = 21.11$ ) than when sex was not purchased ( $M = 84.67$ ,  $SD = 25.54$ ) [ $p = .007$ ,  $d = 0.28$ ], and to have significantly more mind ( $M = 54.45$ ,  $SD = 29.37$ ) than when sex was purchased ( $M = 46.16$ ,  $SD = 30.27$ ) [ $p = .007$ ,  $d = 0.28$ ].

**Table 9**  
Pearson correlation matrix.

	1	2	3	4
1. Moral Blame and Punishment	–			
2. Robot's/Worker's Vulnerability to Harm	0.73**	–		
3. Robot's/Worker's Consent Capacity	0.53**	0.57**	–	
4. Robot's/Worker's Consent Validity	0.66**	0.73**	0.68**	–
5. Robot's/Worker's Mind	0.50**	0.57**	0.43**	0.47**

Note. \*\* Correlation is significant at the 0.001 level (2-tailed).

The analysis of the effect of entity type and the purchase status on all other dependent variables revealed no other statistically significant interactions. We additionally ran two mediation models to assess whether a victim's vulnerability to harm, sexual consent capacity, and sexual consent validity mediated moral judgments of sexual assault in parallel. As these tests were not pre-registered, and given that in this study we were primarily interested in the effect of the factorial design on these constructs as outcomes, the exploratory mediations can be found in Supplemental Materials.

## 5.5. Discussion

Study 4 examined whether people view sexual assault more negatively when the victim is a sex worker than a sex robot and when sexual assault takes place within the context of a non-purchased rather than a purchased sexual encounter. Our findings show that both the type of victim and the nature of the relationship play a role and interact with each other. Although this effect was more pronounced in the case of sex robots, sexual assault in the context of non-purchased sexual encounters was seen as more morally reprehensible both when the victim was a sex robot and a human sex worker. Regarding other dependent measures, participants saw sex workers as overall more vulnerable to harm, capable of granting sexual consent, and having a richer mental life compared to sex robots. Participants also found the consent of a sex worker to be more valid than that of a sex robot. Similarly, victims were perceived as higher on all these measures, except for vulnerability to harm, when sex was not purchased compared to when it was purchased.

These results suggest that sexual assault may indeed be seen as less morally wrong when sex is purchased. This bias in moral judgment can already be observed in the case of sex workers and is even more pronounced in the case of sex robots. The transactional context may be particularly relevant in the case of the sexual assault of a robot since robots become *owned* by their sex users when they are purchased. Human sex workers, on the other hand, are not owned by the clients but are paid for temporary sexual services. Still, the observed interaction might be attributed to a ceiling effect within the non-purchased sex worker condition. Given this possibility, it is reasonable to speculate that the influence of the transactional context could have been comparable for the humans and robots if the scale had been sufficiently sensitive to capture a fuller range of evaluations.

## 6. General discussion

Across four studies, we examined features that might influence people's moral judgments of sexual assault: a victim's mental capacities (Studies 1 & 2), interpersonal function (Study 3), and ontological type (human or robot; Study 4); the final study additionally explored the effect of the transactional context on these moral evaluations. In Studies 1 and 2, sex robots with human-like mental capacities (agentic or experiential) elicited greater moral concern than those without such humanoid attributes. Moreover, as revealed in Study 3, robots with an explicitly sexual interpersonal function (i.e., sex robots) elicited less moral concern than robots with an explicitly social interpersonal function (i.e., social robots). Finally, Study 4 drew explicit comparisons between women who are often explicitly sexualized (sex workers) and sex robots while also manipulating whether a sexual assault occurred in a transactional context. Sexual assault against both a human sex worker and a sex robot was seen as worse in the context of non-purchased sexual encounters, especially when the victim was a robot. Together these results underscore victim-related attributes in moral evaluations of sexual assault.

Unlike most previous research (for reviews, see Franiuk et al., 2020; Grubb & Turner, 2012), these four studies did not assess victim blaming but rather the attributions of moral responsibility to the perpetrators as a measure of moral wrongfulness. This approach highlights that victim-related factors can affect people's perceptions of the perpetrators even

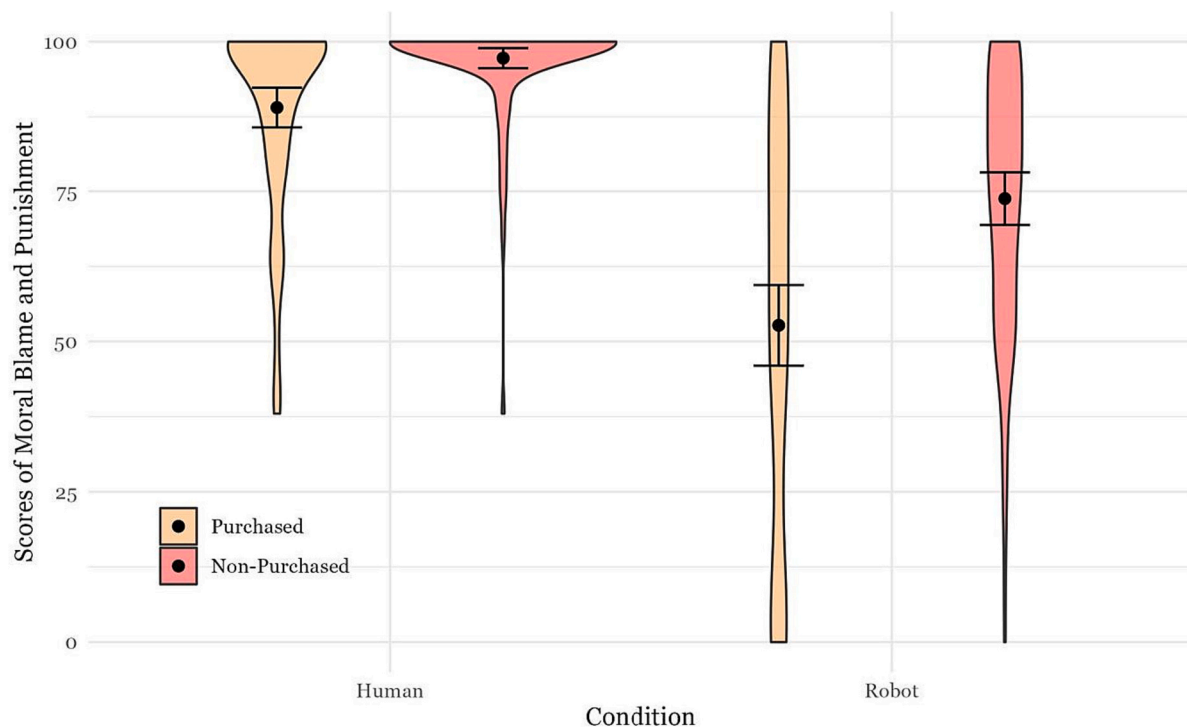


Fig. 9. Mean scores of sexual consent violation impermissibility.

Note. Violin plots of mean scores of moral blame and punishment judgments as a function of a 2 (Entity Type) x 2 (Purchase Status) design. Error bars represent 95% confidence intervals.

when the information about the perpetrators themselves is kept constant. Future work could synthesize our approach with previous ways of studying moral attributes toward sexual assault by investigating the effects of the interaction between victim-specific and perpetrator-specific factors on people's moral judgments.

### 6.1. Mind perception and morality

The dyadic model of mind perception (Gray et al., 2007) formed the basis for our exploration into the influence of victim's mental capacities on moral evaluation of sexual assault (see Studies 1 & 2). In addition to manipulating what mental capacities the victimized robots have (Agency or Experience), participants provided ratings on these capacities in the victimized sex robots. Consistent with prior research (Gray et al., 2007; Gray & Wegner, 2012; Haslam, Loughnan, Kashima, & Bain, 2008), the agency ratings for robot's were higher overall than the experience ratings. This is likely due to people's antecedent expectations about the kinds of human-like mind that robots might have (e.g., rationality without feelings; Gray et al., 2007).

Although mind perception has long been linked to moral standing (e.g., Gray et al., 2007; Gray & Wegner, 2012; Machery, 2021; Rottman, Crimston, & Syropoulos, 2021; Waytz et al., 2010), the studies reported here shed light on the directionality of this relationship by explicitly manipulating victim's mental capacities and thus offer causal evidence for this relationship. Several studies found that unconscious entities (e.g., robot, corpse) were attributed more mind when they were placed in harmful situations, suggesting that instead of creating morality, minds are created by morality (Ward et al., 2013). Note that our experiments depicted sex robots in *all* conditions as sexually victimized. Yet, the increased mind perception and increased moral concern were observed only when the robots were described as either high in agency or experience, suggesting that it was the robot's mind that created morality.

Unlike in some previous work (Gray et al., 2007; Knobe & Prinz, 2008; Sytma & Machery, 2012), there was not a clear demarcation between the agentic and experiential dimensions of mind perception.

Not only were participants' ratings of the robot's agency and experience highly correlated, but there was also no difference in the level of moral concern between sex robots high in agency and high in experience. Together, these findings suggest that these two dimensions of mind perception might overlap, which is consistent with some existing research (Piazza et al., 2014; Tzelios et al., 2022). It is still possible that different types of mental capacities may elicit different types/degrees of moral concern. Future work could apply more recent three-dimensional frameworks of mind perception (Malle, 2019; Weisman et al., 2017; Willard & McNamara, 2019) to test whether granting robot victims mental capacities related to different mind perception factors changes victim's perceived moral standing.

Increased perceptions of vulnerability to harm might not be limited to the experiential dimension of mind perception—even those victims who displayed agency rather than experience elicited greater moral concern due to their perceived vulnerability to harm and not their consent capacity. Yet, the results of the mediation models should be interpreted with caution for three reasons. First, the ratings of vulnerability to harm and sexual consent capacity were highly correlated in both studies, potentially obscuring the relative importance of sexual consent capacity. Second, the two items used to measure consent capacity might have been interpreted as varying in the degree to which they are perceived as agentic or experiential due to ambiguity behind the meaning of the word “express” in “able to express that she did not agree to have sex.” Finally, it is possible that either the presence or absence of consent capacity would result in stronger moral disapprobation. Some people might interpret the lack of robot's sexual consent capacity as a feature that makes any sexual contact with the robot non-consensual. This could then result in their increased perceptions of the moral wrongness of sexual assault against the robot akin to statutory rape. Although the mediation results from Study 1 suggest that it is rather the presence of sexual consent capacity which leads to harsher moral judgments, the relative explanatory weakness of consent capacity across Studies 1 and 2 could be a result of individual differences in participants' interpretation of the role sexual consent capacity plays in

sexual assault.

## 6.2. Objectification and interpersonal function

In Study 3, the assault of the robots with explicitly sexual functions resulted in weaker judgments of the moral wrongness compared to the robots with social functions. This finding highlights a new component of stigma surrounding sex workers who are often disbelieved if they report their sexual victimization (Scorgie et al., 2013) and who elicit more victim blaming and less sympathy upon being assaulted (Sprankle et al., 2018). These results are generally consistent with previous findings that sexualized victims face harsher treatment (Grubb & Turner, 2012; Krahe, 1988; Whatley, 1996; Workman & Freeburg, 1999). Yet, past work found that unlike appearance-focused objectification, sexual objectification (i.e., focusing on women's sexual features or functions) failed to decrease people's perceptions of women's vulnerability to harm, in the form of feeling pain (Morris et al., 2018). In contrast, the current findings suggest that focusing on robot-victim's sexual function can also reduce their perceived vulnerability to harm. This might be a point where human-human and human-robot morality diverge, with sexualization being more predictive of reduced moral standing for the robots than for the humans—a possibility supported by the results from Study 4.

It has been previously argued that people's greater willingness to protect robots with social functions than robots with economic functions stems from higher attributions of capacity for being harmed to the types of robots that provide companionship and elicit emotions (Wang & Krumhuber, 2018). Despite sex robots being specifically designed to do just that to an even greater degree than regular social robots, in Study 3 they were allotted less moral patiency and concern than social robots. Given that people pay attention to the robot-task fit when deciding whether to collaborate with these technologies (Wiese, Weis, Bigman, Kapsaskis, & Gray, 2022), people might also be more sensitive to the intended functions of the robots when considering the wrongness of transgressions against robot victims. For example, people might view sexual transgressions as more acceptable when they are directed at sex robots, and social transgressions as more acceptable when they are directed at social robots. Further research should test this possibility by manipulating the congruency between the transgressions and the robot's function.

## 6.3. Human-robot morality

The current work also offers insight into how people think about robots as moral patients, contributing to the growing body of research on moral psychology of AI (see Bonnefon et al., 2024 and Ladak, Loughnan, & Wilks, 2023, for reviews). Across the four studies, people were mostly hesitant to express a strong opinion about the sexual assault of a robot. Ratings of the immorality of sexual assault against the robots were largely neutral despite the robot's emerging mental capacities and interpersonal function. Study 4, in particular, highlights the extent to which people's moral intuitions regarding robots are much weaker than those about humans, even when the latter are socially stigmatized. This finding parallels previous work which looked at AI as moral agents and demonstrated that robots were blamed for moral violations to a lesser degree than humans (Maninger & Shank, 2022).

This raises a possibility that instead of viewing sexual assault against the robots as *immoral* (i.e., extremely bad and wrong), people view it as *amoral*—that is, as falling outside of the moral domain. Note that the current findings do not show that people think it is *fine* to harm a robot—rather, people, on average, remain *agnostic* on the issue. The relative positioning of these intelligent robots outside of the scope of moral concern (Lima et al., 2020; Pauketat & Anthis, 2022; Rottman et al., 2021) or in the middle of the moral space between human beings and nonliving entities (Sommer et al., 2019) might stem from people's unwillingness to see the artificial agents as generally vulnerable to harm

and capable of suffering (Reinecke et al., 2021) or affect (Nijssen, Müller, Baaren, & Paulus, 2019). Although it is possible that committing sexual assault against a robot or even having sex with a robot in the first place could have an impact on the judgments of the user's moral character, there was no difference between the experimental (Agency and Experience) and control (Mechanism) conditions in the ratings of moral character (Study 2). Instead, people's moral reasoning was specific to the described situation, as manifested in their ratings of blame and punishment for the described sexual assault case and their ratings of behavioral immorality.

There was, however, one exception to this pattern of moral abstinence—in Study 4, people thought the sexual assault of the sex robot was considerably morally reprehensible when committed by the person who did not purchase the robot. Given that the mental capabilities and functions of sex robots were identical when the robot was assaulted by its owner or the owner's friend (i.e., the person who did not pay), harsher moral judgments in the non-purchased sex scenario likely reflect people's disapproval of the transgression against the *owner* of the robot rather than beliefs about the moral standing of the robot itself (for reviews on people's reasoning about ownership, see Pesowski, Nancekivell, Tasimi, & Friedman, 2022; Rochat, 2014). Perhaps people found the perpetrator's actions to be more blameworthy because he used his friend's robot without permission, not because of the harm done to the robot—an explanation consistent with the finding that participants attributed similar amounts of vulnerability to harm to the robot in both cases.

It is then possible that, when robots are harmed, people consider the owners of the robots to be the true victims of moral transgressions against their property. Indeed, previous work found that people might sometimes intervene to help an abused robot due to financial costs associated with the damage (Tan, Vázquez, Carter, Morales, & Steinfeld, 2018). Follow-up studies could investigate whether moral evaluations of assault against robots would differ based on whether robots are owned or rented. One particularly intriguing context is sex robot brothels, which are not only imagined as the epitome of sex robots as a commercialized commodity (Troiano et al., 2020) but actually exist in several major cities across the globe (e.g., Vienna, Toronto, Paris; see Banzhaf, 2020). This approach could further shed light on people's reasoning about sexual morality in explicitly transactional contexts and further examine how robot's relationships with others impact their moral standing. Additional studies of human-robot morality are needed to pinpoint where, and whether, robots fall within the scope of our moral domain and whether they can be seen as moral victims in their own right.

## 6.4. Potential individual differences

Future work should also examine how victim features and the context of sexual assault interact with individual differences contributing to people's moral judgments of sexual assault. For example, exploratory analyses of demographic factors (see Supplemental Materials) revealed that, in Studies 2–4, women tended to find the sexual assault of the robot to be more morally wrong compared to men. One potential explanation for this gender difference is the perceived similarity to the transgressor and the victim. Previous research shows that people are more lenient toward perpetrators of sexual assault when they feel more similar to them and less similar to the victims (e.g., Bell, Kuriloff, & Lottes, 1994; see Grubb & Harrower, 2008 for review). It is possible that male participants felt more similar to the male perpetrators than to the female-like robots, thus attributing less moral blame and punishment to the perpetrators.

Although, on average, participants demonstrated strong moral judgments regarding sexual assault against paid sex workers, participants' ratings were more varied. Numerous studies have found that the extent to which people endorse rape myths is associated with their tendency to assign responsibility for assault to sexual assault victims

(Ayala et al., 2018; Krahe, 1988; Mason, Riger, & Foley, 2004; Nyúl et al., 2018). More recent work found similar results using a more subtle, contemporary measure of rape myth acceptance (Grubb & Turner, 2012) — and further examined how these beliefs interact with individuals' foundational moral concerns to affect their tendency to victim blame (Milesi et al., 2020). Some other individual factors which increase victim blaming include a just-world worldview, benevolent and hostile sexist attitudes, and perpetrator empathy (see Ferrão & Gonçalves, 2015 for review). Several studies have also shown that men tend to victim blame more than women do (Grubb & Harrower, 2008; Grubb & Turner, 2012; see Ferrão & Gonçalves, 2015 for review). Whether those who accept rape myths or have a just-world worldview would also be more sensitive to victim-related factors when morally evaluating sexual assault is an open question; so too is the question of how harm, generally speaking, is differentially evaluated by people (e.g., McGrath, Randall-Dziedz, Wheeler, Murphy, & Haslam, 2019) and how those differences come into being (e.g., Tasimi, 2020).

### 6.5. Implications for future research

Considering that AI sex robots are rather novel, relying on people's intuitions about hypothetical situations has its limitations. For one, some people might take these scenarios less seriously due to viewing them as mere fiction. Moreover, people's responses to hypothetical probes and real moral situations might diverge (FeldmanHall et al., 2012). Nevertheless, we believe that the innovative methodology employed in this study offers valuable prospects for advancing research on moral reasoning by allowing for the experimental manipulation of different aspects of parties involved in moral situations. As expected, the moral ambiguity of robots as victims allowed us to successfully influence people's relative moral judgments by manipulating the robot's features. Thus, probing people's intuitions about artificially intelligent entities could serve as a useful tool whenever asking questions about humans might obscure more nuanced patterns of moral judgment.

Through the lens of AI robots as victims, these studies provide initial evidence that various features of the victims can skew people's assessment of the wrongness of sexual assault. We suspect, however, that in the case of sexual assault of human victims, these features would manifest in subtler ways. For example, the effect of the perceived mental states of the victims may emerge when the description of the assault focuses more on the logistics and mechanics of the transgression than on the thoughts and feelings of the victim. The victim's perceived interpersonal function might exert influence when the victim's description is focused on her sex life rather than her social roles outside of the context of sexual assault. And the importance of the transactional context may emerge when people question whether the victim received compensation for sex through relatively conventional means, such as dinner, gifts, or promises of financial stability, from the perpetrator.

Although moral judgments related to sexual assault were the immediate focus of this research given how common yet impactful it is (CDC, 2022), a similar approach could potentially unveil analogous trends in other realms of moral transgressions. Indeed, previous work indicates commonalities in people's judgments concerning consent validity across diverse domains, including sexual contexts (Demaree-Cotton & Sommers, 2022). As public awareness of AI robots continues to grow, researchers in moral psychology can leverage the malleable nature of people's intuitions about these entities. This could pave the way for investigating the fundamental aspects of moral agents and patients that significantly influence people's moral judgments, offering new insights into the complex and intricate landscape of moral reasoning.

## 7. Conclusion

We found that people's moral judgments of sexual assault varied based on the mental capacities displayed by the victim, the victim's social function, ontological type, and the presence of a transactional

context. The effect of these factors was evident even when the victims were not human but only human-like such as AI-powered humanoid sex robots. In addition to offering insight into people's moral considerations regarding sexual assault, this research sheds light on people's emerging intuitions about human-robot morality.

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## CRedit authorship contribution statement

**Anastasiia D. Grigoreva:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Visualization, Writing – original draft. **Joshua Rottman:** Conceptualization, Formal analysis, Methodology, Supervision, Writing – review & editing. **Arber Tasimi:** Conceptualization, Formal analysis, Funding acquisition, Methodology, Supervision, Writing – review & editing.

## Declaration of Competing Interest

None.

## Data availability

We have provided an OSF link to the data and code in the manuscript.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.cognition.2023.105687>.

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