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Strangulation During Sex Among Undergraduate Students in Australia: Toward Understanding Participation, Harms, and Education

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Abstract

Background Strangulation is becoming a more common sexual practice despite its potentially fatal consequences and associated short- and long-term sequelae. This research provides a preliminary examination of participation and perception toward strangulation during sex among Australian undergraduates.

Methods This study utilized a confidential, cross-sectional online survey collected in 2022–2023. Analysis included 168 undergraduate students at an Australian University and explored their awareness of the harms of strangulation, understanding of criminalization, and the impact of education on these attitudes.

Results In total, 56% reported ever being strangled during sex and 51% ever strangling a partner. Seventeen percent of participants reported being strangled and 13% strangling a partner during their last sexual experience. Higher frequency, wanting, and positive perceptions of strangulation were associated with more liberal sexual attitudes. However, there were differences depending on gender. Participants generally did not perceive strangulation to be harmful and had limited knowledge about its criminalization. Lastly, a brief education intervention on strangulation harms revealed reductions in positive perceptions of strangulation that were pronounced among women.

Conclusions In this convenience survey, Australian university students commonly reported previously engaging in strangulation during sex but with limited awareness of the potential consequences. Our results indicate that education on these consequences could reduce positive perceptions of strangulation, particularly among women.

Policy Implications Education on strangulation harms are likely more effective than criminalization alone in improving awareness of its consequences and changing perceptions of strangulation. These findings could help guide targeted policy and education on strangulation within sexual health contexts.

Keywords Strangulation · Sexual asphyxiation · Breath-play · Non-fatal strangulation · Sexual health · Choking

Background

Sexual asphyxiation or "breath play" (Cardoso, 2022) refers to practices that restrict or stop the breath or circulation of blood to the brain in order to enhance sexual pleasure, arousal, or orgasm through solo masturbation (autoerotic asphyxiation) or partnered sex. Typically seen to be part of stigmatized and "kink" sexual experiences (Cowell, 2009; Rehor, 2015), this behavior can take many forms, such as smothering, chest compression, or the use of plastic bags to induce cerebral hypoxia (depriving oxygen from the brain). Although there are a range of methods for sexual asphyxiation, one is quickly gaining traction as a normalized and common sexual practice: strangulation (Herbenick et al., 2021; Herbenick et al., 2022a).

Strangulation involves applying pressure to the neck to restrict blood flow and/or oxygen through the use of hands, feet, arms (e.g., choke/sleeper hold), and/or ligatures. The use of strangulation during sex has been commonly discussed in health and fashion magazines (Herbenick, Guerra-Reyes et al., 2023; Herbenick, Patterson et al., 2023; Weiss, 2020) and is one of the most common types of physical aggression against women depicted in pornography (Fritz et al., 2020). Despite media coverage and pornographic depiction of this activity, the consequences of strangulation are wide-ranging and may not be well known to the general public.

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Harms of Strangulation

Although the term "choking" might be more commonly recognized and used within the broader community, this terminology minimizes the potential lethality and harms associated with this type of asphyxiation (Busby, 2012). Aside from being potentially fatal, research from strangulation within the context of intimate partner violence (IPV) and sexual assault has found that harms can encompass both short- and long-term physical and mental health issues, including loss of (or change in) voice, difficulty in swallowing or breathing, bruising around the neck, loss of consciousness, depression and anxiety, miscarriage, and problems with memory and concentration, many of which can occur weeks or months after the event (Bichard et al., 2021; Foley, 2015; McClane et al., 2001; Sharman et al., 2023). Research has also identified that the likelihood of developing neurological problems including memory problems and early dementia increases with repeated strangulations (Smith et al., 2001). On the other hand, investigations of harms from strangulation during sex outside contexts of IPV and sexual assaults have primarily drawn from investigations of deaths and significant injuries as a result of the activity (Bauer et al., 2021; Bradley, 2022; Cardoso, 2022; Spungen et al., 2022).

Research directed only at the most extreme harms of strangulation during sex does not allow for nuanced understandings of the potential range of consequences, including those associations that may be positive (e.g., enhanced sexual pleasure, but see Edwards, 2016).[1] Research exploring sexual experiences of women from the kink community found that strangulation behaviors, described as including breath play, choking, strangling, or hanging, were engaged in by participants for their own sensual or erotic pleasure (Rehor, 2015). This experience of strangulation during sex as desirable or pleasurable has also been found across non-kink samples in Germany among women consuming pornography (Sun et al., 2017) and a large university student sample in the USA (US; Herbenick et al., 2021). In particular, Herbenick et al. (2021) found that 82% of 1537 respondents who reported ever being strangled during sex had felt pleasurable or euphoric feelings during at least one of their experiences, although the range of physical reactions that were experienced was wide-ranging, including, most commonly, a head rush, feeling unable to breathe, difficulty swallowing, watery eyes, inability to speak, gasping for air, coughing, neck pain, and neck bruising. Across these lifetime experiences of strangulation during sex, 18.8% experienced some form of alteration of consciousness (e.g., dizziness), and 2.6% reported ever losing consciousness (Herbenick et al., 2021). Overall, although there is overlap in the types of physical responses from strangulation within IPV and during sex, including significant harms such as loss of consciousness, there is also a reported element of pleasure experienced among broader (non-IPV) samples.

Understanding Consent

The component of pleasure and desire for strangulation to occur during sex and the intersection of potentially highly significant consequences, such as unconsciousness, raises questions of understanding and consent. The recognition of potentially harmful effects resulting from strangulation have contributed to legislative changes in Australia with all states and territories explicitly criminalizing non-fatal strangulation (Douglas, 2022, 2023). In Queensland, although legislation does not provide a definition for strangulation (QCC, 1899 *s315A*), cases have determined that strangulation means "hinders or restricts the breathing of the victim" (R v HBZ, 2020 [57]). While the definition of strangulation has been determined, the issue of consent lacks clarity and consistency across jurisdictions (Edwards & Douglas, 2021).

When considering consent to strangulation during sex, Queensland, alongside most other jurisdictions, defines consent as free and voluntary agreement to participate (QCC, 1899 s348). However, while consent can be given to be strangled, we suggest consent cannot be free and voluntary if the person is not aware of the potential risk and harm of the behavior. Furthermore, regarding assault generally, a person cannot legally consent to serious bodily harm such as unconsciousness during sexual activities, so purported consent would not be a defense in circumstances where the person strangled suffered serious harm or death (Sheehy et al., 2023). Given the increasing engagement of strangulation during sex outside of communities that typically understand and communicate its risks, such as BDSM (bondage and discipline, domination and submission, and sadism and masochism) communities (Cardoso, 2022; Herbenick, Guerra-Reyes et al., 2023; Herbenick, Patterson et al., 2023; Holt, 2016), it is unknown whether there is a recognition and understanding of harms among the wider community now engaging in it. This is particularly concerning given recent evidence that many online articles represent that forms of strangulation, via stopping the blood or breath, are able to be done safely (Herbenick, Guerra-Reyes et al., 2023; Herbenick, Patterson et al., 2023). Although criminalization is sometimes argued to be a strategy that increases community awareness of issues such as the harm associated with particular behaviors (Joint Select Committee on Coercive Control, 2021), we currently have little knowledge of whether this strategy has been successful

[1] Edwards (2016) has observed a lack of evidence that strangulation "causes" enhanced sexual pleasure, see p103.

in the case of strangulation in Australia. Further, it is unknown if education would change perceptions of this sexual activity by providing more accurate representations about what a person may be consenting to.

Prevalence of Sexual Strangulation

Strangulation during sex has quickly become the focus of scholarly research in recent years, with more than a dozen studies published on this practice in recognition of its growing popularity in "mainstream" sexual behaviors (for example, see Cardoso, 2022; Herbenick et al., 2020, 2021; Herbenick, Fu, Eastman-Mueller et al., 2022; Herbenick, Fu, Kawata et al., 2022; Herbenick et al., 2022a, b; Herbenick, Guerra-Reyes et al., 2023; Herbenick, Patterson et al., 2023; Rehor, 2015; Vilhjálmsdóttir & Forberg, 2023). However, only two large US samples have investigated prevalence, one nationally representative (Herbenick et al., 2020), and another among college students (Herbenick, Fu, Eastman-Mueller et al., 2022; Herbenick, Fu, Kawata et al., 2022; Herbenick et al., 2022a, b). This research indicated that among those aged 18–60 in a 2016 National Survey of Pornography Use, Relationships, and Sexual Socialization, the prevalence of *ever* being strangled during sex is 21% of women and 11% of men (Herbenick et al., 2020). From this sample, 20% of men and 12% of women reported ever strangling their partners during sex. Among a 2020 sexual health survey of undergraduate students, 34% of women and 6% of men reported ever being strangled during sex (Herbenick, Fu, Eastman-Mueller et al., 2022; Herbenick, Fu, Kawata et al., 2022; Herbenick et al., 2022a, b). Further, approximately 27% of women, 7% of men, and 22% of transgender and non-binary surveyed undergraduates reported being strangled during their *last* sexual encounter, with women more likely to be strangled than men. Among those who carried out strangulation of their partner at their last sexual encounter, 24.8% were men, 5.7% were women, and 14.3% were transgender or non-binary.

The gendered roles regarding strangulation across these studies also reflect findings from Bridges et al. (2016) and Sun et al. (2017) that showed positive associations between watching and enacting gendered sexualized behaviors popular in pornography (i.e., "pornographic sexual scripts"), where men are primarily aggressors targeting those with less social power, such as women and transgender people.

Although findings of undergraduate students' strangulation experiences by Herbenick et al. (2021) reiterate the gendered roles within strangulation, their research also identifies that these experiences differed depending on respondents reported sexuality and feelings toward their partners. Results highlighted that women with a same-sex partner were more likely to report being strangled compared to women with an opposite sex partner and men were more likely to strangle partners when reporting feelings of love and higher levels of wanting to engage in sex. Conversely, men were more likely to strangle partners if they reported one partner disliked the other or if they were in a same-sex relationship. Further, being strangled was somewhat more prevalent among men with sexual partners who they were not in a relationship with. This last finding in particular may suggest that more permissive (open) attitudes about sex may be associated with higher frequencies of being strangled among men, though this is yet to be explored.

Herbenick and colleagues' research provides a strong foundation for understanding strangulation during sex. Using a range of samples and methodologies, their findings suggest that community attitudes are becoming more receptive toward this behavior. Specifically, qualitative interviews exploring social perceptions and consequences of strangulation during sex (Herbenick et al., 2022a, b), analysis of online articles about strangulation during sex (Herbenick, Guerra-Reyes et al., 2023; Herbenick, Patterson et al., 2023) and exploring the use of choking memes (Herbenick, Guerra-Reyes et al., 2023; Herbenick, Patterson et al., 2023) each suggests increasing engagement in the practice and views that strangulation during sex have become mainstream. However, we are yet to understand whether these positive perceptions toward strangulation during sex are reflected in Australia. This study begins to address gaps in knowledge on whether strangulation during sex in Australia is happening, how frequent that participation is, and how people experience or perceive it outside of an IPV or sexual assault context. While most Australian research has focused on the process and outcomes of criminalization of strangulation (Boxall & Morgan, 2021; Rowse et al., 2020; Sharman et al., 2022; Wilson et al., 2021; Zilkens et al., 2016), we have little sense of whether people are aware of the legislation and/or the potential for harms from strangulation. Further, we do not know if education strategies may be a useful intervention to change attitudes and increase knowledge about the potential harms associated with strangulation during sex so that consent to strangulation can be properly informed.

This research draws on a survey of undergraduate students to gain early insight into the potential participation in and perceptions of strangulation during sex in Australia compared to findings from the USA. We explore respondents' understanding of the harms of strangulation, their opinions and knowledge about its legal status, and the impact of education on understanding the potential harms associated with strangulation and attitudes toward strangulation during sex. Although this research is exploratory, based on US studies, we anticipated that (1) ever participating in strangulation during sex would be similar among undergraduate students in Australia compared to the USA (Herbenick et al., 2021) and predicted that (2) the proportion of being strangled would be greater among women than men; (3) the proportion of people strangling partners' would be greater among men

than women; (4) more open sexual attitudes would be correlated with positive perceptions toward strangulation during sex and a greater likelihood of previous participation in it, particularly among men; and (5) positive perceptions toward strangulation during sex would decrease once people have better knowledge of its risks and harms.

Methods

Participants

Participants were 168 undergraduate students from The University of Queensland. They volunteered through an online research platform hosted by the university and were given credit toward a first-year undergraduate psychology course for partaking, partially or wholly, in the survey. They could participate in the survey if they were enrolled in an undergraduate psychology course and were not excluded if they had not engaged in strangulation during sex. Students who undertake the first-year psychology courses may be enrolled in a variety of study disciplines across the university and may not be majoring (or minoring) in psychology. Two additional participants were removed who either did not complete the survey and one who incorrectly identified they had been strangled during sex. A response rate for the survey based on potential participants who clicked on the initial link and those who completed the survey cannot be calculated due to the anonymity of the survey and since people could return to the link at any stage.

Participants were aged 18–53 and were on average 21 years of age. Overall, 63.7% of the sample identified as women, 32.7% as men, and 3.6% as non-binary, trans, or other/preferred not to say and is reflective of the gender distribution of students enrolled in the school. Participants primarily identified as heterosexual (70.7%) or bisexual (19.2%), with the remainder identifying as gay or lesbian, pansexual, asexual, other, or preferred not to say (see Table 1 for demographics). In their last sexual encounter, 74.4% reported being in a male/female pairing (see Table 2). Participants reported their ethnicities to be primarily White/European (58.3%) or Asian (including South Asian; 33.9%), with others in the sample identifying as African/Black or African American, Aboriginal, Middle Eastern, and those who reported two or more of these indicating a mixed heritage. Participants primarily reported living in Queensland (95.8%).

Ethics

This research was approved by The University of Queensland Human Research Ethics Committee (2022/HE001351). Electronic consent was obtained from each study participant.

Measures and Procedure

Sexual Attitudes

The *Brief Sexual Attitudes scale* (Hendrick et al., 2006) was measured; this scale typically consists of 20 items across four subscales: 10 items measuring permissiveness toward an open relationship (e.g., "casual sex is acceptable," $\alpha = 0.84$), three items for responsibility in birth control (e.g., "birth control is part of responsible sexuality"), five items for communion (importance of melding together with a sexual partner; e.g., "sex is the closest form of communication between two people," $\alpha = 0.69$), and five instrumentality items (enjoyment of sex; e.g., "sex is primarily physical"). Because responsibility in birth control was not of interest in this study, this subscale was not included. Instrumentality showed poor reliability, $\alpha = 0.56$, and was excluded from analyses. Items were measured on a five-point scale from 1 = *strongly agree* to 5 = *strongly disagree* and scored by averaging the items in a subscale.

Positive Perceptions of Strangulation

Since no existing measure of attitudes or perceptions of strangulation during sex were available, a brief 4-item scale was created by the authors. Participants were instructed that "the following questions relate to your current attitudes about strangulation/choking during sex" and were asked to rate their agreement with the statements. Items were "I would enjoy being strangled/choked during sex," "Being strangled/choked during sex would make me feel afraid or fearful," "Being strangled/choked during sex would make me feel powerful," and "Being strangled/choked during sex would make me feel excited." A second version of this scale was adjusted for attitude toward acting on strangulation (e.g., "Strangling/choking my partner during sex would make me feel powerful"). All items were scored on a 4-point scale from 1 = *strongly disagree* to 4 = *strongly agree*. Both measures were presented once early in the survey and again at the end of the survey following presentation of a brief paragraph of the harms of strangulation, i.e., pre and post education. After reverse scoring, items were averaged together to form a single scale with very good reliability at each measure, $\alpha_{recieve1} = 0.90$, $\alpha_{recieve2} = 0.89$, $\alpha_{give1} = 0.91$, and $\alpha_{give2} = 0.85$.

Procedure

Survey questions were created using a combination of questions from Herbenick et al. (2021) and those created by the researchers. These were then piloted and amended in three stages in consultation with a small group of undergraduate students and sexual

Table 1 Participant demographics

Demographics		*N*	% of total sample or *M* (SD)
Age		167	21.1 (4.61)
Gender	Man	55	32.7%
	Woman	107	63.7%
	Non-binary/third gender or preferred not to say	6	3.6%
Sexuality	Heterosexual (straight)	118	70.7%
	Men	45	26.9%
	Women	72	43.1%
	Homosexual (gay/lesbian)[a]	8	4.8%
	Bisexual	32	19.2%
	Men	5	3%
	Women	25	15%
	Pansexual or asexual[a]	4	2.4%
	Preferred not to say/other[a]	5	2.9%
Last sexual relationship	Men with women	44	26.3%
	Men with men	5	3%
	Men with non-binary[b]	≤3	-
	Women with men	81	48.5%
	Women with women	7	4.2%
	Women with Non-binary	4	2.4%
	Non-binary with men[b]	≤3	-
	Non-binary with women[b]	≤3	-
Ethnicity	White/European	98	58.3%
	Asian (inc. South Asian)	57	33.9%
	African/Black or African American[b]	≤ 3	-
	Aboriginal[b]	≤3	-
	Middle Eastern[b]	≤3	-
	Mixed heritage (inc. 3 aboriginal persons)	7	4.2%
	Other (unspecified)[b]	≤3	-
Home state	Queensland	161	95.8%
	Other states	7	4.2%
Relationship status	Single	109	64.9%
	Married	4	2.4%
	Divorced/separated or widowed[b]	≤ 3	-
	In a relationship (living together)	13	7.7%
	In a relationship (not living together)	38	22.6%
	Casual relationship[b]	≤3	-
Gender of the last sexual partner(s)	Man	87	59.6%
	Woman	53	36.3%
	Non-binary/third gender or preferred not to say	6	3.6%

[a]Categories merged due to small sample sizes

[b]Ns not provided to ensure participants are not identifiable in small samples

health colleagues. The survey was advertised through an online research participation portal and titled "Sexual Behaviours and Choking/Breath Play" alongside a brief description with relevant contacts for support if they felt any distress as a result of the survey. People interested in participating were provided with a link to the survey. After consenting, they were reminded about the sensitive nature of the questions and the anonymity of the survey, that they could exit at any point, skip questions they wished not to answer, and were provided with links and phone numbers to access support services. When participants began each new section of the survey, they were provided with information about the section ahead (e.g., "the next section asks questions about …") and presented with the same reminder of anonymity and phone numbers to support services.

Table 2 Endorsement of strangulation behaviors and sexual attitudes

	N	*M* (SD) or %yes	Men	Women	*p*
Ever been strangled during sex	94	56%	25 (32.4%)	66 (27.5%)	.575
Ever strangled a partner during sex	86	51.2%	38 (69.1%)	47 (43.9%)	**.002**
Strangled the last time you had sex	30	17.9%	5 (9.1%)	24 (22.4%)	**.036**
Strangled a partner the last time you had sex	22	13.1%	16 (29.1%)	6 (5.6%)	**< .001**
Friends ever discussed strangulation	89	53%	28 (34.3%)	58 (65.7%)	.855
Perception of commonness	168	2.72 (0.72)	2.80 (0.65)	2.68 (0.74)	.121
Freq of being strangled	93	2.39 (1.04)	1.75 (0.80)	2.62 (1.06)	**< .001**
Freq of strangling partners	86	2.16 (0.93)	2.47 (0.98)	1.92 (0.83)	**.006**
For those who have not been strangled, would they like to try it[a]	15	20.3%	9 (12.2%)	5 (6.8%)	N/A
Got the idea you would enjoy it[b]	78		22	53	
Trying it	47	60.3%	9 (40.9%)	37 (69.8%)	N/A
Pornography or erotica	33	42.3%	14 (64%)	16 (30.2%)	N/A
Discussion with a partner	30	38.5%	9 (40.9%)	21 (39.6%)	N/A
Discussion with friends	27	34.6%	6 (27.3%)	20 (37.7%)	N/A
Magazine articles	6	7.7%	2 (9.1%)	4 (7.5%)	N/A
Other (e.g., YouTube, movies)	3	3.8%	0	3 (5.7%)	N/A
The last time you had sex…					
Want to be strangled	93	2.53 (1.08)	2.00 (0.87)	2.75 (1.09)	**.003**
Want to strangle partner	86	2.37 (0.83)	2.37 (0.88)	2.38 (0.80)	.937
How well known was the person who strangled you	93	3.87 (1.35)	3.38 (1.58)	4.09 (1.17)	**.045**
How well known was the person you strangled	86	3.86 (1.47)	3.66 (1.51)	4.02 (1.44)	.261
Sexual attitudes					
Permissive	168	2.93 (0.83)	2.76 (0.77)	3.03 (0.85)	**.045**
Communion	168	2.47 (0.80)	2.38 (0.72)	2.48 (0.83)	**.040**
Perceptions toward strangulation T1					
Being strangled	168	2.34 (0.82)	2.32 (0.71)	2.36 (0.89)	.758
Strangling partners	165	2.27 (0.78)	2.57 (0.72)	2.13 (0.78)	.082
Perceptions toward strangulation T2					
Being strangled	165	2.07 (0.82)	2.22 (0.65)	2.01 (0.89)	**< .001**
Strangling partners	166	1.99 (0.80)	2.38 (0.75)	1.81 (0.75)	**< .001**

N/A not applicable due to samples; % reported for men/women are a within group comparison—e.g., 69% of men reported ever strangling partners; Values in bold indicate significance between groups at $p < .05$

[a]Proportion uses total $n = 74$

[b]participants able to select more than one response option

The survey consisted of four parts: (i) demographic information and sexual attitudes; (ii) participation and perceptions of strangulation/choking; (iii) opinions and knowledge of harms; (iv) opinions and knowledge of criminalization; and (v) education. In part ii, a series of options were provided for participants to select if they had "experienced any of the following during sex," including "felt your neck/throat was being pushed or pressed," "had your partner's hands around your neck/throat," "been the submissive in breath play," "had ropes or ties around your neck," and "felt it was hard to breathe because of something your partner did to you." Following this, participants were given a description of the term "strangulation" to better understand the questions as presented: "The following questions refer to 'strangulation,' sometimes called 'choking.' Strangulation is when a person's breathing is stopped OR restricted by the use of hands, other body parts, or ligatures (like ropes) around the neck." All questions used "strangle/choke," so participants could identify with the term that best suited them. Participants were asked their perceptions of strangulation/choking, frequency of strangulation/choking (1 = *almost never* to 4 = *quite often*), how well they knew the last person who choked/strangled them (1 = *not at all* to 5 = *extremely well*), their "want" to engage (1 = *I didn't want it* to 4 = *I wanted it very much*) or if they think they would like it (yes/no), if they think it is common (1 = *definitely no* to 4 = *definitely yes*), if friends had discussed it (yes/no), and where they got the idea they would like to be strangled.

Part iii asked about participants' opinions regarding the consequences and harms associated with strangulation/choking, scored from 1 = *definitely no* to 4 = *definitely yes*. Questions asked if they thought strangulation/choking-during-sex was harmful, whether they thought it could be safe, if they would be concerned about losing consciousness, and whether they would see a doctor if they did. They were also asked if they would know what signs of injuries to look out for and how long after being strangled they might find injuries: *immediately*, *the following day*, *within the following week*, *within the month*, *within 6 months*, and *within the year*. If participants had indicated that they had been strangled/choked by or strangled/choked a partner during sex before, they were asked to select what range of consequences (if any) they or their partner (respectively) experienced (e.g., "When you have previously been strangled/choked by your partner, what were the consequences, if any?"). Participants were able to select multiple options that included nothing happened, a more intense orgasm (item for self and partner), a sore throat, changed voice, marks or bruising around the neck, losing consciousness, blood shot eyes, having an involuntary bowel movement or losing control of their bladder, or other.

Part *iv* asked about participants' opinions and knowledge of the law using the scale 1 = *definitely no* to 4 = *definitely yes.* Participants were provided with brief information on strangulation that was related to the law stating "Strangulation/choking can be used as part of sex or used otherwise as a form of violence against another person with or without consent." Participants were then asked if they felt strangulation/choking should be a crime if it is consensual or non-consensual (respectively). In relation to the breath, they were then provided definitions on "restriction" (i.e., breathing is limited) and "stopping" of the breath (i.e., not able to breathe). Participants were asked if they think it should be a crime to restrict someone's breathing during sex if they do or do not consent (respectively) and asked the same regarding stopping someone's breathing. Participants were also asked two questions, not analyzed here, regarding their opinions on the types of penalties that should be invoked if a person was found guilty. Participants were then asked if they know if "strangulation that does not cause death is a crime in the state/territory where you live" with responses 1 = *yes*, 2 = *maybe*, 3 = *no*.

Lastly, part v presented a brief statement about the potential consequences and harms of strangulation to examine the impact of education (see Supplementary material), and participants were again asked to complete the attitudes toward strangulation scales before exiting the survey and being debriefed.

Analytic Approach

The data were cleaned and checked indicating there were no significant outliers, skew, or kurtosis across the items and scales. Responses are presented as means, standard deviations, and frequencies, including chi square tests. Pearson's correlations were used to assess associations between attitudinal scales and the frequency, attitudes, and want to partake in strangulation. Lastly, exploratory significance testing was conducted to assess understanding of harm and opinions on law using *t*-tests. These included analyses of gender. Due to smaller sample sizes, comparisons were restricted to man/woman binaries and frequencies reported for heterosexual persons and bisexual women. Where any assumption of equality of variance are violated, appropriate tests are reported. Analyses were conducted using IBM SPSS Statistics (version 28).

Results

Frequency of Strangulation, Knowledge, and Behaviors

Experiencing Strangulation

Over half of the sample, 56%, reported that they were ever strangled (see Table 2 for all prevalence within the data; 69 participants had both been and strangled a partner). These accounted for 64% of women sampled, 45.5% of men sampled, and 66.7% of those who identified as non-binary or preferred not to say. There were no differences between men and women reporting ever being strangled. Notably, 56% ($n = 40$) of heterosexual women, 72% ($n = 18$) of bisexual women, and 42% ($n = 19$) of heterosexual men reported ever being strangled. On average, participants reported a low frequency of being strangled and 17.9% ($n = 30$) reported being strangled during their last sexual experience with 8.9% reporting "maybe/don't remember." The frequency of being strangled was significantly higher among women than men, $t(57.30) = 3.75$, $p < 0.001$, $d = 0.99$. Generally, the last time participants were strangled during sex, they knew the person(s) they were with "well" and reported wanting to engage in it "a little bit" to "moderately." However, there was a significant difference between men and women, with women reporting a higher "wanting" to be strangled than men, $t(88) = 3.098$, $p = 0.003$, $d = 1.03$, and being more likely than men to know the person who strangled them well, $t(36.51) = 2.07$, $p = 0.045$, $d = 1.30$.

Strangulation of Partners

Ever strangling partners during sex was reported by just over half (51.2%) of participants, accounting for 43.9% of women in the sample, 69.1% of men, and 1.2% of non-binary or participants who preferred not to say (17 reported only ever strangling partners and never being strangled). Across

sexual orientation, 39% ($n = 28$) of heterosexual women, 48% ($n = 12$) of bisexual women, and 69% ($n = 31$) of heterosexual men reported ever doing so. On average, participants who had strangled partners reported engaging in it "a little" of the time and 13.1% of the sample reported that it occurred during their last sexual experience. Compared to women, men were more likely to report ever having strangled a partner, $\chi^2(1, 162) = 9.23$, $p = 0.002$, and to report strangling their partner during their last sexual experience $\chi^2(1, 79) = 4.40$, $p = 0.036$. Similarly, men reported generally strangling their partners more frequently than women, $t(83) = 2.84$, $p = 0.006$, $d = 0.90$. The last time participants strangled a partner during sex, on average, they reported knowing the person(s) they were with "well" and reported wanting to engage in it "a little bit."

Opinions and Knowledge

On average, participants reported strangulation during sex as "probably" common and discussed among 53% of participants' friends. For those who had not been strangled ($n = 74$), 20.8% reported wanting to try it. Among these participants and those that reported they enjoy being strangled based on the positive perceptions scale ($n = 78$), they reported they most often got the idea they would like to be strangled via trying it (60.3%), pornography or erotica (42.3%), a partner (38.5%), and/or through friends (34.62%, see Table 2).

Sexual Attitudes

Correlations revealed that greater permissiveness was related to more positive perceptions toward strangling partners overall ($p < 0.001$) with all other relationships showing specific gendered correlations. That is, higher permissive scores were related to more frequent strangling of partners among men ($p = 0.048$), and for women, they were related to a higher frequency of being strangled ($p = 0.008$), more positive perceptions of being strangled ($p < 0.001$), and higher reported levels of wanting to be strangled the last time it occurred during sex ($p = 0.020$). The Communion subscale only revealed a relationship with the extent a person wanted to strangle their partner the last time it occurred during sex for women ($p = 0.012$), indicating that stronger attitudes of communion were related to a greater desire to strangle a partner the last time it occurred during sex for women.

Strangulation Perceptions and Behavior

Pearson correlations shown in Table 3 revealed that, overall, positive perceptions toward being strangled were associated with more positive perceptions toward strangling a partner ($p < 0.001$). They also revealed that a higher frequency of being strangled was associated with more positive perceptions toward both being strangled and strangling partners, and their wanting to be strangled the last time it occurred during sex (p's < 0.001). However, the relationship between the frequency of being strangled and perceptions of strangling partners were only seen among women ($p = 0.007$). Overall, greater positive perceptions toward strangling partners were associated with higher reported frequencies of strangling partner(s) during sex ($p < 0.001$) with no differences across men and women. Greater positive perceptions toward strangling partners were related to more positive perceptions toward being strangled ($p < 0.001$). Further, more positive perceptions toward being strangled or strangling partners were positively associated with the extent a person wanted to be strangled or wanted to strangle their partner when it last occurred during sex (p's < 0.001). However, positive perceptions of being strangled were only related to wanting to strangle partners among women ($p < 0.001$). These results somewhat aligned with associations showing that the more a person wanted to strangle a partner when it last occurred during sex, the higher frequencies reported of being strangled among women ($p = 0.001$) but not men. Lastly, the extent to which a person wanted to be strangled and wanted to strangle their partner the last time it occurred during sex showed a positive relationship ($p < 0.001$).

A repeated measures analysis of variance of perceptions of being strangled during sex revealed a significant main effect of education (pre, post) indicating an overall reduction in positive perceptions across the sample, $F(1, 157) = 36.28$, $p < 0.001$, $\eta_p^2 = 0.19$, and an education × gender (man, woman) interaction, $F(1, 157) = 10.38$, $p = 0.002$, $\eta_p^2 = 0.06$. This revealed that women showed larger reductions in positive perceptions toward being strangled from pre to post education compared to men (Fig. 1 and Table 2).

A significant main effect for education was found for perceptions toward strangling partners showing a reduction in these positive perceptions from pre to post education, $F(1, 157) = 52.09$, $p < 0.001$, $\eta_p^2 = 0.25$. However, there was no education × gender interaction found for perceptions toward strangling partners, $F(1, 155) = 2.31$, $p = 0.13$, $\eta_p^2 = 0.02$.

Harm

Table 4 outlines the prevalence for knowledge of harms across the sample. Strangulation during sex was generally viewed as "probably not" harmful and that it could "probably" be safe. A t-test revealed a significant difference between men and women's views of harm, $t(160) = 4.00$, $p < 0.001$, $d = 0.72$. with women perceiving strangulation to be more harmful than men.

On average, people felt they "probably" knew the signs of injury they would experience and indicated that they would likely find injuries immediately after, or the following day,

Table 3 Pearson bivariate correlations between attitudes and behavior

	Frequency of being strangled	Frequency of strangling partners	Perception of being strangled	Perception of strangling partners	Wanting to be strangled at last event	Wanting to strangle partner at last event
Permissive	**−.256***	**−.237***	**−.346****	**−.412****	**−.256***	−.177
Men	*−.1*	***−.324****	*−.057*	***−.365****	*−.256*	*−.212*
Women	***−.325****	*−.186*	***−.453****	***−.406****	***−.287****	*−.170*
Communion	−.019	−.056	−.132	−.14	−.126	**−.303****
Men	*−.175*	*.015*	*−.139*	*−.135*	*−.066*	*−.230*
Women	*.02*	*−.078*	*−.121*	*−.134*	*−.151*	***−.363****
Frequency of being strangled	-	**.273***	**.591****	**.405****	**.696****	**.349****
Men	-	*.359*	***.561****	***.489****	***.782****	*.355*
Women	-	***.469****	***.585****	***.438****	***.622****	***.320****
Frequency of strangling partners		-	0.197	**.611****	.230	**.623****
Men		-	*.234*	***.674****	*.387*	***.731****
Women		-	***.388****	***.561****	***.360****	***.578****
Perception of being strangled			-	**.658****	**.722****	**.339****
Men			-	***.391****	***.624****	*.170*
Women			-	***.787****	***.749****	***.509****
Perception of strangling partners				-	**.395****	**.659****
Men				-	***.465****	***.677****
Women				-	***.417****	***.649****
Wanting to be strangled at last event					-	***.490****
Men					-	***.451****
Women					-	***.502****

*Pearson's correlation significant at the 0.05 level (2-tailed); **Correlation is significant at the 0.01 level (2-tailed); Values in bold indicate a significant relationship between variables at $p < .05$

with very few indicating that injuries could be found within the month, 6 months, or the year. Participants, on average, felt that they would "probably" be concerned if they lost consciousness or blacked out when strangled during sex and would be more likely to visit a doctor afterward. In qualitative responses, some participants explained that they would be concerned but would be too embarrassed to see a health professional about a strangulation injury. While others revealed that they trusted their partner to "safely" engage in strangulation, alleviating their fears of injury. Overall, women were more likely to be concerned about losing consciousness than men, $t(160) = 2.32$, $p = 0.02$, $d = 1.02$.

For participants who had been strangled, 26 (27.7.6%) reported negative consequences from strangulation such as not being able to breathe, having a sore throat, becoming unconscious, and/or having bloodshot eyes. In contrast, 42 (44.7%) reported positive experiences such as they and/or their partner having a more intense orgasm. Only 13 (15.1%) participants who had strangled partners reported observing negative consequences for a partner they strangled. On the other hand, 47 (54.7%) reported positive consequences. No consequences, positive or negative, were reported by 30.2% of participants who had been strangled and 23.4% of participants who had strangled partners (see Fig. 2).

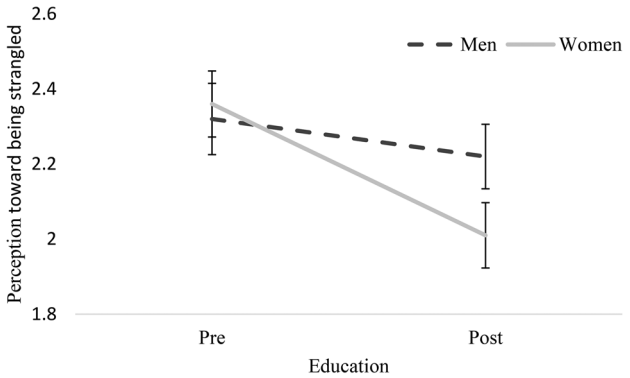

Fig. 1 Men and women's perceptions toward strangulation during sex pre and post education

Law

Participants felt that any form of non-consensual strangulation should "definitely" be a crime (see Table 4 for means and standard deviations), with no differences between men

Table 4 Responses to harm and law

	N	*M* (SD) or %yes	Men	Women	*p*
Harm					
Do you think it is harmful	168	2.46 (0.75)	2.15 (.71)	2.63 (.073)	**< .001**
Do you think it can be safe	168	3.19 (0.89)	3.35 (0.75)	2.09 (0.93)	.083
Would you know what injuries/signs to look for	168	2.70 (0.85)	2.78 (0.83)	2.65 (0.87)	.371
Would you be concerned if you lost consciousness?	168	2.66 (1.03)	2.38 (0.99)	2.78 (1.04)	**.022**
Would you seek out medical help if you lost consciousness?	168	2.72 (0.94)	2.69 (0.89)	2.79 (0.96)	.237
When would you be looking out for injuries*					
Immediately	98	58.30%	35 (63.6%)	61 (57%)	N/A
The following day	125	74.40%	40 (72.7%)	80 (74.8%)	N/A
Within the following week	69	41.70%	21 (38.2%)	46 (43%)	N/A
Within the month	12	7.14%	3 (5.5%)	8 (7.5%)	N/A
Within 6 months	5	2.98%	3 (5.5%)	2 (1.9%)	N/A
Within the year	3	1.79%	2 (3.6%)	1 (0.9%)	N/A
Law					
Non-consensual strangulation should be a crime	168	3.63 (0.62)	3.64 (0.59)	3.60 (0.64)	0.713
Non-consensual restriction of someone's breathing during sex be a crime	168	3.67 (0.62)	3.56 (0.74)	3.71 (0.55)	0.156
Non-consensual stopping of someone's breathing during sex be a crime	168	3.88 (0.38)	3.80 (0.49)	3.92 (0.31)	0.068
Consensual strangulation during sex should be a crime	168	1.63 (0.88)	1.40 (0.78)	1.74 (.88)	**0.018**
Consensual restriction of someone's breathing during sex be a crime	167	1.71 (0.79)	1.51 (0.72)	1.82 (0.81)	**0.017**
Consensual stopping of someone's breathing during sex be a crime	168	2.50 (0.94)	2.13 (0.78)	2.70 (0.55)	**< .001**
If strangulation during sex was a crime, what do you think should happen if a person was found guilty?	168	2.92 (1.53)	3.20 (1.54)	2.75 (1.47)	0.071
Do you know if strangulation that doesn't cause death is a crime where you live?	168	6.50%	6 (10.9%)	5 (4.7%)	0.153

N/A not applicable; Values in bold indicate significance between groups at $p < .05$

*Participants able to select more than one response option

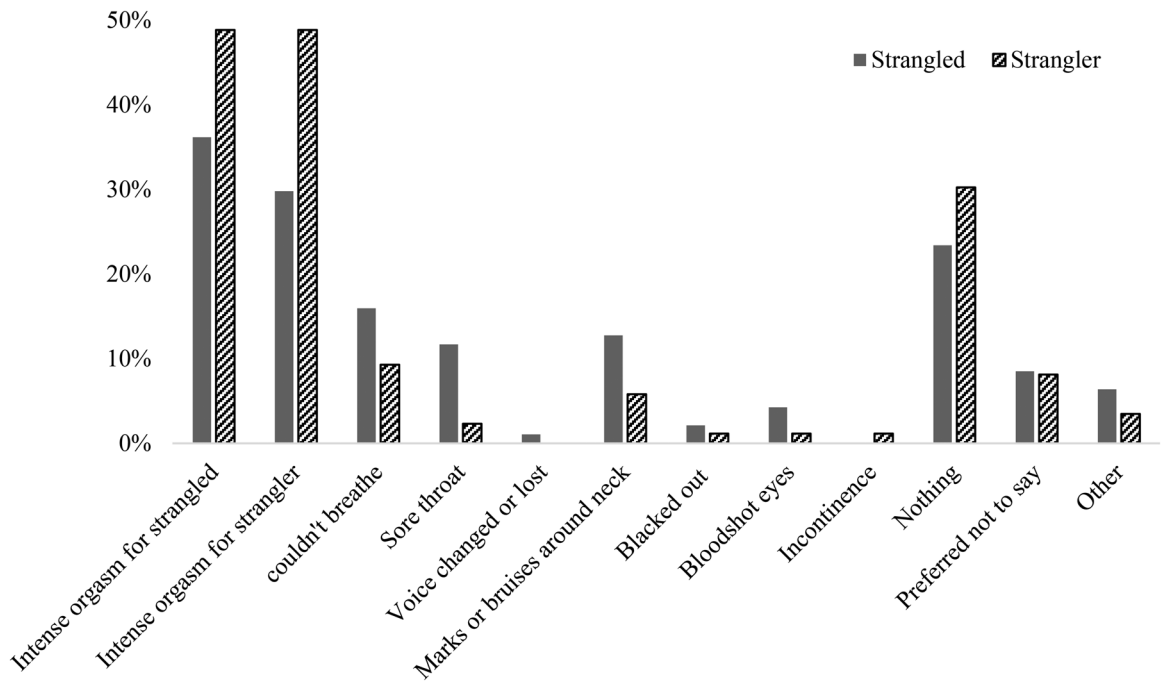

Fig. 2 Reported consequences for people who have been strangled or who strangled their partner

and women. In contrast, criminalization of consensual strangulation was viewed less positively. Consensual strangulation that was unspecified or that involved restriction of the breath was viewed as something that should "probably not" be a crime. However, this was not the case for consensual stopping of someone's breath, which participants felt "probably should" be criminalized. However, for consent to strangulation that was unspecified, $t(160)=2.40$, $p=0.02$, $d=0.85$, consensual restriction of breath, $t(160)=2.42$, $p=0.02$, $d=0.78$, and consensual stopping of the breath, $t(160)=4.09$, $p<0.001$, $d=0.89$, women were more likely to support criminalization than were men. Despite most participants living in Queensland where there is a specific strangulation offence, 83.34% ($n=65$) responded "no" when asked if there was a strangulation offence in the state or territory where they lived and 8.9% ($n=7$) were unsure.

Discussion

Participation in Strangulation During Sex

Using cross-sectional survey data, this study examined the participation in and perceptions of strangulation during sex among a sample of undergraduate university students in Australia. Overall, we found that ever being strangled or strangling partners was common and reported by over half the sample, higher than that reported by a US undergraduate sample (Herbenick et al., 2021). However, during their last sexual experience, 18% of the sample reported having been strangled and 13% had strangled a partner. These frequencies were lower compared to Herbenick et al. (2021) but reflected the gendered nature of strangulation reported in both US prevalence studies, where women were more likely to be strangled and men more likely to strangle (Herbenick et al., 2020, 2021).

Like Sun et al. (2017), we found that generally, "wanting" to be strangled or strangle partners was low-moderate, with women showing a greater want to engage than men. Yet, this was not reflected across initial measurements of positive perceptions toward being strangled, where no differences were shown across groups. We speculate that this may be associated with the social expectation of enjoyment that women subject to, but also part of, the in-the-moment sexual scripts that may be at play (Bridges et al., 2016; Faustino & Gavey, 2022). Along this line, (Herbenick, Fu, Eastman-Mueller et al., 2022; Herbenick, Fu, Kawata et al., 2022; Herbenick et al., 2022a, b) have identified in qualitative research that "ideas" of enjoyment may be related to social processes for women that were also revealed in this research. Specifically, relating to initial ideas of enjoyment stemming from trying it with a partner and discussions with friends and partners. A deeper understanding of the broader social context and norms in which strangulation during sex occurs should be explored in future research to reveal more about how "wanting" to engage may be socially conditioned. For example, is a greater level of wanting to be strangled related to pleasing the person strangling, the social expectation that it is pleasurable for the person being strangled (Herbenick et al., 2022a), a perception that is it now part of "normal sex," or their own intrinsic pleasure of the act (Faustino & Gavey, 2022)?

Attitudes Toward Sex and Strangulation

Generally, greater positive attitudes toward being strangled or strangling partners were related to more frequent engagement in strangulation. However, contrary to expectations, permissive sexual attitudes were associated with higher frequencies of and more positive attitudes toward being strangled among women, but not men. The study showed that higher frequencies of strangling partners were related to higher permissive scores on the sexual attitudes scale. Although these results did not align with our prediction that men with more open sexual attitudes would engage more often in strangulation during sex and have a more positive perception of being strangled, they do reflect the gendered nature of strangulation where primarily women are strangled and men are doing the strangling. Contrary to these gendered roles, we did find that for both men and women, permissive attitudes were related to more positive attitudes toward acting. When interpreted alongside the finding that among women, higher attitudes of sex as communion were related to more wanting to be strangled the last time it occurred, it may be that strangling another person during sex is perceived as a form of connection with an intimate partner for women. This is also consistent with findings that the last known strangulation partners for participants were well-known to both men and women. Further exploration of these views based on sexual orientation in a larger sample would provide greater understanding of how the act of strangulation is perceived.

Criminalization and Education

Despite the explicit criminalization of strangulation across Australia, including the state where participants attended university, there was little knowledge of either the fact that it is criminalized in some contexts or of the dangers of strangulation. This highlights concerns that strangulation is among practices that form a trend toward the normalization of violence in sex that is increasing among young people (Beres et al., 2020; Faustino & Gavey, 2022; Herbenick et al., 2020). Before receiving any education intervention in the present study, participants reported viewing strangulation during sex as potentially harmful but also that

it could be performed safely. Unfortunately, we did not have the scope to ask about how they think it can be performed safely (e.g., safe words and withdrawal of consent). Although not tested here, it is possible that acknowledgement of the danger of strangulation is mediated by trust in a sexual partner, or potentially, participants' perception of its commonness. This idea of "choking safely" is consistent with qualitative research where all interviewees indicated that "choking" was safe or safer than other types of rough sex, and themes of trust in the relationship linked to feeling safe during the act (Herbenick et al., 2022a). This may indicate that criminalization alone is not a suitable strategy to increase community awareness previously argued by some (Joint Select Committee on Coercive Control, 2021). The high initial rate of strangulation during sex displayed among this group shows that responding to strangulation requires reaching audiences outside of domestic and family violence contexts and into general sexual health.

In line with our expectations, even a small amount of targeted information on the harms of strangulation reduced positive perceptions toward strangulation, and this was primarily significant for women's perceptions of being strangled. This indicates that information about the consequences and dangers of strangulation can change perceptions, but that in designing interventions attention needs to be paid to the strangled/strangler status and gender of those targeted. This research suggests that education may have been more impactful for women because the information focused on consequences for the person being strangled and may not have resonated as strongly with men, who were more often in the role of the strangler. Future research might assess the efficacy of education that describes experiences of being strangled, to target those who strangle partners as they showed less insight into their partners' experiences, reporting fewer negative and more positive consequences than participants who had been strangled. It might also consider the limitations of consent if a partner were to experience a serious consequence, such as unconsciousness. This may create a better understanding of fully informed consent and improve understanding of the risks associated with strangulation.

Limitations and Future Research

This research is the first of its kind to be conducted in Australia to explore whether strangulation during sex is engaged in, how it is perceived and understood, including within a legal context. It is also one of the first studies on strangulation to examine the impact of educational messaging and how education could be harnessed in future to increase awareness of its harms.

Despite these strengths, this research had several limitations including that the sample was drawn from one Australian university, meaning we are unable to estimate national prevalence of strangulation in the country. The sample also had a high proportion of bisexual participants relative to the expected population (Wilson et al., 2020). While this may reflect the cohort identity at the university, it also may have been due to the reference to choking and breath play in the title to invite participation in the study. Strangulation as a sexual practice may be more common among LGBTQ + populations (Herbenick et al., 2021; Herbenick, Fu, Eastman-Mueller et al., 2022), and as a result, the topic of the survey may have contributed to the high proportion of willing survey respondents who identified as bisexual in the study. Although we were unable to explore the differences across sexual identities, future, larger samples may be able to shed more light on the nuances of strangulation experiences across different groups.

The survey may also have been susceptible to under-reporting. Despite best efforts to ensure that participants were supported and understood their anonymity, it is possible that some under-reported or adjusted their reporting of experiences and perceptions of strangulation due to shame, stigma, or other reasons. We also provided a definition of strangulation that was focused on hindering or stopping breathing, which did not include hindering/stopping blood flow affecting oxygen to the brain, a common form of choking/strangulation shown in pornography and described in popular media (Bridges et al., 2016; Herbenick, Guerra-Reyes et al., 2023; Herbenick, Patterson et al., 2023). Although this was mitigated in participants' initial reports of strangulation as they were asked about having experienced or placing pressure on the neck during sex without reference to the breath, this definition was still provided after making these selections. This may have contributed to under-reporting as the survey progressed if respondents did not identify with the definition. However, we note that participants had multiple opportunities to provide qualitative context in each section of the survey and none identified that this definition did not apply to them.

Participants were also limited in the number of physical consequences from which they could select. Although we provided a range of options and provided an opportunity for qualitative responses, we expect the actual range of experiences to have been far broader, including a larger range of positive experiences (such as a pleasant vs unpleasant head rush/dizziness). While our study did not fully capture these perceptions and experiences among Australian young people, future research will benefit from a more in-depth assessment of the nature and prevalence of a broader range of experiences. The aim here should also be to increase understanding of harms experienced by people who have been strangled during sex on more than one occasion.

Lastly, although this research did examine "wanting" to engage in strangulation, it did not directly examine consent,

including how consent might be negotiated between partners. Assessing consent to strangulation, particularly in Australian samples where it has yet to be examined, should be a priority for future research.

Conclusion

This exploratory study is the first to examine participation, perceptions, and knowledge around strangulation during sex in Australia, using a sample of Australian university students. Generally, the results show a high proportion of men and women ever engaging in strangulation during sex, and large effect sizes across comparisons of men and women on their "want" to engage, frequency of participation, and the impact of education on positive perceptions of being strangled. There is currently no public education about strangulation during sex in Australia. This research provides some evidence that education can change perceptions of participating in strangulation and, as such, future investigations should examine how education can be tailored to help improve knowledge around the health and legal consequences. A nationally representative sample is needed to better explore the nuances of strangulation experiences and the navigation of safety and consent in the general population and across sexual orientation in Australia.

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Availability of Data and Materials Readers interested in the data for the current study are invited to contact the corresponding author.

Declarations

Conflict of Interest The authors declare no competing interests.

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