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Nudges for news recommenders: prominent article positioning increases selection, engagement, and recall of environmental news, but reducing complexity does not

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Abstract

News aggregators inherently constitute choice architectures in which placement and presentation of news articles in the user interface affect how people perceive and engage with them. Accordingly, deliberate changes of a news aggregators' choice architecture may nudge engagement. Against this background, our study aims to test the effects of 2 nudges, namely a position and an accessibility nudge, on (a) the selection of, (b) the engagement with, and (c) learning from environmental news articles by means of a 7-day field experiment using a news aggregator app in the United Kingdom. Results suggest that prominent article positioning coupled with visual highlighting significantly increases the selection of environmental news, its reading time and recall of information. In contrast, automated rewriting of environmental articles for lower text complexity had no significant effects. Additional analyses indicate that neither nudge backfired by decreasing user satisfaction, thus suggesting the practical usability of our approach.

Keywords: nudging, news recommender systems, news engagement, recall, field experiment

In recent years, there has been a growing interest in the notion of "democratic news recommender design" (Helberger, 2019; Mattis et al., 2024b; Mitova et al., 2023; Vrijenhoek et al., 2021). Drawing on nudge theory (Thaler & Sunstein, 2009), this line of research posits that news recommender systems can be viewed as choice architectures, where decisions on how to select, rank, and present news items can have implications for how people engage with and process news content (Knudsen, 2023; Mattis et al., 2024b). This may have positive downstream effects on democratically relevant outcomes, such as citizens' political learning, political participation, or tolerance (Helberger & Wojcieszak, 2018; Mattis et al., 2024b).

As of now, work on democratic news recommender design is still in its infancy, as many studies predominantly focus on conceptualizing potential approaches (Lorenz-Spreen et al., 2020; Mattis et al., 2024b; Vrijenhoek et al., 2021) and their ethical implications (Vermeulen, 2022). These studies often point to the potential of diversity-aware recommender design or nudging, but rarely test these assumptions (for exceptions see Heitz et al., 2022, 2023; Mattis et al., 2024a). Moreover, while the effects of democratic news recommender design are likely to transpire over longer periods of time, there are still rather few longitudinal research studies (for long-term studies that are an exception to this, see Heitz et al., 2022, 2023; Lee & Suh, 2022). Hence, we still know little about how nudging news engagement works over extended periods of time.

To provide more realistic insights into the promises of democratic news recommender design, we conducted a pre-registered seven-day long field experiment with Informfully (Heitz et al., 2024a),[1] a fully customizable content delivery platform that we used to mimic a news aggregator app; Informfully can be downloaded directly from Google Play and the iOS app store and provided respondents with a realistic news use experience, thereby maximizing external validity. Within this externally valid news aggregator app, we tested how a position nudge and accessibility nudge affect (a) the selection of, (b) the engagement with, and (c) the learning from environmental news. The position nudge denotes the deliberate prominent positioning of a particular article, whereas the accessibility nudge describes changes to an article that make its content easier to understand by lowering its syntactic text complexity.

Our nudges are informed by prior work on nudging and news selection (Loecherbach et al., 2021; Mattis et al., 2024a, 2024b; Thaler & Sunstein, 2009), as well as Lin & Lewis (2022)'s notion that artificial intelligence (AI) could very well be "normatively imagined and [...] should work in the service of accuracy, accessibility, diversity, relevance, and timeliness" (p. 1627). In addition to news selection, engagement, and knowledge acquisition, we explore potential backfire effects on user satisfaction and engagement. Thereby, we hope to highlight the practical applicability of "nudging news engagement" without negatively impacting user engagement

and satisfaction. We chose to nudge environmental news for two major reasons. First, environmental news is a more niche category that readers might not always be confronted with, making it easier to delineate possible effects on knowledge acquisition. Second, given the political and social impact of climate change, nudging environmental news can be defended from a normative standpoint, as being well-informed on the topic could benefit political decision-making. In doing so, our study also adds to existing research on facilitating engagement with science news more broadly (e.g. Janet et al., 2022).

Overall, this study makes an important methodological and substantive contribution to existing literature on democratic news recommender design and nudging, as well as work on news engagement and its effects. First, by testing nudging effects over a full week and with an externally valid news aggregator featuring daily scraped news articles from six major UK news outlets, this study answers Mitova et al. (2023)'s call for more longitudinal and externally valid research on (democratic) news recommender design. More specifically, due to its high external validity, this study is able to validate prior findings for the nudging effect of article position on news engagement (e.g. Knudsen, 2023) in more realistic news environments. Second, with much of existing literature focusing predominantly on selective exposure (Mitova et al., 2023), this study provides an additional theoretical lens towards democratic news recommender design that goes beyond asking what readers engage with and instead explores how news platforms can facilitate normative goals—particularly knowledge acquisition—without negatively impacting user engagement and satisfaction. Third, by testing a nudge that automatically simplifies content, our study also provides insights into the normative implications of potential use cases of generative AI in journalism. Fourth, by using a dedicated open-source tool for conducting news recommender experiments, this study adds to a growing body of user studies that have been conducted with standardized user interface—thus minimizing the potential of unintended side effects from different user interfaces (Beel & Dixon, 2021). The uniformity of interfaces and open-source code allow for cross-study comparisons and replications of the entire experimental design. Furthermore, the dataset resulting from the study has been published to facilitate future research (Heitz et al., 2024b).[2]

Theoretical framework

The emergence of a high-choice media environment, coupled with the increasing use of algorithmic filtering techniques has sparked worries about the extent to which citizens still engage with political and diverse news (Helberger & Wojcieszak, 2018; Pariser, 2011). While these worries may not always align with existing empirical evidence (Dahlgren, 2021), they have given rise to important questions surrounding the design of (algorithmically curated) news platforms. This, in turn, has led to arguments for more explicitly incorporating normative goals into the design of "democratic news recommenders" (Helberger, 2019).

Democratic news recommender design

Democratic news recommender design builds on the observation that the effects of algorithmic curation are not inherently bad for diverse and politically relevant news exposure but instead depend on how a specific system is designed (Möller

et al., 2018). Thus, there is an argument to be made for designing news recommender systems with normative goals in mind (Helberger, 2019). Such goals can be informed by democratic theory. This line of literature proposes different models of democracy that outline the responsibilities of individual citizens and inform democratic news recommender design by determining how news media can support them therein (Helberger, 2019; Strömbäck, 2005).

For this study, we explicitly draw on deliberative and participatory models of democracy. According to Helberger (2019), "[t]he participative and the deliberative models of democracy share a focus on community, the placing of societal interest above individual self-interest, and the importance of active, interested citizens." This requires an active (news) media that provides the public with diverse perspectives on important issues and facilitates active citizenship (Helberger, 2019). As such, these models theoretically allow for editorial control and digital nudging that facilitates engagement with societally relevant content.

Nudging news engagement

In addition to literature on normative models of democracy, our study draws from Thaler and Sunstein (2009)'s work on nudging. A *nudge* is "any aspect of the choice architecture that alters people's behaviour in a predictable way without forbidding any options or significantly changing their economic incentives" (Thaler & Sunstein, 2009, p. 6). The term *choice architecture* refers to the context in which decisions are made; in our case, this is the user interface of the news aggregator app.

Nudges were originally introduced and applied in offline settings. However, over time the subcategory of digital nudges emerged to capture nudges that are employed in digital environments (Sadeghian & Otarkhani, 2024). Digital nudges can take on a variety of different forms, be applied in various contexts, and facilitate a multitude of goals via different mechanisms (Jesse & Jannach, 2021; Sadeghian & Otarkhani, 2024). For example, recent studies have examined digital nudges in education (Dimitrova & Mitrovic, 2022), online search (Rieger et al., 2024), and journalism (Mattis et al., 2024a). For this study, we specifically focus on the context of news recommender systems due to its relevance for democratic participation (Helberger, 2019).

A number of scholars suggest that nudging users towards specific forms of news engagement may increase political knowledge, participation, or tolerance (Helberger, 2019; Mattis et al., 2024b; Vermeulen, 2022). According to Mattis et al. (2024b), this involves manipulating how news is filtered and ranked (algorithmic nudges) and how news is presented (presentation nudges). The authors also acknowledge a third possibility, namely altering the content of an article, but refrain from discussing this in detail.

In this study, we explore whether such nudges can facilitate the selection of, engagement with, and recall of environmental news. We do so through the theoretical lens of Luskin (1990)'s opportunity-motivation-ability (OMA) framework. The OMA framework aims to explain the conditions under which (political) learning can take place. It posits that in order to learn, citizens must have the opportunity, motivation, and ability to engage with relevant information in a way that leads to durable knowledge acquisition. This argument also aligns with work on information processing: Dual-processing theories suggest that elaborative processing requires at least

some degree of motivation and ability (Choi, 2024). Similarly, recent studies on learning from news articles have shown that both exposure to information (Leeper, 2020) and the motivation to process the information (Stroud et al., 2022) play a key role in effective knowledge acquisition.

We posit that news selection and news engagement—which we conceptualize as reading time[3]—serve as two subsequent steps that are necessary for readers to learn from news. Accordingly, nudges that facilitate readers' opportunities, motivation, and ability to engage with environmental news should lead to higher recall of the nudged information. Next, we motivate two nudges that aim to achieve this through different mechanisms.

Position nudge

Our first nudge builds on the importance of ordering effects in digital environments. Jesse and Jannach (2021) argue that the composition of choices constitutes an integral part of a recommender systems' decision structure and can be deliberately manipulated for the purpose of nudging. Prior work on news recommender systems supports this argument, indicating that prominent ranking can facilitate engagement (Loecherbach et al., 2021). When it comes to news selection specifically, this effect may be due to several reasons, including primacy effects (Jesse & Jannach, 2021), or the fact that news readers perceive prominent news to be more important (Costera Meijer & Groot Kormelink, 2020). Related to that, article position may also be understood as an editorial cue, as the size and positioning of an article often reflect editorial importance and quality assessments (Choi, 2024).

To capture these potential mechanisms, our position nudge combines prominent article ranking with visual highlighting by means of enlarged article size (larger image, title, and inclusion of the article lead in the preview). As such, this nudge could be described as a mix of an algorithmic and a presentation nudge (Mattis et al., 2024b). By combining an algorithmic component, namely article ranking, with a clear visual difference in the user interface, we hope to maximize the effects of the position nudge. We expect the following:

> H1: The position nudge increases (a) the selection of, (b) the engagement with, and (c) the learning from environmental news, independent of environmental news interest and the accessibility nudge.[4]

Accessibility nudge

The accessibility nudge is motivated by Lin and Lewis (2022)'s argument that journalistic AI should be used to make news more accurate, diverse, and accessible. It specifically focuses on the news' accessibility and builds on the observation that (syntactic) text complexity can have important implications for people's recall (Song et al., 2022; Tolochko et al., 2019). Specifically, prior work suggests that in the context of political information, text complexity can inhibit factual knowledge acquisition (Song et al., 2022; Tolochko et al., 2019), with people's cognitive elaboration abilities as an important moderator (Song et al., 2022). Given the general assessment that news is not necessarily written in a particularly accessible manner (Lin & Lewis, 2022), this suggests that rewriting news in a more understandable way should facilitate recall for at least some readers.

The call for more accessible news also aligns with Luskin (1990)'s OMA framework, as lower text complexity may cater better to (some) readers' abilities. The emergence of generative AI makes it much easier to repackage existing content. Thus, following Lin and Lewis (2022)'s call to use journalistic AI to increase the news' accessibility, this study explores how automated article rewriting affects the selection of, engagement with, and learning from environmental news.

Prior work on text complexity and recall (Song et al., 2022; Tolochko et al., 2019) provides solid evidence for a positive effect of such a manipulation on recall. However, it is not clear whether effects can be expected for news selection and engagement. Work on clickworthiness of news headlines suggests that simpler and shorter titles as well as fewer stop words may facilitate click-through rates (Hagar et al., 2022; Shulman et al., 2024). However, the effects of linguistic headline elements are small at best; a recent experimental study testing the effects of three different forms of headline formulations on the selection of and engagement with environmental news found no significant differences (Janet et al., 2022). Moreover, while our operationalization of the accessibility nudge did at times lead to shorter titles, this was not always the case. Thus, we pose both a hypothesis for the effects on recall and a research question for news selection and engagement:

> H2: The accessibility nudge increases the learning from environmental news, independent of environmental news interest and article position
>
> RQ1: Does the accessibility nudge increase (a) the selection of and (b) the engagement with environmental news, independent of environmental news interest and article position?

The moderating role of environmental interest

While nudging can be a powerful tool, doing this against people's preferences is often difficult, if not impossible (de Ridder et al., 2022). Thus, we argue that individual readers' interests are important. Interest is a key predictor of news engagement (Mattis et al., 2024b) that is also reflected in news value research (Eilders, 2006). In the context of nudging news selection, interests may thus constitute a boundary condition for the effectiveness of digital nudges: if a reader is not interested in environmental news at all, nudging them towards selecting it will likely be either substantively harder, or result in possible backfire effects such as decreased user satisfaction or less engagement with the nudged article. Conversely, if a reader is extremely interested in such news, nudges may become almost superfluous.

To test whether individual interests really do constitute a boundary condition, and building on de Ridder et al. (2022)'s observation that a negative relationship exists between existing preferences and nudging effects, we pose the following hypotheses:

> H3: Environmental news interest is positively related to (a) the selection of, (b) the engagement with, and (c) the learning from environmental news articles.
>
> H4: The effects of the position nudge on (a) the selection of, (b) the engagement with, and (c) the learning from environmental news articles are more pronounced among respondents with a higher interest in the environment

H5: The effects of the accessibility nudge on learning from environmental news articles are more pronounced among respondents with a higher interest in the environment

Methodology

We carried out a preregistered[5] seven-day long field experiment with $N = 502$ respondents in the UK.[6] Respondents were recruited through a UK-based market research company. They were paid £3 for completing an intake survey that measured demographics and relevant controls and another £15 for successfully completing the study (see Figure 1). We used a moving time window, such that some users started and finished the study slightly earlier than others.

Our recruitment process involved an element of self-selection, as respondents first needed to express interest in the study, and then successfully complete the different steps (intake survey, downloading and using the app and then completing the in-app survey). As a result, even though the research market company approached a sample that was balanced in terms of age, gender and education, our final sample was skewed towards female respondents, as well as people with a high interest in news. During the experiment, we asked participants to read news on the app for at least five minutes a day. We gave no further instructions except asking them to use the app exactly as they would use any other news aggregator to maximize external validity.

The Informfully platform

Informfully is an all-in-one research platform for content distribution that has been tested and used in previous studies (see Heitz et al., 2022, 2023). The infrastructure of this platform includes an app for content delivery, giving researchers complete control over when and what items are shown to experimental participants. It automatically logs all user interactions (such as clicks, reading time, scroll percentage, article ratings, and bookmarks). For this experiment, it was used to mimic a real-world news aggregator app. Participants were offered an Android and iOS version of the app. The user interface was kept constant across all platforms and devices. To collect feedback on individual articles, we added two optional ratings below each article that users could respond to with a thumbs up/down. Those were (a) 'I found this article interesting' and (b) 'I found this article easy to read'.

We populated the Informfully news app (see Figure 2) with a total of 26 news articles, scraped daily from six different UK news outlets. Of these, 24 were filler articles meant to create a realistic user experience. They were randomly ordered and displayed to each user in the exact same order. To

ensure sufficient topic diversity, we included two articles for each of the following 12 topics: business, crime, entertainment & arts, football, health, life & style, politics, science, sport, technology, UK news, and world news. Topics were inferred from the categories that news outlets used on their website. In addition to the 24 filler articles, we added one environmental news article, as well as one popular Guardian article from the previous day to the news feed. These two articles were used for our experimental manipulations, which we describe in detail below.

The decision to include only 26 articles per day and refrain from continuous scraping was made to ensure a sufficient degree of internal validity. If participants had been exposed to different articles, different numbers of articles, and different ordering of articles, a systematic comparison would have been much harder. It would have also resulted in a sparse dataset with a long-tail distribution of articles with few or no user interactions.

Experimental manipulations

Our study involved two experimental manipulations (see Figure 2), namely a "position nudge" and an "accessibility nudge." The position nudge pertained to how an article was displayed on the apps' home feed, whereas the accessibility nudge pertained to a systematic manipulation of the article's content. Both manipulations were exclusively applied to a single environmental news article per day. The environmental news articles that we nudged covered a broad variety of topics, ranging from the United Nations' climate conference 'COP23' over endangered species to sustainable solutions to climate change.

Position nudge

The position nudge highlighted an environmental article by ranking it first in the news feed and showing it at twice the size of other options. For our manipulation, the environmental article was either displayed on position 1 or on position 5. As such, the article was visible on everyone's home page regardless of their experimental group. To have comparable stimuli across groups, we used a popular article from the Guardian as the pendant to the environmental article. Thus, respondents either saw the environmental article on position 1 and a popular article from the previous day on position 5 or vice versa. For our analyses we created a binary dummy variable that indicated whether the position nudge was present.

Accessibility nudge

The accessibility nudge manipulation involved automated article rewriting to decrease syntactic text complexity as
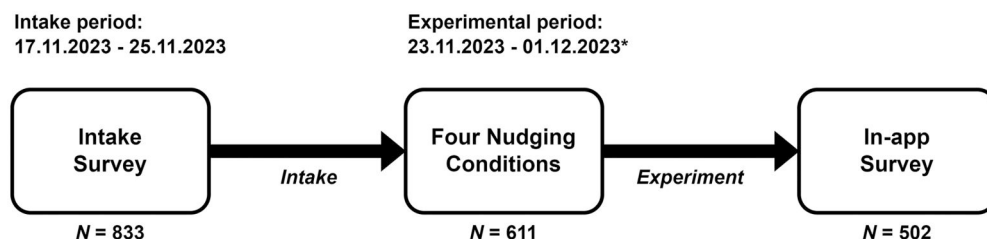
Figure 1. Experimental procedure.

Note: December 1 was the last date for which we updated the in-app surveys' recall questions but that respondents could (and in some cases did) take the survey at a later point.
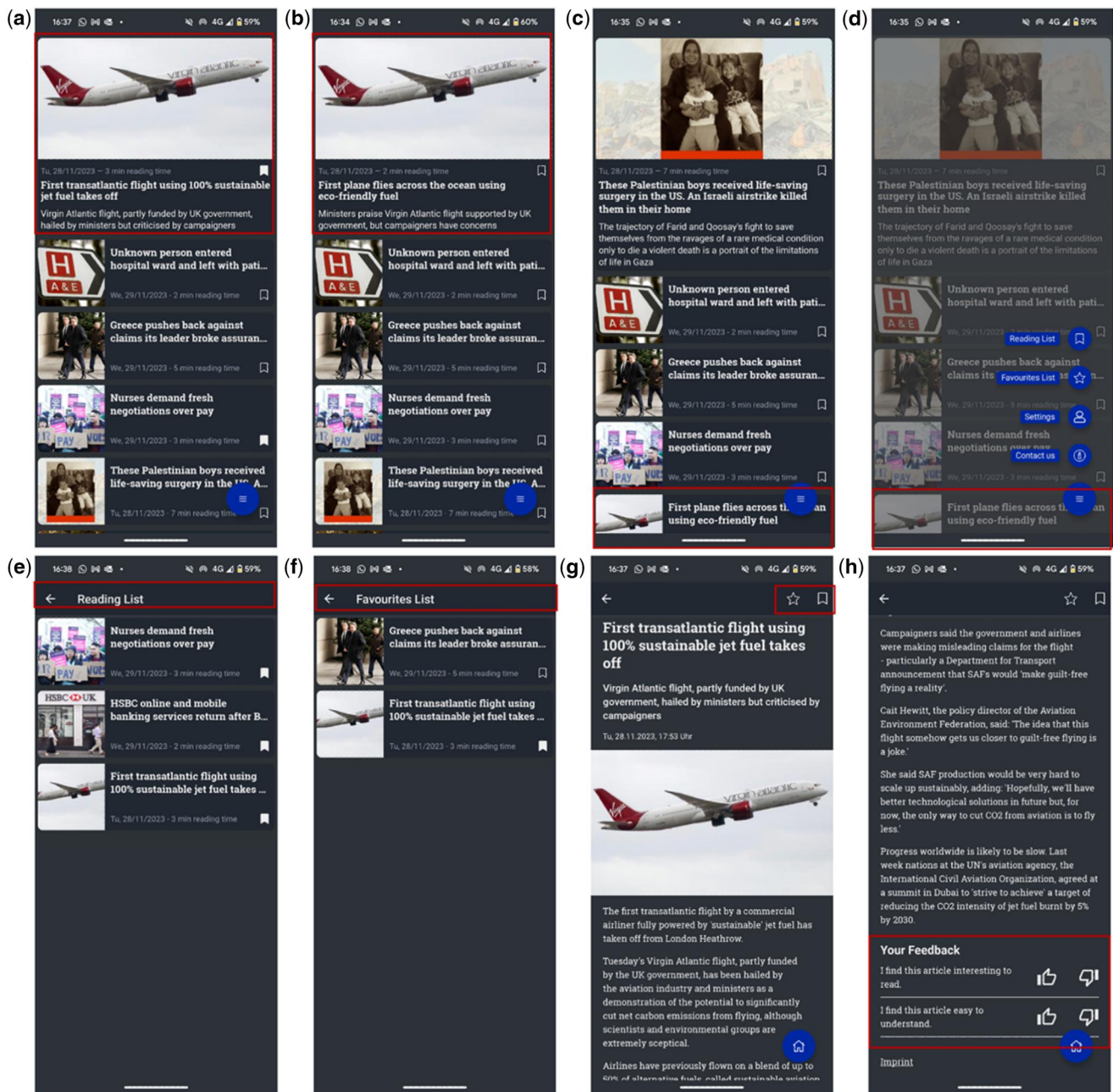
Figure 2. Experimental conditions (A–D) and Informfully affordances (E–H): (A) position nudge present, accessibility nudge absent; (B) position nudge present, accessibility nudge present; (C) position nudge absent, accessibility nudge absent; (D) position nudge absent, accessibility nudge present; (E) reading list; (F) favorites list; (G) single article including favorite and bookmark button; (H) bottom section of article view with explicit feedback options.

measured by common reading ease measures (e.g. Flesh-Reading Ease score). For this, we ran a Python script that automatically rewrote previously scraped environmental news articles. The script relied on Chat GPT's 3.5-turbo model and used slight adaptations of the following prompt to rewrite the title, teaser, and headline[7]:

> "I want you to act as an editor. I will provide you with article texts and your task is to rewrite them in a way that makes sure that a 10-year-old can understand it. There are a couple things I would like you to do for this, including making shorter sentences and getting rid of jargon and complicated words wherever possible. Also, it is important that you keep the structure of the article somewhat similar to the original. Please also make sure that the new version includes at least five facts from the original and that the new article is not dramatically longer or shorter than the original version."

The script automatically calculated reading scores for both the original and rewritten texts. The main author then used the resulting reading ease scores to select the daily article that was best suited for the experimental manipulations.[8] Selections were based on article topic and the differences in accessibility between the original and rewritten articles. The outcome of this procedure was two versions of the same environmental news articles that differed in their text complexity (see Supplementary Appendix D). Based on this, we created a

binary dummy variable for each nudged article indicating whether it had been rewritten.

Measures

In addition to various behavioral measures that were collected automatically, we measured several control variables prior to and all the dependent variables after the experiment. The precise wording for each measure can be found in our codebook.[9]

Dependent variables

Our dependent variables concerned respondents' selection of and engagement with the nudged articles—both was logged automatically inside the app—as well as their overall user satisfaction, their recall of the nudged articles' content and their subjective knowledge of issues around the environment—all of which were measured in an in-app survey.

News selection & engagement

News selection ($M = 0.34$, $SD = 0.47$) was measured as a binary dummy variable that captured whether a user clicked on the nudged article on any given day.

News engagement ($M = 1.84$, $SD = 1.70$) was measured as their time spent reading the nudged article. While the app had measured milliseconds, we used minutes for a more meaningful analysis. We also log-transformed reading times [mean (M) = .81; standard deviation (SD) = .59], because this led to a significantly better model. The implications of this choice are discussed in the results section.

Recall

Recall was measured by means of three multiple-choice questions for each environmental news article that had been nudged during the experiment. We kept the format of the recall questions consistent throughout the whole duration of the experiment. The first question always asked respondents to pick the statement that best summarized a given article, the second concerned a factual statement, and the third took the form of a 'which of the following is not true?' question. Respondents were given five answer options (including 'I don't know').[10] All recall items were asked in a single in-app survey that respondents filled in upon completing the first experimental week. Based on this, we created a daily recall index per person that ranged from a minimum of 0 to a maximum of 3 correct answers ($M = 0.61$, $SD = 0.88$). While recall was assessed for every nudged article, our analyses exclude measures from days where users did not use the app.

To explore potential differences between the actual recall of specific information as opposed to the feeling of being well-informed, we also measured respondents' "subjective knowledge" ($M = 4.57$, $SD = 1.22$). We did so with a single-item measure that asked participants: "How knowledgeable do you consider yourself to be about issues around climate change and the environment?" Responses were recorded on a 7-point Likert scale.

User satisfaction

User satisfaction ($M = 5.65$, $SD = 1.05$) was measured by a battery of five items that tapped into future use intentions ($M = 5.37$, $SD = 1.54$), ease of use ($M = 6.31$, $SD = 0.97$), ease of selection ($M = 5.99$, $SD = 1.13$), quality of selection ($M = 5.50$, $SD = 1.33$), and Informfully's additional value on top of their existing news diet ($M = 5.08$, $SD = 1.63$). The resulting index proved highly reliable ($\alpha = .85$). Additionally, we also explored respondents' "perceived topic diversity" ($M = 5.40$, $SD = 1.19$) by asking them to indicate on a 7-point Likert scale how diverse they perceived Informfully to be in terms of topics.

Control variables

Since news engagement is known to vary according to both demographic variables and individual interests and attitudes, we included several controls. For demographics, we asked for respondents' "age," "gender," and "education." Overall, our sample leaned towards the younger side ($M = 37.94$, $SD = 11.91$), was comparably highly educated with the average respondent having completed college or university education ($M = 3.96$, $SD = .80$), and consisted of more female ($N = 324$) than male ($N = 174$) and non-binary ($N = 5$) users.[11]

Regarding users' attitudes and interests, their "interest in the environment" ($M = 5.43$, $SD = 1.31$) was measured on a 7-point Likert scale with the following item: "Generally speaking, how interested are you in news about climate change and the environment? Please answer on a scale from 1 (extremely disinterested) to 7 (extremely interested)". For "general news interest" ($M = 6.08$, $SD = 2.16$), we asked respondents how many days in the last week they had read at least one news article (both online and offline). Lastly, we measured how many days respondents had read about the environment outside of Informfully in our post-survey, henceforth "environmental news consumption" ($M = 3.11$, $SD = 2.48$). We used this variable as a control in our models for subjective knowledge and user satisfaction.[12]

Analytical approach

Our analysis builds on a rich dataset of user behaviour and survey responses collected between Nov 23rd and Nov 30th, 2023. While we encouraged users to log in daily and sent reminders to those who did not, we allowed for some days where they did not engage at all. Nonetheless, as Figure 3A shows, engagement remained stable over the course of the experiment. On average, participants were active on five out of seven days ($M = 4.96$, $SD = 1.50$). Overall, our respondents engaged with a diverse range of news topics (see Figure 3B), and left additional traces (such as article bookmarks and ratings) that enabled us to further explore how individual articles were perceived (for details see Supplementary Appendix C).

Our behavioral data (clicks and reading time), as well as our recall measure, was nested in individual days and users. Therefore, we used multilevel regression models with random intercepts for both days and users for all subsequent analyses except for that of subjective knowledge, which we only measured once after completion of the experiment.

Depending on whether our dependent variable was binary (news selection, responses to individual recall questions) or continuous (news engagement, daily recall index, subjective knowledge), we used either a logistic or a linear model. For our news engagement analyses, we used log-transformed reading time as dependent variable. By log-transforming reading time, we gave more weight to differences between shorter reading times. Doing so not only made for a more meaningful analysis, as longer reading times are less frequent and possibly confounded (e.g. users being momentarily distracted and not actually engaging), but also led to
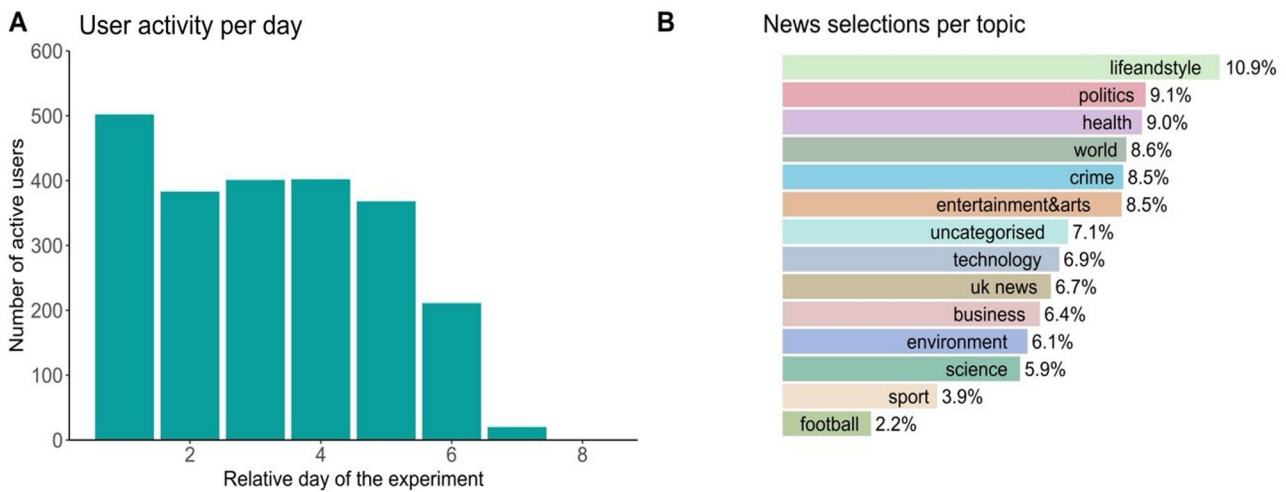
Figure 3. (A) Active users per day of the experiment (since first logging in). (B) Overall news selections across different topics. Note that the daily news feed included two articles per topic, as well as one environmental and one popular article used for the position nudge manipulations. Uncategorized articles were added when a given day saw insufficient supply of topical news, which happened mostly around the weekend. Uncategorized news articles were always at the bottom of the feed whereas other categories were ranked randomly.

significantly better model performance [Akaike information criterion $(AIC) = 1169.0$, Bayesian information criterion $(BIC) = 1228.7$, *deviance* $= 1142.6$] compared to the original variable $(AIC = 2998.9, BIC = 3058.6, deviance = 2972.9)$.

Despite successful randomization,[13] we included several control variables in each model. We did so, because these controls have previously been shown to matter for our variables under study and because their inclusion underlines the robustness of our findings (but note that their results were consistent with what we find in simpler baseline models; see Supplementary Appendix A). In all models, we controlled for environmental interest (thereby testing **H3**), as well as respondents' age, gender, and education. In the news selection and engagement models, we further controlled for the number of days respondents had already been active. In the recall models, we instead controlled for the number of days between seeing an article and answering questions about it. Finally, in our subjective knowledge model we controlled for readers' self-reported engagement with environmental news throughout the week. Moreover, our analyses excluded data points where respondents were not active (news selection and recall models) or did not click on an article (reading time model). For an overview see Table 1.

Results

In this 7-day long preregistered field experiment, we tested to what degree deliberate changes to how environmental news articles are ranked, presented, and written can facilitate readers' selection of, engagement with, and recall from such articles (Figure 4). In the following, we first present results for our confirmatory analyses ordered by hypotheses (for a summary, see Table 1), before presenting exploratory results that probe recall for different question types (Figure 5), as well as potential effects on user satisfaction and engagement (Figure 6).

Confirmatory analyses

Our first hypotheses posited that the "position nudge" would facilitate the selection of (**H1a**), engagement with (**H1b**), and recall from (**H1c**) environmental news, independent of

environmental news interest. Results from three multilevel regression models as described above support all three hypotheses. More specifically, our news selection model ($R^2 = .30$), suggests that prominent article positioning coupled with visual highlighting increased the odds that a user clicked on the news article by 1.51 [odds ratio $(OR) = 1.51$; confidence interval (CI) 1.14—1.99; $p = .004$]. Similarly, our news engagement model ($R^2 = .46$) suggests that the presence of the position nudge also led to significantly longer reading times ($\beta = .11$; CI 0.01—0.21; $p = .033$). Finally, the results of our recall model ($R^2 = .30$) also suggest a positive effect of the position nudge on recall ($\beta = .12$; CI .04–.20; $p = .004$).

H2 argued that the "accessibility nudge" would facilitate recall independent of environmental interest. For effects on news selection and engagement we posed a research question (**RQ1**). However, contrary to **H2**, our results (Figure 4) suggest that the accessibility nudge had no significant effect on respondents' factual recall of the news they read ($\beta = .04$; CI −.04 to .13; $p = .310$). In response to RQ1, we also do not find significant effects of the accessibility nudge on news selection ($OR = 0.83$; CI 0.61—1.12; $p = .228$) and news engagement ($\beta = .01$; CI −0.09 to 0.12; $p = .844$). To contextualize these null effects, it is worth noting that respondents rated both the original ($M = 0.94$; $SD = 0.25$) and rewritten ($M = 0.97$; $SD = 0.19$) articles as easy to understand—a marginal difference that was found not to be significant in a Welch two sample *t*-test [$t(284) = −1.20$; $p = .231$].

Our third hypothesis probed the effects of "environmental news interest" on the selection of (**H3a**), engagement with (**H3b**) and recall from (**H3c**) environmental news. In support of **H3a** and **H3c**, we find that environmental news interest positively predicts the selection of ($OR = 1.23$; CI 1.10—1.37; $p < .001$) and recall from ($\beta = .08$, CI .05–.11; $p < .001$) environmental news. However, contrary to **H3b**, we find no support that environmental news interest increased reading times of environmental news articles ($\beta = .02$; CI −0.02 to 0.07; $p = .265$). When comparing these effects to those of the position nudge, we see that the position nudge effects for news selection and recall are at least as large, if not larger than that of interest in the environment.

Table 1. Overview of hypotheses and their empirical support.

Hypothesis	Wording	Supported
H1	The position nudge increases (a) the selection of, (b) the engagement with, and (c) the learning from environmental news, independent of environmental news interest and the accessibility nudge.	Yes
H2	The accessibility nudge increases the learning from environmental news, independent of environmental news interest and article position	No
H3	Environmental news interest is positively related to (a) the selection of, (b) the engagement with, and (c) the learning from environmental news articles.	Partially (support for H3a and c, but not H3b)
H4	The effects of the position nudge on (a) the selection of, (b) the engagement with, and (c) the learning from environmental news articles are more pronounced among respondents with a higher interest in the environment.	No
H5	The effects of the accessibility nudge on learning from environmental news articles are more pronounced among respondents with a higher interest in the environment.	No
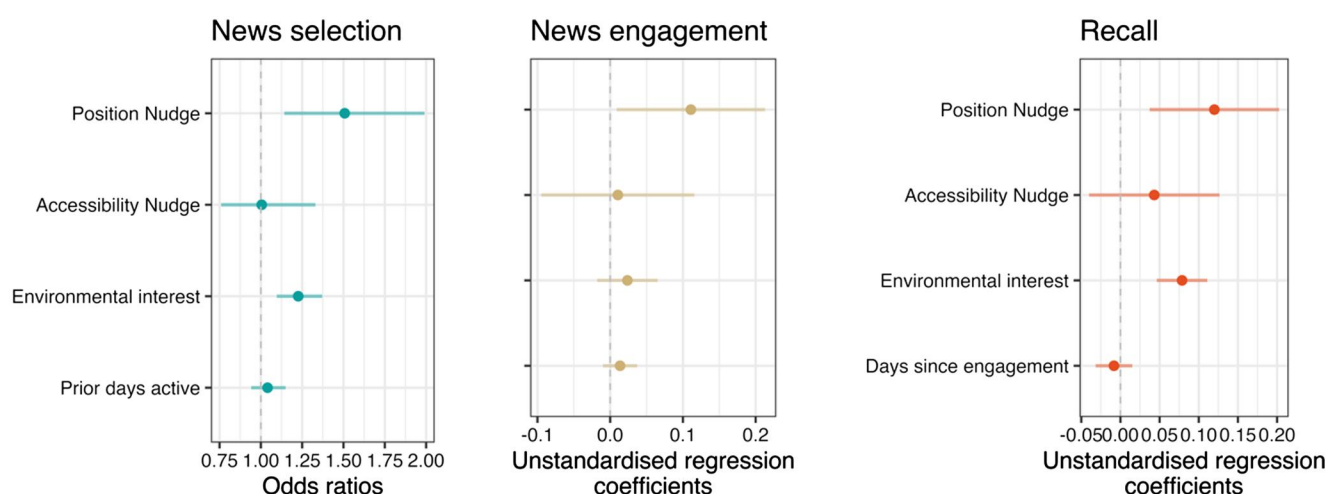
Figure 4. Results of (binary logistic) multilevel linear regression analyses with news selection, log-transformed reading time in minutes, and a daily recall index as dependent variables. Note that the original model also included age, gender, and education as controls (see Supplementary Appendix Tables 1 through 3).
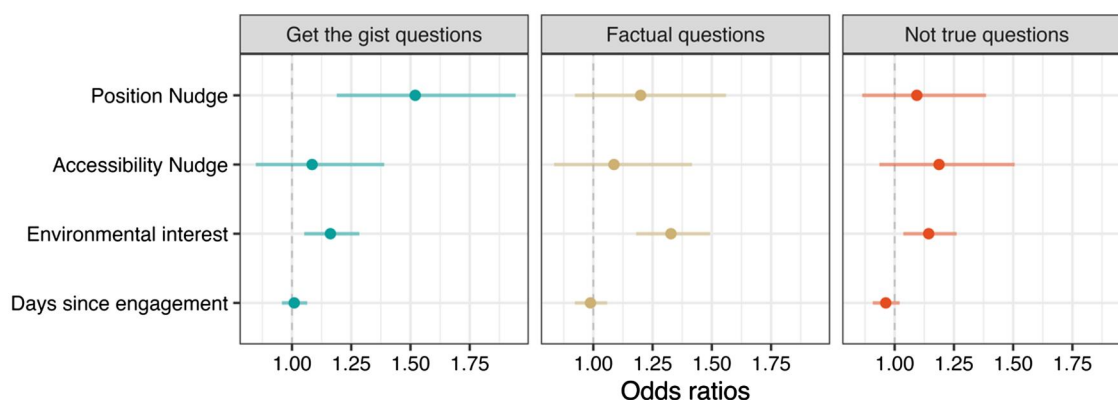
Figure 5. Binary logistic multilevel regression analyses for nudging effects on individual question types. We report odds ratios, indicating the effect of a one unit increase in the predictor variable on the likelihood of correctly answering (A) get-the gist, (B) factual, and (C) not-true recall questions. Note that in addition to the shown variables, the models also included age, gender, and education as additional control variables.

Theoretically, nudging effects could vary across individuals with different levels of interest, such that nudges work better for those who are less interested in environmental news. Accordingly, **H4** and **H5** posited that environmental news interest moderates the position nudge effects on news selection (**H4a**), news engagement (**H4b**), and recall (**H4c**), as well as the accessibility nudge effect on recall (**H5**). However, as we find no significant interaction effects (see Supplementary Appendix Tables 4 and 5), our results support neither hypothesis.
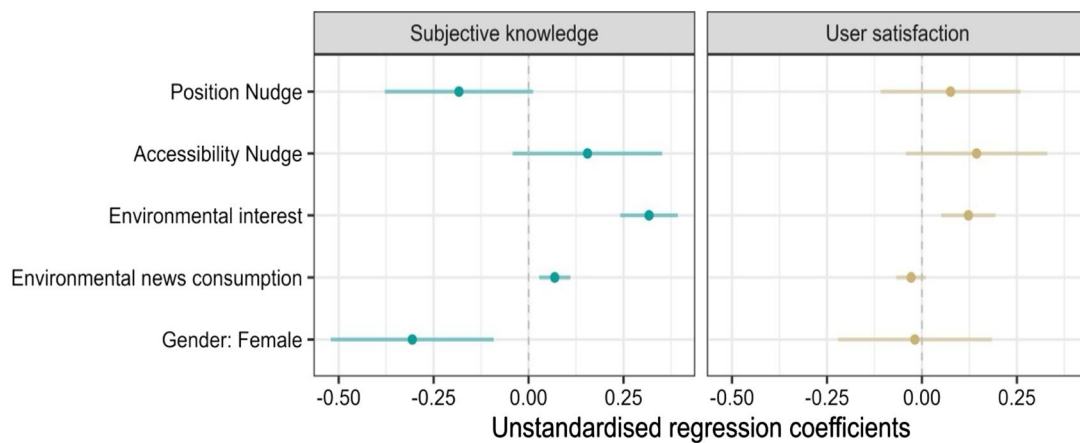
Figure 6. Linear regression analyses with self-reported subjective knowledge and user satisfaction as dependent variables. We report unstandardized regression coefficients, indicating changes on the 7-point Likert scales that both variables were measured on. Note that the models also controlled for age and education.

Overall, we conclude that the position nudge facilitated not just the selection of and engagement with environmental news, but also its factual recall, while the accessibility nudge proved largely ineffective. Another noteworthy finding was that the selection of environmental news did not become less likely over time ($OR = 1.04$; CI 0.94–1.15; $p = .436$), suggesting that effects of the position nudge did not wear off. Robustness tests with additional controls confirm these observations (see Supplementary Appendix A).

Exploratory analyses

While our confirmatory analyses provide causal evidence for the effectiveness of the position nudge, we believed it crucial to further contextualize the effects on recall and to explore potential backfire effects that may complicate the practical application of our nudges. In the following, we therefore briefly present nudging effects broken down by individual question types (see Figure 5) and explore nudging effects on readers' subjective knowledge and user satisfaction (see Figure 6) as well as reading time (see Figure 4).

Exploratory analyses suggest that the effects of the position nudge are predominantly driven by one type of recall questions, namely the more general "get the gist" questions (see Figure 5). It is also worth noting that the question types varied in difficulty, with respondents answering "get the gist" questions ($M = 0.26$; $SD = 0.44$) more successfully than "factual" ($M = 0.14$; $SD = 0.35$) and "which one is not true" questions ($M = 0.16$; $SD = 0.37$).

For "subjective knowledge," we find no significant effect of either the position ($\beta = -.18$; $t(493) = -1.85$; $p = .066$) and the accessibility nudge ($\beta = .16$; $t(493) = 1.55$; $p = .122$) across the whole sample, but we do see a significant effect of environmental news interest ($\beta = .32$; $t(493) = 8.22$; $p <.001$) and several other controls (see Figure 6). Our model explains about 19% of the variance in respondents' self-reported subjective knowledge ($R^2 = .19$). It suggests that despite measurable increases in factual recall, neither nudge type made readers feel more knowledgeable about the topic.

Finally, results of a linear regression analysis ($R2 = .04$; $F(493) = 2.38$; $p = .016$) indicate that neither nudge significantly impacted users' overall level of user satisfaction (see Figure 6) (including, among others, measures for future use intentions, ease of selection, and Informfully's usefulness for

users' news diets). Coupled with the findings that neither nudge decreased engagement with the nudged articles and that a higher number of prior days being online and exposed to the position nudge did not seem to limit its effect on news selection (see Figure 4), this suggests that the nudges did not cause backfire effects.

Discussion

In this seven-day long preregistered field experiment, we tested whether deliberate changes to how environmental news articles are ranked, presented, and written can facilitate readers' selection of, engagement with, and recall from such articles. Specifically, using a two-by-two between-subjects design with $N = 502$ respondents, we tested (a) a position nudge that displayed environmental articles enlarged and on top of the news feed (as opposed to fifth position) and (b) an accessibility nudge that used ChatGPT to automatically rewrite articles to score lower on overall text complexity, which in turn could help facilitate recall. We also explored potential backfire effects on user satisfaction and engagement.

Overall, our results suggest that prominent article positioning can serve as a powerful nudge that facilitates the selection of, engagement with, and learning from environmental news, whereas the accessibility nudge had no significant effect on these outcomes. Below, we reflect on the theoretical, practical, and methodological implications of our findings for research on nudging, (political) learning, and responsible platform design more broadly.

Methodological implications

To the best of our knowledge, this study is among the first to take research on nudging news engagement from controlled lab settings into the field. While our study still featured an element of controlled experiments (namely the random allocation to different nudging conditions), we maximized its external validity by (a) using a realistic-looking news aggregator app, (b) featuring daily updated real news as stimuli, and (c) allowing respondents extended time to get used to and interact with the news aggregator. As such, our results provide concrete evidence that experimental findings (e.g. see Knudsen, 2023; Loecherbach et al., 2021) for the prominent article positioning hold in more realistic environments, where

users have access to a broad variety of news at any time in the day that suits their habits and preferences. Arguably, this methodological approach should prove fruitful for research on any (algorithmically curated) content delivery platform and highlights the value of customizable open-source tools such as Informfully for social–scientific research.

Moreover, our choice to use an open-source tool also carries additional methodological advantages. This includes the ability to fully replicate our experimental design (using our openly accessible materials on Open Science Framework (OSF)[14], as well as the opportunity to compare results across various user studies that draw on the same tool and feature comparable user interfaces—an important benefit considering that differences in user interface design across studies can introduce considerable variation in the effects of particular manipulations (Beel & Dixon, 2021). Finally, by making an anonymized version of our dataset openly accessible (Heitz et al., 2024b), our study also facilitates future work on news engagement and recommendation.

Theoretical and practical implications

The nudges we tested differed in terms of their design and underlying mechanisms. Whereas the position nudge changed how prominently an article was displayed, the accessibility nudge altered the content of a nudged article. This might help explain why we find significant effects for one, but not for the other. Indeed, literature reviews often distinguish between different types of nudges, such as changes to the decision structure, decision information, decision assistance or social decision appeal (Jesse & Jannach, 2021) and meta-analyses show that some of them work better than others (Mertens et al., 2022). The results of this study are no different in that we find significant effects of changes to the decision structure (position nudge), but not of changes to decision information (accessibility nudge).

As such, our findings provide further evidence that nudges that manipulate existing content or provide additional information are frequently ineffective (see also Mattis et al., 2024a). For the accessibility nudge, exploratory analyses show that while the rewritten articles were objectively easier to understand, the difference in subjective perceptions was not significant. Given the relatively high levels of general news interest, environmental interest, and level of education in our sample, ceiling effects may explain this finding. However, our results could also suggest that lower text complexity might not always be better. Instead, it might be more promising to aim for content that aligns with readers' cognitive elaboration abilities (Song et al., 2022) and is perceived as both accessible and engaging—a notion that points towards the need of personalizing such nudges. Still, even though generative AI opens up novel ways of customizing journalistic content (Lin & Lewis, 2022) and plays an increasingly important role in everyday newsroom practices (Cools & Diakopoulos, 2024), our results highlight the complexities involved in automatically tailoring content to larger user segments.

In addition to contributing to broader literature on digital nudges, our findings also add to prior work on political knowledge acquisition. While earlier studies have already identified the importance of article position for news selection (Knudsen, 2023; Loecherbach et al., 2023), our study provides causal evidence that this in turn can affect democratically relevant outcomes such as knowledge acquisition over a seven-day period. Moreover, our results also show that while individual interests do play a role, mere news exposure facilitates some form of learning regardless (see Leeper, 2020).

On a more practical note, given that neither nudge negatively affected user engagement and satisfaction, our study suggests that both nudges can be applied in practical settings without compromising user satisfaction and engagement. However, our results also emphasize that the editorial or algorithmic ranking decisions of news (aggregator) apps carry a certain societal relevance in that they affect readers' news selection, news engagement, and recall. Indeed, if, as we find, readers remember what is on top but are comparably less likely to engage with lower-ranked content, news publishers must think carefully what type of content to highlight and how to safeguard diverse news engagement.

Thus, whereas this study used the position nudge on an aggregate level to draw attention towards environmental news, moving forward personalized implementations may be more promising. If personalized, position nudges could potentially address individual blind spots, diminish knowledge gaps between those with high and low interests, or broaden readers 'diversity corridor' (Loecherbach et al., 2021).

Limitations and future research

While our study relied on a longitudinal and highly externally valid design, it is not without limitations. First, to allow for a meaningful analysis, we had to make trade-offs between internal and external validity. For example, whereas an actual news aggregator would update content throughout the day, we decided to only feature 26 articles from the previous day. This allowed for a comparable study design and internally valid hypothesis tests but may have altered how users engaged with the app and led some to complain about the limited amount of content in open ended survey responses. Thus, future research might want to extend the amount of recommended news or implement some form of personalised recommendation to test whether the nudging effects that we find also hold in personalised environments.

Second, our conceptualization of news engagement as reading time might not be the best indicator of deeper news engagement. However, in the absence of more meaningful measures (e.g. eye-tracking), it still serves as a helpful behavioral proxy.

A third limitation pertains to how we measured knowledge acquisition. For instance, our subjective knowledge measure may have been too generic for meaningful effects to materialize. Likewise, while the difficulty of our recall items makes it even more meaningful that we do find effects for the position nudge, our differential effects for factual recall and subjective knowledge raise the question of what kind of knowledge acquisition would be normatively desirable and how it could be measured more reliably. Ultimately, our choice of three questions per day was a compromise between the best possible measurement and practical considerations such as survey overload.

Since this study only nudged environmental news from the Guardian, the generalizability of our nudging effects could be limited. While article positioning has been shown to facilitate engagement with other news genres as well (Loecherbach et al., 2021; Mattis et al., 2024a), our study can therefore say little about the extent to which the position nudge effects vary across news topics. Similarly, it is possible that the accessibility nudge would have worked better for content that

is more complex (e.g. scientific reports). Thus, future field experiments might want to test similar nudges for a broader range of news.

A fifth limitation pertains to our sample, which was self-selected and not representative of the general UK population. However, given the high levels of self-reported news interest and consumption, this self-selection may have led to a sample that is reasonably reflective of actual news aggregator users. This may in fact strengthen our arguments about the practical applicability of our approach, but it also questions our findings' generalisability. For example, do our nudges work the same for users who are not that interested in news? And can they also be effectively applied in other settings, such as on social media, or are their effects limited to more digital news environments?

Future work with larger and more representative samples, as well as in different contexts could help answer these questions. Moreover, future work might also want to probe the mechanisms that underlie the position nudge effect. Based on our results, it is not entirely clear whether the position nudge worked because it made people click on a given article, or whether higher levels of factual recall were predominantly driven by the fact that users saw additional information (in form of the teaser) on the home page. While both mechanisms seem likely and may well work together, future work might want to test the relative importance of these two mechanisms, potentially in relation to readers' motivation or interest in the topic.

Conclusion

In this study, we used the open source Informfully app, populated with real news articles from various UK news outlets, to examine the effects of a position and an accessibility nudge on (a) the selection of, (b) the engagement with, and (c) the recall from environmental news. To the best of our knowledge, this study is among the first that tested nudging effects on knowledge acquisition in news aggregators through an externally valid field experiment and over a seven-day period. The results suggest that prominent article positioning works as a powerful nudge for the selection of, engagement with, and recall of news, without sacrificing user satisfaction. Our findings offer empirical evidence and a clear message to practitioners: Prominent article display not only increases engagement but also carries implications for subsequent outcomes such as knowledge acquisition. Regardless of whether news media choose to leverage this fact for nudging readers towards particular content, our findings highlight the importance of carefully reflecting not only on the type of content that editors or algorithms recommend, but also on how it is positioned and visualized in people's news feeds.

Supplementary material

Supplementary material is available at *Journal of Communication* online.

Data availability

The anonymized data, materials, and analysis scripts that were used for this study are available on OSF: https://osf.io/8zfn5. For the Informfully content platform and a broader dataset with additional data-points please see https://github.com/Informfully.

Notes

1. Official website: https://www.informfully.ch, GitHub repository: https://github.com/Informfully, Google Play: https://play.google.com/store/apps/details?id=ch.uzh.ifi.news, Apple App Store: https://apps.apple.com/de/app/ddis-news/id1460234202.
2. The anonymous dataset is shared on GitHub: https://github.com/Informfully/Datasets.
3. While the limitations of using behavioral measures such as clicks and reading time for capturing user engagement are well established (Costera Meijer & Groot Kormelink, 2020), in the absence of better measures such as eye-tracking, we believe that (a) selecting an article and (b) reading it for a longer time are distinct forms of engagement that can serve as proxies for information processing relevant to our hypothesized effects on recall.
4. Note that we changed the preregistered wording from "text complexity" to "the accessibility nudge" for internal cohesion.
5. For preregistration see https://osf.io/yp5d9.
6. Overall, the experiment lasted two weeks, as described in our preregistration. However, due to a technical error in reassigning participants to experimental conditions in the second week, we are unable to use the data from week two. Thus, we limit our analyses to the first week only. We only included respondents that successfully completed the in-app survey after the first experimental week, leaving us with a final sample that fell slightly short of the 550 respondents we had aimed for in our preregistration.
7. The script is available on OSF under the title "ChatGPTNewsRewriter.py": https://osf.io/8zfn5.
8. Due to its prominence in existing research on the topic (e.g. see Song et al., 2022; Tolochko et al., 2019), the Flesch reading ease score took priority even though it usually aligned with the other indices.
9. See OSF repository: https://osf.io/8zfn5.
10. Excluding a sizeable amount of don't know responses ($N = 3944$) did not increase the overall knowledge index dramatically ($M = 3.45$, $SD = 2.71$) as opposed to ($M = 3.21$, $SD = 2.76$)
11. Note that our recruitment involved a strong element of self-selection, with respondents first having to express interest in the study and then needing to download the app. As a result, our sample is not representative of the United Kingdom as a whole but might arguably be a good reflection of who is interested in using news aggregators in the first place.
12. We also measured several control variables that were not included in the main analyses, but featured in the robustness tests. We report those in the supplementary materials.
13. The results of all randomization checks are available in our analysis output on OSF (Section 3.2.2 titled Randomization in DataAnalysisW1_Items.pdf); see https://osf.io/8zfn5
14. See OSF repository: https://osf.io/8zfn5

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