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A Theory-Based Intervention to Reduce Risk and Vulnerability Factors of Sexual Aggression Perpetration and Victimization in German University Students

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ABSTRACT

The current study evaluated an intervention program, designed by the authors and based on the theory of sexual scripts and social learning theory, to reduce empirically established risk and vulnerability factors of sexual aggression. A sample of 1,181 university students in Germany (762 female) were randomly assigned to an intervention and a no-intervention control group. The intervention group completed six modules addressing established antecedents of sexual aggression perpetration and victimization: risky sexual scripts, risky sexual behavior, low sexual self-esteem, low sexual assertiveness, acceptance of sexual coercion, and perceived realism of pornography. After baseline (T1), intervention effects were measured one week after the last module (T2), nine months later (T3), and another 12 months later (T4). The intervention group showed significantly less risky sexual scripts and higher sexual self-esteem at T2, T3, and T4. The intervention indirectly reduced risky sexual behavior at T3 and T4 via less risky sexual scripts at T2 and increased sexual assertiveness at T3 and T4 via higher sexual self-esteem at T2. No intervention effects were found on the acceptance of sexual coercion and pornography realism. The implications of the findings for reducing the prevalence of sexual aggression perpetration and victimization are discussed.

Sexual aggression, defined as any sexual contact against a person's will, is a serious problem facing women worldwide, with severe consequences for health and well-being (Basile et al., 2021; World Health Organization, 2019). The problem of male sexual victimization is also being increasingly recognized (Depraetere et al., 2020). Therefore, interventions that effectively reduce the likelihood of sexual aggression perpetration and victimization are needed. Particularly since the last decade, increased research attention, primarily in high-income countries, has been devoted to the development and evaluation of evidence-based programs (Massetti et al., 2020). These approaches include the promotion of bystander interventions (Mujal et al., 2021; Salazar et al., 2019), resistance and self-defense trainings (Senn et al., 2017, 2021) as well as sex education on sexual refusal skills (Santelli et al., 2018). College students have been the prime target group for these intervention efforts, because college life is associated with a range of risk and vulnerability factors, such as alcohol and hookup cultures (Bonar et al., 2022; Gantman & Paluck, 2022).[1]

Within intervention research, the most prominent approach targets modifiable risk factors of sexual aggression perpetration and vulnerability factors of sexual victimization at the individual cognitive and behavioral level (DeGue et al., 2014), as opposed to individual biographical factors, such as child sexual abuse, that are irreversible (Schuster et al., 2022), albeit their effects can be treated. For example, interventions were able to reduce attitudes toward date rape and hostility toward women as well as increase self-defense self-efficacy and willingness to intervene as a bystander (Evans et al., 2019; Mujal et al., 2021; Senn et al., 2021). Intervention effects on cognitive and behavioral factors have been shown to be sustainable over some time. For instance, the Enhanced Assess, Acknowledge, Act (EAAA) program produced a reduction of rape myth acceptance and beliefs in female precipitation of rape as well as an increase in self-defense self-efficacy, remaining significant at the 6-, 12-, 18-, and 24-month follow-ups (Senn et al., 2017). Despite successful intervention effects shown by some studies, a meta-analysis of studies designed to reduce men's sexual aggression perpetration did not find any effects on sexual assault knowledge, sexual assault-related attitudes, and rape empathy (Wright et al., 2020). In addition, many intervention efforts adopt the traditional focus of women as victims and men as perpetrators in heterosexual interactions (Bonar et al., 2022), despite evidence that women may also perpetrate sexual aggression and men may be victimized by other men (Fisher & Pina, 2013; Lowe & Rogers, 2017). Furthermore, there have been calls for a more rigorous evaluation of intervention effects, for example, by employing randomized control trials and longitudinal designs (Banyard, 2014; Orchowski et al., 2020). In line with these calls, the present study developed and evaluated a theory-based intervention designed to change

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[1]We use the term "vulnerability factor" when referring to victimization to underline that no causal role of victims is implied. The term "risk factor" is used when referring to perpetration.

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cognitive and behavioral variables associated with a higher risk of perpetrating and a higher vulnerability to experiencing sexual aggression in a sample of university students in Germany.

A number of factors have been identified in the literature to increase the probability of victimization and/or perpetration (Knight & Sims-Knight, 2011; Tharp et al., 2013; Ullman & Najdowski, 2011). In particular, mental representations of consensual sexual interactions, referred to as sexual scripts, are considered to play a key role in explaining sexual aggression through their function of guiding sexual behavior. Hence, a large part of the intervention developed in the present research was based on sexual script theory, as described below. Further target variables were selected from the existing literature on risk factors of sexual aggression perpetration and vulnerability factors of victimization. At the cognitive level, these were sexual self-esteem, perceived realism of pornography, and the acceptance of coercion to obtain sex. At the behavioral level, our intervention addressed risky sexual behavior and sexual assertiveness. The evaluation used a combined experimental-longitudinal design with four data waves over a 23-month period and included both men and women with different sexual orientations and sexual experience backgrounds. The theoretical and empirical basis of the intervention is explained in the following sections.

Cognitive Risk and Vulnerability Factors

Cognitive representations related to sexuality, gender, and violence play a key role in understanding sexual aggression perpetration and victimization (Krahé & Berger, 2021; Tharp et al., 2013). Sexual behavior is guided by mental representations of sexual interactions, as captured in the construct of *sexual scripts* (Simon & Gagnon, 1986). Sexual scripts are influenced by cultural norms and beliefs, which are internalized and adapted by individuals based on their own experience (Krahé et al., 2007; Sakaluk et al., 2014). With regard to sexual aggression perpetration and victimization, certain elements of sexual scripts have been identified as risk and vulnerability factors (see also section on behavioral risk and vulnerability factors): (1) alcohol use in sexual situations, (2) ambiguous communication of sexual intentions, and (3) casual sexual contacts (Krahé & Berger, 2021; Schuster & Krahé, 2019a; Tomaszewska & Krahé, 2018). Therefore, sexual scripts which comprise these features may be considered as risky with regard to sexual aggression perpetration and victimization, designating them as targets for intervention efforts.

Within a network of sexuality-related cognitions, *sexual self-esteem*, conceptualized as an individual's perception of worth as a sexual being (Buzwell & Rosenthal, 1996), presents a further cognitive construct relevant for explaining sexual aggression. Lower sexual self-esteem was linked to a higher risk of sexual aggression perpetration and a higher vulnerability to sexual victimization among both women and men (Krahé & Berger, 2017b; Schuster & Krahé, 2019a, 2019b; Tomaszewska & Krahé, 2018). A gendered pattern was revealed in another study, with lower sexual self-esteem predicting higher odds of sexual aggression perpetration among men and higher odds of sexual victimization among women (Krahé & Berger, 2017a).

Normative beliefs about violence in the form of *acceptance of sexual coercion* have been identified as a further cognitive risk factor of sexual aggression perpetration and a vulnerability factor to sexual victimization at the cognitive level (Tomaszewska & Krahé, 2018). More broadly, accepting interpersonal violence as well as rape myths were also linked to higher odds of sexual aggression perpetration (O'Connor et al., 2021; Trottier et al., 2021).

Sexuality-related cognitions are shaped by direct experiences as well as through representations of sexuality in *pornographic media*. Content analyses have identified features of pornographic material that may be linked to sexual aggression perpetration and victimization, such as use of coercion and sexual objectification of women, directly or via affecting cognitive representations of sexuality (Fritz & Paul, 2017; Kulibert et al., 2021). Cross-sectional and longitudinal studies have shown an association between pornography consumption and sexual aggression perpetration among both women and men (Wright et al., 2016). Perceived realism of pornographic material mediated the effect of sexually explicit Internet material on instrumental attitudes toward sex, referring to a focus on sexual gratification over relational aspects of sex (Peter & Valkenburg, 2010), which is a predictor of sexual aggression perpetration in males (Huntington et al., 2022).

In combination, these lines of research have identified different aspects of sexuality-related cognitions linked to an increased probability of engaging in, and experiencing, sexual aggression, which designates them as candidates for evidence-based intervention efforts.

Behavioral Risk and Vulnerability Factors

Several factors at the behavioral level have been associated with a risk of sexual aggression perpetration and higher vulnerability to sexual victimization. It is estimated that alcohol is involved in as many as 9 out of 10 cases of men's self-reported perpetration incidents (Koss et al., 2022). *Alcohol use*, both in sexual situations and as a general pattern of behavior, may contribute to a higher likelihood of sexual aggression perpetration and victimization due to its psychological and pharmacological effects (Abbey et al., 2004; Rogers & Rogers, 2021). On the side of the perpetrator, alcohol impairs higher-order cognitive processes and narrows the perceptual field, facilitating the misperception of the other person's signals. Also, short-term benefits of sex may become more salient than the potential negative long-term effects. On the side of the victim, alcohol intoxication may undermine the recognition of risk cues and the ability to resist due to motor and cognitive impairments.

Furthermore, having *multiple sex partners* and engaging in noncommittal sex, such as hookups, increases the odds of meeting a person willing to engage in sexual aggression. It also increases the opportunities for engaging in sexual aggression due to the absence of close emotional bonds with the partner. In line with this reasoning, studies showed associations between high numbers of sexual partners or hookups and sexual aggression perpetration and victimization (Bhochhibhoya et al., 2021; Davis et al., 2018; Sutton & Simons, 2015). In addition, *ambiguous communication of consent*, such as refusing a sexual contact at first despite actually

being willing to engage in it, has been linked to higher odds of sexual aggression perpetration and victimization (Kuyper et al., 2013; Walsh et al., 2021). Ambivalent cues may undermine the recognition of non-consent, increasing the likelihood of both sexual aggression perpetration and victimization. Also, if the ambiguous communication of consent is an integral part of one's sexual scripts, another person's rejection of a sexual advance may not be taken seriously, increasing the odds of sexual aggression perpetration. In line with this reasoning, positive associations of a composite score of risky sexual behavior, including alcohol use, casual sex, and ambiguous communication of sexual intentions, with sexual aggression perpetration and victimization were found both cross-sectionally and longitudinally in different countries (Krahé & Berger, 2021; Schuster & Krahé, 2019a, 2019b; Tomaszewska & Krahé, 2018).

Another component of sexual behavior refers to *sexual assertiveness*, defined as the ability to make autonomous sexual choices (Morokoff et al., 1997). *Refusal assertiveness* refers to the ability to refuse unwanted sexual advances, and *initiation assertiveness* is defined as the ability to initiate desired sexual activities. Based on the traditional sexual script that considers women as gatekeepers and men as initiators of sexual interactions (Sakaluk et al., 2014), refusal assertiveness has been primarily examined in female samples, showing negative associations with sexual victimization (Franz et al., 2016; Kirwan et al., 2022). Other studies showed a similar association for men (Krahé et al., 2015; Schuster & Krahé, 2019a). Regarding initiation assertiveness, only a few studies examined its links with sexual aggression, presenting mixed findings. The study by Fernández-Fuertes et al. (2020) found a negative correlation with sexual victimization, whereas the association with sexual aggression perpetration was not significant. Another study showed a positive association with sexual aggression perpetration among Turkish, but not among Chilean participants (Schuster & Krahé, 2019b).

Taken together, past research has shown that specific aspects of behavior in sexual interactions are associated with sexual aggression perpetration and victimization cross-sectionally as well as longitudinally. Hence, changing those behavioral risk and vulnerability factors may be a promising approach to reduce the odds of sexual aggression perpetration and victimization (Testa et al., 2020).

From Sexuality-Related Cognitions to Sexual Behavior: Indirect Intervention Effects

In line with the theory of sexual scripts, it is assumed that sexuality-related cognitions guide sexual behavior (Simon & Gagnon, 1986), and longitudinal research has shown that risky sexual scripts indirectly predict sexual aggression perpetration and victimization via their association with sexual behavior (D'Abreu & Krahé, 2014, 2016; Krahé & Berger, 2021; Schuster & Krahé, 2019a, 2019b; Tomaszewska & Krahé, 2018). Similarly, an indirect effect of low sexual self-esteem, as another sexuality-related cognitive variable, was found on sexual victimization via lower refusal assertiveness (Schuster & Krahé, 2019a). Therefore, the current study examined whether intervention effects on the cognitive antecedents of sexual aggression perpetration and victimization would prospectively predict changes in behavioral risk and vulnerability factors.

The Current Study

The current study implemented and evaluated an intervention designed to reduce risk and vulnerability factors of sexual aggression derived from theories and empirical findings on key variables associated with an increased likelihood of perpetration and victimization summarized above. The study comprised four measurement points, covering a total period of 23 months. After baseline (T1), intervention effects were measured one week after the last module (T2), nine months later (T3), and another 12 months later (T4). A preliminary study with a smaller sample and a shorter time frame provided first evidence that the intervention would elicit the intended changes (Schuster et al., 2022). As a first step toward evaluating the efficacy of the intervention, the focus of the present analysis is on demonstrating intervention effects on the targeted antecedents of sexual aggression. We examined both direct intervention effects on the included risk/vulnerability factors as well as indirect effects of the intervention on the behavioral risk/vulnerability factors via the cognitive variables. The following hypotheses were tested:

Hypothesis 1: Participants in the intervention group will show less risky sexual scripts (1a), higher sexual self-esteem (1b), lower acceptance of sexual coercion (1c), and lower pornography realism (1d) compared to the control group.

Hypothesis 2: Participants in the intervention group will show less risky sexual behavior (2a), higher refusal assertiveness (2b), and higher initiation assertiveness (2c) than participants in the control group.

Hypothesis 3: Indirect effects of the intervention on risky sexual behavior at T3 and T4 will be found via intervention effects on risky sexual scripts at T2.

Hypothesis 4: Indirect intervention effects on refusal and initiation assertiveness at T3 and T4 will be found via intervention effects on sexual self-esteem at T2.

Method

Sample

Participants in this study were 1,181 students (762 women, 419 men) at different universities in two federal states in Germany, who had signed up for a study designed to promote competence in sexual relationships. A power calculation based on a Monte Carlo simulation had yielded an N of 750 (power of .90, $p = .05$; see Supplementary Material, SM), which means that the current sample size provided sufficient power to test the predicted associations. The mean age of the sample at T1 was 22.6 years ($SD = 3.52$; range: 18–35 years). Almost all participants (92.9%) were German nationals. In

terms of sexual and relationship experience at T1, 89.9% of the sample had coital experience, 2.5% did not; the remaining 7.5% did not answer this question. The mean age at first sexual intercourse was 16.8 years (*SD* = 2.20). The mean number of casual sex partners was 6.49 (*SD* = 10.49) and the mean number of sex partners in a steady relationship was 2.44 (*SD* = 1.87). Most participants (87.0%) were or had been in a steady relationship at the time of the survey and/or in the past. The majority of participants (78.6%) described their sexual orientation as heterosexual, 5.7% as homosexual, 11.1% as bisexual, and 4.7% did not answer the question. Most participants reported exclusively heterosexual contacts (67.0% of women, 68.9% of men), 1.6% of women and 6.6% of men reported exclusively same-sex contacts; and 26.3% of women and 16.3% of men reported both heterosexual and same-sex contacts, 5.1% of women and 8.3% of men reported neither opposite-sex nor same-sex contact.

Attrition was low across the four data waves: Of the T1 participants, 93.0% (*n* = 1,098) participated in T2, 89.8% (*n* = 1,060) in T3, and 80.1% (*n* = 946) in T4. All 1,181 participants were included in the path analyses, and missing data were handled with the Full Information Maximum Likelihood (FIML) approach (Enders, 2010).

Measures

Risky Sexual Scripts

To arrive at a measure of risky sexual scripts for consensual sexual encounters, a two-part measure was used at each wave from T1 to T4, following past research (Schuster et al., 2022). The first part measured the descriptive content of risky scripts with regard to the following scenario: "You spend the evening together with a man/woman. In the course of the evening, you sleep together for the first time." Participants received a tailored version depending on their sexual experience background: Women with exclusively heterosexual experience and men with exclusively same-sex experience received the version referring to a male partner, men with exclusively heterosexual experience and women with exclusively same-sex experience received the version referring to a female partner, participants with both heterosexual and same-sex experiences received a gender-neutral version referring to "a person". All participants were instructed to imagine themselves in this situation and indicate how likely a total of 11 features would be present in such a situation in their experience (i.e., generalizing across personal experiences). The features referred to (a) casual sex (three items, example item: "How likely is it that you would have been on a date with the man/woman prior to that evening?"; reverse coded), (b) alcohol use (four items, example item: "How likely is it that you would have drunk alcohol in that situation?"), and (c) ambiguous communication of sexual intentions (four items, example item: "How likely is it that you would explicitly ask the man/woman whether he/she wants to sleep with you?"; reverse-coded). Responses were made on a five-point scale ranging from *very unlikely* (1) to *very likely* (5).

The second component of the script measure addressed the normative endorsement of the script elements with 10 items referring to the same three categories of (a) casual sex (two items, example item: "I find it OK to have sex with a man without having been on a date with him before."), (b) alcohol use (four items, example item: "When I have sex with a man/woman, I don't mind if he/she has had too much to drink."), and (c) ambiguous communication of sexual intentions (four items, example item: "For me, it is clear that you talk with your partner to agree about sleeping together."; reverse coded). Responses to the normative items were made on a five-point scale ranging from *do not agree at all* (1) to *completely agree* (5). Based on the analyses of measurement invariance, one item of the descriptive and five items of the normative elements of the script measure had to be eliminated (see SM). A final score reflecting risky sexual scripts was calculated for each participant by multiplying the mean of the descriptive script items by the mean of the normative script items, following previous research (Schuster & Krahé, 2019a, 2019b; Tomaszewska & Krahé, 2018). As both sets of items were rated on response scales ranging from (1) to (5), the resulting score had a range from 1 to 25.

Sexual Self-Esteem

Sexual self-esteem was measured at each data wave with 12 items from the short form of the Sexual Self-Esteem Scale by Zeanah and Schwarz (1996). Although the scale was originally developed for women, it has been used in research with both women and men (Lloyd et al., 2021). Four items each from the *Skill and Experience* scale (ability to please, or be pleased by, a sexual partner, and the availability of opportunities to engage in sexual activity; example item: "I feel I am pretty good at sex."), the *Control* scale (ability to direct or manage one's own sexual thoughts, feelings, and interactions; example item: "I feel physically vulnerable in a sexual encounter."; reverse coding), and the *Adaptiveness* scale (congruence of one's sexual experience or behavior with other personal goals or aspirations; example item: "In general, I feel my sexual experiences have given me a more positive view of myself.") were used. Responses were made on a five-point scale ranging from *do not agree at all* (1) to *totally agree* (5) and averaged across the 12 items to yield a total score of sexual self-esteem.

Acceptance of Sexual Coercion

The extent to which participants found the use of sexual coercion acceptable was measured at T1, T3, and T4 with seven items derived from previous research (Schuster et al., 2022; Tomaszewska & Krahé, 2016). Participants were presented with the following scenario, tailored to their gender and sexual experience by referring to a heterosexual or same-sex partner: "Imagine Alexander/Hannah wants to have sex with Hannah/Alexander, but she/he clearly and unequivocally says 'no.' Under what circumstances would you find it okay for Alexander/Hannah to get Hannah/Alexander to sleep with him/her nonetheless?" The seven items presented justifications for one person's persistence despite the other person's "no" (example items: "If Hannah is drunk or stoned"; "If Hannah slept with Alexander before"). Responses were made on a five-

point scale ranging from *under no circumstances* (1) to *definitely* (5) and were averaged across the seven items to yield a total score of acceptance of sexual coercion.

Frequency of Use and Perceived Realism of Pornography

Frequency of pornography use was measured at T1, T3, and T4 by the following item: "Have you ever deliberately watched media with explicit sexual content (i.e., images, videos, or films of sexual acts, such as sexual intercourse, oral sex, masturbation, etc.)?" Responses were made on a five-point scale ranging from *never* (1) to *very often* (5). Perceived realism of pornography was measured by three items (Peter & Valkenburg, 2010): "The way sexuality is presented in pornographic media is quite realistic."; "By watching sexual images and videos, one learns how to behave in sexual situations."; "Pornographic media convey valuable information about sex." Responses were made on a five-point scale ranging from *do not agree at all* (1) to *completely agree* (5). Responses were averaged across the three items to yield a total score of perceived realism of pornography. To create an overall score of pornography realism at each wave, we multiplied the perceived realism score by the frequency of deliberate exposure to pornography. As both measures had a response scale ranging from 1 to 5, the resulting multiplicative score had a range from 1 to 25.

Risky Sexual Behavior

The extent to which the elements of the sexual scripts for consensual sex were reflected in actual sexual behavior was measured at T1, T3, and T4 with nine items based on past research (Krahé & Berger, 2021; Tomaszewska & Schuster, 2020). It was not measured at T2 because the period of one week was considered too short to provide behavioral opportunities that would show intervention effects. Participants were asked to indicate how often they had shown a particular behavior when they had sex in the past (T1), in the last eight months (T3), and in the last 12 months (T4), using a five-point scale ranging from *never* (1) to *very often* (5). Three items referred to casual sex (example item: "How often have you had sex with a man/woman on your first date?"), four items referred to alcohol use in sexual encounters (example item: "How often had you drunk too much in situations in which you had sex?"), and two items referred to the ambiguous communication of sexual intentions (example item: "In situations in which you had sex, how often have you said 'no' to a sexual encounter at first even though you actually wanted it?"). A risky behavior score for each participant was calculated at T1, T3, and T4 by averaging responses across all items.

Sexual Assertiveness

Two facets of sexual assertiveness were measured at T1 to T4 with the Sexual Assertiveness Scale by Morokoff et al. (1997). Four items measured *refusal assertiveness*, that is the ability to refuse unwanted sexual activities (example item: "I refuse to have sex if I don't want to, even if my partner insists."). Four items measured *initiation assertiveness*, referring to the ability to initiate desired sexual activities (example item: "I let my partner know if I want my partner to touch my genitals."), but one item had to be eliminated to achieve metric measurement invariance. Response options for both scales ranged from *never* (1) to *always* (5). Overall scores were calculated by averaging responses across the four refusal items and the three initiation items, respectively. Higher scores reflect greater self-reported ability to refuse unwanted sexual advances and to initiate sexual interactions.

Sexual Experience Background and Demographic Information

At T1, T3, and T4, participants were asked to indicate their sex, age, whether they were currently in a steady relationship and whether they had been in a steady relationship in the past. In terms of sexual experience background, they were asked whether or not they had ever engaged in sexual contact with a member of the same sex and a member of the opposite sex (response options: no, yes without sexual intercourse; yes with sexual intercourse). Sexually experienced participants were asked to indicate their age at first sex and number of sexual partners. In addition, participants' nationality, home university, and subject of study were recorded at T1.

Open-Ended Questions

Participants in the intervention group received two open-ended questions prior to starting the first module to elicit their understanding of the concept of sexual competence: (1) "What do you consider to be sexual competence? How does sexual competence show itself?" and (2) "How does low sexual competence manifest? What consequences may low sexual competence have?" They were asked to give free responses without any length restrictions, which were content-analyzed as presented elsewhere (Tomaszewska et al., 2022b).

Intervention Program

The intervention group received a total of six modules in weekly intervals designed by the authors based on previous research. Participants received three modules addressing the risk factors in sexual scripts and sexual behavior: alcohol use (M1), ambiguous communication of sexual intentions (M2), and casual sex (M3). Three further modules addressed sexual self-esteem and sexual assertiveness (M4), realism of pornography (M5), and acceptance of sexual coercion (M6). The intervention 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 discussing the covered topics with peers and partners. 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 control group did not receive any treatment. More details of the contents of the modules can be found in the SM.

Procedure

The study, which was run completely online, was advertised as a study on competence in sexual situations (Kompetenz in sexuellen Situationen; KisS) through various channels addressing undergraduate students in the federal states of Berlin and Brandenburg in Germany. Potential participants were informed that the study would cover several data waves over a period of about two years. Interested participants were invited to register in a data base created for the purposes of this study. Registered participants were randomly assigned to the intervention or control group on an individual basis and sent the link to the appropriate T1 questionnaire. T1 data collection took place between the beginning of January and the middle of February 2019. At T1, participants in the intervention and control groups received the same measures of the target constructs. Participants in the intervention group additionally received the first module of the intervention after having completed the baseline measures. They completed the remaining five modules at weekly intervals over the next five weeks. Most participants (89.9%) completed all six modules, 3.2% completed five modules, 1.2% completed four modules, 1.7% completed three modules, 2.2% completed two modules, and 1.9% completed one module. One week after the end of the intervention (= seven weeks after T1), all participants received the T2 measures.

Data collection for T2 took place between the end of February and mid-March, 2019. Participants who did not complete the T2 measures after one reminder received a second reminder in which they could indicate that they no longer wished to participate in the study. All participants who did not endorse that option were invited to take part in T3, for which data collection took place between the beginning of November and mid-December 2019, amounting to a nine-month interval between T2 and T3. All participants who did not explicitly opt out at T3 were invited to T4, which ran from November to December 2020, covering a 12-month interval between T3 and T4. This resulted in four measurement points covering a total period of 23 months. Participants in the intervention group received shopping vouchers worth 25€ at T1, 60€ at the post-intervention wave of T2, and 20€ for each of the T3 and T4 follow-ups. Participants in the control group received 20€ shopping vouchers at each wave.

The study was approved by the Ethics Committee of the authors' university. On the first page of the survey, participants were informed that they could terminate the study at any point and had to give active consent before being able to proceed to the questions. The study design and materials were preregistered "as predicted" on the website of the Open Science Framework, https://osf.io/cg6xq.

Plan of Analysis

In the first step of the data analysis, we examined measurement invariance of the different measures across conditions and time (T1-T4 for risky sexual scripts, sexual self-esteem, and sexual assertiveness; T1, T3, and T4 for risky sexual behavior, pornography realism, and acceptance of sexual coercion). Based on the results of these analyses, the final versions of the measures were determined in which a small number of items had to be dropped because they did not meet the invariance criteria. Aggregate scores, descriptive statistics, and bivariate correlations were then calculated with SPSS28 based on the final measures.

To test the hypotheses, path models were examined with the Mplus software, version 8.7 (Muthén & Muthén, 1998–2017), using the MLR estimator. Models included both the intervention main effect and the interaction with the baseline scores of the respective constructs at T1 and controlled for T1 values at the subsequent data waves. For each hypothesis, we first estimated a multigroup model by gender in which all paths were constrained to be equal, followed by a multigroup model in which the paths were allowed to vary. If the unconstrained model fitted significantly better than the constrained model as determined by the Satorra-Bentler χ^2 difference test, it was accepted as the final model. If the constrained model did not fit significantly worse and there were no mean differences on the included measures, that model was accepted as the final model. If the constrained model did not fit significantly worse and there were gender differences in the means of the constructs, we ran a single-group model with gender as a covariate in the final step of the analyses. Only the final models are presented in the following section, but full information about the preceding models is presented in the SM. Indirect paths were tested via 10,000 bias-corrected bootstrapped confidence intervals using the ML estimator in Mplus.

Results

Descriptive Results and Correlations

The final measures were determined based on measurement invariance tests. As described in the SM, all measures showed at least metric MI. The internal consistencies for all measures at each data wave are also shown in the SM, Table S2. With the exception of refusal assertiveness, the measures showed acceptable to good reliability. Means and standard deviations for all study variables in the total sample and the two gender groups are presented in Table 1. Men scored significantly higher than did women on risky sexual scripts at T3, sexual self-esteem at T2, and on pornography realism at all three waves. Women scored higher than did men on refusal assertiveness at all time points. No other mean differences were found between men and women.

The bivariate correlations between the model variables and their correlation with age at T1 are shown in Table 2, separated by gender. The correlation of risky sexual scripts and risky sexual behavior was positive for both gender groups, but significantly higher for women than for men. The correlation of sexual scripts and pornography realism was also positive for both gender groups, but significantly higher for men than for women. Risky sexual scripts showed a significant positive correlation with the acceptance of sexual coercion for men, but not for women, and negative correlations with refusal assertiveness (women and men) as well as initiation assertiveness (women only). Sexual self-esteem was positively correlated with refusal and initiation assertiveness for men and women, with

Table 1. Means and Standard Deviations of All Model Variables.

	T1			T2			T3			T4		
Variable (Range)	Total *M/SD*	M *M/SD*	F *M/SD*	Total *M/SD*	M *M/SD*	F *M/SD*	Total *M/SD*	M *M/SD*	F *M/SD*	Total *M/SD*	M *M/SD*	F *M/SD*
Risky sexual scripts (1–25)	7.11 3.01	7.43 3.11	6.94 2.95	6.76 2.88	7.04 2.93	6.61 2.84	6.67 2.77	6.99[a] 2.74	6.50[b] 2.77	6.86 2.71	6.93 2.67	6.55 2.72
Sexual self-esteem (1–5)	3.73 0.68	3.78 0.64	3.71 0.70	3.70 0.67	3.78[a] 0.63	3.66[b] 0.69	3.70 0.67	3.73 0.65	3.68 0.68	3.72 0.67	3.75 0.64	3.71 0.69
Acceptance of sexual coercion (1–5)	1.42 0.58	1.42 0.60	1.42 0.57	-	-	-	1.28 0.48	1.27 0.51	1.28 0.47	1.24 0.45	1.24 0.48	1.24 0.44
Pornography realism (1–25)	5.45 3.43	7.59[a] 3.68	4.26[b] 2.61	-	-	-	4.55 3.30	6.65[a] 3.51	3.44[b] 2.57	4.74 3.29	6.80[a] 3.50	3.68[b] 2.61
Risky sexual behavior (1–5)	2.04 0.60	2.02 0.62	2.05 0.59	-	-	-	1.72 0.59	1.75 0.60	1.70 0.59	1.69 0.58	1.77 0.60	1.65 0.57
Refusal assertiveness (1–5)	3.76 0.86	3.50[a] 0.88	3.90[b] 0.81	3.83 0.82	3.57[a] 0.86	3.97[b] 0.76	3.83 0.81	3.64[a] 0.84	3.93[b] 0.78	3.89 0.82	3.71[a] 0.82	3.98[b] 0.80
Initiation assertiveness (1–5)	3.17 0.95	3.21 0.89	3.15 0.98	3.15 0.90	3.20 0.86	3.13 0.92	3.19 0.95	3.21 0.89	3.18 0.98	3.20 0.94	3.31 0.88	3.14 0.97

Note. Critical p for comparisons of means between gender groups: .05/7 = .007 at T1, T3, and T4; .05/4 = .0125 at T2. [ab] Values are significantly different between men and women. M = male; F = female.

significantly higher correlations for women. Acceptance of sexual coercion was positively linked to pornography realism and negatively linked to refusal assertiveness in both gender groups, with no significant differences in the size of the correlations. In addition, acceptance of sexual coercion was positively correlated with risky sexual behavior among men, but not among women. Pornography realism showed a positive correlation with risky sexual behavior (higher for men than for women) and a negative correlation with refusal assertiveness. Refusal assertiveness was significantly correlated with initiation assertiveness for women, but not for men. Finally, age was positively correlated with risky sexual scripts, sexual self-esteem, and risky sexual behavior among men and women and, additionally, with initiation assertiveness among women.

Path Analyses

Risky Sexual Scripts (Hypothesis 1a)

The comparison of the constrained and unconstrained multigroup model by gender showed that the unconstrained model had a significantly better fit than the constrained model (see Table S3 in the SM). A comparison of the individual coefficients using the DIFF test option in Mplus showed that the only path that differed significantly between men and women was the path from risky sexual scripts at T3 to risky sexual scripts at T4. To account for the gender differences in the means of risky sexual scripts at T1 and T3, we decided to run a single-group model with gender as covariate. This model, shown in Figure 1, had a good fit, χ^2 (df = 2) = 0.20, p = .903, CFI = 1.000, RMSEA = .000, 90% CI [.000; .024], SRMR = .006. A significant negative path was found from intervention condition (coded "0" for the control and "1" for the intervention group) to risky sexual scripts at T2, indicating that participants in the intervention group had less risky sexual scripts compared to the control group. The indirect path from intervention condition via risky sexual scripts at T2 to risky sexual scripts at T4 was also significant (see Table 3). The main effects of the intervention were qualified by significant interactions of condition and T1 risky sexual scripts for the direct path to T2 and the indirect path up to T4. Figure 2 visualizes the interaction effect and shows that the direct and indirect reduction in risky sexual scripts was significant for participants with moderate and high risky sexual script scores, but not for those with low risky sexual scripts scores at T1. The pattern of findings is consistent with the prediction in Hypothesis 1a that the intervention would reduce risky sexual scripts, with the qualification that the effect was only found for those participants who held riskier sexual scripts.

Sexual Self-Esteem (Hypothesis 1b)

The path model estimating intervention effects on sexual self-esteem is shown in Figure 3. Because the constrained multigroup model by gender did not fit worse than the unconstrained model, and to reflect gender differences in the means of sexual self-esteem at T2, a single-group model with gender as a covariate on all paths was accepted as the final model, which showed a good fit, χ^2 (df = 2) = 0.08, p = .962; CFI = 1.000,

Table 2. Bivariate Correlations between the Predictor Variables at T1.

Construct	1	2	3	4	5	6	7	8
1. Risky sexual scripts	-	.01	**.25*** **	**.29*** **	**.59*** **	−.21***	**.05**	.19***
2. Sexual self-esteem	.05	-	−.04	.02	−.03	**.12***	**.23*** **	.14**
3. Acceptance of sex. coercion	**.02**	−.02	-	.22***	**.17****	−.25***	.04	−.07
4. Pornography realism	**.15*** **	.02	.15***	-	**.23*** **	−.10*	.06	.07
5. Risky sexual behavior	**.67*** **	−.05	**.01**	**.10***	-	−.15**	**.13***	.24***
6. Refusal assertiveness	−.17***	**.25*** **	−.16***	−.11**	−.23***	-	.08	−.02
7. Initiation assertiveness	**−.09***	**.35*** **	−.03	−.01	**−.04**	.16***	-	.07
8. Age	.15***	.16***	−.06	.05	.22***	.02	.13***	-

Note. Correlations for men above the diagonal, correlations for women below the diagonal. *** p < .001, ** p < .01, * p < .05 (two-tailed). Correlations in bold are significantly different (p < .05, two-tailed) between men and women.

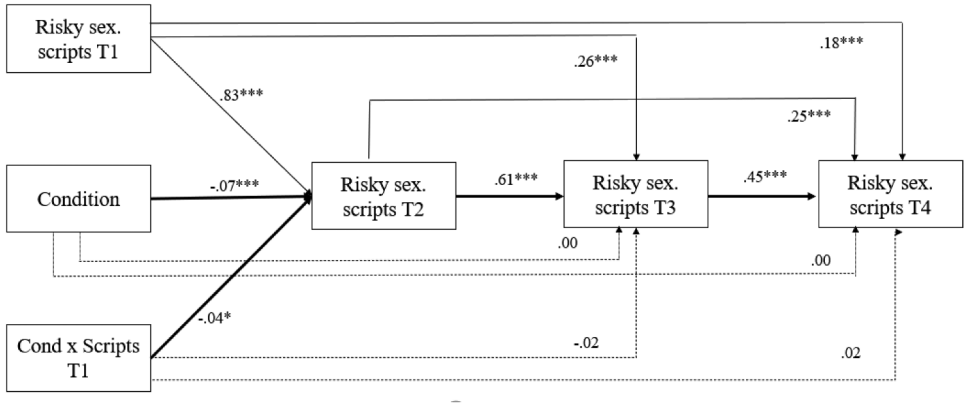

Figure 1. Intervention Effects on Risky Sexual Scripts.
Note. Condition: 0 = control, 1 = intervention. Single-group model with gender as covariate on all paths. Indirect path from condition to risky scripts T4 is significant. Critical paths highlighted in bold. *** $p < .001$, * $p < .05$.

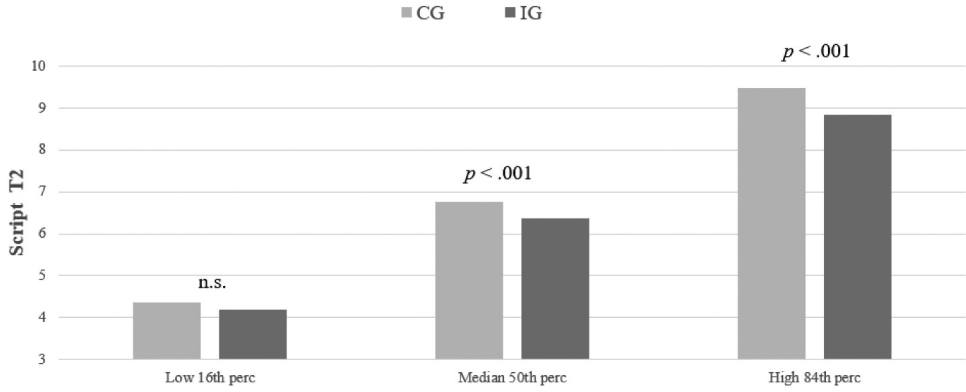

Figure 2. Interactive Effect of Condition x Risky Scripts T1 on Risky Scripts T2.
Note. CG = Control group; IG = Intervention group.

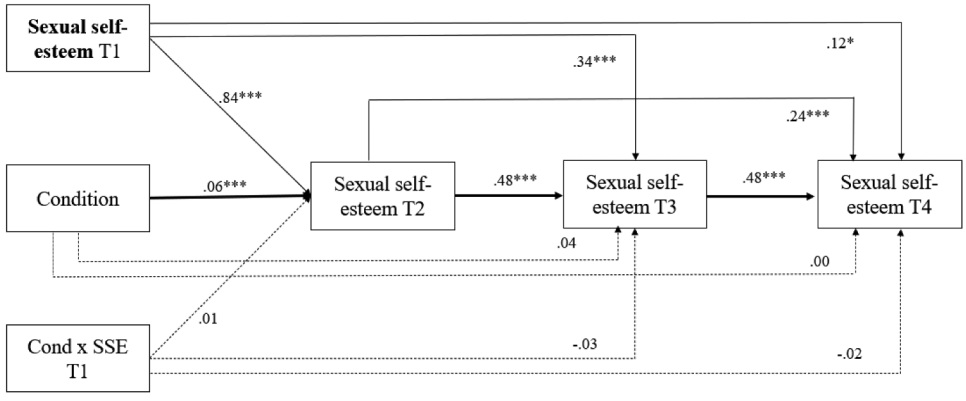

Figure 3. Intervention Effects on Sexual Self-Esteem.
Note. Condition: 0 = control, 1 = intervention. Single-group model with gender as covariate on all paths. Indirect path from condition to sexual self-esteem T4 is significant. Critical paths highlighted in bold. *** $p < .001$, * $p < .05$.

RMSEA = .000, 90% CI [.000; .000], SRMR = .004. Controlling for T1 levels, the intervention significantly increased sexual self-esteem in the intervention group compared to the control group. The indirect path from intervention to sexual self-esteem at T4 was also significant, as shown in Table 3. This finding is consistent with Hypothesis 1b.

Table 3. Intervention Effects: Significant Indirect Paths.

Paths	ß	C.I.
Condition -> Risky scripts T2 -> Risky scripts T3 -> Risky scripts T4	−.020	−.035; −.008**
Condition x Risky scripts T1 -> Risky scripts T2 -> Risky scripts T3 -> Risky scripts T4	−.011	−.023; −.001*
Condition -> Sex. self-esteem T2 -> Sex. self-esteem T3 -> Sex. self-esteem T4	.014	.004; .027**
Condition -> Initiation assertiveness T2 -> Initiation assert. T3 -> Initiation assert. T4	.029+	.010; .053**
Condition -> Risky scripts T2 -> Risky behavior T3 -> Risky behavior T4	−.011	−.020; −.004**
Condition x Risky scripts T1 -> Risky scripts T2 -> Risky behavior T3	−.011	−.023; −.001*
Condition -> Sexual self-esteem T2 -> Refusal assert. T3	.005	.001; .011*
Condition -> Sexual self-esteem T2 -> Refusal assert. T4	.008	.002; .018**
Condition -> Sexual self-esteem T2 -> Initiation assert. T3	.010	.003; .021**
Condition -> Sexual self-esteem T2 -> Initiation assert. T4	.007	.001; .016**
Condition -> Sexual self-esteem T2 -> Initiation assert. T3 -> Initiation assert. T4	.005	.001; .010**

Note. Condition: 0 = control group; 1 = intervention group. C.I.: bias-corrected standardized confidence intervals. All paths controlled for respective T1 scores. ** 99% C.I., * 95% C.I. + Unstandardized coefficient (b).

Acceptance of Sexual Coercion (Hypothesis 1c)

For the acceptance of sexual coercion, measured at T1, T3, and T4, the constrained multigroup model by gender did not fit worse than the unconstrained model, and there were no gender differences in the means of this construct. Therefore, the constrained multigroup model was accepted as the final model, χ^2 (df = 7) = 2.60, p = .920; CFI = 1.000, RMSEA = .000, 90% CI [.000; .019], SRMR = .022. Controlling for T1, no significant main and interaction effects of the intervention on the acceptance of sexual coercion at T3 and T4 were found. The path model is shown in Figure S1 of the SM. Thus, contrary to the prediction in Hypothesis 1c, the intervention was not successful in reducing the acceptance of sexual coercion.

Pornography Realism (Hypothesis 1d)

The stepwise test of the intervention effects on pornography realism (the multiplicative score of perceived realism and frequency of use) at T3 and T4 revealed that the constrained multigroup model by gender did not fit worse than the unconstrained model (see Table S3 in the SM). Because of significant mean differences in the scores at all three time points, a single-group model with gender as covariate was estimated. This model showed a poor fit with the data, which was due to the inclusion of the interaction term of condition and pornography realism at T1. Re-running the model without the interaction term led to a good fit, so this model was accepted as the final model, χ^2 (df = 1) = 0.02, p = .893; CFI = 1.000, RMSEA = .000, 90% CI [.000; .036], SRMR = .001. Controlling for T1 levels, no significant intervention effects on pornography realism at T3 and T4 were found. The model is shown in Figure S3 in the SM. Therefore, Hypothesis 1d was not supported by the data.

Risky Sexual Behavior (Hypothesis 2a)

For risky sexual behavior, the constrained multigroup model by gender did not fit worse than the unconstrained model. Because there were no mean differences between male and female participants on this measure, the constrained model was accepted as the final model, χ^2 (df = 7) = 10.86, p = .145, CFI = .993, RMSEA = .033, 90% CI [.000; .070], SRMR = .059. No significant main or interaction effects with T1 scores were found on T3 and T4 scores of risky sexual behavior. The model is shown in Figure S3 in the SM. Thus, Hypothesis 2a, predicting a direct effect of the intervention on risky sexual behavior was not supported.

Refusal Assertiveness (Hypothesis 2b)

The constrained multigroup model by gender did not fit worse than the unconstrained model (see Table S3 in the SM), but women scored significantly higher than did men on this measure at all four time points. Therefore, the single-group model with gender as covariate was accepted as the final model, χ^2 (df = 2) = 1.47, p = .481; CFI = 1.000, RMSEA = .000, 90% CI [.000; .055], SRMR = .011. No direct main or interaction effects of the intervention on refusal assertiveness were found (see Figure S4 in the SM), failing to confirm Hypothesis 2b.

Initiation Assertiveness (Hypothesis 2c)

The test of intervention effects on initiation assertiveness showed that the constrained multigroup model by gender did not fit worse than the unconstrained model (see Table S3 in the SM). Because there were no gender differences in means on this

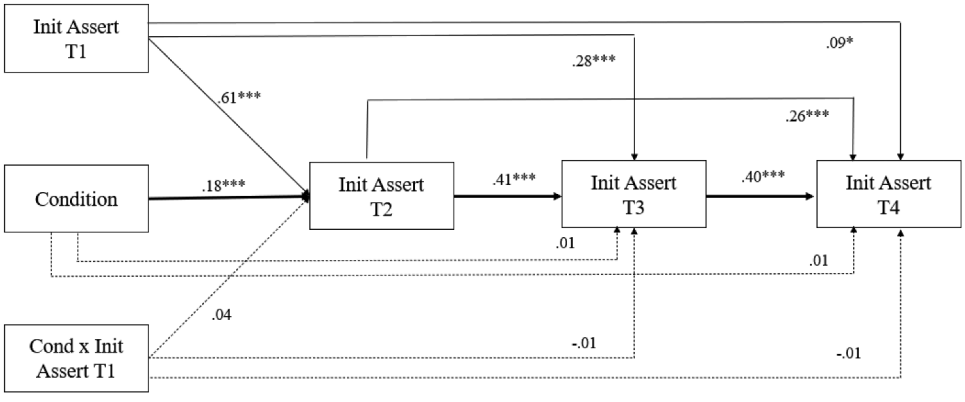

Figure 4. Intervention Effects on Initiation Assertiveness. Note. Condition: 0 = control, 1 = intervention. Constrained multigroup model by gender, unstandardized coefficients. Indirect paths from condition to initiation assertiveness at T4 is significant. Critical paths highlighted in bold. *** p < .001, * p < .05.

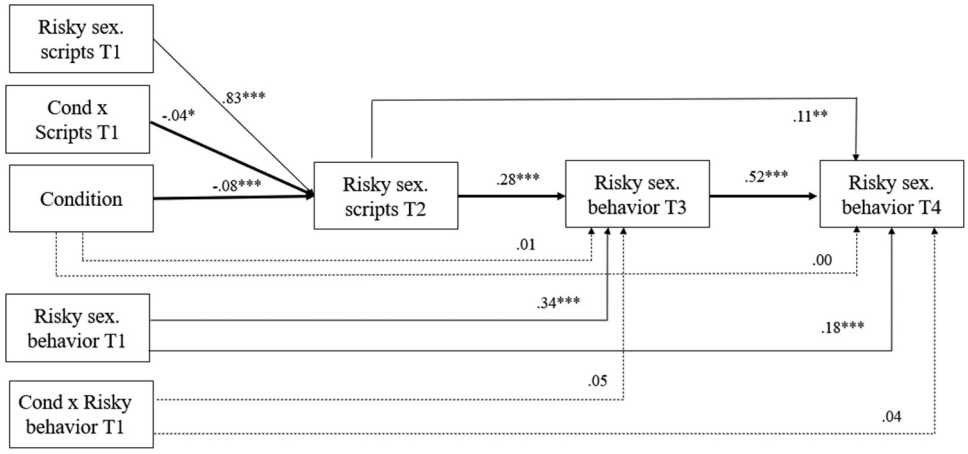

Figure 5. Indirect Intervention Effects on Risky Sexual Behavior via Risky Sexual Scripts. Note. Condition: 0 = control, 1 = intervention. Single-group model with gender as covariate on all paths. Indirect path from condition via risky sexual scripts T2 to risky sexual behavior T4 is significant. Indirect path from the interaction of condition and risky sexual scripts T1 is significant to T3, but not T4. Critical paths highlighted in bold. *** $p < .001$, ** $p < .01$, * $p < .05$.

variable at any of the four time points, the constrained multigroup model was accepted as the final model, χ^2 (df = 12) = 16.75, p = .159; CFI = .996, RMSEA = .027, 90% CI [.000; .056], SRMR = .067. Because the standardized coefficients varied slightly between men and women, Figure 4 presents the unstandardized coefficients that are identical for both groups. Participants in the intervention group scored significantly higher on initiation assertiveness at T2, post intervention, than did participants in the control group, and the indirect path remained significant until T4 (see Table 3). Thus, as predicted in Hypothesis 2c, the intervention was successful in promoting assertiveness in initiating sexual interactions.

Indirect Effects on Risky Behavior via Risky Sexual Scripts (Hypothesis 3)

Based on the conceptualization of sexual scripts as guidelines for sexual behavior, Hypothesis 3 predicted an indirect effect of the intervention on reducing risky sexual behavior by reducing risky sexual scripts. The estimation of unconstrained and constrained multigroup models by gender showed that the constrained model did not fit worse than the unconstrained model (see Table S3 in the SM). To account for gender differences in the mean risky script scores, a single-group model with gender as covariate was accepted as the final model, as shown in Figure 5, χ^2 (df = 12) = 18.94, p = .090, CFI = .996, RMSEA = .023, 90% CI [.000; .042], SRMR = .018. The indirect paths from condition to less risky sexual behavior at T3 and T4 via less risky sexual scripts at T2 were significant (see Table 3). The indirect effect of the interaction between condition and T1 risky sexual scripts on risky sexual behavior via risky sexual scripts was also significant at T3, but no longer at T4. This means that by T4, the intervention had reduced risky sexual behavior through changing sexual scripts in all participants, including those with less risky sexual scripts at T1. Thus, Hypothesis 3 was supported by the data.

Indirect Effect on Sexual Assertiveness via Sexual Self-Esteem (Hypothesis 4)

The final set of analyses examined indirect effects of the intervention on the two facets of sexual assertiveness, refusal, and initiation assertiveness, via promoting sexual self-esteem. Both facets were included in the same model for this test as shown in

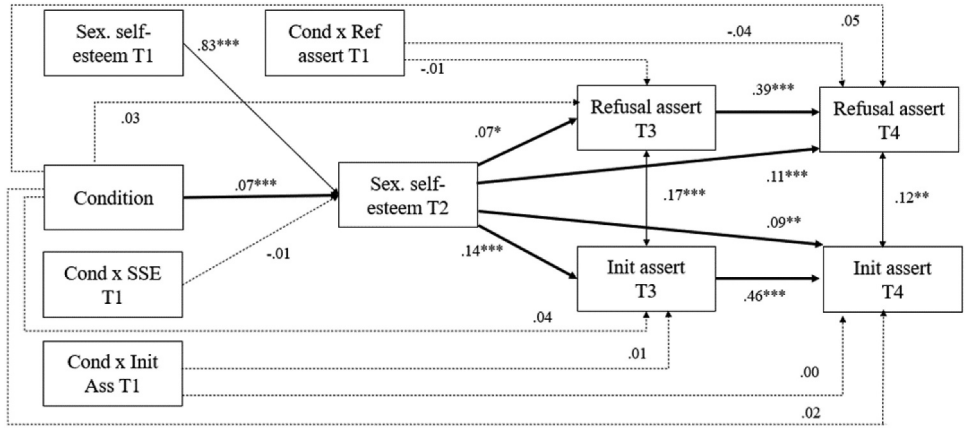

Figure 6. Indirect Intervention Effects on Sexual Assertiveness via Sexual Self-Esteem. Note. Condition: 0 = control, 1 = intervention. Single-group model with gender as covariate on all paths. All T2-T4 constructs controlled for their respective T1 scores, and correlations between sexual self-esteem, refusal assertiveness, and initiation assertiveness at T1 included in the model. Indirect paths from condition via sexual self-esteem T2 to refusal assertiveness and initiation assertiveness T3 and T4 are significant. Critical paths highlighted in bold. *** $p < .001$, ** $p < .01$, * $p < .05$.

Figure 6. The constrained multigroup model did not fit significantly worse than the unconstrained model (see Table S3 in the SM). To account for the gender differences in refusal assertiveness at all four time points, a single-group model with gender as covariate was specified and accepted as the final model based on good model fit, χ^2 (df = 34) = 40.79, p = .197, CFI = .997, RMSEA = .014, 90% CI [.000; .027], SRMR = .023. The intervention indirectly led to higher refusal and initiation assertiveness at T3 and at T4 via higher sexual self-esteem in the intervention group at T2 (see Table 3), as predicted in Hypothesis 4.

Discussion

The current study implemented and evaluated a theory-based intervention designed to change established cognitive antecedents of sexual aggression found to be amenable to change in a pilot study (Schuster et al., 2022) as well as behavioral risk and vulnerability factors which were consistently shown to predict sexual aggression perpetration and victimization (Krahé, 2021). In a large sample of female and male university students of different sexual orientation and experience backgrounds, we tested the efficacy of the intervention in a four-wave longitudinal design covering a total of 23 months. In addition to direct effects on the targeted variables, we examined indirect effects of the intervention on the behavioral risk and vulnerability factors via the cognitive variables.

At baseline, men scored higher on pornography realism, weighted by frequency of use, than did women, which corresponds to previous evidence (e.g., Krahé et al., 2022; Wright & Štulhofer, 2019), although it is worth noting that other studies did not find gender differences (e.g., Baams et al., 2015; Komlenac & Hochleitner, 2022). Also in line with previous research, women scored higher on refusal assertiveness than did men (Fernández-Fuertes et al., 2020).

As predicted, participants in the intervention group showed less risky sexual scripts at T2 compared to the control group, controlling for baseline scores, which supports Hypothesis 1a. Risky sexual scripts were shown to be modifiable in previous research (Schuster et al., 2022), which underlines the efficacy of changing cognitive risk and vulnerability factors for the prevention of sexual aggression perpetration and victimization (DeGue et al., 2014). No direct intervention effects were found on risky sexual scripts at T3 and T4. However, the indirect path from condition to risky sexual scripts at T4 via the direct effect of condition on risky sexual scripts at T2 was significant, indicating a long-term effect of the intervention, which has rarely been examined by past studies (Bonar et al., 2022). The main effect of condition on sexual scripts was qualified by a significant interaction with T1 risky script scores, showing that the intervention was successful in reducing the risky sexual scripts at T2 in participants with moderate and high levels of risky sexual scripts prior to the intervention, but not in participants with low baseline levels. The interaction indirectly predicted risky script scores at the two follow-ups via the reduction in risky scripts observed at one-week post-intervention. This means that our intervention had sustainable effects on participants holding more risky sexual scripts, who are arguably the group that needs intervention. The moderation effect is consistent with prevention research, showing, for example, that social norms interventions were more effective in reducing the perceived likelihood of committing sexual aggression for men with higher rates of past sexual aggression perpetration compared to those who reported lower rates (Zounlome & Wong, 2019), or that college students with a history of sexual victimization were less likely to notice a risk in potential sexual assault situations and saw more barriers to intervene as a bystander compared to those without victimization experiences (Kistler et al., 2021).

Consistent with Hypothesis 1b, we found that the intervention was successful in enhancing sexual self-esteem. Controlling for the baseline scores, participants in the intervention group, relative to participants in the control group, reported higher levels of sexual self-esteem at T2, which in turn predicted higher sexual self-esteem nine months (T3) and 21 months (T4) later. Sexual self-esteem is conceptually and empirically important for achieving sexual well-being (see Sakaluk et al., 2020, for a meta-analysis) and sexual satisfaction (Lafortune et al., 2022; Peixoto et al., 2018). Previous research has already shown that sexual self-esteem is modifiable and can be increased by intervention programs (Ogunsanmi & Agbede, 2020). However, sexual self-esteem was rarely examined in the context of preventing sexual aggression (Bonar et al., 2022). Therefore, the finding that university students' sense of worth as sexual beings may be influenced in a sustainable fashion by a relatively brief intervention is promising with regard to the evidence that lower sexual self-esteem is linked to higher odds of sexual aggression perpetration and victimization (Krahé & Berger, 2017b; Schuster & Krahé, 2019b; Tomaszewska & Krahé, 2018; Van Bruggen et al., 2006).

No direct effects of the intervention were found on risky sexual behavior and refusal assertiveness, lending no support to Hypotheses 2a and 2b. However, as predicted in Hypothesis 2c, the intervention group scored significantly higher on initiation assertiveness at T2 than the control group, which in turn predicted higher levels of this variable nine (T3) and 21 months later (T4). A tentative explanation could be that sexual interactions provide more practicing chances for initiating sexual contacts than practicing opportunities for refusing unwanted sexual contacts, increasing the chances of finding intervention effects.

As predicted, indirect effects of the intervention on behavioral risk and vulnerability factors could be established via the cognitive variables of risky sexual scripts and sexual self-esteem. Consistent with Hypothesis 3, risky sexual behavior at T3 and T4 was lower in the intervention than the control group, via less risky sexual scripts at T2, demonstrating long-term effects of the intervention and supporting the conceptualization of sexual scripts as guiding sexual behavior (Simon & Gagnon, 1986). This means that changes in the mental representation of consensual sexual interactions by the intervention translated into changes in actual sexual behavior over time. This finding contributes to theory-building of sexual script theory by demonstrating causal relations, facilitated by the combined experimental-longitudinal design of the present study. The indirect effect of the interaction between condition and risky sexual script at T1 on risky sexual behavior was significant at T3, but no longer at T4, indicating that the intervention was successful

in reducing risky sexual behavior via less risky sexual scripts in participants with moderate and high levels of risky sexual script at T3. At T4, only the main effect of the intervention on risky sexual behavior via risky sexual scripts at T2 was significant, indicating that all participants had benefited from the intervention in a similar way 21 months later. Given the longitudinal pathways from risky sexual scripts via risky sexual behavior to sexual aggression victimization and perpetration shown for both women and men (D'Abreu & Krahé, 2014, 2016; Krahé & Berger, 2021; Schuster & Krahé, 2019a, 2019b; Tomaszewska & Krahé, 2018), the result that the intervention reduced risky sexual behavior via reducing the risk-related elements in sexual scripts is encouraging for prevention efforts. The approach of changing behavior via changing the cognitive antecedents was also shown to be successful in other sexual assault preventions, such as the study by Testa et al. (2020), who reduced the frequency of hookups by changing college women's perception of how common hookups would be among their peers.

Supporting Hypothesis 4, the intervention was successful in strengthening both refusal and initiation assertiveness at T3 and T4 via strengthening sexual self-esteem at T2. As past research demonstrated the relevance of these variables in predicting sexual aggression perpetration (Krahé & Berger, 2020; Peterson et al., 2019) and victimization (e.g., Franz et al., 2016; Kirwan et al., 2022), strengthening sexual self-esteem and both facets of sexual assertiveness should be a viable strategy for reducing the risk of perpetration and vulnerability to victimization. For example, teaching students to say no to as part of sex education in school was associated with a lower likelihood of experiencing penetrative sexual assault in college (Santelli et al., 2018). No effect of the intervention was found on reducing the acceptance of sexual coercion (Hypothesis 1c). This finding is in line with the meta-analytic result that sexual assault prevention programs aimed at men as potential perpetrators failed to change assault-related attitudes (e.g., negative attitudes toward women; Wright et al., 2020). However, it is worth noting that the post-intervention measurement of this variable took place at T3, nine months after the intervention, so the threshold for finding a significant effect was substantially higher for this outcome. Past research has shown that the acceptance of sexual coercion can be reduced, at least in the short term, by intervention programs (Schuster et al., 2022). The same caveat is true for the failure to find an effect of the intervention on pornography realism (Hypothesis 1d), also not measured at T2. In addition, because we examined general pornography use and did not differentiate between the genres, participants might have consumed alternative pornography (including Feminist and Women' s pornography). These types of pornographic media contain less sexual objectification and more female sexual agency than mainstream pornography (Fritz & Paul, 2017) and might be seen as more realistic. Future interventions should consider a broader range of pornography genres, especially since other studies have shown the efficacy of porn literacy interventions (e.g., Davis et al., 2020; Rothman et al., 2018).

Taken together, the present study showed that risky sexual scripts, sexual self-esteem, and sexual assertiveness are modifiable risk factors of sexual aggression perpetration and vulnerability factors of sexual victimization. Also, it was demonstrated that sexuality-related cognitions (risky sexual scripts, sexual self-esteem) guide sexual behavior (risky sexual behavior, sexual assertiveness), contributing to the understanding of causal pathways from sexuality-related cognitions to sexual behavior. It is noteworthy that the significant intervention effects at T2 remained significant 21 months after the intervention. Only a few studies covered such an extensive period (e.g., 24 months in Senn et al., 2017), with most studies not reporting effects beyond 6 or 7 months (e.g., Gidycz et al., 2015; Salazar et al., 2019). The online administration of the intervention offers an easily accessible format, provides anonymity, and facilitates broad dissemination – a factor often neglected by past research (Bonar et al., 2022).

Strengths and Limitations

The current research designed, implemented, and evaluated a new intervention to prevent sexual aggression, targeting a large sample of female and male university students. The intervention was based on a clear theoretical and empirical framework regarding modifiable individual-level risk factors of perpetration and vulnerability factors of victimization. The intervention was evaluated in a combined experimental-longitudinal design (Farrington, 2006), including four data waves covering an extensive period of 23 months. Participants were randomized into the intervention and control group on an individual basis rather than a group- or campus-based randomization (e.g., Coker et al., 2015). It targeted women and men in the role of both victims and perpetrators and administered tailored versions of the intervention materials and all measures depending on the sexual experience background of the participants. Attrition rates were low across the four waves due to online administration, financial incentives, and the acceptance of the intervention materials by participants, as reflected in their comments on the intervention.

However, several limitations need to be acknowledged. First, all constructs were measured by self-report, so social desirability might have played a role because students in the intervention group knew that they were a part of an intervention program. However, they were most likely unaware that there was a control group, therefore any social desirability effects would have been more likely to affect within-person changes in the intervention group than comparisons between the two groups.

Second, some of our measures (e.g., normative endorsement of the scripts elements and refusal assertiveness) showed low reliability. Although past research showed good reliability using the same scale to measure sexual assertiveness (e.g., Fernández-Fuertes et al., 2020), other scales with better reliability should be used in future studies (e.g., Gil-Llario et al., 2021). Half of the items of the normative endorsement of the sexual scripts had to be eliminated to achieve measurement invariance, indicating that they were not interpreted

consistently across the four data waves and in both the intervention and control groups. Future research should use new items developed on the basis of prior qualitative data with the target group of college students to capture the normative endorsement of the script features.

Third, the interval between the third (T3) and fourth (T4) data waves fell partly into the Covid-19 pandemic, which led to substantial restrictions on interpersonal contact. This affected the behavioral variables in our study, given that the number of sex partners, hookups, and casual sex decreased during the pandemic (Gleason et al., 2021). Hence, there were fewer opportunities for practicing sexually assertive behavior or having casual sexual contacts in our sample. The sexuality-related cognitions should have been affected to a lesser extent.

Fourth, only the intervention group received a treatment, whereas the control group did not receive any kind of intervention or attention control. Future studies should also provide a program unrelated to sexual competence to the control group to prevent a potential bias due to receiving a treatment. Finally, space limitations precluded the presentation of findings regarding intervention effects on sexual aggression perpetration and victimization, although such data were collected as part of the evaluation. These findings, reported in a separate paper (Tomaszewska et al., 2022a), demonstrate indirect effects of the intervention on reducing sexual aggression perpetration and victimization 21 months after the intervention via reducing risky sexual scripts and risky sexual behavior.

Conclusion

Programs promoting bystander intervention to avert sexual aggression when danger is imminent have produced mixed results, with no strong evidence for their efficacy in reducing perpetration (Kettrey & Marx, 2019). The current intervention was designed to change individual-level risk and vulnerability factors that would prevent situations in which bystander intervention might be needed. The intervention was successful in reducing risky sexual scripts leading to risky sexual behavior, and promoting sexual self-esteem as a precursor of higher assertiveness in initiating sexual interactions and refusing unwanted sexual contacts. However, it was not successful in reducing the acceptance of sexual coercion and the perception of pornography as realistic, showing that the task of finding effective and comprehensive strategies for preventing sexual aggression remains a challenge.

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