Public attitudes towards algorithmic personalization and use of personal data online: Evidence from Germany, Great Britain, and the US

Anastasia Kozyreva[a,1,2], Philipp Lorenz-Spreen[a], Ralph Hertwig[a], Stephan Lewandowsky[b,c], and Stefan M. Herzog[a,1]

[a]Center for Adaptive Rationality, Max Planck Institute for Human Development; [b]School of Psychological Science, University of Bristol; [c]University of Western Australia

Despite their ubiquity online, personalization algorithms and the associated large-scale collection of personal data have largely escaped public scrutiny. Yet policy makers who wish to introduce regulations that respect people's attitudes towards privacy and algorithmic personalization on the Internet would greatly benefit from knowing how people perceive different aspects of personalization and data collection. To contribute to an empirical foundation for this knowledge, we surveyed public attitudes using representative online samples in Germany, Great Britain, and the United States on key aspects of algorithmic personalization and on people's data privacy concerns and behavior. Our findings show that people object to the collection and use of sensitive personal information and to the personalization of political campaigning and, in Germany and Great Britain, to the personalization of news sources. Encouragingly, attitudes are independent of political preferences: People across the political spectrum share the same concerns about their data privacy and the effects of personalization on news and politics. We also found that people are more accepting of personalized services than of the collection of personal data and information currently collected for these services. This acceptability gap—the difference between the acceptability of personalized online services and the acceptability of the collection and use of data and information—in people's attitudes can be observed at both the aggregate and the individual level. Our findings suggest a need for transparent algorithmic personalization that respects people's data privacy, can be easily adjusted, and does not extend to political advertising.

algorithms | personalization | data privacy | artificial intelligence | public attitudes

The online experience of billions of people is shaped by machine-learning algorithms and other types of artificial intelligence (AI) technologies. These self-learning programs include a variety of algorithmic tools that harvest and process people's personal data in order to customize and mediate information online, in, for example, personalized social media feeds, targeted advertising, recommender systems, and algorithmic filtering in search engines (for more examples see Table S1 in the SI Appendix). Although many personalized services might be innocuous (e.g., music or movie suggestions), others pose challenges to the existence of a transparent and open "marketplace of ideas" and ultimately, to a collectively shared reality (1). For instance, there is substantial concern that personalized political messages containing false claims influenced both the U.S. presidential election and the Brexit referendum in 2016 (2, 3). Algorithms can amplify conspiracy theories, false or misleading information, and extremist content, which in turn contribute to radicalization, the

rise of political extremism (4–7), and growing distrust in the media (8). Further concerns relate to data privacy and transparency: People's data are at the heart of the online ecosystem, where service providers monetize behavioral traces collected directly or by third-party trackers (9). This widespread collection of behavioral data permits AI algorithms to infer more information than people intend to share (e.g., information on sexual orientation, personality traits, and political views; 10–14). But how aware are people of these processes? And how acceptable do they find the way their personal information is used for the purpose of personalization?

Investigating these questions has become particularly urgent with the growing number of Internet users who rely on either social media or search engines to find and access political news (8). Social media news feeds (e.g., on Facebook), video suggestions (e.g., on YouTube), and online advertising (on most platforms) have become highly personalized environments governed by nontransparent algorithms, and users have little control over how the information they see is curated. To date, and despite the importance of digital news environments for public discourse and political opinion, there has been little public involvement in monitoring and shaping the design of algorithms and the collection of data used for personalization. Our goal is to contribute to a better understanding of people's attitudes towards various aspects of online personalization. An awareness of these attitudes is crucial for regulatory interventions or guidelines, as well as for platforms' efforts to self-regulate in a way that respects people's preferences, concerns, and values.

Previous studies in the US and the UK have shown that attitudes towards personalization are context dependent: Attitudes are generally more positive towards commercial applications than towards personalized political information (15, 16). People in the US and Europe feel they have little control over their personal data, and they have general concerns about their digital privacy (17, 18). Yet although people profess to care a great deal about their data privacy, their actual behavior does not necessarily reflect this concern. The inconsistency between people's privacy attitudes and privacy behaviors has been coined the "privacy paradox" [e.g., (19, 20); reviews: (21, 22); but see (23) and meta-analysis by (24)]. For example, even people with high privacy concerns do not display adequate privacy-protecting behavior (e.g., limiting profile visibility on social networks or controlling privacy settings on online platforms), although there is a modest positive relation between high

privacy concerns and behavior (24).

Attitudes towards privacy are not homogeneous: They may vary across different types of personalized services and across different types of personal data and information that make personalized services possible. Most studies have looked separately at either attitudes towards personalized services or attitudes towards data privacy. However, personal data is essential for personalized services, and so attitudes on data collection have implications for personalization, and possibly vice versa. We therefore contrasted people's attitudes towards different aspects of personalization, including services and collection of data and information, in order to draw a more comprehensive picture of people's attitudes and the extent to which they cohere or conflict with each other. We included questions about the acceptability of personalization in various kinds of digital services and of collecting and processing people's data for the purpose of personalization (see (13) for a systematic review of demographic characteristics that can be inferred from people's digital footprints).

In an online survey (using representative quota sampling) in three countries (Germany, $N = 1,065$; Great Britain, $N = 1,092$; United States, $N = 1,059$), we inquired into three main aspects of public attitudes and behavior: (1) people's awareness of the use of AI algorithms in online environments; (2) people's attitudes towards three key components of algorithmic personalization online: personalized services (e.g., recommendations for music and movies, political campaigning), personal data collected online and used for personalization (e.g., location history, likes and shares on social media), and personal information that can be provided by users directly or inferred from data (e.g., age, gender, political leaning, sexual orientation); and (3) people's concerns about the use of their personal data and how they protect their own personal information. We also investigated the extent to which people's attitudes and concerns are moderated by political leaning and demographic characteristics.

Results

Public awareness of AI technologies online. Respondents were partially familiar with AI-related concepts and key entities: They knew that algorithms are employed online, and that algorithms are used to curate social media feeds (see Figure S1 in the SI Appendix). For example, in all three countries, the majority of participants were familiar with the term "artificial intelligence" (GER:

86%; GB: 74%; US: 67%) and, more specifically, with targeted/personalized advertising (GER: 70%; GB: 58%; US: 50%). However, significantly fewer participants were familiar with recommender systems (GER: 34%; GB: 12%; US: 12%) and machine learning (GER: 42%; GB: 31%; US: 33%). Respondents were also aware that AI algorithms are employed in smart assistants such as Siri or Alexa (GER: 70%; GB: 66%; US: 63%), search engine results ranking (GER: 59%; GB: 52%; US: 48%), and advertising on social media (GER: 57%; GB: 56%; US: 55%). They were less aware of AI used to recommend partners on dating websites (GER: 38%; GB: 41%; US: 40%) or curate social media news feeds (GER: 44%; GB: 43%; US: 44%). A clear majority of respondents correctly identified environments with little or no personalization (e.g., Wikipedia or a local restaurant's website).
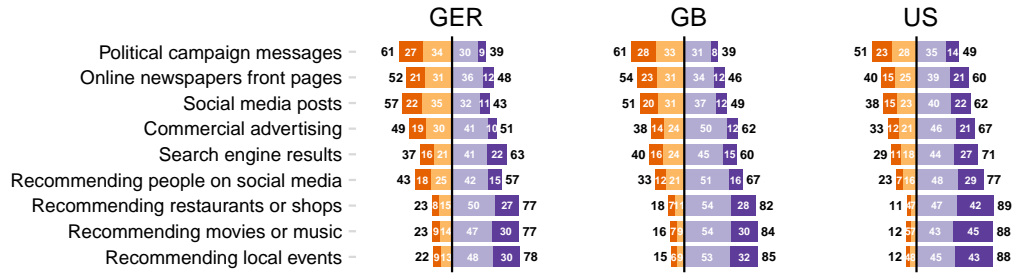
Public attitudes towards personalization and the collection and use of information and data. We found heterogeneity in respondents' attitudes towards three key components of algorithmic personalization online (Figure 1).
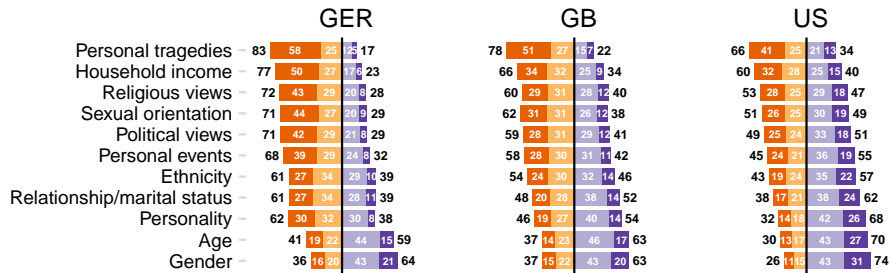
Personalized services: Most respondents in Germany (61%) and Great Britain (61%) and approximately half in the US (51%) said personalized political advertising was unacceptable. Approximately half of respondents in Germany and Great Britain opposed personalized news, including on front pages of online newspapers (GB: 54%; GER: 52%) and in news feeds on social media (GB: 51%; GER: 57%). In contrast, 60% of respondents in the US found personalized online newspapers acceptable and 62% approved of personalized social media news feeds. At the same time, a majority in all three countries approved of personalized recommendations for entertainment (movies or music: GER: 77%; GB: 84%; US: 88%), shopping (GER: 77%; GB: 82%; US: 89%), and search results (GER: 63%; GB: 60%; US: 71%).

Information: A majority of respondents found the collection and use of their personal information unacceptable. They clearly opposed personalization based on sensitive information (e.g., tragic and personal events, household income, sexual orientation, religious or political views). This opposition was highest in Germany and Great Britain; for instance, 71% and 59%, respectively, found it unacceptable to use political views for personalization. Respondents in Germany (71%) and Great Britain (62%) also found the use of information about their sexual orientation unacceptable. In

4

Acceptability of personalizing a service

GER | GB | US

Item	GER	GB	US
Political campaign messages	61 · 27 34 30 9 · 39	61 · 28 33 31 8 · 39	51 · 23 28 35 14 · 49
Online newspapers front pages	52 · 21 31 36 12 · 48	54 · 23 31 34 12 · 46	40 · 15 25 39 21 · 60
Social media posts	57 · 22 35 32 11 · 43	51 · 20 31 37 12 · 49	38 · 15 23 40 22 · 62
Commercial advertising	49 · 19 30 41 10 · 51	38 · 14 24 50 12 · 62	33 · 12 21 46 21 · 67
Search engine results	37 · 16 21 41 22 · 63	40 · 16 24 45 15 · 60	29 · 11 18 44 27 · 71
Recommending people on social media	43 · 18 25 42 15 · 57	33 · 12 21 51 16 · 67	23 · 7 16 48 29 · 77
Recommending restaurants or shops	23 · 8 15 50 27 · 77	18 · 7 11 54 28 · 82	11 · 4 7 47 42 · 89
Recommending movies or music	23 · 9 14 47 30 · 77	16 · 7 9 54 30 · 84	12 · 5 7 43 45 · 88
Recommending local events	22 · 9 13 48 30 · 78	15 · 8 7 53 32 · 85	12 · 4 8 45 43 · 88

Acceptability of using information for personalization

GER | GB | US

Item	GER	GB	US
Personal tragedies	83 · 58 25 12 5 · 17	78 · 51 27 15 7 · 22	66 · 41 25 21 13 · 34
Household income	77 · 50 27 17 6 · 23	66 · 34 32 25 9 · 34	60 · 32 28 25 15 · 40
Religious views	72 · 43 29 20 8 · 28	60 · 29 31 28 12 · 40	53 · 28 25 29 18 · 47
Sexual orientation	71 · 44 27 20 9 · 29	62 · 31 31 26 12 · 38	51 · 26 25 30 19 · 49
Political views	71 · 42 29 21 8 · 29	59 · 28 31 29 12 · 41	49 · 25 24 33 18 · 51
Personal events	68 · 39 29 24 8 · 32	58 · 28 30 31 11 · 42	45 · 24 21 36 19 · 55
Ethnicity	61 · 27 34 29 10 · 39	54 · 24 30 32 14 · 46	43 · 19 24 35 22 · 57
Relationship/marital status	61 · 27 34 28 11 · 39	48 · 20 28 38 14 · 52	38 · 17 21 38 24 · 62
Personality	62 · 30 32 30 8 · 38	46 · 19 27 40 14 · 54	32 · 14 18 42 26 · 68
Age	41 · 19 22 44 15 · 59	37 · 14 23 46 17 · 63	30 · 13 17 43 27 · 70
Gender	36 · 16 20 43 21 · 64	37 · 15 22 43 20 · 63	26 · 11 15 43 31 · 74

Acceptability of collecting and using data

GER | GB | US

Item	GER	GB	US
Emails/online messages content	84 · 69 15 9 6 · 16	81 · 61 20 13 6 · 19	72 · 52 20 15 13 · 28
Interaction with people online	78 · 51 27 16 6 · 22	66 · 35 31 27 7 · 34	60 · 33 27 25 15 · 40
Location history	69 · 41 28 24 7 · 31	57 · 31 26 34 9 · 43	55 · 31 24 30 15 · 45
Browsing and search history	63 · 36 27 29 8 · 37	57 · 28 29 35 8 · 43	52 · 26 26 31 17 · 48
Typing and scrolling behavior	62 · 32 30 30 8 · 38	59 · 28 31 31 10 · 41	51 · 25 26 32 17 · 49
Purchasing history	56 · 28 28 35 9 · 44	53 · 26 27 37 10 · 47	49 · 27 22 34 17 · 51
Videos watched	56 · 29 27 35 9 · 44	48 · 23 25 41 11 · 52	38 · 21 17 40 22 · 62
Likes and shares on social media	57 · 29 28 34 9 · 43	46 · 22 24 43 11 · 54	35 · 17 18 44 21 · 65

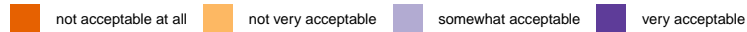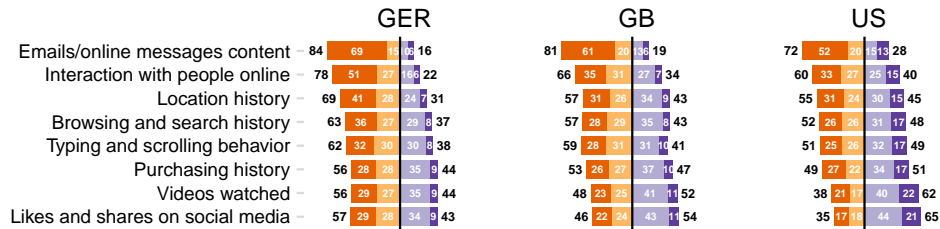Legend: ■ not acceptable at all ■ not very acceptable ■ somewhat acceptable ■ very acceptable

Fig. 1. Public attitudes towards algorithmic personalization online in Germany, Great Britain, and the United States. Percentage of respondents indicating levels of acceptability for personalizing services (top panel), using information for personalization (middle panel), and collecting and using data in online services in general (bottom panel). White numbers show percentages per rating category; black numbers show total percentages for the two sides of the rating scale. Within panels, items are ordered by their average rating pooled across all three countries (in ascending order of acceptability).

the US, approximately half of respondents objected to the use of information about their political views (49%) and sexual orientation (51%), while a majority opposed the use of information about their household income or personal tragedies. Only age and gender were considered acceptable for personalization in all three countries by the majority of respondents. Respondents in the US were more accepting of information such as personal events (55%), their ethnicity (57%), their marital status (62%), and their personality traits (68%) being used for personalization online.

Personal data: In all three countries, most people objected to the collection and use of their personal data, including data related to their online interactions, such as with whom and how often

5

they communicate (GER: 77%; GB: 66%; US: 60%); their location history (GER: 69%; GB: 57%; US: 55%); and their browsing and search history (GER: 63%; GB: 58%; US: 53%). Among the types of data that approximately half of respondents found acceptable were purchasing history (GER: 44%; GB: 47%; US: 51%), videos watched (GER: 44%; GB: 52%; US: 62%), and likes and shares on social media (GER: 43%; GB: 54%; US: 65%).
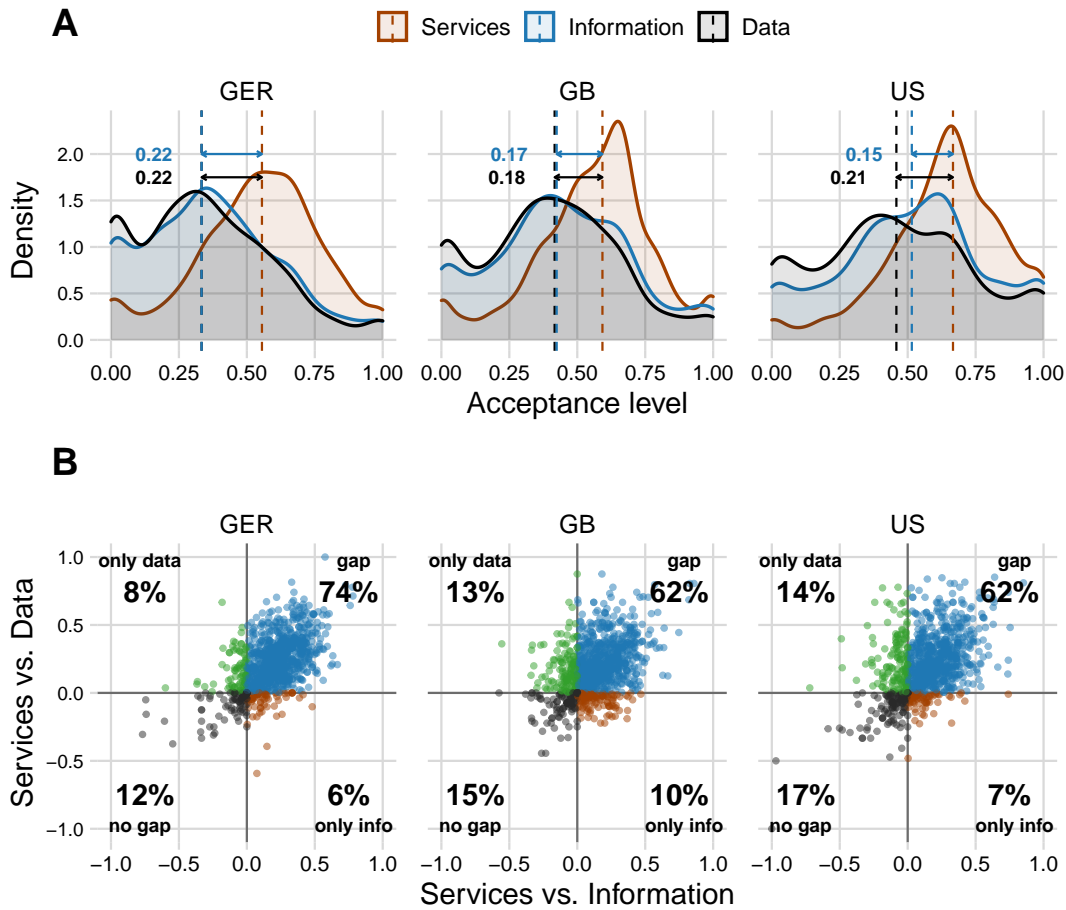

Fig. 2. Acceptability gap between personalized services and information and data used for personalization in Germany, Great Britain, and the United States. A respondent's acceptance level is defined as the arithmetic mean of their ratings (mapped into the [0, 1] range), ranging from 0 (not acceptable at all) to 1 (very acceptable). **(A)** Country subpanels show kernel-smoothed densities of the population distributions of acceptance levels for services, information, and data, respectively. Vertical dashed lines show the median values for each distribution; decimal values indicate how much lower the median value for information and data is compared to the median value for services. **(B)** Respondent-level differences between the acceptability level for services versus information (x-axis) and services versus data (y-axis). Positive values indicate that a respondent rated services as, on average, more acceptable than collecting information (upper half of each subpanel) or data (right half of each subpanel). Bold values show percentages of respondents falling into each of the four quadrants. Respondents in the upper-right quadrants (blue) reported higher acceptability levels for both information and data, whereas respondents in the lower-left quadrants (grey) showed the opposite. Respondents in the upper-left and lower-right quadrants showed an acceptability gap for only data (green) or only information (maroon).

Acceptability gap in attitudes towards personalization. In all three countries a dilemma emerged: Respondents found personalized services (e.g., customized search results, online advertising, entertainment recommendations) more acceptable than the use of personal information and data

(e.g., personal interests or location history), even though this information is currently used for personalized services. This constitutes what we call an acceptability gap, which we define as the difference between how acceptable people find personalized online services (e.g., social media news feeds, video suggestions) and how acceptable they find the collection and use of their personal data and information for such personalization. The gap exists both on the aggregate and individual level (see Figure 2).

On the aggregate level, the acceptability gap refers to the finding that the population medians of respondents' average acceptability rating for services are greater than those for collecting information or data (Figure 2A). Across comparisons and countries, the size of this gap ranges between one sixth and one quarter of the full range of the response scale ("not acceptable at all," "not very acceptable," "somewhat acceptable," "very acceptable"). That is, the size of the gap equalled as much as one step on the four-step rating scale. The gap was most pronounced in Germany (one quarter of the rating scale), and somewhat less pronounced, but still pronounced, for Great Britain (one fifth of the rating scale) and the US (one sixth of the rating scale for information and one fifth for data).

On the individual level, the acceptability gap refers to the finding that a large majority of respondents rated, on average, personalized services as more acceptable than the collection of personal information or data (Figure 2B). Across countries, 84%–89% of respondents showed at least one acceptability gap (for information and/or data). Between 64% and 75% of respondents showed an acceptability gap for both information and data. Only 13%–16% showed no gap. Mirroring the aggregate-level results, the individual-level acceptability gap is somewhat more pronounced in Germany than in Great Britain and the US.

In sum, for all three dimensions of online personalization (services, information, and data), we found that preferences were heterogeneous: Some services and data types were judged acceptable, others not. And services were on average judged more acceptable than information and data.

Data privacy concerns and behavior. People in all three countries reported high levels of concern about their data privacy (Figure 3, top panel): 82% of participants in Germany, 81% in Great Britain, and 82% in the US said they were somewhat or very concerned. Only a small fraction of respondents were not at all concerned (GER: 4%; GB: 4%; US: 6%), indicating that lower concern
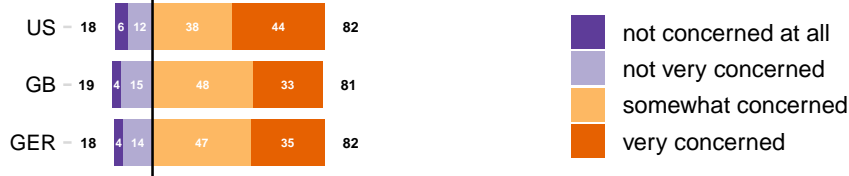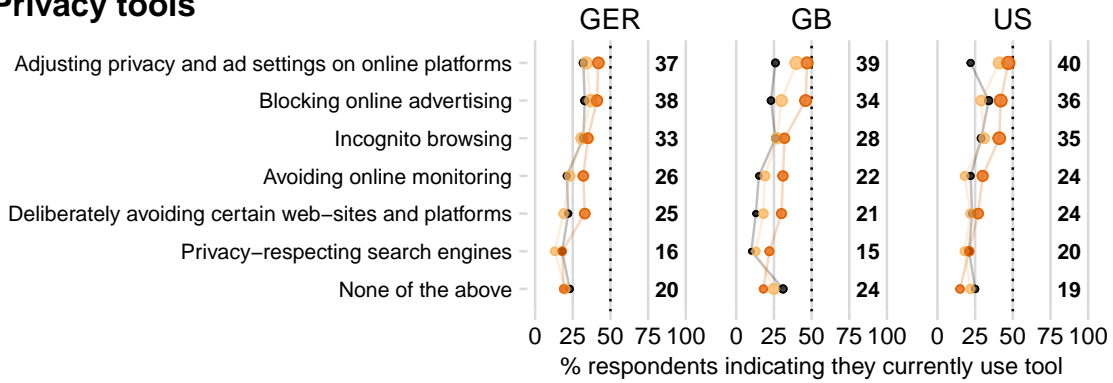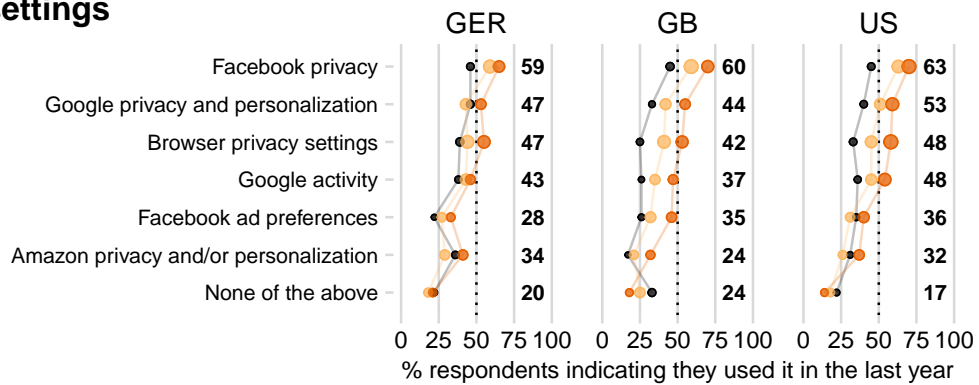
Fig. 3. Privacy concerns and behavior in Germany, Great Britain, and the United States. The top panel shows answers to the question "How concerned are you about your data privacy when using the Internet?" White numbers show percentages per rating category; black numbers show total percentages for the two sides of the rating scale. The middle panel shows the percentage of respondents indicating that they currently use a privacy tool, separately for respondents who indicated that they were not or not very (black), somewhat (orange), or very (red) concerned about their privacy online. The size of the points indicates the number of respondents contributing to a percentage value (see legend at the bottom of the figure); because only very few respondents said they were not concerned at all (see top panel), these respondents and those who said they were not very concerned were pooled into one category. Bold values show the percentage of respondents using a tool, irrespective of their level of concern. Items are ordered by this overall percentage of use, pooled across all three countries (in descending order except for "None of the above," which is always last). The bottom panel shows the percentage of respondents who indicated that within the last year they had checked or adjusted privacy settings (only considering respondents who indicated having used the respective service within the last year).

does not explain the more pronounced laissez-faire attitudes to algorithmic personalization found in the US (see Figures 1 & 2).

Despite the high levels of concern, respondents reported taking few steps to protect their privacy online (Figure 3, middle and bottom panels). Popular measures included changing privacy settings on Facebook (GER: 59%; GB: 60%; US: 63%) and Google (GER: 47%; GB: 44%; US: 53%) and

using ad blockers (GER: 38%; GB: 34%; US: 36%). About 20% of respondents in Germany, 24% in Great Britain, and 17% in the US indicated that they did not use any privacy-protecting tools; for privacy-protecting settings, the results were similar (GER: 20%; GB: 24%; US: 19%). Respondents who were more concerned about privacy were also more likely to change privacy settings and use privacy tools (see Figure 3, middle and bottom panels).
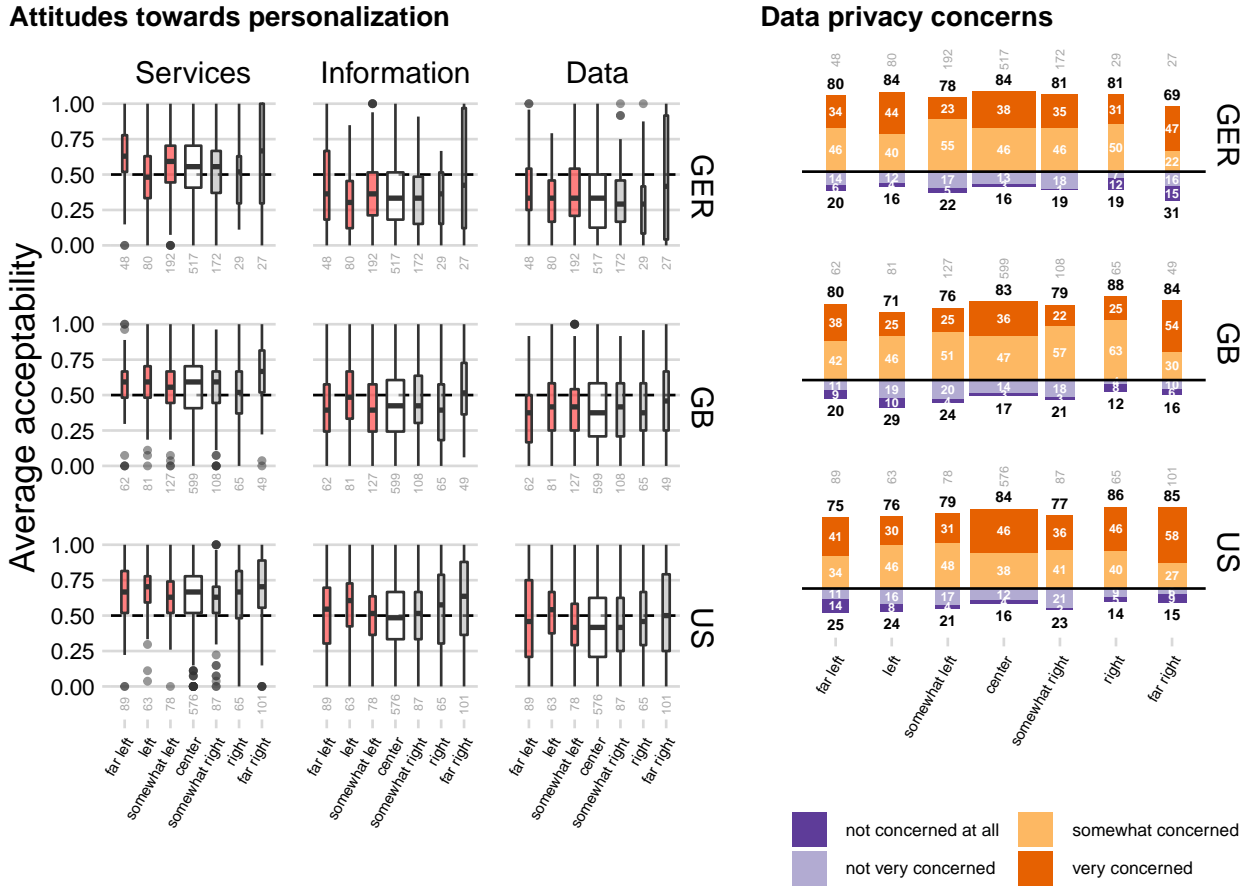

Fig. 4. Political leaning and attitudes towards personalization and data privacy concerns in Germany, Great Britain, and the United States. The left panel shows boxplots of respondents' acceptance level towards services, information, and data (panel columns) broken down by political leaning (x-axis in subpanels) and country (panel rows). A respondent's acceptance level is defined as the arithmetic mean of their ratings (mapped into the [0, 1] range), ranging from 0 (not acceptable at all) to 1 (very acceptable). The width of the boxplots is proportional to the square root of the weighted number of respondents per distribution; these weighted counts are also shown as grey numbers below the x-axis. The right panel shows answers to the question "How concerned are you about your data privacy when using the Internet?" broken down by political leaning (x-axis in subpanels) and country (panel rows). White numbers show percentages per rating category; black numbers show total percentages for the two sides of the rating scale. The width of the stacked bars is proportional to the square root of the weighted number of respondents per distribution; these weighted counts are also shown as grey numbers above the stacked bars.

Role of demographics and political attitudes. With the exception of male respondents in the US, there was a general decline in acceptability of all three aspects of personalization (services, information, data) across age (Figure S2 in SI Appendix). For men in the US, there was an indication of a slight inverted U-shape, where acceptance increased slightly up to age 40 then declined; men

in the US were thus overall slightly more accepting of all three aspects of personalization. No noteworthy gender effects emerged for Germany and Great Britain. Age and gender did not moderate our finding of a lower acceptance of information and data compared to services (see left panel of Figure S2 in SI Appendix). In general, older respondents were more concerned about data privacy than were younger respondents and male respondents were slightly less concerned than were female respondents (see right panel in Figure S2 in SI Appendix). We found no noteworthy associations between personalization attitudes and privacy concerns on the one hand and education or location (urban/rural) on the other hand (see Figure S3 in SI Appendix).

Importantly for public policy makers, we found no political polarization in attitudes towards personalization and privacy in all three countries (Figure 4). Respondents across the political spectrum agreed on the acceptability of personalized services, the use of people's information and data for personalized services, and the collection and use of sensitive information. They were also equally concerned about data privacy.

Discussion

The public perceives clear ethical boundaries in the use of algorithmic personalization online. Although people accept personalized commercialized services (e.g., shopping and entertainment), they object to the use of personal data and sensitive information that is currently collected for personalization. They consistently oppose advertising that is customized based on sensitive information, and find personalization in commercial services more acceptable than in political and informational domains: People in all three countries oppose personalization in political campaigning, and people in Germany and Great Britain also oppose personalized news sources and social media feeds. This is an important finding with potentially far-reaching implications, given that social media feeds and political advertisement, like entertainment recommendations, can be highly personalized. People across the political spectrum are equally concerned about their data privacy and the effects of personalization on news and politics. These consensual attitudes, unusual in the current polarized political environment (especially in the US), raise the hope that policies for protecting online privacy and regulating the personalization of political news and advertising would receive broad support.

10

A clear tendency towards higher acceptability rates for all three categories—services, information, and data—can be observed in the US. Germany lies on the other side of the spectrum, with the lowest acceptability rating. Yet in all three countries, we observed an acceptability gap: Even though most people accept personalized services, they generally oppose the collection and use of the personal, and specifically sensitive, information that personalized services collect. The reasons behind this gap are unclear. One possibility is that people have incommensurable preferences, that is, they value their data privacy but also they value the use of personalized services. In their behavior, people cannot help but to act as if they found a trade-off between the immediate advantages of personalized services and future risks to their data privacy. But when asked for their attitudes, they have the liberty to express the fact that those two goals are to some extent in conflict, causing the emergence of the acceptability gap. Trade-off processes also appear to play a role in for the privacy paradox as has been pointed out in the literature (20, 22). However, it is also possible that the acceptability gap results from a lack of transparency in online services. Specifically, users might not be aware that companies such as Facebook or Google Maps need to collect information about their online behavior in order to customize news feeds or optimize suggestions. If this were the case, the trade-off people make between convenient personalized services and maintaining privacy online might not accurately reflect their preferences, since they may underestimate the extent to which the efficiency of personalized services hinges on data collection. This lack-of-awareness hypothesis is supported by the finding that 74% of Americans did not know that Facebook maintained a list of their interests and traits (25). Further research is needed to reveal the reasons behind the acceptability gap.

Our results did not reveal a mere inconsistency between attitudes (here, privacy concerns) and behavior (here, self-reported use of privacy measures). Instead, people's privacy concerns were moderately related to their privacy-protection behavior. This is consistent with the findings of a meta-analysis by (24), which demonstrated that privacy concerns are associated with the extent to which individuals engage in privacy management, although the magnitude of the association was modest. The positive relation between concerns and behavior could be another indicator that the observed acceptability gap and privacy paradox are rooted in the current online environment, which does not offer users simple tools to keep their data safe and, consequently, does not support

attitude-consistent privacy behavior. If this explanation is correct, then in order for privacy concerns and behavior to match more closely, the data privacy functions of online services should be more accessible, explained in simpler terms, and easy to use. Behavioral interventions (e.g., digital nudging and boosting; see 26, 27) can also be employed to empower users to align their privacy protective measures to their level of privacy concern. New transparency measures could enable people to exercise their preferences in a more nuanced way; this would be an important next step towards regaining autonomy in the online world.

Finally, our results highlight the importance of personalization that respects people's preferences for data privacy and their shared belief that personalization should not extend to political campaigning— or, in Europe, to news sources. To this end, it is important to conceptualize data privacy and its protection in AI-assisted information environments as a public, as well as an individual, right and good (28). Because algorithmic inferences from data collected from users can be harnessed to predict personal information of nonusers ("shadow profiles"; 29), an individual's privacy may be at risk through no fault of their own. Instead, the risk may arise from other users who are unconcerned about their data or were "nudged" by online choice architectures towards privacy-threatening options (30). Protecting user privacy must therefore encompass the privacy protection of citizens as a whole in what is known as a networked privacy model (31)—a challenging but urgent task both for future research and policy making. Understanding people's general attitudes is crucial for defining the goals and values that inform regulations on networked data privacy and algorithmic personalization online.

Materials and Methods

Data collection. Dalia Research conducted the survey for the Max Planck Institute of Human Development in September (GER sample) and November (GB and US samples) 2019. Online samples were obtained in Germany ($N = 1,065$), Great Britain ($N = 1,092$), and the United States ($N = 1,059$), using quota sampling and applying post-stratification weights to account for current population distributions with regard to age (18-65 years), gender, and education. The Institutional Review Board of the Max Planck Institute for Human Development approved the surveys. See Table 1 for demographic information about

Table 1. Demographic information

Country	GER	GB	US
Sample size: n	1065	1092	1059
Age: median (IQR)			
age	43 (31–54)	42 (29–56)	40 (29–51)
Gender: n (%)			
female	530 (50)	550 (50)	532 (50)
male	535 (50)	542 (50)	527 (50)
Education: n (%)			
no	10 (1)	13 (1)	25 (2)
low	182 (17)	279 (26)	52 (5)
medium	647 (61)	523 (48)	671 (63)
high	226 (21)	277 (25)	311 (30)
Urban/rural: n (%)			
urban	737 (69)	646 (59)	662 (62)
rural	328 (31)	446 (41)	397 (38)

Note. IQR: interquartile range.

the three samples (weighted based on post-stratification survey weights; for both weighted and unweighted demographic infromation see Table S2 in the SI Appendix for). Some preliminary results for the German sample, not including the acceptability gap, were made available in a technical report in English and in German.

Study design. The survey was conducted online in German and English. The survey questions covered three topics: Public awareness of the use of AI and personalization algorithms on the Internet, attitudes towards algorithmic personalization, and public attitudes and behavior regarding online privacy. Additionally, we collected information about participants' demographics and political leanings. Below we summarize the gist of the questions in these survey sections; for the full questionnaire in English and in German, see SI Appendix.

(1) *Public awareness of the use of AI and personalization algorithms on the Internet*: For the purposes of the survey, we defined "artificial intelligence (AI) technologies" as self-learning computer programs ("machine learning") that analyze people's personal data in order to customize their online experience. We asked people whether they thought that AI technologies are used in a variety of online situations, including news feeds, advertising on social media, and product recommendations in online shops (see Figure S1 in the SI Appendix for full list).

(2) *Attitudes towards algorithmic personalization*: In order to gain a fuller picture of how acceptable people find algorithmic personalization online, we asked about three key components of personalization: services, information, and data. All three are necessary for a full picture of attitudinal heterogeneity, within

individuals and across individuals. The set of questions for all three dimensions (services, information, and data) represents common personalization practices. To elicit attitudes towards personalizing services, we asked respondents "How acceptable do you think it is for social media and other websites to collect and use data about you and your past online activities to [personalize different online services, e.g., search results or friend suggestions]?" (see Figure 1 and SI Appendix for full list). To elicit attitudes towards information we asked respondents "How acceptable do you think it is for online web platforms to use any of the following information about you to create personalized advertising?" (e.g., gender, age, political views, sexual orientation; see Figure 1 and SI Appendix for full list). To elicit attitudes towards data collection, we asked respondents "How acceptable do you think it is for web services and applications to record and use the following types of information that they collect about you on their platform?" (e.g., browsing and search history, location history, content of e-mails and online messages; see Figure 1 and SI Appendix for full list). Respondents could answer "not acceptable at all," "not very acceptable," "somewhat acceptable," or "very acceptable."

(3) *Public attitudes and behavior regarding online privacy*: To elicit respondents' concerns about their data privacy online, we asked "How concerned are you about your data privacy when using the Internet?" Respondents could answer "not concerned at all," "not very concerned," "somewhat concerned," or "very concerned".

To elicit people's self-reported privacy-protecting behavior online, we asked "Which of the following [privacy settings] have you used in the last year to check and/or adjust what kind of data on you can be used by Internet companies?" (e.g., activity controls on Google) and "Which of the following measures and tools do you currently use to protect your data privacy online?" (e.g., ad blockers, VPN; see Figure 3 and SI Appendix for full lists of settings and tools).

(4) *Demographics and political leanings:* We collected respondents' demographics (age, gender, education level, and location: urban/rural) and political leaning (on a scale ranging from "1 (left-wing)" to "7 (right-wing)"; see Figures S2 and S3 and Table S2 in the SI Appendix for demographic information).

Data analysis. Anonymized data and code are available at Open Science Framework (https://osf.io/7nj8h/). Unless explicitly noted, all numbers and figures reported incorporate post-stratification survey weights provided by Dalia Research (based on age, gender, and education level) to increase the representativeness of the reported results.

For binary responses (or binary categorizations of rating-scale responses), the worst-case margin of error (i.e., the 95% confidence interval of a true proportion of 50%) is $\approx \pm 3$ percentage points for a sample size of $N = 1,000$ and $\approx \pm 10$ percentage points for a sample size of $N = 100$.

Supporting Information (SI). The SI includes additional figures, tables, and the survey questionnaire (in English and German).

References

1. Mazarr MJ, Bauer RM, Casey A, Heintz SA, Matthews LJ (2019) The emerging risk of virtual societal warfare: Social manipulation in a changing information environment, (RAND Corporation), Research report.

2. Persily N (2017) Can democracy survive the internet? *Journal of Democracy* 28:63–76.

3. Digital, Culture, Media and Sport Committee (2019) Disinformation and 'fake news': Final report, (House of Commons, U.K. Parliament), Research report.

4. Kaiser J, Rauchfleisch A (2018) Unite the Right? how YouTube's recommendation algorithm connects the U.S. far-right. Available at: https://medium.com/@MediaManipulation/unite-the-right-how-youtubes-recommendation-algorithm-connects-the-u-s-far-right-9f1387ccfabd [Accessed August 12, 2020].

5. Rauchfleisch A, Kaiser J (2017) YouTubes Algorithmen sorgen dafür, dass AfD-Fans unter sich bleiben. Available at: https://www.vice.com/de/article/59d98n/youtubes-algorithmen-sorgen-dafur-dass-afd-fans-unter-sich-bleiben [Accessed August 12, 2020].

6. Horwitz J, Seetharaman D (2020) Facebook executives shut down efforts to make the site less divisive. Available at: https://www.wsj.com/articles/facebook-knows-it-encourages-division-top-executives-nixed-solutions-11590507499 [Accessed August 12, 2020].

7. Baumann F, Lorenz-Spreen P, Sokolov IM, Starnini M (2020) Modeling echo chambers and polarization dynamics in social networks. *Physical Review Letters* 124(4).

8. Newman N, Fletcher R, Schulz A, Andi S, Nielsen R (2020) Reuters Institute digital news report 2020, (University of Oxford, Reuters Institute for the Study of Journalism), Research report.

9. Zuboff S (2019) *The Age of Surveillance Capitalism.* (Profile Books).

10. Kosinski M, Wang Y, Lakkaraju H, Leskovec J (2016) Mining big data to extract patterns and predict real-life outcomes. *Psychological Methods* 21:493–506.

11. Matz SC, Kosinski M, Nave G, Stillwell DJ (2017) Psychological targeting as an effective approach to digital mass persuasion. *Proceedings of the National Academy of Sciences* 48:12714–12719.

12. Youyou W, Kosinski M, Stillwell D (2015) Computer-based personality judgments are more accurate than those made by humans. *Proceedings of the National Academy of Sciences* 112:1036–1040.

13. Hinds J, Joinson AN (2018) What demographic attributes do our digital footprints reveal? A systematic review. *PLOS ONE* 13:e0207112.

14. Hinds J, Joinson A (2019) Human and computer personality prediction from digital footprints. *Current Directions in Psychological Science* 28:204–211.

15. Pew Research Center (2018, November) Public attitudes toward computer algorithms, (Pew Research Center), Research report.

16. Ipsos Mori (2020, February) Public attitudes towards online targeting - a report by Ipsos MORI for the Centre for Data Ethics and Innovation and Sciencewise, (Ipsos Mori), Research report.

17. Pew Research Center (2019, November) Americans and privacy: Concerned, confused and feeling lack of control over their personal information, (Pew Research Center), Research report.

18. Directorate-General for Communication (2019) Special eurobarometer 487a: The General Data Protection Regulation, (European Commission), Research report.

19. Norberg P, Horne D, Horne D (2007) The privacy paradox: Personal information disclosure intentions versus behaviors. *Journal of Consumer Affairs* 41:100–126.

20. Acquisti A, Brandimarte L, Loewenstein G (2015) Privacy and human behavior in the age of information. *Science* 347:509–514.

21. Kokolakis S (2017) Privacy attitudes and privacy behaviour: A review of current research on the privacy paradox phenomenon. *Computers & Security* 64:122 – 134.

22. Barth S, de Jong MDT (2017) The privacy paradox — investigating discrepancies between expressed privacy concerns and actual online behavior — a systematic literature review. *Telematics and Informatics* 34:1038–1058.

23. Dienlin T, Trepte S (2015) Is the privacy paradox a relic of the past? an in-depth analysis of privacy attitudes and privacy behaviors. *European Journal of Social Psychology* 45(3):285–297.

24. Baruh L, Secinti E, Cemalcilar Z (2017) Online privacy concerns and privacy management: A meta-analytical review. *Journal of Communication* 67:26–53.

25. Pew Research Center (2019, January) Facebook algorithms and personal data, (Pew Research Center), Research report.

26. Kozyreva A, Lewandowsky S, Hertwig R (2020) Citizens versus the internet: Confronting digital challenges with cognitive tools. *Psychological Science in the Public Interest* in press.

27. Lorenz-Spreen P, Lewandowsky S, Sunstein CR, Hertwig R (2020) How behavioural sciences can promote truth and, autonomy and democratic discourse online. *Nature Human Behaviour*.

28. Fairfield JAT, Engel C (2015) Privacy as a public good. *Duke Law Journal* 65:385–457.

29. Garcia D (2017) Leaking privacy and shadow profiles in online social networks. *Science Advances* 3:e1701172.

30. Utz C, Degeling M, Fahl S, Schaub F, Holz T (2019) (Un)informed consent: Studying GDPR consent notices in the field in *Proceedings of the 2019 ACM SIGSAC Conference on Computer and Communications Security*. pp. 973–990.

31. Garcia D (2019) Privacy beyond the individual. *Nature Human Behaviour* 3:112–113.

Supplementary Information for

Public attitudes towards algorithmic personalization and use of personal data online: Evidence from Germany, Great Britain, and the US
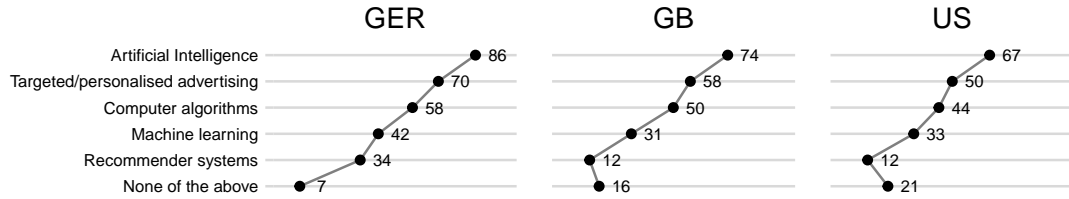
Anastasia Kozyreva*, Philipp Lorenz-Spreen, Ralph Hertwig, Stephan Lewandowsky, Stefan M. Herzog*

*AK and SH contributed equally to this work. Corresponding author: Anastasia Kozyreva, kozyreva@mpib-berlin.mpg.de
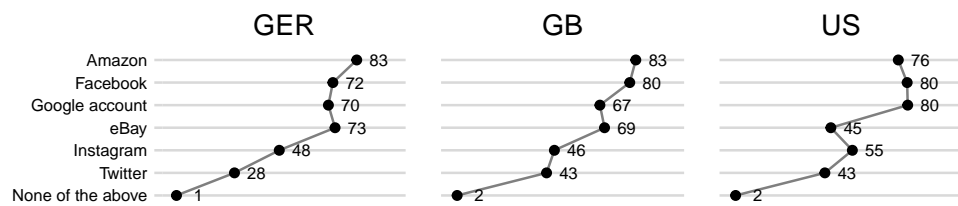
This PDF file includes:

"Which of the following terms are you familiar with (that is, you know more or less what they mean)?"

	GER	GB	US
Artificial Intelligence	86	74	67
Targeted/personalised advertising	70	58	50
Computer algorithms	58	50	44
Machine learning	42	31	33
Recommender systems	34	12	12
None of the above	7	16	21

"Which of the following applications have you used within the past year?"

	GER	GB	US
Amazon	83	83	76
Facebook	72	80	80
Google account	70	67	80
eBay	73	69	45
Instagram	48	46	55
Twitter	28	43	43
None of the above	1	2	2

"In which of the following situations do you think AI technologies are commonly used?"

	GER	GB	US
Answers of smart assistants (e.g., Siri, Alexa, ...)	70	66	63
Advertisement on social media	57	56	55
Ranking of results on search engines	59	52	48
Recommendations on video streaming sites	43	49	52
Recommendations in webshops	55	43	39
Curation of news feeds on social media	44	43	44
Suggestions for potential partners on dating platforms	38	41	40
Website of a local restaurant	11	25	25
Content of Wikipedia articles	14	20	23
None of the above	6	9	8

"What do you think are the main criteria used to customize which posts you see?"

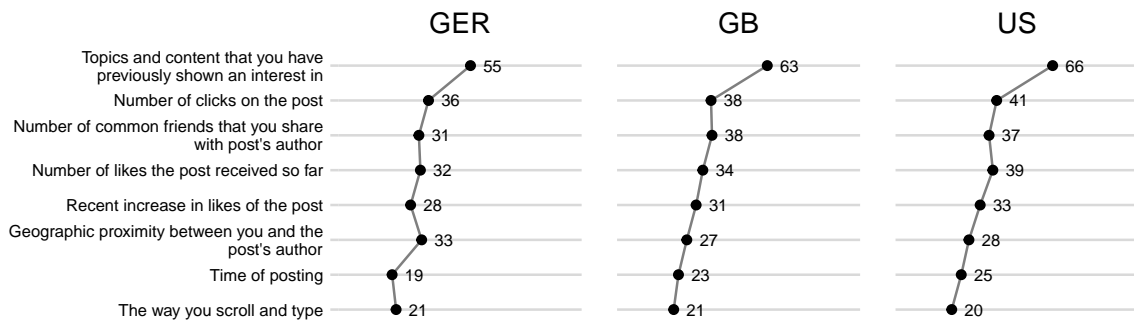|	GER	GB	US
Topics and content that you have previously shown an interest in	55	63	66
Number of clicks on the post	36	38	41
Number of common friends that you share with post's author	31	38	37
Number of likes the post received so far	32	34	39
Recent increase in likes of the post	28	31	33
Geographic proximity between you and the post's author	33	27	28
Time of posting	19	23	25
The way you scroll and type	21	21	20

Fig. S1. Familiarity with terms, use of applications, awareness of AI technologies online, and assumptions about how posts are sorted in Germany, Great Britain, and the US. Percentage of respondents who gave an affirmative answer per question (in decreasing order of answers pooled across all three countries)

Anastasia Kozyreva*, Philipp Lorenz-Spreen, Ralph Hertwig, Stephan Lewandowsky, Stefan M. Herzog*
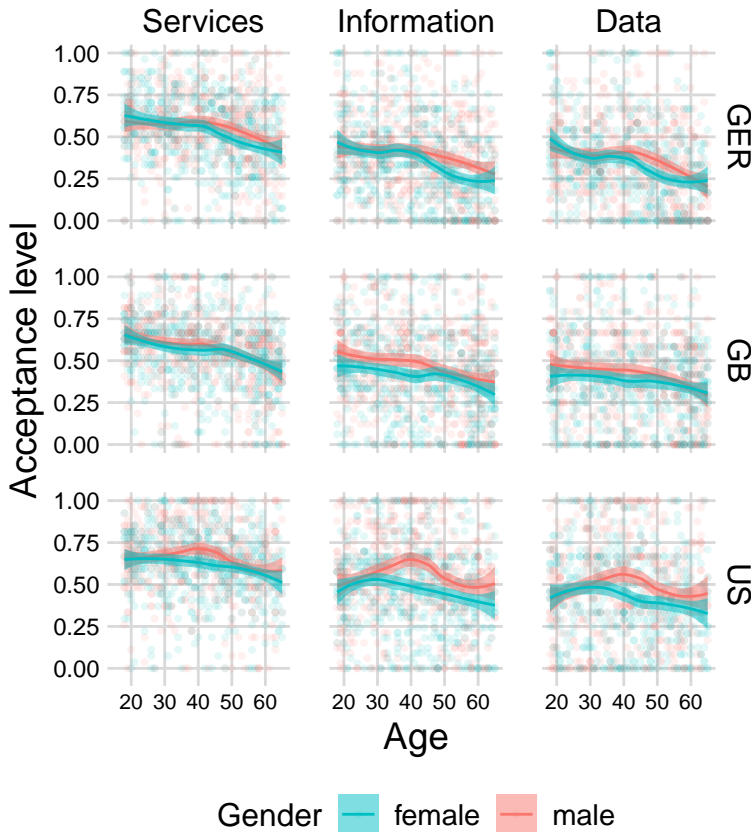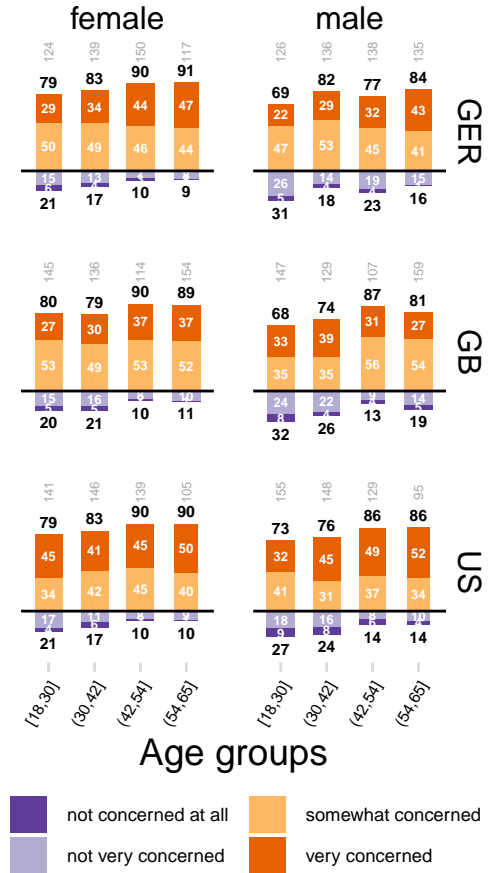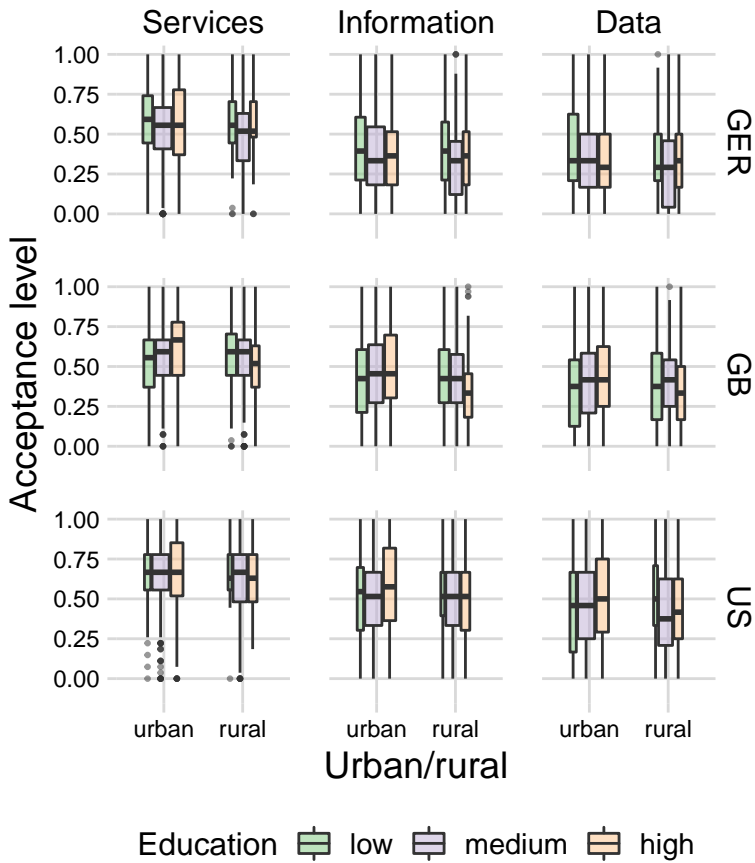
Fig. S2. Age and gender and attitudes towards personalization and data privacy concerns in Germany, Great Britain, and the US. The left panel shows scatterplots of respondents' acceptance level towards services, information, and data (panel columns) broken down by age (x-axis in subpanels), gender (color coding), and country (panel rows). Semi-transparent dots indicate individual respondents; lines show smoothed conditional means (using generalized additive models) plus their 95% confidence bands. A respondent's acceptance level is defined as the arithmetic mean of their ratings (mapped into the [0, 1] range), ranging from 0 (not acceptable at all) to 1 (very acceptable). The right panel shows answers to the question "How concerned are you about your data privacy when using the Internet?" on a 4-point rating scale, broken down by four age groups (x-axis in subpanels), gender (panel columns), and country (panel rows). Age groups were created to be roughly of equal size when ignoring gender. White numbers show percentages per rating category; black numbers show total percentages for the two sides of the rating scale. The width of the stacked bars is proportional to the square root of the weighted number of respondents per distribution; these weighted counts are also shown as numbers above the stacked bars.
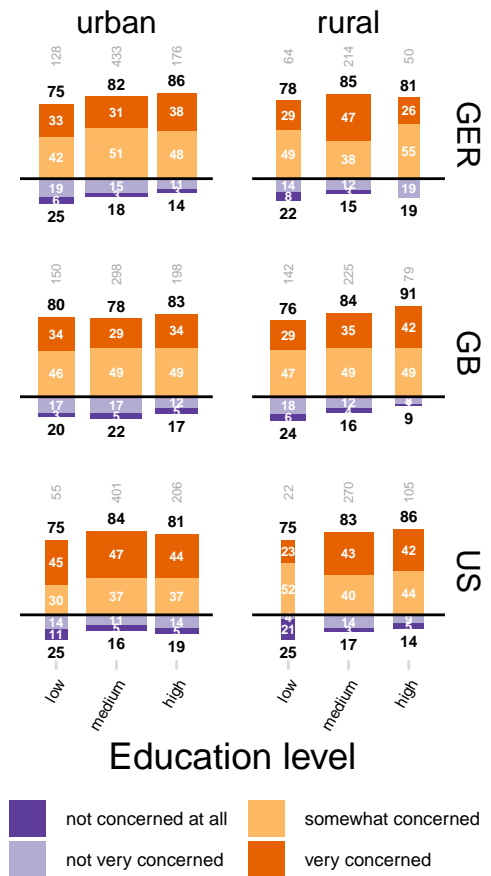
Fig. S3. Education level, location (urban/rural), and attitudes towards personalization and data privacy concerns in Germany, Great Britain, and the US. Education levels are classified as low (no formal education or only primary or secondary education), medium (high school or equivalent degree), or high (university, postgraduate, or equivalent degree). The left panel shows boxplots of respondents' acceptance levels towards services, information, and data (panel columns) broken down by location (x-axis in subpanels), education level (color coding), and country (panel rows). A respondent's acceptance level is defined as the arithmetic mean of their ratings (mapped into the [0, 1] range), ranging from 0 (not acceptable at all) to 1 (very acceptable). The width of the boxplots is proportional to the square root of the weighted number of respondents per distribution. The right panel shows answers to the question "How concerned are you about your data privacy when using the Internet?" on a 4-point rating scale, broken down by education level (x-axis in subpanels), location (panel columns) and country (panel rows). White numbers show percentages per rating category; black numbers show total percentages for the two sides of the rating scale. The width of the stacked bars is proportional to the square root of the weighted number of respondents per distribution; these weighted counts are also shown as numbers above the stacked bars.

Anastasia Kozyreva*, Philipp Lorenz-Spreen, Ralph Hertwig, Stephan Lewandowsky, Stefan M. Herzog*

Table S1. AI-Assisted Information Architectures Online

Algorithmic Curation and Personalization		
Recommender systems - Algorithmic recommendations for media items and products (e.g., YouTube, Amazon). - Friends and accounts to follow (e.g., Facebook, Twitter). - Potential matches in online dating (e.g., Tinder).	**Search algorithms and ranking systems** - Search results (e.g., Google Search). - Predictive searches (e.g., Google's personalized search suggestions). - News feed and timeline customization (e.g., Facebook, Twitter).	**Advertising algorithms** - Auctions for purchasing automated advertising space (e.g., Google AdSense, Facebook Ads). - Customizing and targeting advertising to specific audiences (e.g., Facebook, Twitter).
Bots and Smart Assistants		
Virtual assistants - Software agents performing tasks based on commands by human users (e.g., Siri, Amazon Alexa, Google Assistant).	**Social media bots** - Software agents designed to behave like human users (e.g., to post comments or share posts on social media).	**Chatbots** - Software agents designed to converse with human users (e.g., in customer support).
Algorithmic Tools		
Translation and speech recognition - Machine-learning-based translation services (e.g., Google Translate, DeepL). - Voice-to-text speech recognition.	**Maps and navigation** - Directions and orientation on maps (e.g., Google Maps).	**Facial recognition** - Identifying people in digital images (e.g., tag suggestions and image identification on Facebook). - Face ID (e.g., on iPhone).
Fraud detection - Fraud prevention in online banking and credit card transactions.	**Filtering algorithms** - E-mail filters for separating mail into categories (e.g., spam, promotions, social, primary).	**Content moderation** - Detection and automatic removal of harmful content (e.g., of fake accounts, hate speech, offensive graphic content, disinformation, inauthentic behaviour).

Note. Adapted from Figure 4 in (1).

Table S2. Demographic Information

Country	GER	GER (weighted)	GB	GB (weighted)	US	US (weighted)
Age: median (IQR)						
age	42 (31–54)	43 (31–54)	42 (29–56)	42 (29–56)	40 (29–51)	40 (29–51)
Gender: n (%)						
female	524 (49)	530 (50)	552 (51)	550 (50)	541 (51)	532 (50)
male	541 (51)	535 (50)	540 (49)	542 (50)	518 (49)	527 (50)
Education: n (%)						
no	10 (1)	10 (1)	13 (1)	13 (1)	24 (2)	25 (2)
low	185 (17)	182 (17)	275 (25)	279 (26)	51 (5)	52 (5)
medium	665 (63)	647 (61)	527 (48)	523 (48)	669 (63)	671 (63)
high	205 (19)	226 (21)	277 (26)	277 (25)	315 (30)	311 (30)
Urban/rural: n (%)						
urban	735 (69)	737 (69)	646 (59)	646 (59)	661 (62)	662 (62)
rural	330 (31)	328 (31)	446 (41)	446 (41)	398 (38)	397 (38)
Political leaning: n (%)						
far left	48 (4)	48 (4)	62 (6)	62 (6)	89 (9)	89 (9)
left	79 (7)	80 (7)	81 (7)	81 (7)	63 (6)	63 (6)
somewhat left	193 (18)	192 (18)	128 (12)	127 (12)	78 (7)	78 (7)
center	518 (49)	517 (49)	598 (55)	599 (55)	576 (54)	576 (54)
somewhat right	172 (16)	172 (16)	109 (10)	108 (10)	87 (8)	87 (8)
right	28 (3)	29 (3)	65 (6)	65 (6)	65 (6)	65 (6)
far right	27 (3)	27 (3)	49 (4)	49 (4)	101 (10)	101 (10)

Note. The target weighting variables were age, gender, and education level. An estimation of the average design effect based on the distribution of weights was calculated at 1. IQR: interquartile range.

Anastasia Kozyreva*, Philipp Lorenz-Spreen, Ralph Hertwig, Stephan Lewandowsky, Stefan M. Herzog*

Survey questionnaire (English version)

1. Which of the following terms are you familiar with (that is, you know more or less what they mean)? Select all that apply.

   - Artificial intelligence
   - Computer algorithms
   - Machine learning
   - Targeted/personalized advertising
   - None of the above

2. Which of the following applications have you used within the past year? Select all that apply.

   - Facebook
   - Twitter
   - Instagram
   - Google account
   - Amazon
   - eBay
   - None of the above

   For the purpose of this survey, whenever we speak of "artificial intelligence (AI) technologies" we mean self-learning computer programs ("machine learning") that analyze people's personal data in order to customize their online experience.

3. In which of the following situations do you think AI technologies are commonly used? Select all that apply

   - Advertising on social media
   - Curation of news feeds on social media
   - Recommendations in webshops
   - Recommendations on video streaming sites
   - Ranking of results on search engines
   - Answers given by smart assistants (e.g., Siri, Alexa, ...)
   - Suggestions of potential partners on dating platforms
   - Content of Wikipedia articles
   - Websites of local restaurants
   - None of the above

   AI technologies are often used to help choose which posts you see on social media platforms such as Facebook, Twitter, and Instagram.

4. What do you think are the main criteria used to customize which posts you see? Select all that apply

   - Time of posting
   - Number of likes the post received so far
   - Number of common friends you share with post's author
   - Topics and content you have previously shown an interest in
   - Recent increase in the number of likes on the post
   - Number of clicks on the post
   - Geographic proximity between you and the post's author
   - The way you scroll and type

5. How acceptable do you think it is for social media and other websites to collect and use data about you and your past online activities to. . .

   - . . . show you personalized advertising for commercial products and services?
   - . . . show you personalized messages from political campaigns?

- ... recommend events in your area?
- ... recommend someone you might want to follow or add as a friend on social media?
- ... suggest restaurants and shops?
- ... recommend movies or music?
- ... customize the posts you see in your social media feed?
- ... customize the search results returned by search engines (e.g., Google search)?
- ... customize front pages of online newspapers?

- Very acceptable - Somewhat acceptable - Not very acceptable - Not acceptable at all

Personalized advertising is a type of online advertising that shows ads to people based on their online activity and profile (gender, age, interests, political views, etc.).

6. How acceptable do you think it is for online web platforms to use any of the following information about you to create personalized advertising?

- Age
- Gender
- Ethnicity
- Relationship/marital status
- Sexual orientation
- Religious views
- Political views
- Household income
- Personality (e.g., outgoing, cautious, ...)
- Personal events in your life (e.g., pregnancy, marriage, ...)
- Personal tragedies in your life (e.g., death in the family, divorce, ...)

- Very acceptable - Somewhat acceptable - Not very acceptable - Not acceptable at all

7. How acceptable do you think it is for web services and applications to record and use the following types of information that they collect about you on their platform?

- Your browsing and search history
- Your purchasing history
- Your location history
- Videos you have watched
- Your typing and scrolling behavior
- Interaction with people online (who you communicate with and how often)
- Content of your e-mails and online messages
- Your likes and shares on social media

- Very acceptable - Somewhat acceptable - Not very acceptable - Not acceptable at all

Online data privacy refers to a set of rules for how Internet companies collect, share, and use information about their users. One important aspect of data privacy is whether users choose to reveal or protect their personal information.

8. How concerned are you about your data privacy when using the Internet?

- Not concerned at all
- Not very concerned
- Somewhat concerned
- Very concerned

9. Which of the following have you used in the last year to check and/or adjust what kind of data on you can be used by Internet companies? Select all that apply

- "My activity" or "Activity controls" page on your Google account
- "Privacy and personalization" page on your Google account
- "Privacy settings" page on Facebook
- "Manage your Ad preferences" page on Facebook
- Privacy and/or personalization preferences on Amazon
- Privacy settings in your preferred browser
- None of the above

10. Which of the following measures and tools do you currently use to protect your data privacy online? Select all that apply

- Software that protects you from seeing online advertising (e.g., ad blockers in your browser)
- Incognito mode in your browser
- Software that prevents the monitoring of your online activities (e.g., Tor Browser, VPN)
- Search engines that protect your privacy (e.g., DuckDuckGo)
- Deliberately avoiding certain websites and platforms (e.g., Google, Facebook, ...)
- Adjusting privacy and ad settings on online platforms
- None of the above

11. People sometimes use the labels 'left' or 'left-wing' and 'right' or 'right-wing' to describe political parties, party leaders, and political ideas. Where would you place yourself on this scale?) (on a scale ranging from "1 (left-wing)" to "4 (center)" to "7 (right-wing)").

12. Please feel free to share your thoughts on this survey and the topic.

[open comment field]

Survey questionnaire (German version)

1. Welche der folgenden Begriffe sind Ihnen bekannt (d. h. Sie wissen mehr oder weniger, was sie bedeuten)? Alle zutreffenden Antworten auswählen

- Künstliche Intelligenz
- Computer-Algorithmen
- Maschinelles Lernen
- Empfehlungsdienste
- Gezielte / personalisierte Werbung
- Keine der Genannten

2. Welche der folgenden Anwendungen haben Sie während des letzten Jahres verwendet? Alle zutreffenden Antworten auswählen.

- Facebook
- Twitter
- Instagram
- Google-Benutzerkonto
- Amazon
- eBay
- Keine der Genannten

Für den Zweck dieser Umfrage handelt es sich bei Technologien, die mit „Künstlicher Intelligenz" arbeiten, um selbstlernende Computerprogramme („maschinelles Lernen"), die personenbezogene Daten analysieren, um das Online-Erlebnis von Personen individuell anzupassen.

3. Zu welchem Zweck werden Ihrer Vermutung nach Technologien, die mit Künstlicher Intelligenz arbeiten, häufig eingesetzt? Alle zutreffenden Antworten auswählen.

- Werbung in sozialen Netzwerken

- Kuratierung von Neuigkeiten in sozialen Netzwerken
- Empfehlungen in Onlineshops
- Empfehlungen auf Videostreaming-Seiten
- Ranking der Ergebnisse in Suchmaschinen
- Antworten von intelligenten Assistenten (z. B. Siri, Alexa, ...)
- Vorschläge über potenzielle Partner auf Dating-Plattformen
- Inhalt von Wikipedia-Artikeln
- Website eines lokalen Restaurants
- Keiner der Genannten

Technologien, die mit Künstlicher Intelligenz arbeiten, werden häufig verwendet, um zu bestimmen, welche Beiträge in Sozialen Netzwerken wie Facebook, Twitter und Instagram angezeigt werden.

4. Was sind Ihrer Vermutung nach die Hauptkriterien, anhand derer die angezeigten Beiträge angepasst werden? Alle zutreffenden Antworten auswählen.

- Zeitpunkt der Veröffentlichung
- Anzahl der Likes, die der Beitrag bisher erhalten hat
- Anzahl der Freunde, die Sie mit dem/der Verfasser/in des Beitrags gemeinsam haben
- Themen und Inhalte, für die Sie sich interessieren
- Kürzlich gestiegene Anzahl an Likes für einen Beitrag
- Anzahl der Klicks auf den Beitrag
- Geografische Nähe zwischen Ihnen und dem/der Verfasser/in des Beitrags
- Ihre Art zu scrollen und zu tippen

5. Wie akzeptabel ist es Ihrer Meinung nach, dass Soziale Netzwerke und andere Webseiten, Daten über Sie und Ihre vergangenen Online-Aktivitäten sammeln und nutzen, um ...

- ... Ihnen personalisierte Werbung für kommerzielle Produkte und Dienstleistungen anzuzeigen?
- .. Ihnen personalisierte Nachrichten aus politischen Kampagnen anzuzeigen?
- ... Ihnen Veranstaltungen in Ihrer Nähe zu empfehlen?
- ... Ihnen Leute zu empfehlen, denen Sie folgen oder die Sie als Freund in einem sozialen Netzwerk hinzufügen könnten?
- ... Ihnen Restaurants und Geschäfte vorzuschlagen?
- ... Ihnen Filme oder Musik zu empfehlen?
- ... die in Ihrem Social Media-Feed angezeigten Beiträge anzupassen?
- ... die Suchergebnisse in Suchmaschinen (z. B. Google-Suche) anzupassen?
- ... die Titelseiten von Online-Zeitungen anzupassen?

- Sehr akzeptabel - Einigermaßen akzeptabel - Nicht sehr akzeptabel - Überhaupt nicht akzeptabel

Personalisierte Werbung ist eine Art von Online-Werbung, bei der Personen, aufgrund ihrer Online-Aktivität und ihres -Profils, Werbung angezeigt wird (d. h. Geschlecht, Alter, Interessen, politische Ansichten usw.).

6. Wie akzeptabel finden Sie es, dass Online-Internet-Plattformen die folgenden Online-Informationen über Sie nutzen, um personalisierte Werbung zu schalten?

- Alter
- Geschlecht
- Ethnizität
- Beziehungsstatus / Familienstand
- Sexuelle Orientierung
- Religiöse Ansichten
- Politische Gesinnung

Anastasia Kozyreva*, Philipp Lorenz-Spreen, Ralph Hertwig, Stephan Lewandowsky, Stefan M. Herzog*

- Haushatseinkommen
- Charakter (z. B. extrovertiert, introvertiert, ...)
- Persönliche Ereignisse in Ihrem Leben (z. B. Schwangerschaft, Heirat, ...)
- Persönliches Unglück in Ihrem Leben (z. B. Todesfall in der Familie, Scheidung, ...)

- Sehr akzeptabel - Einigermaßen akzeptabel - Nicht sehr akzeptabel - Überhaupt nicht akzeptabel

7. Wie akzeptabel finden Sie es, dass Webdienste und -anwendungen, die folgenden Informationstypen, die sie über Sie auf ihrer Plattform sammeln, erfassen und verwenden?

- Ihren Browser- und Suchverlauf
- Ihre Kaufhistorie
- Ihren Standortverlauf
- Videos, die Sie sich angesehen haben
- Online-Interaktion mit Personen (mit wem und wie oft Sie kommunizieren)
- Inhalt Ihrer E-Mails und Online-Nachrichten
- Ihre Likes und Beiträge in Sozialen Netzwerken

- Sehr akzeptabel - Einigermaßen akzeptabel - Nicht sehr akzeptabel - Überhaupt nicht akzeptabel

In den Online-Datenschutzbestimmungen sind Richtlinien darüber festgelegt, wie Internetunternehmen Informationen über ihre Online-Nutzer erfassen, teilen und verwenden. Ein wichtiger Aspekt des Datenschutzes betrifft die Wahlfreiheit der Nutzer, ihre persönlichen Daten preiszugeben oder zu schützen.

8. Wie besorgt sind Sie, bei der Benutzung des Internets, über den Schutz Ihrer Daten?

- Überhaupt nicht besorgt
- Nicht besonders besorgt
- Ein bisschen besorgt
- Sehr besorgt

9. Welche der folgenden Methoden haben Sie im letzten Jahr genutzt, um zu überprüfen und / oder zu bestimmen, welche Art von personenbezogenen Daten über Sie derzeit von Internetunternehmen verwendet werden? Alle zutreffenden Antworten auswählen.

- Die Seite „Meine Aktivität" oder „Aktivitätssteuerung" in Ihrem Google-Konto
- Die Seite „Datenschutz und individuelle Anpassung" in Ihrem Google-Konto
- Die Seite „Privatsphäreeinstellungen" auf Facebook
- Die Seite „Werbepräferenzen verwalten" auf Facebook
- Datenschutz- und / oder Personalisierungseinstellungen bei Amazon
- Datenschutzeinstellungen in Ihrem bevorzugten Browser
- Keine der Genannten

10. Welche der folgenden Maßnahmen und Werkzeuge verwenden Sie normalerweise, um Ihren Datenschutz online zu gewährleisten? Alle zutreffenden Antworten auswählen.

- Software, die die Anzeige von Online-Werbung verhindert (z. B. Werbungsblocker in Ihrem Browser)
- Inkognitomodus in Ihrem Browser
- Software, die verhindert, dass Ihre Online-Aktivitäten überwacht werden (z. B. Tor Browser, VPN)
- Suchmaschinen, die Ihre Daten schützen (z. B. DuckDuckGo)
- Bewusstes Vermeiden bestimmter Webseiten und Plattformen (z. B. Google, Facebook, ...)
- Anpassen der Einstellungen zum Datenschutz und Werbung auf Online-Plattformen
- Keine der Genannten

11. Man verwendet manchmal die Bezeichnungen „Links" oder „Linksaußen" und „Rechts" oder „Rechtsaußen", um politische Parteien, Parteichefs und politische Ideologien zu beschreiben. Wo würden Sie sich auf dieser Skala einstufen, die von 1 (links) über 4 (Mitte) bis 7 (rechts) reicht?

12. Bitte teilen Sie uns etwaige Gedanken zu dieser Umfrage und diesem Thema mit.

[open comment field]

References

1. A Kozyreva, S Lewandowsky, R Hertwig, Citizens versus the internet: Confronting digital challenges with cognitive tools. *Psychol. Sci. Public Interest* **in press** (2020).

Anastasia Kozyreva*, Philipp Lorenz-Spreen, Ralph Hertwig, Stephan Lewandowsky, Stefan M. Herzog*