

WEB APPENDIX

The Pitfalls of Personalization: Understanding Consumer Responses to Online

Embarrassing Recommendations

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WebAppendix A. Pilot Study 1

Pilot Study 1 was preregistered to investigate whether consumers encounter embarrassing recommendations in everyday digital environments and how they evaluate them, using a cross-cultural design spanning seven countries to ensure broader generalizability.

A1. Method

A total of 1,999 participants (56% female; $M_{age} = 36.63$, $SD_{age} = 12.42$) completed an online survey across seven countries: Australia, Canada, China, Germany, South Africa, the United Kingdom, and the United States. Sample sizes varied by country due to participant pool availability (see Table A1). Participants were first asked whether they had ever received embarrassing recommendations. Those who responded affirmatively were invited to list up to three sources of such recommendations and then rate their evaluations “How much did you like to see such recommendations? (1 = dislike a lot, 7 = like a lot; reverse-coded)”.

Table A1. Demographic Information and Preregistration Links by Country (in Alphabetic Order of the Seven Countries, Pilot Study 1)

Countries	Demographic information	Preregistration links
Australia (N=100)	46% female; $M_{age} = 39.90$, $SD_{age} = 13.51$	https://aspredicted.org/v9jx-dz8p.pdf
Canada (N=100)	53% female; $M_{age} = 36.48$, $SD_{age} = 13.69$	https://aspredicted.org/4zx7-8qpv.pdf
China (N=500)	65.4% female; $M_{age} = 31.38$, $SD_{age} = 8.34$	https://aspredicted.org/jyt7-ncj3.pdf
Germany (N=100)	29% female; $M_{age} = 33.27$, $SD_{age} = 9.89$	https://aspredicted.org/n5cy-fntr.pdf
South Africa (N=199)	70.9% female; $M_{age} = 31.28$, $SD_{age} = 9.16$	https://aspredicted.org/sxvf-bfx6.pdf
UK (N=500)	47% female; $M_{age} = 40.54$, $SD_{age} = 13.25$	https://aspredicted.org/jwyt-nx65.pdf
US (N=500)	57.6% female; $M_{age} = 40.16$, $SD_{age} = 13.22$	https://aspredicted.org/zcdm-mbnk.pdf

A2. Results and Discussion

Overall, 72.9% of participants reported having received embarrassing recommendations, validating their prevalence across digital platforms. A one-sample t-test showed that participants generally showed negative evaluation to these recommendations ($M_{embarrassing} = 5.67$, $SD = 1.25$; $t(1456) = 51.06$, $p < 0.001$ compared with 4 on a 7-point scale). The results were consistent across all seven countries (Table A2).

Among the platforms listed as sources of embarrassing recommendations, 48.1% of such recommendations were from social media, 21.8% from shopping platforms, 10.2% from search engines, 9.2% from online streaming sites, 2.4% from information/knowledge-sharing platforms, and the remaining from other sources (see Table A3).

Together, these findings demonstrate that embarrassing recommendations are common across platforms and cultures and are generally evaluated negatively.

Table A2. Percentage of Participants Receiving Embarrassing Recommendations and Evaluation (in Alphabetic Order of the Seven Countries, Pilot Study 1)

Countries	Australia (N=100)	Canada (N=100)	China (N=500)	Germany (N=100)	South Africa (N=199)	UK (N=500)	US (N=500)	Overall (N=1999)
Percentage of participants who have received embarrassing recommendations	62 (62%)	69 (69%)	487 (97.4%)	64 (64%)	155 (77.9%)	286 (57.2%)	334 (66.8%)	1457 (72.9%)
Negative evaluation	5.60***	5.78***	5.82***	5.83***	5.40***	5.56***	5.65***	5.67***

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table A3. Sources of Embarrassing Recommendations by Country (in Alphabetic Order of the Seven Countries, Pilot Study 1)

Countries	Categorization of platforms	Percentage
Australia	Social media	51.6%
	Shopping platforms	14.0%
	Search engines	11.8%
	Online streaming platforms	8.1%
	Information sharing platforms	3.8%
	Others	10.7%
Canada	Social media	52.2%
	Shopping platforms	10.1%
	Search engines	10.6%
	Online streaming platforms	15.5%
	Information sharing platforms	0.5%
	Others	11.1%
China	Social media	45.0%
	Shopping platforms	35.0%
	Search engines	8.6%
	Online streaming platforms	5.5%
	Information sharing platforms	3.0%
	Others	2.9%
Germany	Social media	50.0%
	Shopping platforms	13.5%
	Search engines	10.9%
	Online streaming platforms	13.5%
	Information sharing platforms	3.6%
	Others	8.5%
South Africa	Social media	48.4%
	Shopping platforms	12.5%
	Search engines	12.3%
	Online streaming platforms	14.8%
	Information sharing platforms	2.6%
	Others	9.4%
UK	Social media	48.7%
	Shopping platforms	19.6%
	Search engines	9.1%
	Online streaming platforms	7.9%
	Information sharing platforms	1.6%
	Others	13.1%
US	Social media	50%
	Shopping platforms	14.1%
	Search engines	12.0%
	Online streaming platforms	11.0%
	Information sharing platforms	2.2%
	Others	10.7%

WebAppendix B. Pilot Study 2

Pilot Study 2 investigates whether consumers generally hold the lay belief that online recommendations are generated based on their digital traces. To enhance generalizability, we employ a cross-cultural design spanning three countries.

B1. Method

A total of 152 participants (46.1% female; $M_{age} = 40.14$, $SD_{age} = 12.49$) completed an online survey across three countries: the United States, the United Kingdom, and China. Participants were first informed that people are usually exposed to various types of recommendations across different platforms and were asked to indicate whether they thought these recommendations were generated based on traces they had previously left on the platform (1 = definitely no, 2 = maybe no, 3 = maybe yes, 4 = definitely yes). They were then informed that platforms also provided embarrassing recommendations and were asked to report whether they believed these embarrassing recommendations were generated based on their previous digital traces (1 = definitely no, 2 = maybe no, 3 = maybe yes, 4 = definitely yes).

B2. Results and Discussion

Overall, 97.4% of participants believed that online recommendations are generated based on their traces left on the various platforms, and 80.9% believed that embarrassing recommendations are personalized. The results were consistent across all three countries (Table B1).

Table B1. Demographic Information and Consumers' Lay Belief by Country (Pilot Study 2)

Countries	US (N=52; 48.1% female; $M_{age} = 41.5$, $SD_{age} = 12.31$)	UK (N=50; 32% female; $M_{age} = 46.48$, $SD_{age} = 12.36$)	China (N=50; 58% female; $M_{age} = 32.4$, $SD_{age} = 8.11$)	Overall (N=152)
Recommendations are generated based on individual traces (Participants who choose options "definitely yes" and "maybe yes")	50 (96.2%)	50 (100%)	48 (96%)	148 (97.4%)
p-value (compare with 50%)	< 0.001	N.A.	< 0.001	< 0.001
Embarrassing recommendations are generated based on individual traces (Participants who choose options "definitely yes" and "maybe yes")	47 (90.4%)	39 (78%)	37 (74%)	123 (80.9%)
p-value (compare with 50%)	< 0.001	< 0.001	< 0.001	< 0.001

WebAppendix C. Study 1

C1. Experimental Stimuli for Study 1

Manipulation for recommendation type

Cond1: Embarrassing recommendation condition

Imagine that you have purchased a lubricant through a large e-commerce platform. Your order looks like the one below.

Several days later, while browsing this platform again for other products, you notice on the “Recommended for You” page that the platform recommends lubricants and condoms.

Cond2: Neutral condition

Imagine that you have purchased shampoo through a large e-commerce platform. Your order looks like the one below.

Several days later, while browsing this platform again for other products, you noticed on the “Recommended for You” page that the platform recommends shampoo and conditioner for you.

C2. Replication for Study 1

Study 1 Replication

This study aimed to replicate the central hypothesis that consumers receiving embarrassing recommendations show more negative evaluations and are more likely to disrupt the recommendation algorithm. Embarrassing products generally fall into two categories: intimate items (e.g., condoms) and health-related items (e.g., medications). This study demonstrates that both types of embarrassing recommendations elicit consumer aversion and trigger strategic resistance. Additionally, it retests the driving role of fear of judgment as a key underlying mechanism. Whereas Study 1 asked participants to imagine receiving embarrassing recommendations through an online shopping platform, this study expands the context by asking participants to recall experiences of receiving recommendations across a broader range of platforms. This methodological adjustment enhances the generalizability of the findings.

Method

This study adopted a one-factor, three-level (recommendation type: intimate vs. health-related vs. neutral product) between-subjects design. Three hundred and one participants (48.8% female; $M_{\text{age}} = 39.15$, $SD_{\text{age}} = 13.44$) were recruited via Prolific and received monetary compensation.

Participants were randomly assigned to one of three conditions and asked to recall and describe a specific experience of receiving online recommendations. In the *intimate product* condition, participants recalled an experience in which online platforms recommended sex-related products/information that made them feel embarrassed. In the *health-related product* condition, participants recalled an experience in which online platforms recommended products or information related to personal weaknesses that made them feel embarrassed. In the *neutral product* condition, participants recalled a recent experience in which online platforms recommended products/information (see Table C1 for examples).

Participants then reported their negative evaluation using three items: 1) To what extent were you bothered by such recommendations? (1=not bothered at all, 7=very bothered); 2) How satisfied were you with the recommendations? (1=not satisfied at all, 7=very satisfied; reverse-coded); 3) How did the recommendations affect your attitude towards the platform that offered the recommendation? (1= became much more negative, 7= became much more positive; reverse-coded) ($\alpha = 0.74$).

Participants also reported their desire to disrupt the recommendation algorithm by indicating how likely they would be to search for unrelated products or information to hide the recommendation (1=not likely at all, 7=very likely). In addition, they estimated the time they would be willing to spend disrupting the algorithm: If you could hide the recommendation by spending more time browsing unrelated products/information, how long would you be willing to spend? (0-150min). Finally, they reported their fear of judgment using the same measure as in Study 1 ($\alpha = 0.86$).

Results and Discussion

An ANOVA on negative evaluation found a significant effect ($F(2, 298) = 18.31, p < 0.001, \eta^2_p = 0.109$). As expected, contrast analysis indicated that participants receiving embarrassing (vs. neutral) recommendations reported more negative evaluations ($ps < 0.001$). Another ANOVA on disruption desire also revealed a significant effect ($F(2, 298) = 12.03, p < 0.001, \eta^2_p = 0.075$). Contrast analysis indicated that participants receiving embarrassing (vs. neutral) recommendations showed a stronger desire to disrupt the recommendation algorithm ($ps < 0.001$). Similarly, an ANOVA on estimated time found a significant effect ($F(2, 298) = 4.23, p = 0.015, \eta^2_p = 0.028$). Contrast analysis indicated that participants receiving embarrassing (vs. neutral) recommendations were willing to spend more time browsing unrelated products/information to disrupt the recommendation algorithm ($ps < 0.05$). However, there was no significant differences between the two embarrassing conditions ($ps > 0.1$; see Table C2).

To clarify the underlying mechanism, an ANOVA on fear of judgment found a significant effect ($F(2, 298) = 13.91, p < 0.001, \eta^2_p = 0.085$). Contrast analysis indicated that participants receiving embarrassing (vs. neutral) recommendations reported higher levels of fear of judgment ($ps < 0.01$). A bootstrapping mediation analysis using PROCESS Model 4 (5,000 resamples) with the recommendation type being a multicategorical independent variables revealed that both health-related and intimate embarrassing recommendations increased negative evaluations (health: indirect effect = 0.5269, 95% CI = [0.3268, 0.7485]; intimate: indirect effect = 0.3353, 95% CI = [0.1348, 0.5561]), strengthened consumers' desires to disrupt the algorithm (health: indirect effect = 0.4495, 95% CI = [0.2340, 0.7005]; intimate: indirect effect = 0.2860, 95% CI = [0.0983, 0.5212]), and increased the time they were willing to spend disrupting the algorithm (health: indirect effect = 3.3646, 95% CI = [1.6746, 5.4160]; intimate: indirect effect = 2.1407, 95% CI = [0.7937, 3.8251]) through the fear of judgment. These findings replicate the effects observed in Study 1 of the main text.

Table C1. Examples of Consumers' Recalled Experience

Condition	Recalled Experience
Neutral	On social media I was recommended a beard grooming kit which showed a video and great customer reviews of the product.
	When buying toys from an online merchant, after the purchase I had a pop-up on the bottom of the screen where they showed several items that are apparently frequently bought together with the items I had purchased by other consumers.
	I was looking through my emails when I saw an ad for a jacket that I was looking to buy the day prior. I see ads all the time so it was nothing out of the ordinary.
	I was on a travel website looking at different areas in the country I wanted to travel to. The website recommended certain brands for hiking and there were waterproof gear.
Health-Related (Embarrassing)	An advert came up on social media advertising thrush cream - I assumed this came up as I had been googling it. This made me feel embarrassed as I find it a personal subject and not something I want to see on my social media page regularly.
	When I watch freevee there is a repeated advert about male incontinence. The advert is absolutely cringing and appears with no warm up. Makes me surprised every time I see it.
	When I bought vitamins online from boots and some hair growth shampoo I was also shown a list of regaine products.
	facial hair remover, I feel embarrassed because its not a medical issue, I feel like medical issues like haemorrhoids etc are given a bit of a pass because you cant help them and theyre medical issues but seeing adverts for facial hair remover is embarrassing because it makes me feel like im the only one suffering with this.
Intimate (Embarrassing)	A daily newspaper that had adverts along the left and right side advertised condoms for me after previously buying them. I felt embarrassed as I didn't know how long it would keep advertising it.
	I keep getting recommended hook-up and escort apps which is very embarrassing. I have a long-term partner and no interest in using such apps. I feel like I can't talk about it - I feel some kind of guilt for these being suggested to me.
	I received an ad hoc message addressed directly to myself advertising a brand of anal lubricant with full implications and benefits for its use in safe gay intercourse. I was embarrassed to think I was somehow touted to be a homosexual.
	I was recommended condoms once when looking for the morning after pill and I felt really embarrassed and shamed that the computer knew this secret information about me.

Table C2. Consumers' Negative Evaluation and Disruption Desire

Dependent Variables	Neutral (<i>N</i> = 100)	Health-Related (Embarrassing) (<i>N</i> = 100)	Intimate (Embarrassing) (<i>N</i> = 101)	<i>p-value</i> (Omnibus Test)	<i>p-value</i> (neutral vs. health-related)	<i>p-value</i> (neutral vs. intimate)	<i>p-value</i> (intimate vs. health-related)
Negative evaluation	3.82	4.90	4.70	<0 .001	< 0.001	< 0.001	0.294
Disruption desire	2.41	3.51	3.63	< 0.001	< 0.001	< 0.001	0.652
Spent time (min)	8.79	17.02	15.02	0.015	0.006	0.035	0.497
Fear of judgment	3.29	4.52	4.08	< 0.001	< 0.001	0.001	0.058

C3. Experimental Stimuli for Replication Study

Manipulation for recommendation type

Cond1: Intimate product recommendation (embarrassing)

In this part, please recall a specific experience in which online platforms (e.g., online merchants, social media, etc.) recommended you sex-related products/information that made you embarrassed, such as condoms and lubricant.

In your own words, please describe your experience in detail and explain why you felt embarrassed.

Cond2: Health-related product recommendation (embarrassing)

In this part, please recall a specific experience in which online platforms (e.g., online merchants, social media, etc.) recommended you self-weakness-related products/information that makes you embarrassed, such as medication for hemorrhoids, incontinence or gas prevention, and anti-odor foot powder.

In your own words, please describe your experience in detail and explain why you felt embarrassed.

Cond3: Neutral product recommendation

In this part, please recall a specific recent experience in which online platforms (e.g., online merchants, social media, etc.) recommended you products/information, such as apparel and sports equipment.

In your own words, please describe your experience in detail.

WebAppendix D. Summary of Measurement Items

Negative evaluation (Studies 1-3)

To what extent are you bothered by these recommendations? (1=not bothered at all, 7=very bothered) (Studies 1-3)

How much do you like to see these recommendations? (1 = dislike a lot, 7 = like a lot; reverse-coded) (Studies 1-3)

Do you find these recommendations helpful or annoying? (1 = very helpful, 7 = very annoying) (Studies 1-2)

How satisfied are you with these recommendations? (1=not satisfied at all, 7=very satisfied; reverse-coded) (Study 3)

Disruption desire (Studies 1-3)

How much do you want to avoid receiving the recommendations shown above? (1 = not at all, 7 = very much) (Studies 1-3)

To avoid the type of recommendations shown above, how motivated are you to search for other products [content, Study 2] to mislead the recommendation algorithm? (1 = not at all, 7 = very much) (Studies 1-3)

Suppose you could avoid the type of recommendations shown above by searching for other products [content, Study 2] to mislead the recommendation algorithm. How much time would you be willing to spend? (1 = no time at all, 7 = a significant amount of time) (Studies 1-2)

How likely are you to search for other products on the shopping platform to overshadow the recommendation shown above? (1 = not likely at all, 7 = very likely) (Study 3)

Fear of judgment (Study 1)

I felt that I was being evaluated by the recommendation algorithm in an undesirable way.

I felt that the recommendation algorithm associated me with a specific type of person.

I felt that the recommendation algorithm was judging me. (1=strongly disagree, 7=strongly agree)

Privacy concern (Study 1)

I am concerned about my information privacy.

I worry about the potential misuse of my personal information.

I pay more attention to my privacy than usual. (1 = strongly disagree, 7 = strongly agree)

Embarrassment perception (Study 1)

How would you feel when receiving the recommendations described above?

(Embarrassed; awkward; uncomfortable)

WebAppendix E. Study 2

E1. Experimental Stimuli for Study 2

Manipulation for the personalization

Cond: High-personalization condition

Imagine that you frequently use a platform to watch videos, and this platform offers multiple methods for providing video recommendations to users.

Now, you are about to watch videos. When you log into your account, you come across some recommendations at the top of the page:

Cond: Low-personalization condition

Imagine that you frequently use a platform to watch videos, and this platform offers multiple methods for providing video recommendations to users. Specifically, on the Trending Page, recommendations are typically less personalized and focus more on showcasing popular content and viral hits that are currently trending across the entire user base, either globally or regionally.

Imagine that Valentine's Day is coming soon. When you log into your account, you come across some recommendations at the top of your Trending Page.

Manipulation for the recommendation type

Cond: Embarrassing recommendation



Bedroom Tips for Couples



Shocking Mistakes That Kill Passion



Timeless Love Songs

Cond: Neutral recommendation



Bedroom Decoration Tips



Shocking Mistakes That Ruin Life



Timeless Love Songs

E2. Post-test for Study 2

This post-test was conducted to examine whether the manipulation of recommendation type in Study 2 was successful.

Method

The post-test adopted a one-factor, two-level (recommendation type: embarrassing vs. neutral) between-subjects design. One hundred US participants (47% female; $M_{\text{age}} = 41.05$, $SD_{\text{age}} = 13.75$) were recruited via Prolific and received monetary compensation.

Participants were randomly assigned to one of two conditions. In both conditions, participants imagined receiving recommendations and reported how embarrassing it would be to receive such recommendations. In the *embarrassing* condition, participants imagined receiving recommendations for intimate videos while watching videos online. In the *neutral* condition, participants imagined receiving recommendations for daily videos while watching videos online.

Results and Discussion

An ANOVA revealed that participants in the embarrassing condition reported stronger feelings of embarrassment than those in the neutral condition ($M_{\text{embarrassing}} = 3.38$, $SD = 2.01$ vs. $M_{\text{neutral}} = 1.96$, $SD = 1.36$; $F(1, 98) = 17.17$, $p < 0.001$, $\eta^2_p = 0.149$). These results indicate that the manipulation in Study 2 was successful.

WebAppendix F. Study 3

F1. Experimental Stimuli for Study 3

Manipulation for recommendation type and care signaling cue

Cond1: Embarrassing – Personalization without care

Imagine that you are browsing a shopping platform you frequently use that generates product recommendations based on your previous activity. Today, you notice several condom recommendations labeled “Top Picks for You.”

Cond2: Neutral – Personalization without care

Imagine that you are browsing a shopping platform you frequently use that generates product recommendations based on your previous activity. Today, you notice several baby wipes recommendations labeled “Top Picks for You.”

Cond3: Embarrassing – Personalization with care

Imagine that you are browsing a shopping platform you frequently use that generates product recommendations based on your previous activity. Today, you notice several condom recommendations labeled “Care for Each Other.”

Cond4: Neutral – Personalization with care

Imagine that you are browsing a shopping platform you frequently use that generates product recommendations based on your previous activity. Today, you notice several baby wipes recommendations labeled “Care for Each Other.”

F2. Post-test for Study 3

This post-test was conducted to examine whether the manipulation of recommendation type in Study 3 was successful.

Method

The post-test adopted a one-factor, two-level (recommendation type: embarrassing vs. neutral) between-subjects design. One hundred US participants (52% female; $M_{\text{age}} = 36.06$, $SD_{\text{age}} = 10.98$) were recruited via Prolific and received monetary compensation.

Participants were randomly assigned to one of two conditions. In the embarrassing condition, participants imagined receiving recommendations for condoms, whereas in the neutral condition they imagined receiving recommendations for baby wipes. Participants then rated how they would feel when receiving the recommendations described above as a manipulation check: embarrassed, awkward, uncomfortable ($\alpha = 0.90$).

Results and Discussion

An ANOVA revealed that participants in the embarrassing condition perceived stronger feelings of embarrassment than those in the neutral condition ($M_{\text{embarrassing}} = 2.99$, $SD = 1.59$ vs. $M_{\text{neutral}} = 2.23$, $SD = 1.45$; $F(1, 98) = 6.20$, $p = 0.014$, $\eta^2_p = 0.060$). These results indicate that the manipulation in Study 3 was successful.