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Breaking the endometriosis silence: a social norm approach to reducing menstrual stigma and policy resistance among young adults

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ABSTRACT

Objective: Endometriosis is a menstrual disorder that affects one in ten women. Diagnosis often takes several years due to low awareness and menstrual stigma. In this study, we employed a social norm approach (SNA) to investigate the effects of an educational leaflet on endometriosis knowledge, menstrual stigma, and acceptance of paid menstrual leave among women and men.

Methods: The 3 × 2 online experiment tested the influence of either descriptive norm messages or both descriptive and injunctive norm messages (compared to a control group, factor 1) in an educational leaflet by taking the role of addressee's sex into account (quasi-experimental factor 2). The study included 796 German participants aged 16–35.

Results: Men exhibited significantly poorer knowledge, stronger menstrual stigma, and weaker policy acceptance compared to women. No significant main effect of the social norm messages on menstrual stigma was found. In contrast, the combined norm messages seem to be beneficial when addressing policy acceptance. Moreover, compared to the control group, the intervention material indirectly influenced stigma and policy acceptance through increased knowledge.

Conclusions: Providing information about social norms appears to be an effective strategy for educating not only women but especially men about menstrual disorders like endometriosis.

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Social norm approach; endometriosis; stigma; policy acceptance; women's health; health promotion

The vast majority of women[1] under the age of 25 experience menstrual pain (Armour et al., 2019; Parker et al., 2010). Even if this pain is severe, it is often dismissed as a 'normal, natural part' of being a woman (Krebs & Schoenbauer, 2020). However, dysmenorrhea may also be a symptom of menstrual disorders, such as endometriosis—a disease where tissue similar to the lining of the uterus grows in other parts of the body (National Institute of Child Health and Human Development, 2022), resulting in painful menstrual cramps, pain during or after sex, or infertility.

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Endometriosis affects ~1 in 10 women worldwide (Viganò et al., 2004) and is therefore as common as diabetes (CDC, 2022). Despite the disease burden, the average delay between the onset of the first symptoms and the final endometriosis diagnosis is seven years (Nnoaham et al., 2011). One of the primary drivers of this significant diagnostic delay is menstrual stigma (Guidone, 2020; Gupta et al., 2018), which is rooted in the social norm that menstruation is surrounded by shame and disgust (Zaman & Mohiuddin, 2023). Stigma defines what is considered acceptable or not, and, unfortunately, talking about period pain or other menstrual symptoms is still considered socially unacceptable (Olson et al., 2022).

Certain aspects of menstrual stigma also come to light within the ongoing discourse surrounding the implementation of menstrual leave policies within the workplace (Levitt & Barnack-Tavlaris, 2020). For instance, when Spain became the first European country to cover sick leave for menstruating workers in 2022, this topic prompted extensive media coverage and discussion (BBC, 2022). While such policies would be a great relief for women who experience severe menstrual pain, some scholars have expressed concerns that these policies may violate social norms surrounding menstrual non-disclosure in the workplace and even perpetuate menstrual stigma, potentially leading to unhealthy and discriminatory practices (King, 2021; Levitt & Barnack-Tavlaris, 2020).

Hence, there is a great need for public health interventions aiming at the reduction of menstrual stigma to promote women's health and well-being. Indeed, recent health interventions have made efforts to enhance awareness concerning menstrual health and disorders. However, these endeavors often fall short in their scope (Olson et al., 2022). On one hand, matters linked to menstruation are frequently perceived as specific to women (Levitt & Barnack-Tavlaris, 2020), leading most interventions to focus solely on female audiences. We contend that educating men about menstrual disorders, such as endometriosis, holds equal significance. Historically, men have marginalized menstruating women by characterizing them as 'hysterical' and 'overly emotional', thereby perpetuating and internalizing prevailing social norms surrounding menstruation (Cleghorn, 2022; Olson et al., 2022). On the other hand, Olson et al. (2022) found that existing policy initiatives often struggle to effectively challenge or dismantle menstrual stigma. While they succeed in raising awareness about menstruation, they concurrently advocate concealing visible signs of menstruation, emphasizing bodily management over individual agency and autonomy.

Thus, interventions are needed that (1) correct the social norms surrounding menstruation and (2) follow a holistic approach recognizing the importance of educating not only women but also men about menstrual disorders. In this study, we adopt a social-psychological lens to investigate how social norm correction messages impact young adults' understanding of endometriosis, the persistence of menstrual stigma, and the acceptance of paid menstrual leave. Additionally, we aim to discern the direct and moderating effects of recipients' biological sex on the effectiveness of social norm correction messages to ensure that social norm interventions on endometriosis do not backfire in male samples. The study contributes theoretically by deepening our understanding of the intricate dynamics between biological sex, social norms, and stigma in the context of health interventions for menstrual disorders. Practically, the findings underscore the potential of strategically designed interventions to not only

alleviate stigma but also foster a more inclusive and informed societal perspective on menstrual health and related policies.

To begin, we establish the groundwork by explaining the core concepts of social norms and the enduring stigma surrounding menstruation and endometriosis. Subsequently, we delve into existing research on interventions targeting stigma reduction through social norm interventions, whereby we also explore the potential challenges of norm correction messages among male audiences. Then, we shift our focus to the pivotal role of knowledge in reducing stigma. Lastly, the methods and results are described and discussed.

Social norms and stigma toward menstruation

Social norms play a significant role in predicting health behavior and are integral to several health behavior theories, such as the Theory of Planned Behavior (Ajzen, 1991), the Health Belief Model (Rosenstock, 1974), and the COM-B Model (Michie et al., 2011). Social norms refer to 'rules and standards that are understood by members of a group, and that guide or constrain social behaviors without the force of law' (Cialdini & Goldstein, 2004, p. 152). They can be classified into two distinct categories (Dempsey et al., 2018; Smith et al., 2012): descriptive norms, reflecting perceptions of others' engagement in a behavior, and injunctive norms, relating to the perceived approval of others.

Social norms towards menstruation, such as the concealment of menstrual pain or visible signs of menstruation (Olson et al., 2022), have resulted in the stigmatization of menstruating women (As-Sanie et al., 2019). Menstrual stigma manifests in various ways, including the view of menstrual blood as a disgusting bodily fluid that should be handled secretly (Bramwell, 2001; Roberts et al., 2002). Additionally, menstruating women are perceived as more irrational, impure, and irritable than women in general (Forbes et al., 2003). Lastly, menstruation is inevitably linked to the female sex, marking women as different from the 'normal'—that is, male—body (Young, 2005).

The menstrual stigma causes two trends in public discourse about menstrual pain (Krebs & Schoenbauer, 2020): first, a discourse of psycho-abnormality that discredits menstrual pain as imagined and not real, and second, a discourse of biological normality that considers severe menstrual pain as a natural part of being a woman. Women with endometriosis are particularly affected by menstrual stigma since most symptoms are directly linked to their menstruation (overview of menstrual stigma and endometriosis: Sims et al., 2021). Matías-González et al. (2021) demonstrated through a qualitative study that endometriosis patients often feel dismissed as excessive complainers without serious reason by their family members, peers, and doctors. Moreover, women felt not taken seriously in their private and professional environments and were even accused of malingering because of their menstrual pain (Seear, 2009). Similar findings were found by Gupta et al. (2018) among a youth sample. As a result, women have learned to conceal their period and avoid discussing this topic in public (Johnston-Robledo & Chrisler, 2020). The established taboo on conversations about menstruation negatively affects women's health by hindering the exchange of experiences: Patients with severe menstrual pain often feel alone

and abnormal, thereby delaying the time until they finally seek help (Hudelist et al., 2012).

In conclusion, social norms about menstruation influence human behavior in terms of what is socially accepted and expected, such as concealing menstrual pain and menstruation itself. Menstrual stigma acts as a control mechanism for those who do not adhere to these norms, which includes people openly talking about menstruation and menstrual pain (Smith et al., 2016). Therefore, educational interventions on endometriosis correcting the perceived social norm towards menstruation might be able to reduce menstrual stigma and lead to greater acceptance of policy measures aiming to protect menstruating women, such as paid menstrual leave.

The social norm approach

In health promotion, social norm interventions have been found to be an appropriate strategy to lead to attitudinal and behavioral changes (for an overview of its application in various health fields, see, e.g. Dempsey et al., 2018). The social norm approach (SNA), also referred to as the norm correction strategy (Cislaghi & Berkowitz, 2021), proposes that negative health behaviors are driven by misperceptions of social norms, which can be corrected by providing information on actually reported norms. This approach has been tested in various fields, such as substance use (Foxcroft et al., 2015; Moreira et al., 2009), sun protection (Reid & Aiken, 2013), and handwashing (Lapinski et al., 2013). Moreover, studies have found that providing descriptive norm corrections can effectively reduce mental health stigma (Botha et al., 2017; Silke et al., 2017). While most studies focused on testing descriptive norm messages, fewer studies used a mixed-norm approach by combining messages correcting descriptive and injunctive norms (for an overview, see Dempsey et al., 2018). The findings indicate that providing descriptive and injunctive norm feedback may amplify the effects of descriptive norm messages alone (Dong et al., 2022; Ridout & Campbell, 2014). Thus, in cases where descriptive norms may have an undesirable boomerang effect, adding an injunctive message that the desired behavior is approved could prevent such an effect (Schultz et al., 2007).

This pattern of effects was also demonstrated in a study on gynecological disease stigma. Dong et al. (2022) tested the influence of a health intervention containing either descriptive or descriptive plus injunctive norms on women's perceived stigma of a common gynecological disease, vaginal yeast infection. The first condition included messages informing about the prevalence of the disease (descriptive norm message: 'According to the statistics, about 75% of women get vulvovaginal candidiasis at least once, and 45% of women have experienced recurrent vulvovaginal candidiasis'), while the combined condition also provided behavioral recommendations ('We suggest you contact your healthcare provider to get testing and treatment if needed'). The version correcting both descriptive and injunctive norms demonstrated the greatest potential to reduce stigma, leading the authors to conclude that by providing information about the disease and behavioral recommendations, stigma-reduction interventions on gynecological diseases can reach their full potential.

However, it is still unknown whether this approach can be effective in addressing menstrual stigma, particularly among male audiences. Group identification plays a key role in explaining the impact of normative misperceptions on behavior (Dempsey et al., 2018). Social identity approaches emphasize the importance of self-categorization in conforming to group norms, particularly for individuals who closely identify with a social group (Hogg & Reid, 2006; Hornsey, 2008). Such individuals are more likely to follow the group's norms as a means of fitting in and as a guide for their own behavior. In the context of women's health, this ingroup-outgroup mentality becomes apparent, too. Studies demonstrate that the social norm of concealing menstruation and its symptoms is rooted in sexist and misogynistic structures (Cleghorn, 2022; Olson et al., 2022), whereby menstruation is viewed through the *male gaze*—encompassing heteropatriarchal views of how women are expected to behave and appear, and disassociating women from their own well-being and needs (Levitt & Barnack-Tavlaris, 2020). Therefore, it is likely that men internalized greater menstrual stigma and show stronger policy reactance than women.

Research showed that individuals who hold negative attitudes towards a specific behavior may react with greater reactance towards descriptive norm messages than those with a more positive attitude (e.g. for the context of disaster preparation, see Ozaki & Nakayachi, 2020). Given our assumption that men show stronger menstrual stigma and less acceptance of paid menstrual leave than women, it is possible that the effectiveness of social norm messages is moderated by the audiences' sex. However, we found no studies testing the role of the addressee's gender in health interventions on menstruation or menstrual disorders, which is why this study will also delve into the main and interaction effects of the recipients' biological sex on the effectiveness of a social norm intervention on endometriosis. This not only applies to the influence on menstrual stigma and policy acceptance but also to knowledge, which was found to be a major lever in stigma reduction.

Stigma and knowledge

As a result of menstrual stigma, endometriosis often goes unrecognized. Studies have found that only 50% of women have heard of the disease (Armour et al., 2019; Shah et al., 2010). Furthermore, most of those who have heard of endometriosis were unable to provide accurate information on the symptoms and risk factors (Shadbolt et al., 2013). Among men, the percentage of those who are familiar with the term endometriosis is even lower (Shah et al., 2010). This lack of knowledge is problematic, as it contributes to the diagnostic delay of endometriosis (Guidone, 2020; Hudelist et al., 2012). Hence, social norm interventions providing information about endometriosis (i.e. prevalence) have a great potential to impart knowledge about the disease.

Knowledge gaps also play a significant role in perpetuating stigmatization (Fang et al., 2021). Improving mental health literacy has been shown to lead to decreased stigmatizing attitudes and positive emotional responses (Chisholm et al., 2016; Lopez et al., 2018; Morgan et al., 2018). Similarly, research on stigma related to HIV demonstrated that misconceptions lead to increased stigma and a lack of willingness to disclose (Yang et al., 2006), and knowledge of the prevalence of HPV has been found

to be related to lower levels of stigma, shame, and anxiety (Waller et al., 2007). However, we found no study investigating if knowledge of endometriosis can reduce menstrual stigma and the acceptance of policy measures, such as paid menstrual leave.

The present study

This experimental study aims to explore the impact of a health education intervention that addresses prevailing social norms related to menstruation. It focuses on young adults aged 16–35, a critical age group for endometriosis development and diagnosis. The study's interests are 3-fold.

Firstly, we seek to understand how social norm correction messages can influence perceptions of menstrual stigma and acceptance of paid menstrual leave policies. Building on previous research showing the effectiveness of messages combining descriptive and injunctive norms compared to descriptive norms alone (Dempsey et al., 2018; Schultz et al., 2007), and taking a cue from a similar context in women's health promotion (Dong et al., 2022), we propose the following hypotheses:

H1: Health information with descriptive and injunctive norms will reduce menstrual stigma more effectively than health information with descriptive norms alone or a control group.

H2: Health information with descriptive and injunctive norms will strengthen the acceptance of menstrual leave policies more strongly than health information with descriptive norms alone or the control group.

Secondly, this study delves into the interaction between biological sex, social norms, and how they relate to the study's goals. Recognizing that societal norms about menstruation are deeply influenced by misogynistic structures (Cleghorn, 2022), we expect differences in how both men and women have internalized menstrual stigma. Similarly, we expect that the acceptance of paid menstrual leave differs significantly between the target groups, as men are typically excluded from such policies (except for trans men, who face other forms of menstrual-related stigma, as discussed in Levitt & Barnack-Tavlaris, 2020). Considering these differences and acknowledging the importance of group identification in the context of stigma development (Dempsey et al., 2018; Hogg & Reid, 2006), norm messages aiming to correct menstrual stigma might work differently for men and even have unintended backfire effects. Surprisingly, there is no research on this topic yet. Hence, the study presents the following hypothesis and research questions:

H3: Women show (a) less menstrual stigma and (b) a stronger acceptance of menstrual leave policies than men.

RQ1: Does the biological sex of the target group moderate the influence of health information with descriptive vs. with descriptive and injunctive norms on menstrual stigma?

RQ2: Does the biological sex of the target group moderate the influence of health information with descriptive vs. with descriptive and injunctive norms on the acceptance of menstrual leave policies?

Thirdly, we address the role of knowledge in mitigating menstrual stigma and fostering support for menstrual leave policies. Given the limited understanding of

endometriosis (Armour et al., 2021), particularly among men (Shah et al., 2010), there exists a significant opportunity to enhance awareness through health education interventions. Past research on stigmas related to mental health (Lopez et al., 2018; Morgan et al., 2018), HIV (Yang et al., 2006), and HPV (Waller et al., 2007) underscores the pivotal role of knowledge in diminishing stigma and its consequences (e.g. acceptance of menstrual leave policies). We posit the following hypotheses:

H4: Social norm interventions on endometriosis increase the knowledge of the disorder compared to a control group.

H5: Women show a greater knowledge of endometriosis than men.

H6: Social norm interventions on endometriosis will (a) reduce menstrual stigma and (b) promote policy acceptance through knowledge.

Method

Sampling procedures

Before the data was collected, the study was preregistered (https://osf.io/tdfaz/?view_only=9fcb6935da21492387a021064b3ffa6e) and approved by the IRB of the University of Vienna (ID 20220804_040). Participants were recruited in September 2022 *via* the online panel provider *bilendi*.[2] The study collection took place in Germany. Participants were assigned to quota representative sampling by biological sex (female *vs.* male) and educational level (low *vs.* high). The focus was on 16- to 35-year-olds since endometriosis typically emerges during this age span. Because we were interested in the knowledge and perceptions of people not affected by endometriosis and did not want to risk additional confounding effects by cohorts, we apply this age range for both women and men. If participants did not match the criteria or quotas indicated that already enough participants with a characteristic, e.g. higher education, took part, participants were screened-out after the introduction page. Each participant received 1.40€ for completing the survey.

Sample

An *a-priori* power analysis revealed an estimated sample size of $N = 566$ to be suitable for the planned analysis ($f = 0.15$, power = 0.95; *g*Power*, version 3.1.9.6 for macOS; Faul et al., 2007). We decided to oversample for further analyses with diagnosed endometriosis patients (analyses are not part of this paper). In the end, we reached $N = 859$ participants. For this study, we excluded all participants who indicated that they had trouble seeing the stimulus material clearly ($n = 33$) as well as participants with endometriosis diagnosis ($n = 30$). We excluded the latter because it is highly likely that (1) they have been exposed to plenty of information before and (2) they hold experiential knowledge that makes them unsuitable for the experimental questions in this study.

After data cleansing, the sample size was $N = 796$. Participants were on average 26.8 years old ($SD = 5.8$), and 50.3% were female ($n = 400$). 49.0% showed a lower level

of education (without university qualification, $n = 390$). 52.2% of participants ($n = 415$) indicated having heard of endometriosis. The awareness among women was 73.3% ($n = 293$) and 30.9% ($n = 122$) among men, respectively. Within the female sample, 93.2% regularly experienced menstrual pain ($n = 368$), whereby 15.8% ($n = 58$) indicated that pain medication does not provide any relief.

Experimental design

To test our assumptions, we conducted an online experiment with a 3×2 design with the following factors: *social norm message* (descriptive norm message *vs.* descriptive plus injunctive norm message *vs.* control group) × *participants' biological sex* (female *vs.* male).

A health information brochure about endometriosis (adapted from an official brochure of the *Endometriose-Vereinigung Deutschland e.V.*, an NGO informing about endometriosis in Germany) served as the stimulus for both experimental groups. The manipulation of social norms was adapted from Dong et al. (2022). The stimulus with descriptive norm messages contained information about the prevalence of endometriosis. The messages with descriptive and injunctive norms further offered three behavioral recommendations (message overview: Table 1). Regarding the control group, we decided on a health information brochure that should be similar to the endometriosis leaflet in length and complexity, and should cover a gynecological topic as well. A health information flyer about HPV vaccination served as the stimulus in the control group. The experimental groups did not differ significantly in their distribution of sociodemographic variables (i.e. age, educational status). We asked about participants' biological sex (male, female, divers) on the sociodemographic information page at the beginning of the questionnaire. The stimulus material as well as a flowchart diagram that depicts the step-by-step implementation of the design and measures can be found on OSF (https://osf.io/dvztx/?view_only=721132a18620454da0783571a2cced80).

Procedure

After giving informed consent, participants were randomly assigned to one of three conditions. In all conditions, participants were asked to carefully read a health information. Each page of the stimulus was displayed on separate web pages. To ensure that participants do not skip the informational leaflet pages, the Continue-button appeared 10 s after they entered each page. Afterward, the dependent measures and control variables were assessed.

Measures

The full operationalization can be found in Supplement S1 (https://osf.io/dvztx/?view_only=721132a18620454da0783571a2cced80).

Table 1. Overview of social norm messages (stimulus translation).

Descriptive norm message	Descriptive + injunctive norm message
Endometriosis is not a matter of age: Adolescents can experience symptoms of the disease from their first menstruation. According to estimates by experts, around 8–15% of all women between puberty and menopause develop endometriosis. That is about 2 million people in Germany. […] Unfortunately, endometriosis is often detected very late. Due to poor information about the disease, an average of 6 years pass in Germany between the onset of symptoms and the final diagnosis.	Endometriosis is not a matter of age: Adolescents can experience symptoms of the disease from their first menstruation. According to estimates by experts, around 8–15% of all women between puberty and menopause develop endometriosis. That is about 2 million people in Germany. […] Unfortunately, endometriosis is often detected very late. Due to poor information about the disease, an average of 6 years pass in Germany between the onset of symptoms and the final diagnosis. […] Let's talk about period pain! People with endometriosis often feel alone and misunderstood. Regardless of whether you are affected by endometriosis yourself or not—by following a few simple principles, you can contribute to a non-judgmental, informed atmosphere! • Menstruation isn't a taboo! By talking about your pain or giving a sympathetic ear to others, you help to normalize communication about menstruation. • Severe menstrual pain isn't normal! Be aware: Severe period pain should not be taken lightly. In this case, seeking medical advice is the best option. • Take menstrual pain seriously! If you or your partner are experiencing severe period pain or other endometriosis symptoms, take these signals seriously and do not ignore your or her needs!

Dependent variables

Endometriosis knowledge: Participants' knowledge was measured with nine questions. These include a correct definition, incidence, symptoms, consequences, diagnosis, symptoms, and treatment options. All items were designed as a single choice with one correct answer and three noises (e.g. 'What is the most common symptom?' [*] 'severe pain during menstruation', [] 'increased estrogen level', [] 'photosensitivity', [] 'joint pain'). Correct answers were summed up to form a knowledge score (0 = 'no correct answers at all', 9 = 'all answers correctly', $M = 5.84$, $SD = 2.44$, Cronbach's $\alpha = 0.78$).

Menstrual stigmatization: We adapted the BATM Scale (beliefs about and attitudes toward menstruation, Marván et al., 2006) to assess menstrual stigma. From the original 45 items in the validation paper, we took those with the highest factor loadings for the three subscales related to stigma (*secrecy, annoyance, disability*). Based on evidence about the public endometriosis discourse (e.g. Metzler et al., 2022), we expanded the scale by two more subscales, covering the dimensions *public discourse* and *weakness/disgust*. Each of the five subscales was measured with two Likert-scaled items (1 = 'do not agree at all', 5 = 'totally agree'). Based on the first Cronbach's alpha analysis ($\alpha = 0.63$), we decided to run an exploratory factor analysis (KMO = .82). Accordingly, items can be summed up to two factors, including the stigma dimensions *concealment* (e.g. 'Menstrual pain should be kept as a secret') and *downplay of symptoms* (e.g. 'Menstrual pain has an impact on women's capacity for daily business.'). The detailed findings of the EFA can be found in Supplement S2. The concealment scale (five items, including secrecy, public discourse, and disgust; $M = 2.17$, $SD = .90$, Cronbach's $\alpha = 0.77$) and the downplay of symptoms scale (five

items, including annoyance, disability, and weakness; $M = 2.07$, $SD = 0.71$, Cronbach's $\alpha = 0.81$) are analyzed separately.

Menstrual leave acceptance: Participants' attitudes toward menstrual leave policies were measured based on the findings of Barnack-Tavlaris et al. (2019). The generated five-point Likert scale consists of ten items (e.g. 'Pain and other symptoms of menstruation make workplace menstrual leave necessary', 1 = 'do not agree at all', 5 = 'totally agree'). The scale demonstrated a good internal consistency (Cronbach's $\alpha = 0.73$; $M = 2.98$, $SD = 0.64$).

Control variables

Sociodemographic variables: We decided to control for educational level (1 = low, 2 = high) and age. Working in healthcare (yes/no) was assumed to be a beneficial factor for knowledge and policy acceptance and a decreasing factor for stigma, therefore, we included this as well.

Analytical approach

Data was analyzed using *R* (version 2022.07.2 Build 576). We used ANCOVAs to determine if knowledge about endometriosis or policy acceptance is different between experimental conditions or sex groups. Divergent from the preregistration, we used two ANCOVAs for the two identified stigma dimensions (i.e. concealment and downplay of symptoms) instead of an overall analysis of stigma. We used age, education level, and working as a healthcare professional as covariates to estimate their effects on the dependent variables. Mediation models (PROCESS Model 4, Hayes, 2017) were used to see if the experimental conditions (when compared to the control group) increased knowledge, which, in turn, may be associated with (a) a decreased concealment stigma, (b) a decreased downplay of symptoms stigma, and (c) an increased policy acceptance.

Results

Results for the stigma subscales are shown in Figure 1, and results for knowledge and policy acceptance are shown in Figure 2 (respective ANCOVA tables can be found in Supplement S3-S7, https://osf.io/dvztx/?view_only=721132a18620454da0783571a2cced80).

Manipulation checks

As part of the knowledge measurement, we asked participants to indicate the endometriosis prevalence in Germany (multiple choice, one correct answer). Chi-square tests revealed that participants in the experimental groups performed significantly better in estimating the endometriosis prevalence compared to the control group, showing that the manipulation of the descriptive norm messages was successful [$\chi^2(2) = 60.19$, $p < .001$; percentage of correct answers in the control group: 20.0%; percentage of correct answers in the descriptive norm group: 49.4%; percentage of correct answers in the descriptive plus injunctive norm group: 47.4%].

To control for the variation of the injunctive norm messages, participants had to indicate if the brochure suggests that 'Talking about menstrual pain is unpleasant'

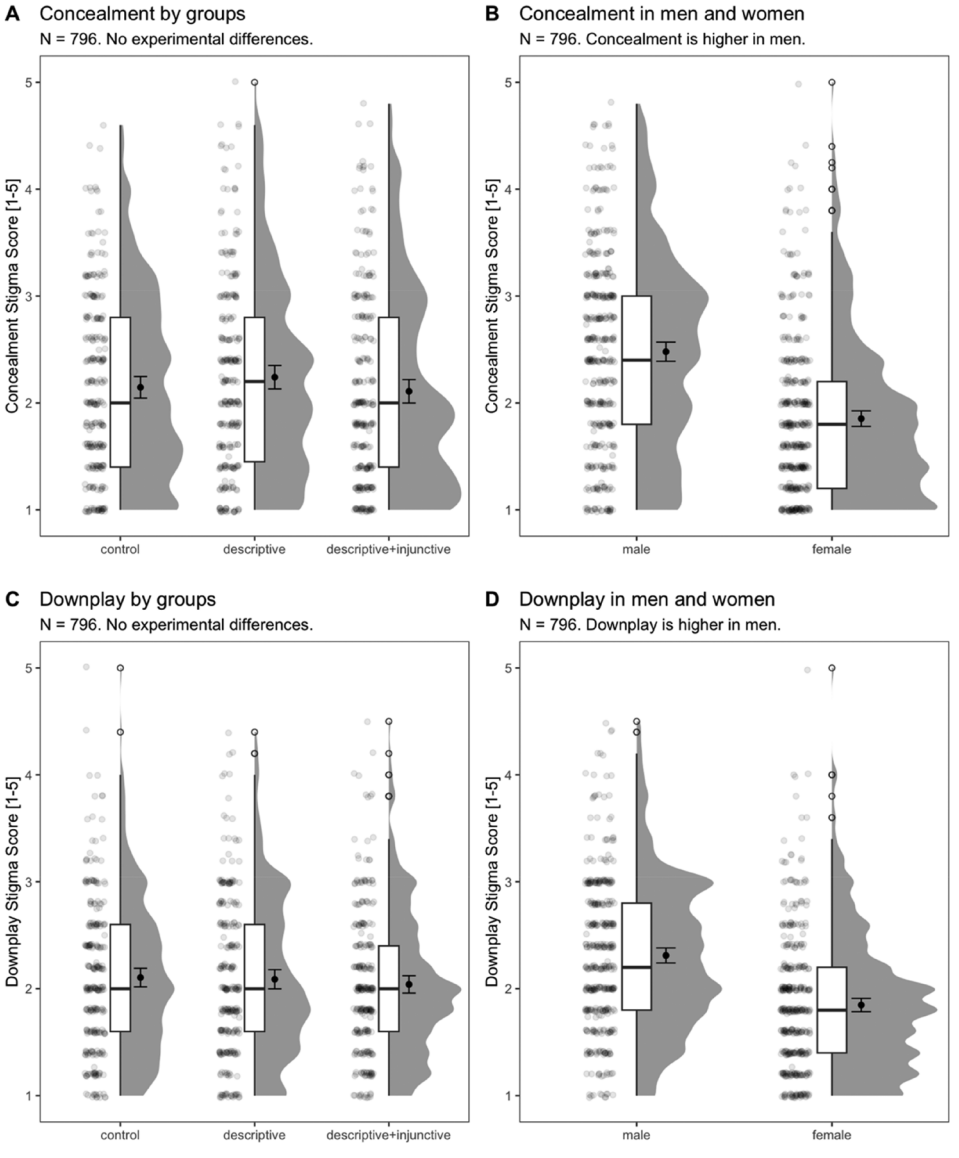

Figure 1. Raincloud-plots including distribution, box plots, and unadjusted means with 95% confidence intervals for hypotheses for both stigma dimensions. *Note*. The means and confidence intervals for stigma scales are shown alongside of boxplots and distributions for all conditions (A,C) and for male and female participants (B,D). Stigma is higher in men (both scales). There is no effect of experimental condition on any of the stigma subscales.

(1 = absolutely not, 5 = absolutely). As intended, the experimental group receiving descriptive plus injunctive norm messages showed less agreement with this statement ($M = 2.12$, $SD = 1.24$) compared to those who received descriptive norm messages alone ($M = 2.37$, $SD = 1.24$), $F(2, 790) = 3.86$, $p < .05$. However, they did not differ to the control group ($M = 2.10$, $SD = 1.18$). Possible explanations for this finding will be discussed later.

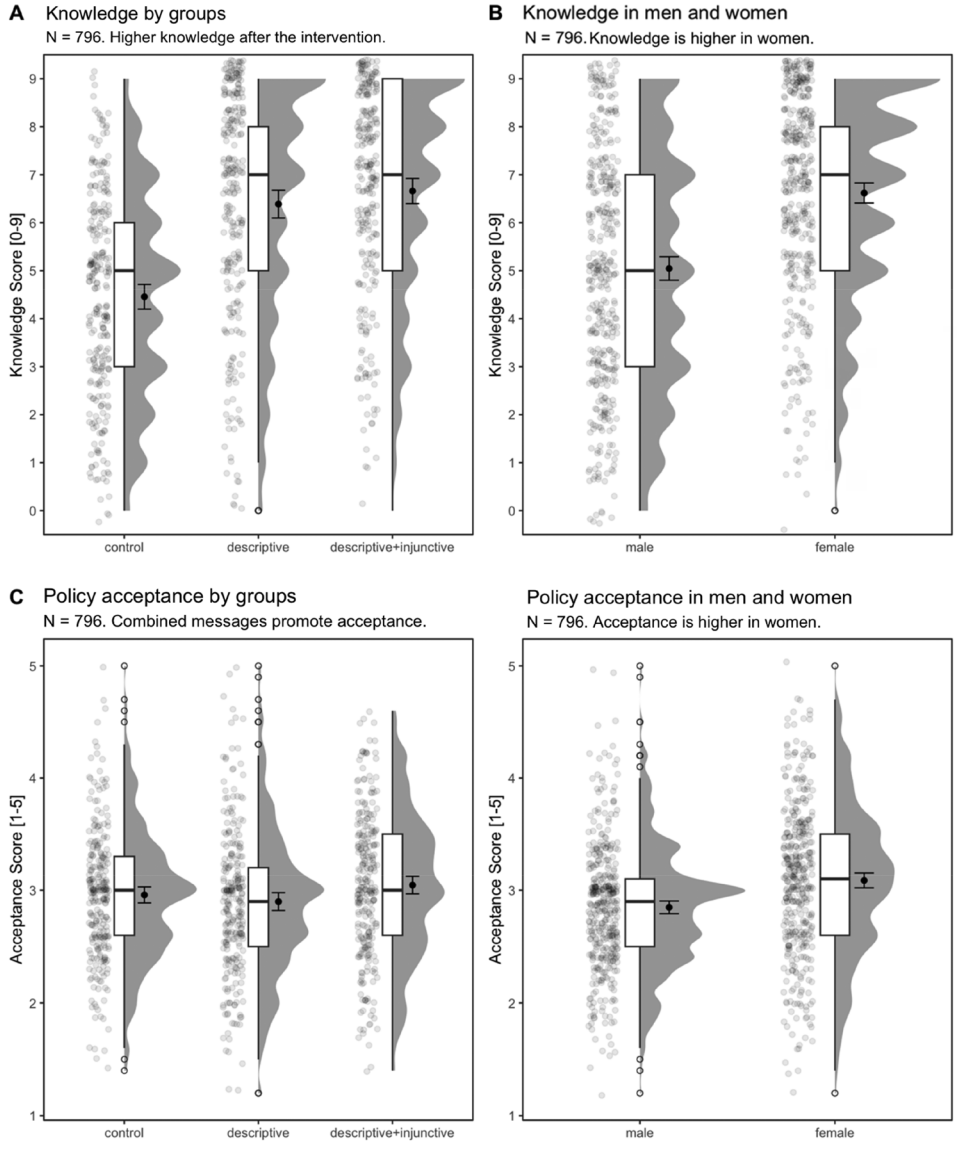

Figure 2. Raincloud-plots including distribution, box plots, and unadjusted means with 95% confidence intervals for pre-registered hypotheses for knowledge and policy acceptance. *Note*. The means and confidence intervals for knowledge and policy acceptance scores are shown alongside of boxplots and distributions for all conditions (A,C) and for male and female participants (B,D).

Effects of social norm messages and gender on stigma (H1, H3a, RQ1)

The stigma hypotheses are partially confirmed. Regarding the effects of gender (H3a), both stigma dimensions were higher in male than female participants [concealment: $F(1, 790) = 112.94$, $p < .01$, $\eta^2 = .13$; downplay of symptoms: $F(1, 788) = 94.64$, $p < .01$, $\eta^2 = .11$]. In contrast, we found neither a main effect of the experimental condition (H1, *ns*) nor an interaction effect with gender (RQ1, *ns*). Repeating the analysis with

control variables did not change the pattern of results. However, for the concealment dimension, higher education [$F(1, 783) = 15.96$, $p < .001$, $\eta^2 = .02$] and lower age [$F(1, 783) = 5.10$, $p = .002$, $\eta^2 < .01$] were related to less concealment. No effects of the covariates occurred for the subscale downplay of symptoms.

Effects of social norm messages and gender on policy acceptance (H2, H3b, RQ2)

As postulated in H3b, women stated higher policy acceptance than men, $F(1, 790) = 29.04$, $p < .001$, $\eta^2 = .04$. Moreover, the experimental condition with combined norm messages led to a higher policy acceptance compared to descriptive norm messages alone (H2), $F(2, 790) = 3.48$, $p < .01$, $\eta^2 < .01$. There was no interaction between group and gender, $F(2, 790) = 1.03$, $p = .36$, $\eta^2 < .01$ (RQ2). The intervention effect did not persist when control variables were included in the model. Of all covariates, only age did have an additional (negative) impact on policy acceptance, $F(1, 783) = 7.56$, $p < .01$, $\eta^2 = .01$.

Effects of social norm messages and gender on knowledge (H4, H5)

As pre-registered, post-hoc tests revealed that both intervention groups resulted in a higher knowledge about endometriosis than the control group, $F(2, 790) = 91.82$, $p < .01$, $\eta^2 = 0.19$, confirming H4. In accordance with our hypothesis 5, women have higher knowledge about endometriosis than men, $F(1, 790) = 120.60$, $p < .01$, $\eta^2 = .13$. Repeating the analysis with control variables did not change the pattern of results. Higher education further explained endometriosis knowledge, $F(1, 783) = 12.58$, $p < .01$, $\eta^2 = .02$.

Indirect intervention effects on stigma and policy acceptance through knowledge (H6)

We were also interested in multivariate relations between educational material, knowledge, and menstrual stigma/policy acceptance. Using mediation analyses, we tested if the interventions (both intervention groups are tested together against the control group) increased knowledge and if this, in turn, was associated with reduced stigmatization (H6a) and increased policy acceptance (H6b). To test these hypotheses, we used PROCESS Model 4 (Hayes, 2017). As independent variable (X) we used the group distinction (1: both interventions *vs.* 0: the control group). As mediator (M) we used the knowledge score. The dependent variables in the three respective models were concealment stigma (Y1), downplay of symptoms stigma (Y2), and policy acceptance (Y3). We are interested in the direct effects of X to Y and X to M, as well as in the indirect effect, explaining the relation between experimental influence on knowledge and its association with stigma and policy acceptance.

Figure 3 shows the results of the mediation analyses. The findings demonstrate that experimental conditions increased knowledge significantly. Moreover, higher

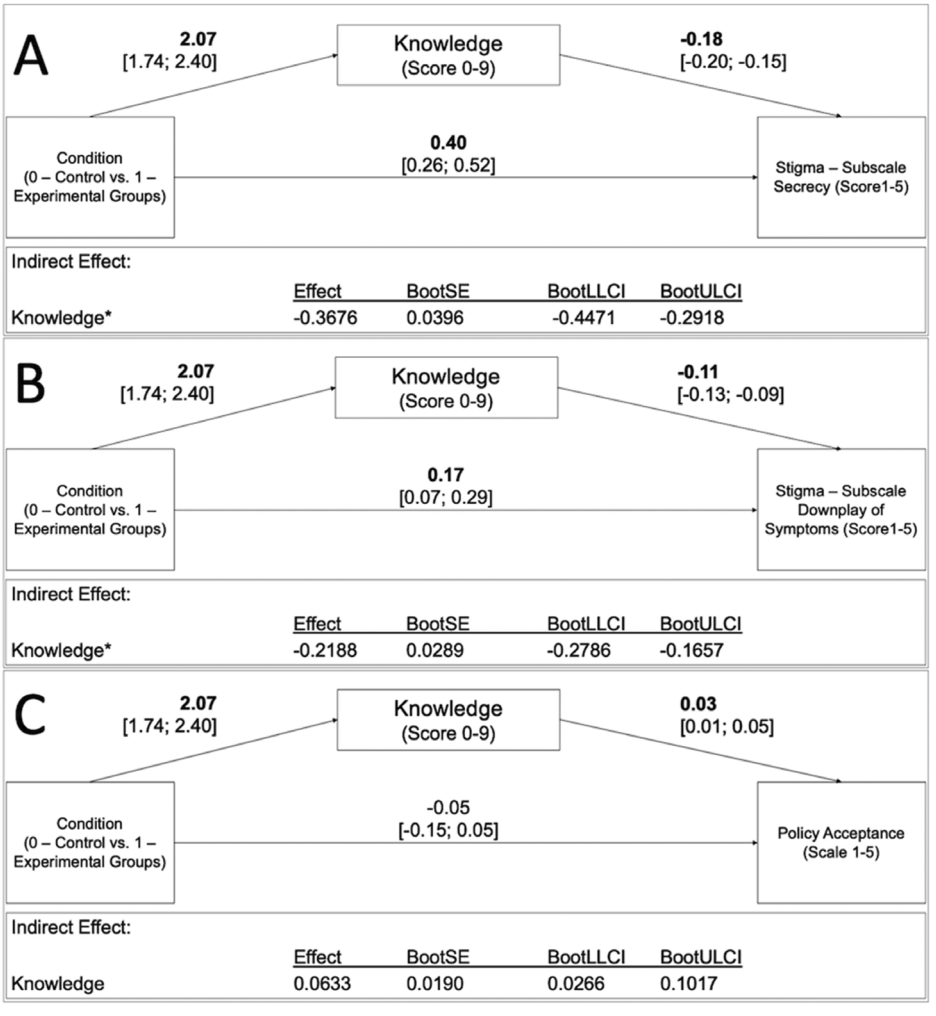

Figure 3. Mediation analyses for menstrual stigma: concealment (A), menstrual stigma: downplay of symptoms (B), and policy acceptance (C). *Note.* $N = 790$.

knowledge was significantly associated with lower stigma (for both dimensions). The indirect effect of the experimental conditions through knowledge of stigmatization is significant, confirming hypothesis 6a. The remaining direct effect on stigmatization is positive. Regarding policy acceptance, higher knowledge about endometriosis was related to greater policy acceptance. In accordance with hypothesis 6b, the indirect effect of the experiment over knowledge on policy acceptance is also significant. Hence, knowledge is an important mediator for both stigma and policy acceptance.

Discussion

This study aimed to explore the potential of an educational social norm interventions to address the societal taboo surrounding menstruation, which poses a significant barrier to women's health in the context of menstrual disorders. Specifically, we

examined the impact of health information brochures containing descriptive norm messages versus brochures containing both descriptive and injunctive norm messages on endometriosis knowledge, menstrual stigma, and policy acceptance among both men and women. Given the high prevalence of endometriosis among women and the low rates of individuals actively seeking help for their menstrual issues, it is crucial to expand our understanding of this topic to develop effective and evidence-based communication strategies that promote women's health.

In our sample, as expected, both dimensions of stigma were higher among men compared to women, highlighting the significant role that men play in perpetuating the communication taboo surrounding menstrual pain and tending to downplay its consequences. Interestingly, contrary to the findings of Dong et al. (2022) on stigma toward vaginal yeast infections, we did not observe any differences between interventions containing descriptive norm messages versus those containing combined social norm messages. This finding can be interpreted in the following ways: Firstly, our stimulus material corrected the descriptive norm pertaining to endometriosis and provided behavioral recommendations for individuals experiencing severe menstrual pain (injunctive norm messages). However, it is possible that menstrual stigma and endometriosis stigma do not entirely overlap, and that correcting social norms specifically related to endometriosis may not be sufficient to address menstrual stigma. Further research is needed to explore how menstrual and endometriosis stigma share similar characteristics or if they each possess unique features that should be considered when measuring the construct. Secondly, the absence of a main effect could also suggest that menstrual stigma is more enduring than stigma associated with other non-menstrual gynecological diseases (Dong et al., 2022). Consequently, reducing menstrual stigma may require more than a single exposure to an educational social norm intervention. Long-term interventions that target the public from an early age (e.g. educational interventions in school settings that focus on adolescents) may prove to be more effective. Thirdly, an alternative interpretation for the lack of differences between interventions containing descriptive norm messages and those containing combined social norm messages could involve the intricacies of social norm perception. Since social norms are complex, multifaceted constructs, they might extend beyond the specific messages provided in our interventions. Moreover, participants' pre-existing beliefs, cultural contexts, and personal experiences might interact with the intervention content, shaping their responses. In this light, the absence of distinct effects could indicate that the impact of social norm interventions on menstrual stigma reduction is influenced by a multitude of factors that extend beyond the scope of the immediate intervention.

We also want to highlight the findings of our manipulation check. While participants who received the combined norm messages showed significantly lower agreement toward the statement 'Talking about menstrual pain is unpleasant' than those who received the descriptive norm messages alone, the combined messages did not differ significantly from the control group. Therefore, even in the absence of a main effect of the experimental conditions on menstrual stigma, this finding suggests that it may be advisable to combine informational material on menstrual pain and endometriosis with an injunctive norm correction. Otherwise, the material may lead to backfire effects, wherein recipients perceive talking about menstrual pain as more

unpleasant after reading the informational material than they would if they had not read the brochure at all. This finding is in line with previous research, demonstrating that by adding an injunctive message potential backfire effects of descriptive norm corrections might be prevented (Ozaki & Nakayachi, 2020; Schultz et al., 2007). Due to the scarcity of studies and the complexity of this topic, further research is warranted investigating in more detail which aspects of menstrual stigma are prone to potential backfire effects of social norm messages, ultimately aiding the development of more refined and effective interventions to improve women's health.

Regarding policy acceptance, we found that women exhibited significantly higher levels of acceptance toward menstrual leave policies compared to men. However, both women and men expressed moderate levels of acceptance, suggesting that the controversy surrounding menstrual leave policies in media portrayals might not entirely align with public attitudes. Analyzing the effects of the experimental conditions, we observed that brochures containing combined social norm messages significantly increased acceptance of menstrual leave policies compared to brochures containing descriptive messages alone. The results highlight the importance of addressing both factual information and behavioral recommendations in awareness campaigns related to endometriosis and menstrual pain. Combining these elements not only enhances individuals' understanding of the seriousness of the condition but also contributes to increased acceptance of menstrual leave policies. This implies that policy initiatives should emphasize the prevalence of endometriosis and its impact on individuals' lives, aiming to reduce stigma and promote a more supportive attitude towards menstrual health. However, it should be noted that the main effect of the social norm message did not persist when control variables were included in the analysis. This outcome accentuates the potential interplay of various factors in shaping policy acceptance, and it is imperative to consider these influences in designing and implementing effective interventions. For instance, the negative effect of age on policy acceptance shows that in endometriosis policy acceptance, older people would be the target for acceptance interventions. This effect is consistent with findings from other health policies, such as parental leave policy perceptions (e.g. Lott & Klenner, 2018).

Correcting social norms regarding this topic has been found to be of great importance in relation to knowledge. In comparison to the control group, both experimental conditions increased endometriosis knowledge, which emerged as a significant mediator in reducing stigma and promoting policy acceptance. Hence, these findings indicate that addressing the descriptive norm toward endometriosis can contribute to changing the social norm surrounding the non-disclosure of menstruation. These insights have valuable implications for campaign design and employment law. Therefore, when disclosing information about menstrual pain and implementing menstrual leave policies, it is crucial to accompany these initiatives with widely disseminated knowledge campaigns, highlighting the prevalence of the disease. The second lesson derived from the mediation analyses is the presence of a positive direct effect between the experimental conditions and stigma. The unexpected positive direct effect suggests the presence of potential additional mediators. This presents an avenue for future research to delve deeper into understanding these mediating factors and their role in shaping attitudes. Identifying and addressing these factors could enhance

the effectiveness of interventions aimed at reducing stigma and promoting policy acceptance.

When examining knowledge more closely, our study revealed significantly higher levels of endometriosis knowledge in women compared to men, highlighting the importance of educating men on this topic as well. Given the notable gender differences observed in menstrual stigma and policy acceptance, the findings from the mediation analysis hold particular relevance for male recipients. By engaging in educational efforts that aim to change the social norm toward menstruation, men can become advocates for women's health rather than perpetuators of oppressive norms (e.g. by acknowledging that severe menstrual pain is not normal or natural, thus challenging prevailing social norms surrounding menstruation; Krebs & Schoenbauer, 2020). This finding is also significant in the context of the non-existent interaction effects between social norm messages and gender: Despite the higher levels of menstrual stigma and lower policy acceptance observed in men compared to women in our sample, we did not observe any backfire effects when implementing social norm corrections for male participants. This highlights the need for educational initiatives that engage both men and women in discussions about menstruation and its implications.

When looking at the covariates, working in health care is not a significant predictor of the observed dependent variables. We conclude that endometriosis is not a salient diagnosis across all medical fields, even though patients have a higher risk for over 20 different comorbidities (Surrey et al., 2018). Endometriosis awareness should be increased even in the health care system to increase understanding for burdened patients.

The results have to be interpreted under the following limitations. First, the data was collected online. While this approach offers several advantages, such as convenience and reach, it is important to acknowledge its limitations. Online surveys may introduce a bias in the sample, as they might not capture the perspectives of individuals who have limited access to the internet or who are not comfortable with digital platforms. Additionally, respondents might be more likely to participate if they have a higher level of interest or knowledge about the subject, which could introduce a selection bias. Therefore, the findings should be interpreted considering these limitations, recognizing that the sample might not be fully representative of the entire target population (Ball, 2019). However, the fact that we collected data from a young sample and we used a panel provider that is not restricted to health behavior research leads us to assume that the error might not be extensive.

Second, we decided to stratify the sample to ensure that different groups were equally represented. Hence, it is essential to acknowledge that this deliberate stratification might not perfectly reflect the broader German population aged 16–35 years. However, as we used biological sex as quasi-experimental factor, we were interested in an equal representation of male and female participants. Moreover, we decided to stratify by educational level since it strongly correlates with health literacy, which is a central construct affecting health-related knowledge and attitudes (Van Der Heide et al., 2013).

Third, the focus on menstruation and menstrual-related disorders introduces a layer of sensitivity to the responses provided by participants. Individuals might be inclined

to provide answers that align with social norms and expectations, rather than their true thoughts and attitudes. This social desirability bias could lead to an underestimation of stigmatizing attitudes or an overestimation of socially acceptable perspectives. Although the study mitigated this to some extent by ensuring a high degree of anonymity through the online survey, the potential for this bias to influence the results should still be acknowledged.

Fourth, the study incorporates insights from the social norms literature, which suggests that the source of feedback can impact how it is received and acted upon (Dempsey et al., 2018). Thus, presenting feedback as emanating from an authority figure could lead to changes in behavior and attitudes based on compliance pressure or fear. While the study made efforts to avoid overtly authoritative presentation, there remains a consideration that participants might respond differently to perceived authority. To mitigate this, future research is suggested to explore the use of testimonials or feedback from peers or individuals within the target group. This approach could potentially yield more authentic responses and insights, reducing the potential for undue influence on participants' behaviors and attitudes.

Conclusion

Millions of women suffer from severe menstrual pain due to menstrual disorders like endometriosis. However, there is a significant delay in reaching a diagnosis, primarily caused by a lack of knowledge and the stigma associated with menstruation and menstrual pain. Our article sheds light on the potential and limitations of educational interventions that target social norms. From our research, we have identified three key findings. Firstly, endometriosis awareness and knowledge in Germany, particularly among men, remain insufficiently low. Secondly, menstrual stigma is a complex and deeply ingrained construct that is hard to directly address through norm correction messages on endometriosis solely. However, by providing educational material containing social norm corrections, interventions can enhance endometriosis knowledge, leading to reduced menstrual stigma and increased acceptance of menstrual leave policies. Thirdly, it is essential to address not only women but especially men through social norm interventions, as they exhibit lower levels of knowledge and higher levels of menstrual stigma. Despite being underrepresented in communication studies, we argue that studying the promotion of women's health within the context of menstruation from a communication perspective is vital for the development of effective, evidence-based health campaigns. Such campaigns can contribute to breaking the menstrual-related communication taboo that negatively impacts women worldwide.

Author note

Preregistration: https://osf.io/tdfaz/?view_only=9fcb6935da21492387a021064b3ffa6e

Open data/Open material: https://osf.io/dvztx/?view_only=721132a18620454da0783571a2cced80

Notes

1. Reflecting literature on this topic, this paper focuses on young people who menstruate and identify as girls/women. However, we are aware that the diagnosis might be even more difficult for non-woman gender identities (e.g. trans men) due to transphobic norms in medicine (Krebs & Schoenbauer, 2020; Nadal et al., 2012) and we clearly acknowledge that not every menstruating person identifies as female.
2. Bilendi is a European panel provider that is recruiting *via* online and telephone advertisement. During the time of the study, the German panel includes ~300,000 possible participants. Based on the inclusion criteria, possible participants were invited *via* mail.

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Data availability statement

Data, R codes, stimulus materials, and supplemental materials are online accessible *via* OSF (https://osf.io/dvztx/?view_only=721132a18620454da0783571a2cced80).

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