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Changing Cognitive Risk Factors for Sexual Aggression: Risky Sexual Scripts, Low Sexual Self-Esteem, Perception of Pornography, and Acceptance of Sexual Coercion

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Abstract

Sexual aggression is a problem among college students worldwide, and a growing body of research has identified variables associated with an increased risk of victimization and perpetration. Among these, sexuality-related cognitions, such as sexual scripts, sexual self-esteem, perceived realism of pornography, and acceptance of sexual coercion, play a major role. The current experimental study aimed to show that these cognitive risk factors of sexual aggression victimization and perpetration are amenable to change, which is a critical condition for evidence-based intervention efforts. College

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students in Germany ($N = 324$) were randomly assigned to one of three groups: a treatment group designed to change participants' sexual scripts for consensual sex with regard to the role of alcohol consumption, casual sex, and ambiguous communication of sexual intentions as risk factors for sexual aggression (EG1), a treatment group designed to promote sexual self-esteem, challenge the perceived realism of pornography, and reduce the acceptance of sexual coercion (EG2), and a non-treatment control group (CG). Baseline (T1), post-experimental (T2), and follow-up (T3) measures were taken across an eight-week period. Sexual scripts contained fewer risk factors for sexual aggression in EG1 than in EG2 and CG at T3. Sexual self-esteem was enhanced in EG2 at T2 relative to the other two groups. Acceptance of sexual coercion was lower in EG2 than in EG1 and CG at T2 and T3. No effect was found for perceived realism of pornography. The findings are discussed in terms of targeting cognitive risk factors as a basis for intervention programs.

Sexual aggression, defined as sexual contact without consent, is a widespread problem among young people worldwide, including college students. Based on large, representative samples in the United States and using multiple behaviorally specific questions, it is estimated that one in five women experience sexual victimization while at college (see Fedina et al., 2018; Muehlenhard et al., 2017, for reviews). In addition to the long-standing focus on women as victims and men as perpetrators, evidence is growing that men can also be victimized, both by women and by other men (see reviews by Depraetere et al., 2020; Stemple et al., 2017). A large-scale survey of undergraduate students in Germany revealed a victimization rate of 36% for women and 19% for men (Krahé & Berger, 2013), and a similar study across 10 European countries yielded total victimization rates of 32% for women and 27% for men (Krahé et al., 2015). Perpetration rates reported by men and women are typically lower than victimization rates, but they also document the widespread occurrence of sexual aggression among college students (Fisher & Pina, 2013; Krahé & Berger, 2013; Krahé et al., 2015; Stemple et al., 2017).

In response to the high prevalence rates, research designing and evaluating interventions to prevent sexual aggression among college students has intensified in recent years (DeLong et al., 2018; Harris et al., 2019; Orchowski

et al., 2020). Psychological interventions targeting individuals rather than policies or institutional change can be successful to the extent that they address risk factors of perpetration and victimization that are amenable to change. Unlike biographical risk factors, such as childhood sexual abuse (Krahé & Berger, 2017a), this is true for behavioral variables, such as alcohol use (Lorenz & Ullman, 2016), engaging in risky sexual behavior, for example, casual sex (e.g., Kelley & Gidycz, 2020), pornography use (e.g., Coyne et al., 2019), and for potentially protective behaviors, such as strengthening refusal assertiveness for rejecting unwanted sexual advances (Marcantonio et al., 2018), and training resistance strategies (Simpson Rowe et al., 2012). Accordingly, many intervention programs have been directed at changes in behaviors related to the vulnerability for sexual victimization and/or risk of sexual aggression perpetration (see reviews by DeGue et al., 2014; Gray et al., 2017; McMahon et al., 2019).

In addition to changing risk-related behavior, a large body of research has targeted cognitive risk factors for sexual aggression. These studies have aimed to change social norms condoning the use of coercive tactics and correcting men's misperceptions of their peers' acceptance of sexual violence (e.g., Dardis et al., 2016), changing attitudes minimizing or denying rape (Senn et al., 2017), and promoting risk perception and knowledge as well as self-efficacy regarding effective resistance in an assault situation (e.g., Senn et al., 2017). However, a recent meta-analysis of sexual assault prevention measures directed at men concluded that there was no evidence of a significant effect across 25 studies in changing attitudes related to sexual assault through intervention efforts (Wright et al., 2020). Thus, there is a need for further studies showing that cognitions and attitudes related to sexual aggression victimization and perpetration may be changed by theory-based treatment efforts.

Cognitive Risk Factors for Sexual Aggression Perpetration and Victimization

A large body of research has identified cognitive risk factors for sexual aggression perpetration and victimization, including attitudes and beliefs related to sexual conduct and the use of coercion (see reviews by Krahé, 2013; Tharp et al., 2013). This literature and our own research (D'Abreu & Krahé, 2014, 2016; Krahé et al., 2007; Schuster & Krahé, 2019a, 2019b; Tomaszewska & Krahé, 2016, 2018) have demonstrated that cognitive scripts for consensual sexual encounters play a critical role for experiencing and engaging in nonconsensual sexual interactions. Sexual scripts are generalized mental representations of sexual interactions (Simon & Gagnon, 1986) and

contain individuals' stored knowledge of the characteristic features of sexual encounters. Sexual scripts contain both descriptive elements, reflecting participants' thoughts on how typical a particular script feature is for a sexual encounter they may have, and evaluative elements, reflecting beliefs about the desirability or normative appropriateness of the feature. In combination, these components provide a frame of reference for understanding and acting in sexual situations (Masters et al., 2013).

Past research has shown that the contents of the script for consensual sexual interactions are linked to a person's risk of showing sexually aggressive behavior and vulnerability to experiencing sexual victimization (D'Abreu & Krahé, 2014, 2016; Hust et al., 2017; Hust et al., 2019; Krahé et al., 2007; Schuster & Krahé, 2019a, 2019b; Tomaszewska & Krahé, 2016, 2018). This is thought to be the case if the consensual sex script contains features that are linked to a heightened probability of sexual aggression perpetration and/or victimization. Established factors that increase the likelihood of sexual aggression perpetration and victimization are (a) the readiness to engage in sex with casual partners (e.g., Tharp et al., 2013), (b) the consumption of alcohol in the context of sexual interactions (e.g., Lorenz & Ullman, 2016), and (c) the ambiguous communication of sexual intentions (e.g., saying "no" to sexual offers when being unsure or meaning "yes") that may complicate the negotiation of consent (e.g., Muehlenhard et al., 2016). In line with the broad literature on scripts as mental representations that guide behavior, we demonstrated in a series of studies in several countries that individuals who consider these aspects to be typical and acceptable elements of their scripts for consensual sexual encounters are more likely to engage in these behaviors, which in turn makes them more likely to report sexual aggression perpetration and victimization (D'Abreu & Krahé, 2014, 2016; Krahé et al., 2007; Schuster & Krahé, 2019a, 2019b; Tomaszewska & Krahé, 2016, 2018). Therefore, demonstrating effective ways of changing sexual scripts to reduce the extent to which risky behaviors are seen as part and parcel of consensual sex is a critical condition for targeting these constructs in systematic treatments.

We conceptualize risky sexual scripts as part of a network of sexuality-related cognitions, in which two further constructs are relevant as predictors of sexual aggression perpetration and victimization: (a) sexual self-esteem and (b) the acceptance of sexual coercion, that is, attitudes condoning the use of coercion to make an unwilling person engage in sex. Sexual self-esteem is defined as a person's self-evaluation of worth as a sexual being (Buzwell & Rosenthal, 1996). Low sexual self-esteem has been found to be a vulnerability factor for sexual victimization in both women and men (Krahé & Berger, 2017b; Schuster & Krahé, 2019a, Tomaszewska & Krahé, 2018). For sexual

aggression perpetration, a longitudinal study found low sexual self-esteem to predict sexual aggression perpetration over a 1-year period in males, but not in females (Krahé & Berger, 2017a). In another study, lower self-esteem was associated with a higher likelihood of sexual aggression perpetration in both gender groups (Schuster & Krahé, 2019b). A further cognitive risk factor for sexual aggression is the acceptance of sexual coercion. Several studies have shown that individuals who believe that the use of coercive tactics to overcome the resistance of an unwilling partner is acceptable under certain circumstances are more likely to engage in coercive behavior (Tomaszewska & Krahé, 2018; Zinzow & Thompson, 2015).

In seeking to understand both the formation of risky sexual scripts and the acceptance of sexual coercion, previous research has identified the use of pornography as a significant predictor of risky sexual scripts, with downstream effects on both consensual sexual behavior and sexual aggression. Pornographic material typically contains features that are considered risk factors of perpetration and vulnerability factors of victimization, such as noncommittal sex, the use of violence, and stereotypes about "token" resistance of women, that is, their tendency to reject a sexual offer despite being willing to accept it (e.g., Dines, 2010). There is plenty of evidence that exposure to pornographic media contents affects users' sexual scripts, attitudes, and behaviors (as summarized by Coyne et al., 2019; Rodenhizer & Edwards, 2019). Furthermore, pornography use has been linked to sexual aggression perpetration, as shown in the review by Wright et al. (2016). Our studies have shown that pornography use increased the acceptance of sexual coercion (e.g., Tomaszewska & Krahé, 2016). In a longitudinal study with Dutch adolescents, Peter and Valkenberg (2010) showed that more frequent use of sexually explicit material on the internet predicted more instrumental attitudes to sex, as reflected in endorsement of statements such as "The main goal of sex is that you yourself have a good time". These authors further showed that the association was mediated by higher perceived realism of pornography. Based on these findings, our study sought to demonstrate that users' critical reflection about the way sexuality and sexual relations are depicted in pornographic material can be changed through our experimental treatment.

Sexual scripts, sexual self-esteem, perceived realism of pornography, and the acceptance of coercion to obtain sex are cognitive variables that can be assumed to influence behavior in sexual interactions. More risky sexual scripts in terms of alcohol use, casual sexual contacts, and ambiguous communication of sexual intentions were found to be predicted by pornography use and to predict corresponding risky behavior (D'Abreu & Krahé, 2014, 2016; Krahé et al., 2007; Schuster & Krahé, 2019a, 2019b; Tomaszewska & Krahé, 2016, 2018).

The Current Study

Based on the evidence reviewed above, which includes both longitudinal and cross-cultural studies, we designed an experimental study to change sexuality-related cognitions that were shown to be linked to an increased likelihood of sexual aggression perpetration and victimization. Reflecting the proposed links between the risk factors and sexual aggression perpetration as well as victimization, two experimental treatments were designed, which are presented in Table 1. One treatment was devoted to the script construct and contained three modules addressing consensual sexual scripts with regard to alcohol consumption, ambiguous communication of sexual intentions, and sexual contacts with casual partners (Experimental Group 1; EG1). The second treatment comprised three modules seeking to promote sexual self-esteem and reduce the perceived realism of pornography as well as the acceptance of sexual coercion (Experimental Group 2; EG2). Following a baseline assessment, participants in the treatment groups completed the modules in three consecutive weekly sessions. A non-treatment control group (CG) was also included in the design. All participants took part in two further assessments one week and five weeks after the treatment, bringing the total study period to eight weeks.

We hypothesized that participants in EG1 would show less risky sexual scripts (i.e., be less likely to see sex with casual partners, alcohol consumption, and ambiguous communication of sexual intentions as integral elements of their scripts for consensual sexual encounters) than participants in EG2 and CG at post-treatment and follow-up, controlling for baseline levels (Hypothesis 1). We expected that participants in EG2, compared to the CG and EG1, would show higher sexual self-esteem, lower perceived realism of pornography, and lower acceptance of sexual coercion at post-treatment and follow-up (Hypothesis 2), again controlling for baseline levels.

Method

Participants

A total of 324 college students (238 female, 73.5%) participated in this study. Of these, 288 took part at T1, and 36 participants entered the study at one of the subsequent sessions because all participants who initially registered for the study were invited to every session. We decided to include these 36 participants in the sample and handled missing data through multiple imputation, as explained below. The sample size was determined on the basis of a power calculation with G*Power 3.1. The analysis for a mixed-model multivariate analysis of variance (MANOVA) with three groups and

Table 1. Key Topics and Goals of Treatment Modules.

Module	Contents
M1: Scripts: Alcohol use	Key topic: Alcohol use seen as a normal and desirable part of sexual encounters in participants' sexual scripts

Goals:
1. Activating and reflecting upon the participants' personal scripts regarding the association of alcohol use and sex
2. Creating an awareness of the effects of alcohol intoxication on perceptions and behaviors in sexual encounters
3. Promoting the understanding of the mechanisms by which alcohol use and sexual aggression are related
4. Challenging the belief that alcohol use is an integral part of sexual encounters

M2: Scripts: Ambiguous communication	Key topic: Ambiguous communication of sexual intentions, particularly in terms of token resistance and compliance

Goals:
1. Activating and reflecting upon the participants' personal scripts regarding the use of ambiguous communication in sexual encounters
2. Creating an awareness of the effects of ambiguous communication on perceptions and behaviors in sexual encounters
3. Promoting the understanding of the mechanisms by which ambiguous communication and sexual aggression are related
4. Challenging the belief that ambiguous communication is an integral part of sexual encounters
5. Providing strategies of clear communication of sexual intentions

M3: Scripts: Casual sex	Key topic: Contacts with casual sexual partners

Goals:
1. Activating and reflecting upon the participants' personal scripts regarding casual sex
2. Promoting the understanding of the mechanisms by which casual sex and sexual aggression are related

M4: Sexual self-esteem	Key topic: Increasing sexual competence by bolstering sexual self-esteem

Goals:
1. Increasing sexual self-esteem and refusal assertiveness
2. Promoting the understanding of clear communication of sexual needs and desires

(continued)

Table 1. (continued)

Module	Contents
M5: Perception of pornography	Key topic: Reducing perceived realism in pornographic media

Goals:
1. Recognizing and reflecting upon sexual stereotypes in pornography
2. Promoting the understanding of the impact of sexual stereotypes on notions about sexuality and sexual behavior

M6: Acceptance of sexual coercion	Key topic: Reducing the acceptance of sexual coercion

Goals:
1. Reflecting upon the participants' own acceptance of sexual coercion and norms of peers
2. Reflecting upon possible justifications for sexual coercion
3. Challenging the possible justifications for sexual coercion and promoting the importance of consent
4. Promoting empathy with the victims of sexual aggression
5. Recognizing that saying 'no' must be accepted at any time of the sexual interaction
6. Reducing the acceptance of sexual coercion

three measurement points, an effect size of $f = .25$, and a power of .95 yielded an N of 151. To allow for dropout from T1 to T3, we had aimed for an N of 210 ($n = 70$ per condition), so the actual sample size of $N = 324$ means that the study was sufficiently powered to yield interpretable results.

Of the 288 participants who took part at T1, 248 were still in the sample at T3. This corresponds to a retention rate of 86.1%. A breakdown of the number of participants in each group is presented in the Supplemental Material (Table S1). The mean age of the sample was 24.8 years ($SD = 4.21$), with women ($M = 24.2$, $SD = 3.94$) being younger than men ($M = 26.5$, $SD = 4.50$), $t(284) = -4.14$, $p < .001$. No age differences were found between the experimental and control groups. Participants' sexual orientation was predominantly heterosexual, with a mean of 2.10 ($SD = 1.47$) on the Kinsey scale ranging from 1 (*heterosexual*) to 7 (*homosexual*). No differences in sexual orientation were found between men and women or between the experimental and control groups. Regarding relationship and sexual experience, most participants reported that they had been in a relationship, either at the time of the study or before (93.3%), and that they had had sexual intercourse (94.3%). Mean age at first sexual intercourse was 17.4 years ($SD = 2.53$). No gender or group differences existed on any of these

variables. Women reported fewer sexual partners ($M = 6.5$, $SD = 6.27$) than did men ($M = 10.3$, $SD = 16.24$), but the difference did not reach significance, $t(81.663) = -1.96$, $p = .053$. No differences between the experimental and control groups were found in the number of partners.

Treatment Conditions

Two treatment conditions were implemented and administered in an online format, each consisting of three modules, as described in Table 1. Participants in EG1 received three modules addressing the risk factors in sexual scripts: alcohol use (M1), ambiguous communication of sexual intentions (M2), and casual sex (M3). Participants in EG2 received three modules addressing sexual self-esteem (M4), perceived realism of pornography (M5), and acceptance of sexual coercion (M6). The treatment employed scenarios describing a particular situation (for example, an encounter of two people who met at a party and ended up having sex and not feeling good about it the next morning), in which participants were asked to imagine themselves and reflect on how they would act and feel in that situation. These experiential tasks were complemented by didactic elements providing scientific information on the different topics (e.g., how alcohol impairs the ability to detect risk cues), explanations to the scenarios that introduced each module, and everyday examples. Furthermore, the modules comprised instructions for peer discussions on the covered topics. This combination of approaches reflects the call for the use of varied teaching methods as a precondition for conducting successful interventions to reduce sexual aggression (DeGue et al., 2014). The baseline, post-treatment, and follow-up measurements of the critical outcome variables were also conducted online in all three groups.

Measures

For the translation of the English measures for which no German version was available from prior research, standard back translation procedures were used. In a first step, the English items were translated into German, and in a second step, they were translated back into English. All measures were assessed at baseline, post-treatment (T2), and follow-up (T3).

Risky sexual scripts. For risky sexual scripts, a composite measure was created, including both descriptive and normative features. To assess the extent to which risk elements are an integral part of participants' consensual sexual scripts, a scenario-based measure developed by Krahé et al. (2007) was used. Participants were asked to imagine a typical situation in which they had

sexual intercourse with a new partner for the first time and to rate the presence of the following elements: (a) consumption of alcohol and degree of intoxication (six items, e.g., "How likely is it that alcohol is consumed by you; by the man/woman?": $\alpha_{T1} = .83$, $\alpha_{T2} = .83$, $\alpha_{T3} = .85$); (b) ambiguous communication of sexual intentions (four items, e.g., "How likely is it that you first say 'no' even though you also want to have sex with her or him?": $\alpha_{T1} = .71$, $\alpha_{T2} = .71$, $\alpha_{T3} = .73$); and (c) length of acquaintanceship and engaging in casual sex (four items, e.g., "How long have the two of you known each other before?," reverse coded: $\alpha_{T1} = .31$, $\alpha_{T2} = .51$, $\alpha_{T3} = .63$). Responses were elicited on a 5-point scale, with response options ranging from 1 (*very unlikely*) to 5 (*very likely*) for alcohol consumption, ambiguous communication, and casual sex, from 1 (*not at all*) to 5 (*totally*) for the level of intoxication, and from 1 (*not at all*) to 5 (*a few months or longer*) for the length of the relationship. The Cronbach alphas for the 14-item scale were $\alpha_{T1} = .66$, $\alpha_{T2} = .68$, $\alpha_{T3} = .75$.

The normative acceptance of risk elements in sexual scripts was measured by 14 items adopted from Krahé et al. (2007). Two items addressed the use of alcohol in sexual situations (e.g., "Drinking alcohol when meeting a man and having sex with him is part of the game."; $\alpha_{T1} = .86$, $\alpha_{T2} = .86$, $\alpha_{T3} = .73$), four items referred to the ambiguous communication of sexual intentions (e.g., "It is part of the game for a woman to say 'no' at first when a man wants to have sex with her even though she wants it too."; $\alpha_{T1} = .58$, $\alpha_{T2} = .68$, $\alpha_{T3} = .71$), and eight items addressed casual sexual activities (e.g., "It is ok for a man to have sex with a woman on the first night out."; $\alpha_{T1} = .93$, $\alpha_{T2} = .93$, $\alpha_{T3} = .94$). The internal consistencies for the total 14-item scale were $\alpha_{T1} = .80$, $\alpha_{T2} = .78$, $\alpha_{T3} = .80$. Response options ranged from 1 (*completely disagree*) to 5 (*completely agree*). For each risk element, an index was created by multiplying the mean scores of the descriptive and normative scales, yielding risk scores for casual sex, alcohol consumption, and ambiguous communication. In addition, an overall script score was computed by summing the three indices.

Sexual self-esteem. Participants' sexual self-esteem was measured by 12 items from the short form of the Sexual Self-Esteem Inventory developed by Zeanah and Schwarz (1996). Four items each from the Adaptiveness subscale (e.g., "In general, I feel my sexual experiences have given me a more positive view of myself."), the Control subscale (e.g., "I feel physically vulnerable in a sexual encounter"; reverse coded), and the Skill and Experience subscale (e.g., "I feel I am pretty good at sex.") were used. Responses were made on a five-point scale ranging from 1 (*do not agree at all*) to 5 (*totally agree*). The internal consistencies were $\alpha_{T1} = .84$, $\alpha_{T2} = .85$, $\alpha_{T3} = .87$.

Perceived realism of pornography. The extent to which participants perceived pornography as realistic was measured with an adapted six-item scale developed by Peter and Valkenberg (2010). Their scale comprised two components: social realism, referring to the perceived similarity of sexually explicit media to real-live sexual relationships (example item: "Sex in pornographic media is similar to sex in real life"), and perceived utility, referring to the possibility to learn about sexuality and for one's own sex life by seeing sexually explicit material (example item: "By watching sex on the Internet, you can learn things you wouldn't learn otherwise."). Response options ranged from 1 (*do not agree at all*) to 5 (*totally agree*). Responses were aggregated across the six items to form a score of perceived realism of pornography. The internal consistencies were $\alpha_{T1} = .77$, $\alpha_{T2} = .82$, $\alpha_{T3} = .81$.

Acceptance of sexual coercion. We used two seven-item short forms (versions A and B) of a scale developed by Krahé et al. (2007) to measure the extent to which participants considered sexual coercion understandable under certain conditions. Participants were asked to imagine someone who wants to have sex with another person, but this person clearly says no, and to indicate under what conditions they would find sexual coercion understandable. A list of seven potential justifications was presented (e.g., "They have been in a relationship for some time"), and responses were made on a five-point scale ranging from 1 (*absolutely not*) to 5 (*absolutely yes*). At T1 and T3, participants received version A; at T2, they completed version B. The two sets of items had been established to be parallel versions based on nonsignificant mean differences in a pilot study. The online format of our survey enabled us to give participants a version of the scale matched to their gender: men were asked about male-perpetrated sexual coercion and women were asked about female-perpetrated sexual coercion in opposite-sex constellations. Internal consistencies were $\alpha_{T1} = .86$, $\alpha_{T2} = .93$, $\alpha_{T3} = .88$.

Demographic information. At T1, all participants were asked about their gender (female/male), age, and whether they were in a steady relationship at the time of the survey or had been in one before (yes/no). Participants' sexual experience background was assessed by asking them about whether they ever had sexual intercourse (yes/no), if so, about their age at first sexual intercourse, and about their sexual orientation, using the seven-point scale by Kinsey et al. (1948) from 1 (*heterosexual*) to 7 (*homosexual*).

Procedure

The Ethics Committee of the authors' university approved the study design and all instruments. To recruit participants, invitations to participate in the study were sent out via an official mailing list at the authors' university, a mid-sized German university, reaching all enrolled students. Students interested in participating registered in a database created for the purposes of this study. From there, participants were randomly allocated to EG1, EG2, and CG. All materials were presented in German and completed online. In return for participation, participants were given either course credit (EG1/2: 4 hr, CG: 2 hr) or an Amazon gift card (EG1/2: 25€, CG: 10€).

Analytic Strategy

Prevalence rates and descriptive statistics were computed without imputation in SPSS 25. The regression analyses examining the efficacy of the treatments were conducted with Mplus (Version 8.2; Muthén & Muthén, 1998-2017), which allowed us to handle missing data through multivariate imputation by chained equations (MICE) in R, following the recommendations of van Buuren and Groothuis-Oudshoorn (2011). MICE imputes missing values based on the observed values (Schafer & Graham, 2002). This missing-data approach is considered to be superior to traditional approaches, such as listwise or pairwise deletion (Enders, 2010). We created 20 imputed datasets, using 100 iterations. All chains showed good convergence.

Results

Descriptive Statistics

Means and standard deviations of the study variables are presented in Table 2. Gender differences were examined in multivariate analyses of variance for each of the three measurement points. Significant multivariate gender effects were found at T1, $F(6, 269) = 11.88$, $p < .001$, T2: $F(6, 245) = 12.71$, $p < .001$, and T3, $F(6, 244) = 7.57$, $p < .001$. Men reported more risky sexual scripts on the total score than did women at T1, T2, and T3. These effects were driven by more risky sexual scripts in terms of ambiguous communication in men's than in women's scripts at all three measurement points, by risky sexual scripts in terms of casual sex at T1, and by risky sexual scripts in terms of alcohol at T2 and T3. Men reported higher sexual self-esteem at T1 and T2 as well as higher perceived realism of pornography at all measurement points. Women

Table 2. Mean Scores and SDs of the Study Variables by Measurement Point and Gender.

	T1				T2				T3			
Variable	Total M (SD)	Men M (SD)	Women M (SD)	F Gender diff	Total M (SD)	Men M (SD)	Women M (SD)	F Gender diff	Total M (SD)	Men M (SD)	Women M (SD)	F Gender diff
Risky sexual scripts: total[a]	16.69 (5.41)	18.45 (6.06)	16.01 (4.99)	11.80**	16.25 (5.17)	17.72 (6.15)	15.72 (4.68)	7.59**	15.82 (5.20)	17.41 (5.99)	15.23 (4.76)	9.00**
Risky sexual scripts: alcohol[b]	2.86 (1.86)	2.98 (1.87)	2.81 (1.85)	0.48	2.70 (1.81)	3.08 (2.35)	2.57 (1.55)	4.07*	2.61 (1.81)	3.05 (2.31)	2.45 (1.56)	5.66*
Risky sexual scripts: casual sex[b]	10.72 (4.51)	11.65 (4.86)	10.35 (4.33)	4.64*	10.81 (4.37)	11.02 (4.59)	10.73 (4.29)	0.22	10.53 (4.38)	10.97 (4.76)	10.37 (4.23)	0.92
Risky sexual scripts: ambiguous comm.[b]	3.11 (1.72)	3.82 (2.09)	2.84 (1.47)	19.22***	2.74 (1.79)	3.62 (2.22)	2.42 (1.50)	23.98***	2.68 (1.84)	3.39 (2.07)	2.41 (1.68)	14.71***
Sexual self-esteem	3.75 (0.67)	3.88 (0.60)	3.69 (0.70)	4.47*	3.72 (0.67)	3.86 (0.58)	3.66 (0.69)	4.53*	3.73 (0.72)	3.82 (0.62)	3.70 (0.76)	1.41
Pornography: perceived realism	1.85 (0.55)	2.02 (0.59)	1.78 (0.52)	11.48**	1.89 (0.56)	2.08 (0.64)	1.83 (0.52)	10.26**	1.90 (0.58)	2.05 (0.57)	1.84 (0.57)	7.13**
Acceptance of sexual coercion	1.43 (0.59)	1.24 (0.39)	1.51 (0.64)	12.21**	1.54 (0.76)	1.33 (0.55)	1.62 (0.81)	7.32**	1.32 (0.52)	1.20 (0.36)	1.36 (0.56)	4.77*

[a]Sum scores based on the three components: alcohol, casual sex, and ambiguous communication.
[b]Mean scores of the descriptive and normative components multiplied responses ranged from 1 to 25. Responses on all other scales ranged from 1 to 5.
*p < .05. **p < .01. ***p < .001.

reported higher acceptance of sexual coercion than did men at all measurement points. The correlations between the variables measured at T1 are shown in the Supplemental Material (Table S2).

Treatment Effects

The predicted treatment effects were tested through linear regression analyses with the imputed dataset in Mplus. The EGs and the CG were dummy-coded into two variables: one dummy-coded variable compared EG1 (coded as 1) to EG2 and CG (coded as 0); the other dummy variable compared EG2 (coded as 1) to EG1 and CG (coded as 0). The dependent variables were regressed on the dummy-coded variables and controlled for gender, sexual orientation, and the respective T1 score of the criterion variable. Table 3 shows the beta coefficients for each analysis.

With respect to Hypothesis 1, we did not find a significant effect of EG1 compared to EG2/CG on the risk elements in sexual scripts at T2. However, at T3, EG1 compared to EG2/CG had a lower total score of risky sexual scripts ($\beta = -.17$, $p = .001$), a lower score on the casual sex script ($\beta = -.10$, $p = .039$), and a lower score on the ambiguous communication script ($\beta = -.15$, $p = .013$), partially confirming our hypothesis.

Consistent with Hypothesis 2, participants in EG2 had higher sexual self-esteem at T2 than participants in EG1 and CG ($\beta = .08$, $p = .034$). No significant direct effect emerged for sexual self-esteem at T3 ($\beta = .05$, $p = .297$). However, the specified path model (see Supplemental Material, Figure 1) yielded an indirect effect of higher sexual self-esteem at T3 via higher sexual self-esteem at T2 ($\beta = .06$, $p = .032$). Also in line with our hypothesis, membership in EG2, but not in EG1/CG, predicted lower acceptance of sexual coercion at T2 ($\beta = -.13$ $p = .020$) and T3 ($\beta = -.13$, $p = .008$). In addition, a path model was specified (see Supplemental Material, Figure 2) to examine indirect effects of our treatment on the acceptance of sexual coercion. As for sexual self-esteem, membership in EG2, but not in EG1/CG, predicted lower acceptance of sexual coercion at T3 through lower acceptance of sexual coercion at T2 ($\beta = -.06$, $p = .040$), showing the sustainability of the treatment effect at least in this short time window. Contrary to our prediction, no effect of the treatment was found on the measure of perceived realism of pornography.

Although not part of our predictions, two cross-over effects emerged in the script scores in EG2 despite the fact that participants in this group had not received the respective modules, whereas those in EG1 had. The total scores of risky sexual scripts at T2 and T3 as well as the alcohol script at

Table 3. Beta Coefficients for the Final Step of the Hierarchical Regression Analyses (N = 324; Imputed Data).

	Scripts T2	Sc_alc T2	Sc_sex T2	Sc_com T2	Scripts T3	Sc_alc T3	Sc_sex T3	Sc_com T3	SSE T2	SSE T3	Coercion T2	Coercion T3	P_real T2	P_real T3
Gender	.07	.13*	-.05	.16**	.07	.13*	-.01	.11	.00	-.04	-.03	-.00	.04	.00
Sex. orientation	.05	.05	.00	.03	.06	-.05	.08	-.00	.04	.01	-.04	.04	.07	.00
Predictor T1[a]	.65***	.50***	.74***	.55***	.67***	.39***	.74***	.47***	.84***	.82***	.61***	.66***	.68***	.68***
EG1 vs EG2/CG	-.05	.00	-.03	-.08	-.17**	-.12	-.10*	-.15*	.08	.04	-.07	-.08	-.04	-.00
EG2 vs EG1/CG	-.12*	-.10	-.06	-.10	-.12*	-.14*	-.03	-.12	.08*	.05	-.13*	-.13*	.09	.08
R^2	.47***	.29***	.54***	.38***	.51***	.19**	.60***	.27***	.71***	.66***	.42***	.46***	.51***	.47***

Note. Scripts = risky sexual scripts: total; Sc_alc = risky sexual scripts: alcohol; Sc_sex = risky sexual scripts: casual sex; Sc_com = risky sexual scripts: ambiguous communication; SSE = sexual self-esteem; Coercion = acceptance of sexual coercion; P_real = perceived realism of pornography. EG1 = experimental group 1, EG2 = experimental group 2, CG = control group.
[a]Predictor T1 = score of the respective dependent variable at T1.
*p < .05. **p < .01. ***p < .001.

T3 were lower in EG2 compared to EG1/CG (total score T2: $\beta = -.12$, $p = .016$; total score T3: $\beta = -.12$, $p = .016$; alcohol script T3: $\beta = -.14$, $p = .022$).

Discussion

The present study was designed to show that cognitive risk factors for sexual aggression may be changed by a theory-based experimental treatment. Specifically, one condition focused on changing cognitive scripts for consensual sex that contained elements shown to be risky with regard to sexual aggression, particularly alcohol consumption, ambiguous communication of sexual intentions, and sexual contacts with casual partners. The second condition was designed to promote sexual self-esteem and to reduce the perceived realism of pornography and the acceptance of sexual coercion, also based on past research showing that these aspects are predictive of sexual aggression perpetration and victimization. The modules used a combination of different didactic methods, which was found to be a successful approach in other studies (e.g., Newins & White, 2021).

The first finding was that the materials presented in the two treatment conditions were well-received by the participants. Of the participants who took part at T1, 86.1% were still in the sample at T3. This high retention rate suggests that the materials were engaging and able to sustain participants' motivation to remain in the study over the course of the eight-week period. This is a critical finding given that reviews of past interventions that produced no effects or even harmful effects cited participants' adverse reactions to intervention contents as a possible cause (DeGue et al., 2014). In terms of assessing the instruments for testing the experimental effects, except for the subscale score of ambiguous communication in sexual scripts, the scales showed acceptable to very good reliability, which qualifies them for use in a future intervention study.

Consistent with previous research, men held more risky sexual scripts for consensual sex than did women (Krahé et al., 2007; Schuster & Krahé, 2019a). The gender difference was mainly driven by men's higher means of ambiguous communication of sexual intentions, that is, the extent to which they considered saying "no" despite wanting a sexual encounter or saying "yes" despite not wanting it to be part of their consensual sexual script. Moreover, men perceived pornography to be more realistic, which is also consistent with previous research (e.g., Tomić et al., 2018). In contrast to previous research (D'Abreu & Krahé, 2016; Tomaszewska & Krahé, 2016), women scored higher than did men on the acceptance of sexual coercion. One explanation for this difference may be that in the

earlier studies, the items referred to male aggression toward a female target for participants of both genders. In the present study, the items were matched to participants' gender, so that men were asked about male-perpetrated sexual coercion and women were asked about female-perpetrated sexual coercion in heterosexual interactions. Thus, in our study, female students justified female sexual coercion toward a man to a greater extent than male students justified male sexual coercion toward a woman. This finding indicates that women consider a woman's use of coercion to obtain sex with an unwilling male partner as more understandable than men consider the use of coercion by a man against a woman. It is consistent with the widely shared myth that men cannot be raped by women (see Turchik & Edwards, 2012, for a review).

Providing partial support for our first hypothesis, risky sexual scripts at T3 were lower in EG1, which had received the treatment addressing sexual scripts, than in EG2 and CG. Breaking down this overall effect into the three modules, it was apparent that the effect was mainly driven by lower risk scores on the casual sex script and the ambiguous communication script. The finding that treatment effects emerged at T3 but not immediately at post-treatment shows that the cognitive changes in consensual sexual scripts triggered by the treatment may have needed some time to unfold.

With respect to our second hypothesis, the treatment was effective in enhancing sexual self-esteem. Participants in EG2 reported higher sexual self-esteem at T2 than did participants in EG1/CG, controlling for initial levels of sexual self-esteem. Considering indirect effects at the follow-up assessment, the difference was still significant one month after the treatment, mediated by higher sexual self-esteem immediately post-treatment at T2. In addition, the acceptance of sexual coercion was lower in EG2, which had received the respective module, than in the other two groups at both T2 and T3. The ability to reduce the acceptance of sexual coercion by an experimental treatment supports the findings from previous research (Palm Reed et al., 2015).

Beyond the predicted effects, we also found evidence of cross-over effects in EG2. Although participants in this group did not receive the modules addressing sexual scripts, their total score of risky sexual scripts as well as their alcohol script were also reduced by the treatment. The modules related to sexual self-esteem, realism of pornography, and acceptance of sexual coercion may have helped participants to reflect on the risky aspects of their mental representations of consensual sexual interactions. These findings suggest that promoting critical reflection about different aspects of their sexual relations not only changed the targeted cognitions specifically, but affected other sexuality-related cognitions as well.

All in all, our results suggest that our experimental treatments were successful in eliciting changes in sexuality-related cognitions, such as sexual scripts, sexual self-esteem, and the acceptance of sexual coercion. The only exception to this pattern was the perceived realism of pornography, for which no effect of the treatment could be observed. One reason may be that the treatment directed at pornography realism was exclusively educational, asking participants to reflect on how pornographic material tends to portray sexual relations and sexual behavior in an unrealistic fashion, such as promoting the objectification of the female body. This set the pornography module apart from the other modules, which used a more varied set of methods, including scenario-based exercises in self-reflection. Another reason might be a floor effect because perceived realism scores were at the low end of the response scale.

Strengths and Limitations

The main strength of our study is that the selection of target constructs and the development of the treatment materials were based on an extensive body of theoretical knowledge and empirical evidence on the factors that increase the odds of sexual aggression perpetration and victimization. Moreover, the high retention rate suggests that our material was well accepted, recommending it for future use with larger samples. A further strength was that the study included both women and men in the potential roles of victims and/or perpetrators, reflecting recent research that showed that men may be victims and women may be perpetrators (Depraetere et al., 2020; Fisher & Pina, 2013; Krahé et al., 2015). Furthermore, the online administration offers an easily accessible and cost-effective format of delivery.

At the same time, several limitations have to be acknowledged. First, we only had a follow-up period of five weeks, which means that we could not examine the sustainability of treatment effects on the targeted sexuality-related cognitions beyond that period. The short follow-up period also precluded the detection of changes in the outcome variables referring to sexual behavior and, most importantly, on the ultimate criterion of reduced odds of engaging in sexual aggression perpetration and experiencing victimization. These limitations will be addressed in a large study currently under way, which includes two follow-up measures, covering a period of two years. A second limitation refers to the low internal consistency of our descriptive and normative measures of ambiguous communication at T1. The results of the current study provided a basis for improving these measures for use in the larger study. Third, regarding the issue of diversity, the gender imbalance in the composition of the sample means that the results

for men were based on a comparatively small number of participants. However, treatment effects were controlled for gender, as gender was included as a covariate in the regression analyses. Moreover, the sample size was not large enough to enable us to include the interaction terms of experimental condition and gender into our regression analyses. Therefore, the current findings cannot address a potential moderating role of gender in the effects of the treatment. Further in relation to diversity, it is a limitation that only heterosexual constellations were addressed in the study. However, the materials used in the present study can easily be adapted to match the sexual experience background of lesbian, gay, bisexual, transgender, and intersex (LGBTI) groups, who have been identified as having a higher vulnerability to sexual victimization and risk of sexual aggression perpetration (e.g., Canan et al., 2021; Eisenberg et al., 2021; López & Yeater, 2021). Finally, although invitations to participate in the study were sent out via a mailing list reaching all enrolled students, participants represent a convenience sample from only one university. Although there is no indication that the student body differs in a systematic way from the general population of college students in Germany, this limits the generalizability of the findings. However, because the key objective of the study was the examination of treatment effects based on a random assignment of participants to the treatment conditions, potential self-selection into the sample as a whole cannot explain the findings.

These limitations notwithstanding, the present study has revealed that the materials designed for the experimental treatment to change cognitive risk factors for sexual aggression were well accepted by the participants, which is a promising outlook for using it in a larger study with a longer follow-up. Our program complements existing prevention approaches that are directed at men, with a focus on implementing anti-aggression norms (Zounlome & Wong, 2019), and programs directed at all gender groups to promote the willingness to intervene as bystanders in situations in which a sexual assault may be imminent (Evans et al., 2019). Furthermore, the results provide first evidence that the modules can elicit the expected changes in cognitive predictors of sexual aggression perpetration and victimization, namely risky sexual scripts, sexual self-esteem, and acceptance of sexual coercion. They provide a starting point for more extensive intervention studies that would have to include a reduction in the odds of sexual aggression perpetration and victimization as the main criteria of success.

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Declaration of Conflicting Interests

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Supplemental Material

Supplemental material for this article is available online.

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