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Original Research

Promoting women's genital self-image with vulva photographs and information about genital appearance and function: an online experiment

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Abstract

Background: Women with more negative genital self-image are more likely to experience sexual dysfunction, less likely to protect themselves from sexually transmitted infections and unwanted pregnancy, and more likely to consider labiaplasty.

Aim: This study investigates whether women's genital self-image can be promoted via exposure to natural vulva diversity and information about genital appearance and function.

Methods: An online experiment was conducted as a two-arm randomized controlled trial including a vulva photographs only, photographs and information, and a control condition. Participants were 563 women aged 18–68 years ($M = 27.6$, SD = 8.3)

Outcomes: The primary outcome was the Genital Self-Image Scale; secondary outcomes included the Female Sexual Function Index, sexual health behavior, and interest in genital plastic surgery.

Results: Results indicated a significant main effect of time. Genital self-image increased significantly in all conditions immediately after the intervention (all $p < .01$, all partial $\eta^2 \geq .03$). In the group with vulva photographs, this increase remained stable at 2-week follow-up ($p < .05$, partial $\eta^2 = .02$). Only women in the vulva photographs and information group showed a significantly more positive genital self-image at 8-week follow-up ($p < .01$, partial $\eta^2 = .05$). Confirming the experimental effect, we found a significant group x time interaction ($p < .001$, partial $\eta^2 = .015$). Planned contrasts indicated a significant group difference in genital self-image in the intervention groups vs. controls immediately after the intervention ($p < .01$, $d = .53$) and at the 2-week follow-up ($p = .042$, $d = .41$). No group differences were found at the 8-week follow-up ($p < .60$). The combined condition of photographs with information was not superior to photographs only at any time point. There were no effects on secondary outcomes (all $p > .20$).

Clinical Translation: The results underscore that women's genital self-image can be improved rapidly and cost-effectively with education.

Strengths & Limitations: This study is the first to examine the changeability of genital self-image in a large convenience sample using an experimental design. The intervention effect could only be shown in the short term. However, the effect was particularly impressive given that women's genital self-image was relatively positive prior to the intervention. The results may not generalize to women with a less positive genital self-image or those considering labiaplasty.

Conclusion: Exposure to photographs of natural vulvas with or without information about genital diversity and function is a useful tool for improving genital self-image in adult women, potentially benefiting sexual health and well-being.

Keywords: genital appearance; body image; genital self-image; sexual function; sex education.

Introduction

Genital self-image refers to the feelings, attitudes, and experiences that individuals have toward their genitals.[1] Genital self-image is a part of body image[2] and an important resource of an individual's sexual health and well-being.[3] The construct has been examined in women and men, showing a tendency for women to have a more negative genital self-image than men.[4] Genital self-image is positively linked to sexual esteem and self-perceived sexual attractiveness and sexual pleasure.[5,6] Moreover, a positive genital self-image is linked to sexual behavior such as more frequent masturbation and receptive cunnilingus.[1] Preliminary work has also demonstrated that more positive genital self-image in women is associated with better sexual functioning and satisfaction.[2,3,7,8] Women with more positive genital self-image also feel more comfortable addressing sexual dysfunction with a professional.[9] Less positive genital self-image, in turn, is associated with poorer decision making about genital and sexual health, such as lower motivation for self- or gynecological examinations.[10] Additionally, a more negative genital self-image can be associated with engaging in risky (ie, unprotected) sexual behavior.[3,8] Consequently, women with negative genital self-image are at increased risk of unwanted pregnancy, exposure to HIV and other sexually transmitted infections (STIs) and undetected changes in internal, external, and secondary sex organs. Additionally, due to negative genital self-perception, women have an increasing desire to undergo genital plastic surgery.[4,11] This could partly be facilitated by a lack of

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knowledge and awareness about the natural variation of vulvas.[12-14] Research showed that women considering labiaplasty (vs. women who did not) were more often exposed to images of vulvas on the internet and in advertisements, which are often idealized.[15,16] The internalization of a genital ideal and genital appearance comparison has been shown to mediate the effect of media exposure on genital appearance dissatisfaction and consideration of labiaplasty.[17] In recent years, a variety of online and offline resources about vulva diversity have been developed in order to counteract the one-sided representation in media, eg, "The Vulva Gallery",[18] "Labia Library",[19] "Gynodiversity"[20] and "Petals".[21] However, there's a lack of empirical evidence testing their effectiveness.

Given that a more positive genital self-image is linked to important components of sexual health and well-being and the increasingly high demand for esthetic genital plastic surgery, the need for interventions that specifically improve genital self-image is strongly justified.[2,5,14]

In recent years, research has investigated whether exposure to sources, such as information or images portraying vulvar diversity, can positively influence young women's perceptions of their own genitalia, but the findings to date are mixed and based primarily on student samples. Sharp and Tiggemann found no effect of exposure to vulva photographs and a video about digital airbrushing of women's genitals in media images on female undergraduate students' attitudes towards their own genitals.[22] The authors explained this by low levels of genital appearance concern of their sample, and very brief stimulus presentation. Laan et al. revealed that exposure to photographs of natural vulvas in young Dutch women had an immediately positive effect on their genital self-image, which was still present after 2 weeks.[23] However, this result was based on a small and homogeneous sample of mainly students. Further, the photographs used were edited with a sepia filter and could therefore be optimized in terms of realism. And it remains unclear whether the positive effect of exposure to the vulva photographs on genital self-image is more long-lasting than the 2 weeks tested. A further study used a quasi-experimental design to test the effect of a course about psychology of human sexuality, including the normalization of the variety of genital appearance, on attitudes towards women's genitals of female psychology students in Florida, USA.[24] Results showed improvement in sexual function and improved attitudes towards women's genitals in general. However, this research design does not adequately control for confounders, such as self-selection bias or the influence of prior knowledge about human sexuality. Finally, Fernando and Sharp demonstrated in 2020 that a short educational video on the anatomy, function and diversity in the appearance of female genitalia improves female adolescents' attitude towards their own genitals immediately.[25] Because the sample consisted of 16–18-year-olds, 35% of whom were bi- or homosexual, it remains unclear whether the effect would be equally evident in adult samples with a higher proportion of heterosexual orientation. Overall, these studies show promise for enhancing genital self-image through demonstrating the diversity of vulvas, and that his may potentially be increased by education about diversity in appearance and function of female genitals. However, the previous studies were rather selective in sample and, except for Laan et al., examined the effect of the intervention only directly and without follow-up. Therefore, it remains unclear whether the positive effects found on genital self-image can be generalized to more diverse samples and if they persist.

The first aim of our study was to replicate the results of Laan et al. that showed efficacy of diverse vulva photographs to promote genital self-image.[23] Overcoming limitations of their study, we included a more diverse sample of women, added a longer follow-up period, and increased the ecological validity by conducting the experiment online, in women's daily life, rather than in the lab. Instead of color-homogenized photographs, we used unedited vulva photographs. The second aim was to test the potential added effect of information about genital appearance and function. Providing information about female genital function and appearance means offering an increase in knowledge in an area that is still often taboo, neglected in education and shaped by the common genital ideal.[24,25] By combining the visual stimulus of the diversity of vulvas with factual information, we therefore expect a stronger confrontation with the diversity of genital appearance and function and thus a stronger positive effect on the individuals' genital self-image. Accordingly, our research questions and hypotheses are as follows:

RQ1: Does exposure to photographs of natural vulvas with and without information about genital appearance and function improve women's genital self-image over time?

H1.1. Women's genital self-image increases (a) immediately after exposure, (b) at 2- and (c) at 8-week follow-up compared to baseline.

H1.2: The exposure to photographs with and without information improves women's genital self-image compared to a control condition (a) immediately after the exposure, (b) at 2- and (c) at 8-week follow-up.

RQ2: Is there an additional positive effect on genital self-image when information about the appearance and function of the genitals is shown alongside the photographs?

H2: The condition with photographs and information shows a significantly positive genital self-image compared to the photographs only condition (a) immediately after the exposure, (b) at 2- and (c) at 8-week follow-up.

Finally, we explore the experimental effect on sexual functioning, sexual health behavior, and intention to have genital plastic surgery.

Methods

This study is designed as an online experiment in which a two-arm randomized controlled trial (RCT) with three parallel conditions (vulva photographs; vulva photographs and information; control) and 4 repeated measures (baseline; immediately after exposure to the stimulus material; 2-weeks; 8-weeks follow-up) is conducted. The study was approved by the Ethics Committee of the Faculty of Human Sciences of the University of Bern, Switzerland (Approval number: 2020-08-00007), and was carried out between September 2020 and March 2021.

Participants

The present study initially involved women, men, and nonbinary individuals. However, due to unsuccessful randomization of men and nonbinary individuals in one of the conditions, only individuals who identified their biological sex as female when responding to the question "What is your biological sex?" were included. We will subsequently refer to these

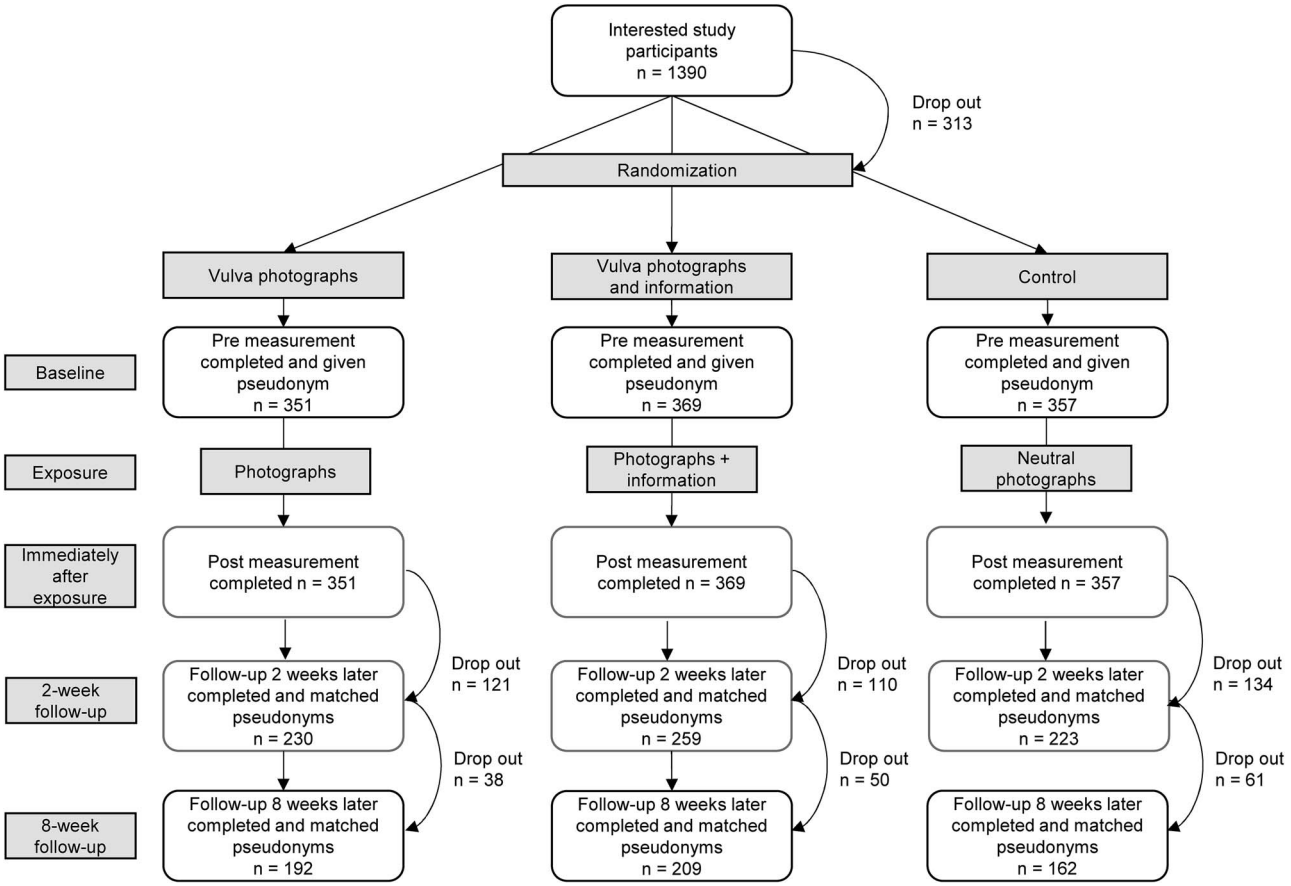

Figure 1. Participant flow chart.

individuals as women, excluding those who identified as male or provided other specifications. Further inclusion criteria were age 18 years or older, German language skills, and willingness to view genital photographs. A priori sample size estimation was calculated with G*Power.[26] Based on the study of Laan et al., a small to medium effect was expected.[23] With a Type I error probability of 0.05 and a power of 0.95, we aimed to include a total sample size of 99 participants with 33 individuals in each group. A convenience sample of women aged 18+ was recruited via media sources, flyers and word of mouth. As an incentive, a total amount of 1000 Swiss francs (CHF) was raffled among women who participated in all four measurement time points. In addition, psychology students from the University of Bern, Switzerland, were invited participate and were exclusively rewarded with course credit for their participation.

Of 1390 women who started to participate, a total of 1077 women filled out the baseline questionnaire, saw the stimulus material and filled out the second questionnaire immediately after exposure. Of these, 563 women participated at all four measurement time points, and their data were successfully matched using their self-generated pseudonyms. A dropout analysis for the demographic and outcome measures showed small but significant differences between participants who completed all measurements and those who dropped out during the study in age, nationality, educational level and sexual health behavior. The results of the dropout analysis can be found in the supplementary material. The flowchart of the three experimental conditions is shown in Figure 1.

The mean age of the 563 women was 27.6 years (*SD* = 8.3; Range = 18-68). About 446 had Swiss (79.3%), 93 German (16.4%), 6 Austrian (1.1%), and 18 other nationality (3.2%). Approximately 236 of the participants had a university degree (41.9%), 87 had graduated from university of applied science or higher technical school (15.5%). About 204 of participants named high school (36.2%), 29 had completed an apprenticeship (5.2%), and 1 obligatory school (0.2%) as their highest education. With regard to civil status, the 498 were single (ie, never married (88.5%), 46 married (8.2%), 18 separated/divorced (3.2%), and 1 widowed (0.2%). 486 participants were identified as heterosexual (86.3%), followed by 56 bisexual (9.9%), 14 homosexual (2.5%), and 7 other sexual orientation (eg, pan sexual) (1.2%). At the time of the survey, 365 participants (64.8%) reported being in a stable romantic relationship with an average duration of 4.9 years (*SD* = 6.2; Range = 0-43).

Primary outcome

Genital self-image was measured with the Genital Self-Image Scale (GSIS). The scale was formed by adding to the Female Genital Self-Image Scale (FGSIS)[1] an item from the Male Genital Self-Image Scale,[27] which distinguishes the two versions. Since it is assumed that genital size is also relevant for women, especially in relation to labia size, the item "I am satisfied with the size of my genitals" was taken from the MGSIS without modification. The sex-neutral GSIS contains eight items answered on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). Scores for all eight

items were summed to yield an overall GSIS score ranging from 8 to 32, with higher scores indicating a more positive genital self-image. Three independent parties translated the GSIS into German whereupon they agreed on a single translation per item by discussion. A native English speaker back-translated the final version, and any deviations were adjusted. The GSIS is reliable and valid[1,8] and yielded a Cronbach's alpha of 0.79 in our sample, demonstrating good internal consistency. Factor analysis shows a good result, see supplementary material.

Secondary outcomes

Sexual functioning was assessed by the German version of the Female Sexual Function Index (FSFI-d).[28] The 19 items scored on a 5-point Likert scale ranging from 1 (eg, almost never, or never) to 5 (eg, almost always or always) and included the option 0 indicating no sexual activity over the past 4 weeks. The total score on FSFI-d ranged between 2 and 36, with higher scores indicating good sexual functioning. In a previous sample, the FSFI-d showed good reliability overall with Cronbach's alpha being 0.75–0.95.[28] In the present sample a very high internal consistency was found with a Cronbach's α of 0.93. Sexual health behavior was measured with self-constructed statements about condom or dental dam use ("I use a condom resp. dental dam during (a) vaginal, (b) anal, and (c) oral sex with new sexual partners"), emergency contraception ("In the event of a contraceptive failure, I take the morning-after pill"), talking about STI status and testing ("Before having unprotected sex, I ask my sexual partner about the status of the most recent test for sexually transmitted infections", "Before I have unprotected sex, I get tested for sexually transmitted infections"), and going for gynecological checkups ("When I feel discomfort in my genitals, I get a medical checkup") and screening ("I attend regular screening (regular means here the recommendation of the gynecologist or at a regular interval of 6–24 months)"). Participants indicated their level of agreement with each statement on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The responses were integrated to a sum score ranged from 8 to 40, with higher scores indicating greater sexual health behavior. The internal consistency was acceptable with a Cronbach's α of 0.70.

Genital plastic surgery

Current intention to undergo genital plastic surgery was asked with the self-constructed question "Are you currently thinking about undergoing cosmetic surgery on your vulva?" and could be answered with "yes" or "no". The question was asked only of those who had previously indicated that they had ever considered undergoing genital surgery.

Demographic questions

Participants were asked about their age (years), nationality (Swiss, German, Austrian, other), educational level (primary, secondary, tertiary), civil status (single, married, separated/divorced, widowed), sexual orientation (hetero-, bi-, homosexual, other), relationship status (yes/no), and duration (years).

Procedure

From the recruitment channels (eg, social media, see above), participants arrived on a webpage that included the detailed study information. First, information on the content and scope of the study was provided. Participants were told that the study was about sexual self-image and how it related to indicators of sexual health and well-being over time. Information was also given that genital photographs would be shown according to one's biological sex with or without text, or neutral photographs. After providing digital written informed consent, participants continued to the baseline online survey, which was implemented on Qualtrics, and lasted ~30 minutes. Participants first completed demographic questions, and then continued to fill in questions on genital self-image, genital plastic surgery, sexual function, sexual pleasure, sexual satisfaction, and sexual health behavior. After completing the questionnaire, participants were randomly assigned to the three experimental conditions by the Qualtrics algorithm in a 1:1:1 ratio. This process ensured that the researchers were entirely unaware and impartial throughout the randomization and data collection phases. The condition "vulva photographs" was then shown 40 photographs of unmodified vulvas, which were shown for 5 seconds each. The "vulva photographs and information" condition received the 40 photographs followed by a digital presentation of 21 slides concerning various facts about women's genitals (see below). The participants clicked through the slides at their own pace. Individuals assigned to the control condition received 40 neutral photographs which were displayed for 5 seconds each. Immediately after exposure, all participants rated genital self-image again (a), and answered the second part of the demographic questions. At the end of the survey, participants were asked to create a 7-character pseudonym. They were then automatically redirected to a new survey where they could enter their email address separately from their data to receive the link to the follow-up surveys. Two (b) and 8-weeks (c) later, participants received invitations to the follow-up surveys via email (with one reminder sent three days after the call). The follow-up surveys again included the core measure of genital self-image. At 8-week follow-up, secondary outcomes were additionally assessed. The study ended by offering the opportunity to participate in the raffle (or receive course credit) and to receive a general report of the results by email later. After the study was completed, participants were fully informed about the background and hypotheses of the experiment and given the opportunity to (re)view the stimulus material of the three conditions.

Stimulus material

The 40 photographs of natural vulvas were presented one at a time in a fixed order for 5 seconds each. Most were taken by a photographer, Gerrit Meier, in his studio in Hamburg, Germany. However, due to the lock-down in the COVID-19 pandemic, not enough photographs could be taken. For this reason, existing photographs by other artists were requested. Ten photographs therefore came from Nadia Scherer, a women's health consultant, and Mirko Hecht, a maker of casts of vulvas. The photographers provided us the rights to use their photographs for our study. The photographs depicted natural vulvas that had not undergone plastic surgery. They were taken at an angle from below and were diverse with respect to labia size, age, and ethnicity of the persons depicted. Some vulvas were shaved, unshaved, some with piercings or tampons visible. On most of the photographs, part of the thighs and mons pubis were also visible, other photographs showed close-ups without any other body parts or clothes

being visible. The vulva photographs can be found in the supplementary material.

The information about genital appearance and function was done with a digital presentation consisting of 21 slides with facts about the anatomy, function, and natural diversity of vulvas and vaginas. Each slide covered a different topic such as the clitoris, labia size and color, hygiene, lubrication and orgasm in a short text section, some were accompanied by a visualization of the content such as anatomic illustrations or models. The digital presentation was created by the authors mainly based on information from the Swiss sexuality education website www.lilli.ch. The website is maintained by practitioners in sexology and sexual medicine and the use of the content for research purposes is approved. The German original and an English translation of the slides can be found in the supplementary material.

The neutral photographs shown to the control condition included animals, architecture, art, everyday objects, and nature. The photos were downloaded from free databases and can be found in the supplementary material.

Analysis

Data analysis was performed using IBM SPSS Statistics 27.0 (IBM Corporation, Release 2020) and R-Studio (Package imputeTS).[29] All genital self-image measures and secondary outcomes were tested for normal distribution by the Shapiro–Wilk tests, which revealed that none of the scales were normally distributed ($P < .05$). However, the mixed analysis of variance (ANOVA) is considered sufficiently robust to the violation of this assumption and in analyses with more than 30 subjects for each group, it can be assumed that the sampling distribution is approximately normally distributed according to the central limit theorem.[30] No extreme outliers (more than 3 times the interquartile range) were identified in scales on genital self-image and sexual function, and therefore all cases were included in the analyses. At baseline, the equivalence of the 3 groups regarding demographic characteristics and outcome measures was examined by a series of one-way ANOVAs and Pearson chi-square tests.

To examine the effect of the experimental conditions on genital self-image over time, mixed ANOVA with four repeated measures was conducted. To examine changes in genital self-image for each condition over time, single factor ANOVA with repeated measures were performed. Sphericity was not given in any of the groups ($\varepsilon > .75$), therefore the Huynh-Feldt correction was used.[31] Planned contrasts compared genital self-image after exposure (immediately after; 2-week; 8-week follow-up) with baseline within all three groups. To compare between experimental conditions at each measurement time point, single-factor ANOVAs were calculated. A robust Welch's test was used because the variances were heterogeneous.[32] Subsequently, planned contrasts were analyzed to test the photographs only and photographs combined with information condition against the control condition, and the photographs only against the photographs combined with information condition immediately after the exposure, at 2- and 8-weeks follow-up. Mixed ANOVAs and Pearson chi-square test were used to test experimental effect from baseline to 8-week follow-up in secondary outcomes. Effect size partial Eta Square (η^2) was used to evaluate the strength of the effect according to Cohen.[33]

Because listwise deletion can be a biased method of analysis, a sensitivity analysis was done. The missing values were imputed using the Last Observation Carried Forward (LOCF) method, where a missing follow-up value is replaced by the participant's previously observed value. The combination of the observed and imputed data was analyzed as though there were no missing data.

Results

Sample characteristics and outcomes compared by group are shown in Table 1. On average, women reported a relatively high genital self-image at baseline with a total GSIS mean value of 25.40 ($SD = 3.48$; Range = 15–32). Participants sexual function reported with the FSFI was also relatively high ($M = 28.62$, $SD = 4.02$; Range = 12–36). Mean value in sexual health behavior was 30.61 ($SD = 5.00$; Range = 8–40). Of the participants, 0.09% ($n = 5$) had had cosmetic surgery on the vulva and 10.4% ($n = 59$) had considered vulvar cosmetic surgery at some point in their lives. Of those, 1.4% ($n = 8$) reported currently considering such surgery at baseline. At baseline, the three groups did not differ in primary and secondary outcomes or in demographic characteristics (all $p > .10$).

Main effect of time

As shown in Table 2, there was a significant main effect for time in genital self-image (GSIS) in the "vulva photographs" condition ($p < .001$), the "vulva photographs and information" condition ($p < .001$), and in the control condition ($p = .005$).

Planned contrasts showed that in the "vulva photographs" condition, GSIS was significantly more positive immediately after exposure ($F(1, 191) = 45.44$, $p < .001$, partial $\eta^2 = .19$, CI 95% [.10, .30]) and at 2-week follow-up ($F(1, 191) = 4.75$, $p = .03$, partial $\eta^2 = .02$, CI 95% [.00, .08]) than at baseline. At 8-week follow-up the difference was no longer significant ($p = .08$). The "vulva photographs and information" condition showed a significant increase of GSIS immediately after exposure ($F(1, 208) = 67.15$, $p < .001$, partial $\eta^2 = .24$, CI 95% [.15, .35]), at 2-week ($F(1, 208) = 13.32$, $p < .001$, partial $\eta^2 = .06$, CI 95% [.01, .14]) and at 8-week follow-up ($F(1, 208) = 11.21$, $p = .001$, partial $\eta^2 = .05$, CI 95% [.01, .12]) compared to baseline. The control condition showed a significantly more positive GSIS immediately after exposure ($F(1, 161) = 10.53$, $p = .001$, partial $\eta^2 = .06$, CI 95% [.00, .15]) than at baseline. While the effect was no longer significant at 2-week follow-up ($p = .69$), GSIS was again significantly more positive at 8-week follow up ($F(1, 163) = 5.36$, $p = .02$, partial $\eta^2 = .03$, CI 95% [.00, .10]) compared to baseline. GSIS means and standard error by condition over time are shown in Figure 2.

Experimental effect

In line with our hypotheses, the results of the mixed ANOVA showed a significant interaction between the measurement time point and condition ($p < .001$). Because of the violation of the assumptions of homogeneity of variance and sphericity of the covariance matrix, a robust mixed ANOVA was computed in R[34] and confirmed the significant interaction effect ($F(6, 192.756) = 4.65$, $p < .001$).

The effect of condition on GSIS scores was significant immediately after exposure (Welch's $F(2, 356.88) = 4.76$, $p < .01$, $\omega 2 = .011$, CI 95% [.00, .04]), but not significant at

Table 1. Characteristics of the three groups at baseline.

	P ($n = 192$) M (SD)/n (%)	P + I ($n = 209$) M (SD)/n (%)	C ($n = 162$) M (SD)/n (%)	χ^2/F		
				Value	*df*	*p*
Demographics					8	
Age	27.6 (7.7)	27.4 (8.1)	27.8 (9.0)	0.12	2	.890
Nationality				10.35	6	.110
Swiss	144 (75.0)	177 (84.7)	125 (77.2)			
German	38 (19.8)	27 (12.9)	28 (17.3)			
Austrian	1 (0.5)	3 (1.4)	2 (1.2)			
Other	9 (4.7)	2 (1.0)	7 (5.2)			
Educational level				12.59	10	.247
Obligatory school	1 (0.5)	0 (0)	0 (0)			
Apprenticeship	11 (5.7)	10 (4.8)	8 (4.9)			
High school	74 (38.5)	71 (34.0)	59 (36.4)			
University of applied science or higher technical school	21 (10.9)	33 (15.8)	33 (20.4)			
University degree	85 (44.3)	91 (43.5)	60 (37.0)			
Others	0 (0)	4 (1.9)	2 (1.2)			
Civil status				2.56	6	.862
Single (ie, never married)	173 (90.1)	182 (87.1)	143 (88.3)			
Married/registered partnership	14 (7.3)	19 (9.1)	13 (8.0)			
Separated/divorced	5 (2.6)	7 (3.3)	6 (3.7)			
Widowed	0 (0)	1 (0.5)	0 (0)			
Sexual orientation				2.29	6	.891
Heterosexual	168 (87.5)	179 (85.6)	139 (86.0)			
Bisexual	18 (9.4)	23 (11)	15 (9.3)			
Homosexual	5 (2.6)	4 (1.9)	5 (3.1)			
Others	1 (0.5)	3 (1.4)	3 (1.9)			
Partnership status				1.31	2	.519
Yes	125 (65.1)	130 (62.2)	110 (67.9)			
No	67 (34.9)	79 (37.8)	52 (32.1)			
Partnership duration	4.49 (5.20)	5.36 (7.00)	4.76 (6.38)	0.67	2	.518
Primary outcome						
GSIS total score	25.38 (3.49)	25.53 (3.27)	25.27 (3.74)	.26	2	.771
Secondary outcomes						
FSFI	28.70 (3.87)	28.65 (4.21)	28.51 (3.98)	.09	2	.913
Sexual health behavior	30.07 (5.19)	30.66 (5.00)	31.19 (4.71)	2.20	2	.112
Labiaplasty intention ($n = 59$, who have ever considered)				3.22	2	.200
Yes	1 (4.2)	2 (16.7)	5 (21.7)			
No	23 (95.8)	10 (83.3)	18 (78.3)			

Abbreviations: P = photographs only; P + I = photograph and information; C = control group. GSIS = genital self-image scale; FSFI = female sexual function index.

Table 2. Mixed ANOVA results.

Effect Condition	*df*	Hunynh-Feldt *F*	*p*	partial η^2	CI 95%
Main effect of time					
Vulva photographs	2.64, 504.41	13.09	<.001	.06	[.03, .11]
Vulva photographs and information	2.93, 608.84	23.76	<.001	.10	[.06, .15]
Control condition	2.58, 414.85	4.76	.005	.03	[.00, .06]
Experimental effect					
Time x condition	5.66, 1585.70	4.24	<.001	.015	[.00, .03]

2-week (Welch's $F(2, 353.19) = 2.79$, $p = .052$, CI 95% [.00, .03]), or at 8-week follow-up (Welch's $F(2, 355.16) = 0.98$, $p = .376$, CI 95% [.00, 1]). According to the planned contrasts, vulva photographs with and without information resulted in a significantly more positive genital self-image than the control group immediately after exposure ($M_{diff} = 1.87$, $SE = 0.68$, $p = .006$, $d = .53$, CI 95% [.54; 3.22]), and 2-week follow-up ($M_{diff} = 1.38$, $SE = 0.68$, $p = .042$, $d = .41$, CI 95% [.05; 2.71]), but not at 8-week follow-up ($M_{diff} = 0.42$, $SE = 0.67$, $p = .538$, CI 95% [−.91; 1.74]). Contrasting the vulva photographs only with the condition with additional information, there was no significant difference at any measurement time point (all $p > .20$).

Effects on secondary outcomes

There was no significant experimental effect from baseline to 8-week follow-up in sexual functioning, sexual health behavior or intention to undergo labiaplasty (all $p > .20$).

Sensitivity analysis

To check the robustness of the results, the analyses were additionally calculated using the LOCF method. Effects remained

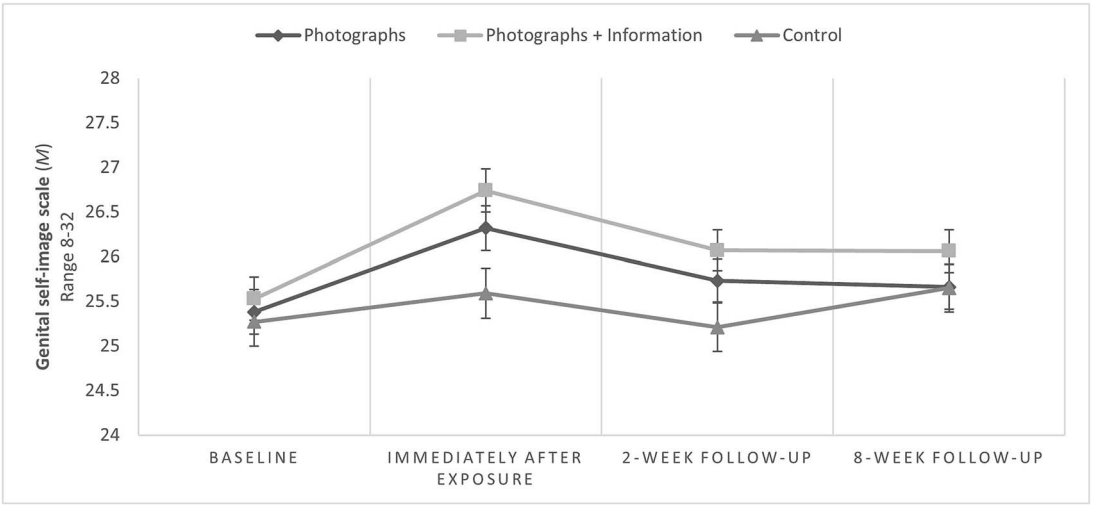

Figure 2. Genital self-image scale (GSIS) mean and standard error by condition over time.

substantively unchanged for the most part. In contrast to the results shown here, the LOCF method resulted in a significant effect of condition at the 2-week follow-up, see supplementary material.

Discussion

Building on the work of Laan et al.,[23] the present study is the first to experimentally test the mid-term effects of exposure to photographs of diverse natural vulvas in a large community sample as well as the combination of vulva photographs with information about genital appearance and function on genital self-image compared to a control group. Overall, we found evidence for an effect of viewing diverse vulvas on genital self-image. Largely consistent with our first hypothesis, we found that women in all three conditions had an immediate significant increase in their genital self-image compared to baseline, including women who viewed neutral photographs. While the increase in the "vulva photographs" condition persisted for two weeks, the positive effect in the "vulva photographs and information" condition was still significant after 8 weeks. In line with our second hypothesis, we found that viewing vulva photographs (with or without information) significantly increased genital self-image compared to viewing neutral photographs immediately after exposure and at 2-week follow-up, but not at 8-week follow-up. This result proved robust in sensitivity analyses. Contrary to our expectations, adding information to vulva photographs was not superior to viewing vulva photographs alone. There was also no evidence of an effect on sexual functioning, sexual health behavior and intention to undergo labiaplasty.

With a mean score of 22.15 in the FGSIS the present sample of German-speaking women showed a rather positive genital self-image compared to previous surveys (eg, 21.31 in a U.S. nationally representative sample, Herbenick et al., 2011; 20.79 in the experiment by Laan et al., 2017). Nevertheless, of the participants, about 12% reported ever considering esthetic plastic surgery on the vulva. This is comparable to Sharp et al.,[17] where in a non-surgical sample at least ten percent showed at least some interest in labiaplasty. Despite the already positive genital self-image before the intervention, the experimental effect was confirmed in the short term. The finding that genital self-image increased in all groups might be explained by the fact that all women completed various questionnaires about their sexuality, which may have led them to reflect about it and consequently feel more comfortable in dealing with sexuality and specifically with their genitals.[35] Contrary to our expectation, no differences in the direct effect comparisons between the "vulva photographs" condition and "vulva photographs and information" condition were observed, even though the effect in the latter remained significantly longer (at the 8-week follow-up) compared to baseline, which was not evident in the former. Furthermore, examining the graph presented in Figure 2, a difference, albeit very slight, between the two groups becomes apparent. The fact that the combination of photos and information showed more lasting effects could be explained by the longer exposure and the deeper cognitive processing effect of the knowledge content. While in the "vulva photographs" condition, visual stimuli alone may evoked a rather superficial reaction, additional information could have promoted a more intensive engagement with the topic. This could explain why the effect in the "vulva photographs" condition disappears over time and is maintained in combination with the information. However, because the study was not blinded and the participants in the "vulva photographs and information" condition knew that they were receiving more stimuli than the other groups a social desirability effect is also possible. Even if the duration of the effects differs by condition, it should be emphasized that the effects of the two intervention conditions do not differ significantly at any point in time. This means that the persistently more positive genital self-image scores over time in the "vulva photographs and information" condition may indicate a longer-lasting effect, but this could not be experimentally confirmed.

Overall, these observations could suggest that there are indeed influencing factors in the presented information, but they may not be sufficiently pronounced yet. One potential explanation for the limited impact of additional information accompanying the vulva photographs on genital self-image, as opposed to just the photographs alone, may lie in the overly general nature of the provided information. It is possible that information more specifically addressing genital appearance and function could have a stronger effect. To enhance the

effectiveness of future interventions, the information could be directly linked to the vulva photographs by presenting facts as comments on the visual differences depicted in the images or by adapting the information to the individual questions and uncertainties. This approach could give participants a better and more individualized understanding of the diversity and functionality of the female genitalia. Additionally, conducting a qualitative survey among the two experimental groups could help uncover factors that contributed to the longer-lasting effect observed in the "vulva photographs and information" condition. Insights from such a survey could guide further refinement of the educational materials and their integration with visual aids to better support improvements in genital self-image.

The unexpected increase in genital self-image in the control group could be explained by the lack of blinding and the resulting social desirability effects. The reactivity of the measurement is also a possible explanation. In sexuality research, it is known that participants can change their answers simply by thinking about intimate topics.[35] However, there is empirical evidence that these reactivity effects subside after a short time.[36] At the same time, exploration of one's own genitals and sexuality may increase in the weeks following participation in the experiment, which may be an explanation for the temporal dynamics of the effect, which first decrease and then increase again at the last measurement point. Temporary fluctuations in the effects would therefore result from a combination of short-term priming by the measuring instruments and the personal engagement with the topic stimulated by participation regardless of the condition. However, it is also important to note that the effect in the control group was comparatively small and should therefore be interpreted with caution.

The observation of no effect of the intervention on sexual function, sexual health behaviors and the intention to undergo labiaplasty may indicate that these behaviors are complex and have multifactorial causes. The state of research clearly shows that there is a relationship between genital self-image and the selected secondary outcomes,[1,7,8,10,37,38,39] but so far there is little empirical evidence on the origin and dynamics of these interactions. Improving genital self-image is therefore probably only a first relevant factor of several to be addressed if sexual function and health behavior are to be changed. Further, longer-term, multifactorial change may be required, which may also mean the need to add further intervention elements in order to achieve a change in sexual behavior and feelings. In particular, volitional concepts for implementing intention in behavior would be of interest here, as described, for example, in the Health Action Process Approach.[40] In the future, these relationships should be further explored through appropriate analyses. Finally, one may question the adequacy of the measurement instrument's sensitivity in identifying changes in genital self-image. The scale, ranging from 1 to 4, might have offered participants a limited range of response options and, therefore, may not have captured sufficient variance. Confounding variables such as further engagement with the topics covered in the experiment or sexual experiences between measurement time points could be considered in future research. It is also unclear whether the measurement time points were favorable for improvement in genital self-image, and more research is needed to better understand the dynamics of change.

Clinical implications

The results suggest that viewing images of natural vulvas, as needed by the patient, in conjunction with education about genital appearance and function, is a simple and inexpensive method to improve women's genital self-image in the short term.

Strengths and limitations

The strengths of this study are the experimental design, the relatively long follow-up period, and the large community sample of 563 women participating at all measurement points. Despite an initially relatively positive genital self-image, exposure to photographs of natural vulvas with and without additional information about genital appearance diversity and function was still able to elicit an increase in the perception of women's own genitals in the short term. As a limitation, the sample was self-selected and represents a population where the majority is young, well-educated, heterosexual women who feel comfortable thinking about their sexuality and who know more about female genitals than the general population might. This selection bias presents a common restriction in sexuality research.[41] How the results generalize to other women, particularly to those with low initial genital self-image, needs to be examined in future studies.

Conclusion

The present study replicates and extends the positive effect of exposure to photographs of natural vulvas on genital self-image found by Laan et al.[23] using a much larger sample of community-dwelling women. Our robust evidence shows that vulva photographs alone can significantly improve genital self-image, at least in the short term. Combining photographs of natural vulvas with information about the appearance and function of the genitals might be promising for a sustained positive effect, but the present study could not confirm this definitively. As a practical recommendation derived from our findings, we emphasize the importance of explaining the concept of genital self-image and its crucial role in sexual health and well-being in school- and counseling-based education. This should include positive representation of the diversity and function of female genitalia, ideally supported by inclusive and accurate visual materials, such as those referenced in this paper. This is important, because improving genital self-image in women in the long-term potentially contributes to sexual function, positive sexual experiences and sexual health. Overall, our findings demonstrate that promoting genital self-image can be achieved through simple and cost-effective measures, providing an accessible and widely applicable approach to sexual health promotion.

Author contributions

Stefanie Gonin-Spahni (Conceptualization, Data curation, Investigation, Methodology, Project administration, Validation, Visualization, Writing—original draft, Writing—review & editing), Lucca Michelle Brandner (Data curation, Formal analysis, Validation, Visualization, Writing—original draft, Writing—review & editing), Maria Schmuki (Data curation, Formal analysis, Investigation, Methodology, Software, Writing—review & editing), Clemens Alexis Haupt (Investigation, Methodology, Project administration, Software, Writing—review & editing), Jennifer Inauen (Resources, Supervision, Validation, Writing—review & editing), and Michèle Borgmann (Writing—review & editing, Writing—review & editing).

Supplementary material

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Conflicts of interest

The authors report no conflict of interest.

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