How 100 news articles about disruptive protest affect environmental attitudes

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Abstract

We research the effect of media content about disruptive climate protest on environmental attitudes, providing generalisable conclusions by employing a stimulus sampling design: participants (n=3222) are exposed to 100 news articles about disruptive protests, sampled representatively from the population of relevant text-based mainstream UK media articles. We investigate both the average article effect and the way in which features such as the protest's target or the article's tone change the effect. Reading a protest article causes large increases in awareness of climate change as an issue, very small increases in policy support, and small decreases in identification with environmentalism. There is high confidence that the features of the protest or article have negligible influence on these effects—possibly because due to repeated exposure, the public now processes news about disruptive climate protests in less detail. The positive effects on awareness and policy support are most likely to influence policymaking.

Disruptive environmental protest has become commonplace in the Western world since 2019 (Kenward and Brick 2024; Thomas-Walters et al. 2025), leading to public and academic debate about whether such protests impact observers' environmental attitudes positively or negatively (Berglund, Davis, and Finnerty 2026; Dablander, Wimmer, and Haslbeck 2025; Young and Thomas-Walters 2024). The matter is of obvious practical relevance, but also connects to key theoretical issues about the nature of persuasion, such as how it relates to social identification (Feinberg, Willer, and Kovacheff 2020; Simpson, Willer, and Feinberg 2022; Thomas-Walters et al. 2025; Vlasceanu et al. 2024).

Attempts to address these issues using methods from quantitative psychology have provided no general conclusion because of mixed results (Vandeweerdt 2026). Studies generally find that using disruptive methods results in negative perceptions of social movements (Feinberg, Willer, and Kovacheff 2020; Joly, Wagner, and Carstens 2025; Gonzatti, Hunger, and Hutter 2023; Fuller et al. 2025; Nylund, Thai, and Hornsey 2025; Kleer, Teutem, and De Vries 2024; Müller et al. 2024; Barkela, Schäfer, and Altenmüller 2025; Schmidt 1993), but there are exceptions (Bugden 2020; Mclaren and Walker 2024; Kenward and Brick 2024). At the same time, a few studies have established that disruptive

climate protests increase the salience of climate change, that is, how much it is on people's minds—but effect sizes vary from moderate to large (YouGov 2019; Vandeweerdt 2025; Akehurst 2023; Kountouris and Williams 2023).

When it comes to people's support for the protesters' cause and intentions to behave in line with protesters' goals, we mostly see slightly positive or null effects of disruptive protests (Brehm and Gruhl 2024; Valentim 2023; Kountouris and Williams 2023; Kenward and Brick 2024; Özden and Glover 2022; Ostarek et al. 2024; Hertel-Fernandez, Naidu, and Reich 2021; Vandeweerdt 2025; Kenward 2024; Akehurst 2023; Haas et al. 2025; Gonzatti, Hunger, and Hutter 2023; Nylund, Thai, and Hornsey 2025; Joly, Wagner, and Carstens 2025; Barkela, Schäfer, and Altenmüller 2025; Huff and Kruszewska 2016; Schieferdecker et al. 2026). However, small negative effects on attitudes have also occasionally been found, especially when respondents are asked about the specific policy demands of the protesters (Ostarek et al. 2025; Akehurst 2023; Feinberg, Willer, and Kovacheff 2020; Kenward 2024; Vandeweerdt 2025). Finally, a few studies have shown minor positive effects of disruptive climate protests on actual pro-environmental behaviour (Haas et al. 2025; Ostarek et al. 2022; Fabel et al. 2025; Valentim 2023).

The universe of non-violent disruptive protests is large, from sit-ins to road blockades to tax strikes, reflecting movements' philosophies and organisers' "theories of change" (Young and Thomas-Walters 2024). Different disruptive strategies are seen as more or less radical, disruptive and effective by the public Furl et al. 2023; Fisher et al. 2025b. Tactics' approval ratings range from somewhat positive attitudes towards school strikes to overwhelming disapproval of "art attacks" (among US respondents, Badullovich et al. 2024). This suggests that different disruptive tactics have widely different probabilities of producing backlash.

As a result, any given protest may not be a typical example of the latent concept of climate disruption (Clifford, Leeper, and Rainey 2024). And even as a group, the protest types that have been investigated so far may not be representative of the population of disruptive climate protests (cf. Wells and Windschitl 1999). Researchers have considerable degrees of freedom in choosing the characteristics of the protest they study (Simonsohn, Montealegre, and Evangelidis 2025). For instance, they must choose between protests that target citizens, governmental institutions, or companies, knowing that some of those categories are much more acceptable to the public as targets of climate protest than others (Badullovich et al. 2024; Fisher et al. 2025a).

In addition to this issue, with few exceptions (e.g. Kenward and Brick 2024; Vandeweerdt 2025; Akehurst 2023), experimental research on disruption has used researcher-written descriptions, often of hypothetical protests. Usually, these descriptions are neutral in tone and contain a few carefully chosen details about the message and tactics used in the protest. In real life, however, most citizens are exposed to information about protests via the media (Sisco et al. 2021). Media content differs from the typical study vignette in a few ways: it includes images and attention-grabbing headlines; it gives highly varying levels of attention to the message of the protest and its disruptive effects; and it may

be clearly hostile or (more rarely) sympathetic in tone (McLeod and Hertog 1992; McLeod 2007).

In this study, we address these problems by experimentally testing the effect of reading a randomly selected, real (though usually summarised) news article about disruptive protest, allowing generalisable conclusions about the effects of the population of news from which these articles come. In other words, we take a stimulus sampling approach. A problematic absence of stimulus sampling in psychology has been regularly noted (Judd, Westfall, and Kenny 2012; Simonsohn, Montealegre, and Evangelidis 2025; Wells and Windschitl 1999) and we are aware of only one published study within political psychology that utilises this approach (Skytte 2025).[1] We select our pool of stimuli in a way that is reproducible, strongly constrains researcher degrees of freedom, and represents the full population of mainstream text- and image-based UK media reports of disruptive climate protest. As a result of this, we also cover the natural variation in types of disruptive climate protest, weighted by their likelihood of receiving media coverage.

By pooling these article treatments, we can measure the effect of an "average" news article about disruption on participants' environmental attitudes. Moreover, we can analyse which protest and article features are most predictive of positive or negative opinion effects. In other words, we can explore whether the treatment effect of the articles is predicted by the target of the protest, the tone of the article, and so on. We crowd-source measurement of these article features using an additional survey ($n = 289$). In addition, by making replication data available, including the stimulus set, we allow anyone to test the effect of additional article features that can be coded. Our results can contribute to theory about when and why social movements are successful, and shed light on the very mixed findings regarding the effects of disruptive protest.

Hypotheses

We hypothesize that exposure to a representative sample of articles about disruptive climate protest on average increases (H1) the salience of climate change; (H2) concern about climate change; (H3) support for climate change policy; and (H4) intentions to take climate-related collective action; but (H5) decreases identification with environmentalism. The salience of climate change captures how much it is at the top of people's minds as a societal problem. Increasing climate salience through media attention is a typical stated goal of (disruptive) climate protest organisers, in order to put pressure on politicians. Indeed, public preferences are more likely to be reflected in policy outcomes when the issues at stake are highly salient (Giger and Lefkofridi 2014; Lax and Phillips 2012; Rasmussen, Reher, and Toshkov 2019).

Next, we look at concern about climate change—-a common way of measuring general engagement with the issue (Bergquist et al. 2025). We also measure

1. Our searches have included checking all 976 articles which cite Judd, Westfall, and Kenny (2012) and the 156 articles resulting from a search in Web of Science for "stimulus sampling" OR "random stimulus" OR "random stimuli" AND psychology.

support for climate policy and intentions to take collective action. These are perhaps the most politically relevant aspect of environmental attitudes, given that public support is the most important predictor of climate policy adoption (Yeganeh, McCoy, and Schenk 2020). Likewise, collective action has been argued to be "the most efficient method of achieving emission reductions" (Roser-Renouf et al. 2014, p.163; see also Schmitt et al. 2020).

We also measure environmentalist identity, since it is proposed that de-identification from the movement and its issues is the main mechanism behind potential opinion backlash (Feinberg, Willer, and Kovacheff 2020; Kenward 2024; Simpson, Willer, and Feinberg 2022; Bashir et al. 2013). We thus hypothesize that identification mediates the effects on other attitudes, where effects via decreased identification are negative (H6), but effects on those attitudes via other pathways (the direct pathway in our analysis) are positive (H7, see Methods section on mediation for a discussion of causal identification in meditation analyses).

We further hypothesize that the effects of disruptive protest articles on environmental attitudes depend on features of the protests as described by the articles. We test for effects of the number of protesters (H8); the targets of the disruption (H9–12); the tactics used (H13–16); the tone of the article and the number of words it spends on the protesters' message, on the disruption, and on negative comments (H17–20); and ordinary citizens' perceptions of how much disruption was caused, whether the protesters come across as ordinary people, and whether the form of protest is acceptable (H21–23). Supplementary Appendix A contains further details and justifications for these hypotheses.

Design overview

Our design consists of a preregistered two-wave survey (see Appendix J for a list of minor deviations from the preregistration). In Wave 1, participants who are nationally representative for age, sex, and political orientation are asked about their environmental attitudes, as well as background variables (see F.2 for minor deviations from representativeness). In Wave 2 ($n = 3222$, retention rate 92%), we randomly allocate 20% of the sample to the control group, which sees no media content. The other 80% of the sample are randomly allocated to see one of 100 news articles on disruptive climate protest that were selected into the stimulus pool. The main quantities of interest are (1) the average effect of the treatment across all articles, for each environmental attitude outcome; and (2) the connection between the features of a protest/article and its effects on environmental attitudes.

We take the following steps to make sure that our estimates are as representative as possible of the real-world effect of disruptive protest through mainstream (text and image) media coverage. First, we cover the ten most popular text-based UK news outlets. Second, every article in those outlets that meets our criterion of owing its existence to a specific disruptive climate protest (or several similar ones) is eligible to be sampled. This also means that protest types that would receive hardly any coverage in the real world are also unlikely to be se-

lected into our treatment pool. Third, participants see articles proportional to the relative readership of the outlet. Fourth, while we have to reduce the length of many articles to make them feasible as survey treatments, we take measures to ensure this process does not change key characteristics of the articles. Fifth, we add an analysis where each response is weighted by the likelihood of that respondent actually reading the outlet whose article they were presented with, based on the respondent's ideology. Together, these measures allow us to get as close as currently realistically possible to the average public opinion effect of disruptive protest coverage, taking into account variation in the protests, journalistic decisions on how to cover them, and readership of the news outlets.

Protest and article features are rated by research assistants (RAs), large language model (LLM) Claude, and participants in a separate, representative survey of UK residents ($n = 289$). Figure 1 shows the distributions of the protest/article features (see Methods section Protest and article features for rating scales). We divide features into four causal "blocks" with features in earlier blocks causally preceding features in later ones. We use this structure when we estimate the effect of each feature, to avoid controlling for features that come later in the causal chain (see Methods section Effect by protest/article features).

Results

Effect of a typical news article

Figure 2 shows the pooled effect of all article treatments on environmental attitudes (standardised in the figure for comparability). The largest effect by far is on salience. In the treatment group, an additional 13% of respondents mentioned climate or the environment as a top issue facing their country ($SE = 2\%$, $p < .001$), a doubling of the baseline of 13%. We also see a very small positive effect on climate policy support, where treated respondents are 0.1 pt. more supportive on a 7-pt. scale ($SE = .04$, $p = .008$). Finally, there is a small negative effect on identity, where treated respondents' identification as environmentalists is 0.3 pt. lower on a 7-pt. scale ($SE = .04$, $p < .001$). Appendix H documents full numerical results; multiple testing correction leaves significance unchanged.

Another way to approach this analysis would be to weight responses by the likelihood that they would occur in the real world, that is, the likelihood that a respondent would actually read the outlet whose article they are being presented with. We can estimate this based on the respondent's ideology and existing media consumption polling data. An analysis applying such weights leads to very similar results (see Appendix H.1.3). We do, however, find heterogeneous treatment effects of the articles by the respondent's ideology—in contrast with the literature, which has not found such an interaction (Feinberg, Willer, and Kovacheff 2020; Kenward and Brick 2024; Vandeweerdt 2025; Haas et al. 2025). More right-wing respondents are affected less positively in terms of salience, as

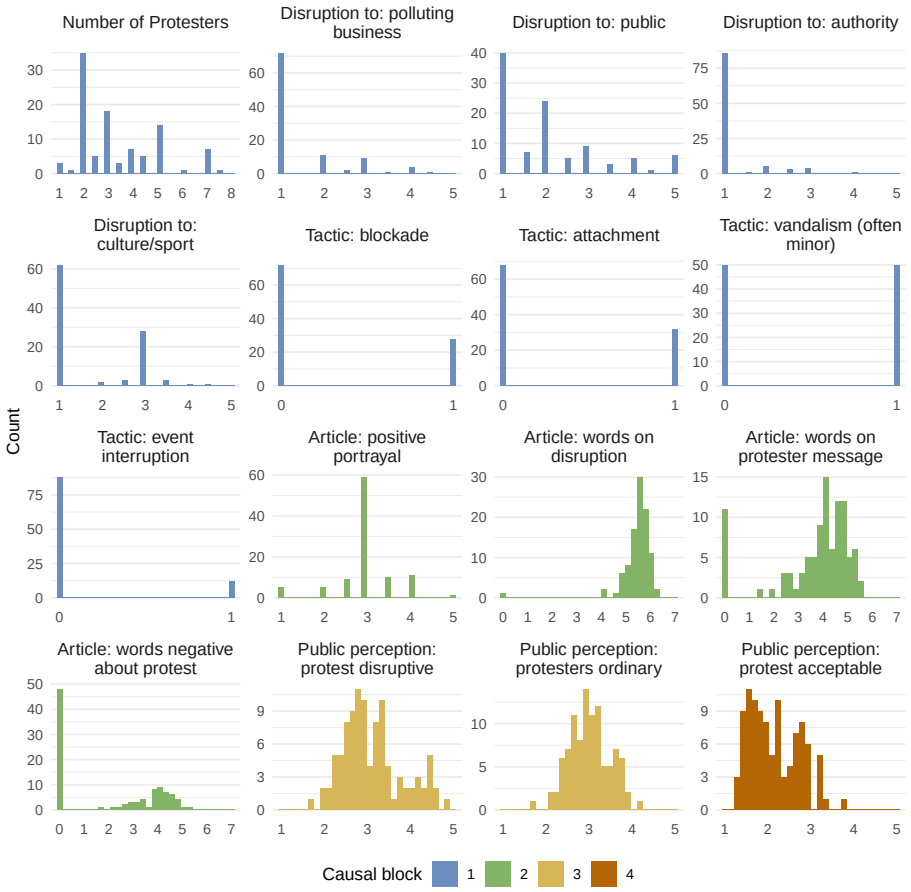

Figure 1: Distribution of each feature across the 100 news articles about disruptive protest. Number of protesters is rated by two RAs on a 8-pt. scale with intervals (e.g. "4 to 10"). Words in the article that cover specific aspects (e.g. disruption) are counted by the LLM Claude and log-transformed. Public perceptions are crowd-sourced via a representative UK survey. All other features are rated by two RAs.

well as more negatively in terms of concern, behaviour, and (with marginal significance) environmentalist identity. Appendix H.1.4 documents and visualizes these results.

Mediation by environmentalist identity

We include environmentalist identity primarily because of its role as a potential mediator: an explanation for why disruptive protests might have a (negative) effect on attitudes. To investigate this further, we perform a mediation analysis

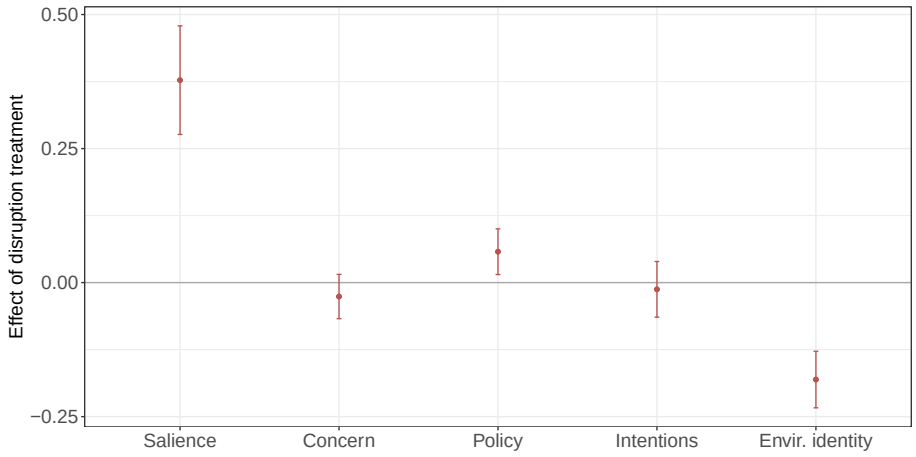

Figure 2: Effect of disruption article treatments on environmental attitudes (all outcomes standardised), with 95% confidence intervals without multiple testing correction.

of the effect of disruptive articles via environmentalist identity (see Methods section on mediation for some guidance on causally interpreting this analysis). The outcome is a composite environmental attitude scale (concern, policy and behaviour). As we hypothesised, there is a very small negative identity-mediated effect of the articles (-0.03, $p < .001$) and a same-sized positive direct effect (0.03, $p = 0.128$), though the latter is not statistically significant. These two pathways cancel out to create a combined null effect of the articles on attitudes (0.001, $p = 0.912$). In other words, respondents who saw decreases in environmentalist identity due to the treatment were more likely to be slightly negatively affected in their environmentalist attitudes, but this was compensated for by a direct effect of the article that was slightly positive.

Effect by protest/article features

Figure 3 illustrates the effect of each feature of the protest or article. This is the connection between the features' presence and the resulting environmental attitudes (composite scale) of the respondents reading it. Both features and attitudes are standardised for comparability. The key conclusions are that most features have no detectable effect on attitudes, and any effects that do exist are almost certainly tiny: no features have a 95% confidence interval outside of the [-0.05, 0.05] bounds (in standard deviations). The only features that has a statistically significant effect is the (logged) number of words used on disruption. Even that effect is tiny, however, and it is not significant under multiple testing correction. Appendix H contains all numerical results.

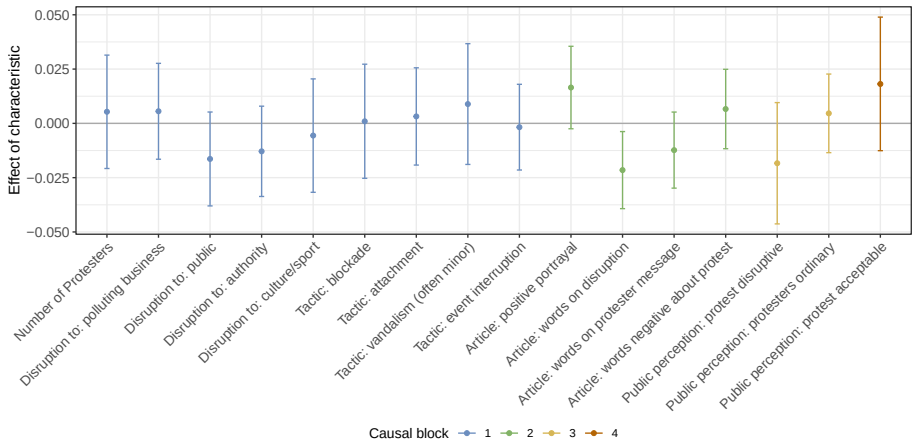

Figure 3: Effect of protest/article features on environmental attitudes (outcome and all features standardised), with 95% confidence intervals without multiple testing correction. See Design overview section for an explanation of the "causal block" color coding.

Effect of all articles owing their existence to disruptive protests

Some news articles are not about one specific protest (or a few closely related ones), but still came into existence due to environmental groups using disruptive activism. Typical examples are an article portraying a single activist and all of the protests that they have been part of, or an article discussing increased government repression of disruptive environmental protest. We recruited an additional 257 respondents to read ten such articles, also randomly sampled from all articles in this category. We can include these additional articles in the pool of treatments to estimate the overall effect of media content on disruptive protest. Results are essentially unchanged; see Appendix H for details.

All analyses mentioned in this Results section are preregistered. Appendix I contains non-preregistered additional analyses. Here, we re-weight respondents to be fully representative of the UK population. We also investigate possible polarizing effects of the treatment (in light of the interaction effects with ideology) and find no evidence of such effects. Finally, we show that the null effects of the features are not due to our joining different attitudes into a single scale, nor to the fact that we model the effect of each feature while controlling for others.

Discussion

Real media content about disruptive climate protest in the UK currently has a strong positive effect on the salience of climate change and the environment, a very small positive effect on support for climate policy, and no effect on concern about climate change or collective action intentions. It also has a small negative effect on readers' identification as environmentalists. The positive effects on salience and policy support are likely of most practical relevance. A meta-analysis has shown that public support for climate policy is the strongest predictor of whether US cities adopt such policy (Yeganeh, McCoy, and Schenk 2020), and there is a clear connection between local public opinion about climate change and Congresspeople's votes on climate bills (Vandeweerdt, Kerremans, and Cohn 2016). In addition, when an issue is more salient to the public, policy tends to better reflect the public's preferences (Giger and Lefkofridi 2014; Lax and Phillips 2012; Rasmussen, Reher, and Toshkov 2019). This is particularly relevant for an issue like climate change, where large majorities of the public already favour more ambitious policy (Andre et al. 2024). At the same time, a recent meta-analysis of experimental evidence concluded that "the evidence of the causal effect of identity on pro-environmental behaviour and other outcome variables is very weak" (Urban et al. 2025, p. 2). And while our mediation analysis shows that respondents who were negatively affected in their identity were also more likely to see small negative opinion effects, this was cancelled out by a small positive direct effect of the treatment.

Surprisingly, we find that no features of a protest or news article noticeably change how it affects public opinion. Any effect that exists is likely to be very small. For instance, the protesters' choice of tactics and targets, the tone of the article, how much time is spent repeating the message of the protesters, and public perceptions of the protest as more or less disruptive or acceptable all have null effects. These conclusions nuance some earlier claims on the use of disruption. For example, some movement scholars have hypothesised that attention-grabbing tactics such as disruption will lead to media coverage, but that this coverage will not give sufficient attention to the protesters' message to have political impact (Sobieraj 2011). Our findings instead indicate that, in the contemporary UK context at least, an average article solicits enough response to change opinions. Additional words dedicated to the message do not add any persuasive effect, possibly because of the familiarity of the public with the oft-repeated basic arguments. This further suggests that from some perspectives it may not matter that in recent times, the UK media has reduced the amount of words devoted to repeating protester messaging (Berglund, Davis, and Finnerty 2026). Our results also add nuance to findings by Badullovich et al. (2024), Furl et al. (2023) and Fisher et al. (2025b). They ask respondents to rate tactics directly on how acceptable, disruptive or radical they are and find clear variability. When we compare such perceptions to a protest's actual effectiveness at changing public opinion, we find no connection.

These findings of homogeneity are, however, strikingly incongruous with the review of prior evidence that motivated the study, which indicated that

generalised conclusions about the effects of protest are challenging to draw because of conflicting results from different studies. While it is difficult to make a direct comparison, the effects we find of different articles also seem more homogeneous compared to previous studies that tested the effect of different protests or portrayals within the same study, including in the UK (Akehurst 2023; Kenward and Brick 2024; Feinberg, Willer, and Kovacheff 2020—but see Fuller et al. 2025; Vandeweerdt 2025; Joly, Wagner, and Carstens 2025; Huff and Kruszewska 2016; Brehm and Gruhl 2024 for examples of very different protests having similar effects). We propose a post-hoc explanation of this initially surprising homogeneity of response to diverse protest forms. Most adult members of the UK public must now have appreciable familiarity with disruptive environmental activism. Since 2022, there have sometimes been thousands of media mentions per month of disruptive activist groups (Berglund, Davis, and Finnerty 2026); we estimate hundreds of mainstream media articles per year since 2023 that focused on disruptive activism (see article sampling details in Technical Materials); and already in 2019 one single large campaign by a then-prominent group, Extinction Rebellion, led to it being known by name by half the adult population (Kenward and Brick 2024).

Our explanation is therefore that because the UK public is highly familiar with the phenomenon of disruptive environmental activism, the effects of exposure on relevant attitudes are now more limited and homogenous because of reduced levels of stimulus processing. Both learning theory and evidence from neuroscientific experiments converge on the idea that when stimuli are more familiar due to repetition, they are processed more quickly, less effortfully and less effectively (Pearce and Hall 1980; Van Kesteren et al. 2012). When processing is more shallow, respondents are more likely to rely on contextual cues such as who is sending the message, and less on content (Petty and Cacioppo 1986; Chaiken 1980). For instance, the differences in effects of strong or weak arguments are reduced when these arguments have been repeated (Garcia-Marques and Mackie 2001), especially if the topic is of low personal relevance (Claypool et al. 2004). Application of these overlapping theories suggests that participants have developed a rapid, gist-based mental response to disruptive environmental activism that does not rely on specific details. The power of these theories to explain our results is strengthened by another discrepancy between previous and current findings. Similarly high-powered studies fielded in earlier years do not find effects to be moderated by participant ideology (Kenward and Brick 2024; Brehm and Gruhl 2024), but we find clear such effects. A less cognitively elaborated response would be expected to include elements determined by relevant social norms, which are now more clearly established—media read by right-wing individuals tends to cue a negative response towards this kind of protest, but left-wing media less so (Berglund, Davis, and Finnerty 2026).

The current design has three key limitations. First, while we went to great lengths to ensure that treatments were sampled from all UK mainstream text-and-image-based news reporting on disruptive climate activism, our sample falls short of complete representativeness of the full media landscape. It does not include video-based news or social media posts, and it leaves out text-and-image

outlets that reached 4% or less of the UK population, such as local news.[2]. In addition, we used an LLM to summarise 75 of the 100 articles so that they could reasonably be presented as part of a survey. While we validated the content of the summarised articles (see Appendix C), they were by definition shortened. Given that the number of words spent on disruption may have had a very small negative effect on environmental attitudes, it is possible that the full-length articles would have had a slightly more negative effect. That being said, our LLM-assisted article summary process includes checks to ensure that all key details of the disruption are left in, and we model the relationship between words and attitudes as logarithmic, with more words having decreasing marginal returns. In other words, we believe that the content on disruption that was present in the summaries were most likely the "most effective" words.

Second, in our design we make sure the treatments are a representative sample given the readership of different outlets, and we can weight by the likelihood of a given respondent consuming a given news source based on their ideology. However, we cannot correct for readership of individual articles within outlets, because such data is unavailable. In the real world, for example, more "spectacular" or controversial protests may attract more readers (as well as more coverage, which our design does account for). If high-reach articles have systematically different effects from low-reach ones, this could introduce some bias into our results. However, the fact that we find little evidence that any protest features affect attitudes assuages this concern.

Lastly, the current design is only able to test the immediate effects of one-time exposure to media content on disruptive protest. A large meta-analysis (Coppock 2016) shows that treatments embedded in survey experiments like ours can have longer-term effects, but it depends on the cognitive mechanism at play. In our case, effects on issue salience might be short-lived, as environmental issues are only made more accessible in people's minds. Effects on other attitudes could be more persistent, because an association between the environment and disruptive tactics is created or strengthened, or because respondents receive new information from the protester's message. Sisco et al. (2021) find that that the attention-raising effects of large climate protests dissipate after four to seven days, while (Brehm and Gruhl 2024) find positive effects of real-world protests on climate concern, despite the fact that the protests occurred up to 14 days before respondents were polled. Further research is needed to understand how the different attitudinal effects of (disruptive) protests decay.

In conclusion, it appears that disruptive environmental protest in the UK between 2023 and 2025 had extremely consistent and primarily positive effects on UK public opinion—although heterogeneity in previous studies indicates this effect may not generalise to other times and places. It should also be noted that the only effect estimated to be sizeable (on salience) is likely also ephemeral, whereas the effect that may be less ephemeral (on policy support) was very small. Also notable is that, where we find overall null main effects (for concern

2. Although we note that due to the recent collapse in UK local newspaper readership, Ofcom 2022, this is not a major omission

and behavioural intentions), this is because exposure has a very small negative effect on right-wing individuals, balanced by perhaps even smaller positive effects on left-wing individuals.

Further, the broader context is important. Although such protest was acting to maintain already high public pro-environmental attitudes, in the same time-period other factors have had stronger effects shifting them in the opposite direction (Berglund, Davis, and Finnerty 2026; YouGov 2025). And evaluated more broadly, such protest has had other effects, not least an increasingly authoritarian government stance on protest with wide implications for civil liberties beyond effects on the climate movement (Berglund et al. 2024; Alkousaa and Jabkhiro 2023; Rossdale et al. 2025). Protest has been working to some extent, but activists must evaluate whether the benefits are worth the cost of the resulting government repression and a potential and a potential widening of the opinion gap between the left and right.

Methods

Respondent sampling

We recruited a sample of 3222 UK adults using Prolific, a platform known to provide high-quality responses (Albert and Smilek 2023; Peer et al. 2022). Participants were quota sampled based on norm data for age, sex, and left-right ideology self-placement. Appendix F contains details about recruitment and the sample's representativeness, and Appendix I.1 contains analyses using re-weighting to compensate for minor differences between our sample and the population.

Participants filled out two surveys that were fielded about two weeks apart (a timeline dictated by the fact that payment for the first wave was made conditional on completion of the second). 80% of respondents were allocated to the treatment group, so that each of the 100 articles were presented to approximately 26 participants.[3]

There are a few reasons why we allocated a large share of the participants to the treatment conditions. First, the effect of the treatment is expected to be heterogeneous across articles and respondents, making the average outcomes of the treated group more challenging to estimate. This means that allocating more than half of participants to the treatment is optimal from the point of view of statistical power. Second, having a large number of treated participants allowed us to productively explore the features of the articles that predict smaller or larger treatment effects.

Selecting news sources

We selected sources based on individual-level polling data from the Reuters Institute Digital News Report (Newman et al. 2024), where UK-representative respondents indicated whether they consume over 70 different news sources. We selected the ten news websites with the highest UK readership. To be included, news websites must use mostly text and image formats (i.e. not be an online video repository), and consist of original content rather than links to content hosted elsewhere (e.g. MSN). For news websites that have a print edition, we add the print audience to their online audience (without double-counting the overlap). We note that by not including sources below a certain readership level, we miss out on non-mainstream sources (e.g. blogs) and local media. However, consumption of local media has recently collapsed in the UK (Ofcom 2022). It is also worth noting that the websites that fell just outside the top-ten were almost all either international websites (Al Jazeera online, Huffington Post, CNN.com, New York Times) or websites whose reporting is so specialised that they are unlikely to cover disruptive climate protests (Financial Times, Economist).

3. We chose to sample 100 articles as treatments because given our resource constraints, this would allow us to have 14 crowd-coders rate the features of each article. This relatively large number of raters was necessary in order to achieve strong reliability for the averaged ratings (see Appendix D).

Table 1: Sources Ranked By Their Consumership, In-/exclusion Criterion, And Article Count.

Source	**Rank and in/exclusion**	**Number of articles**
BBC News online	1 - Included	32
BBC TV News	Excluded - Video	-
ITV News	Excluded - Video	-
Guardian	2 - Included	13
Daily Mail	3 - Included	13
BBC Radio News	Excluded - Radio	-
Sky News 24 hour news	Excluded - Video	-
Sky News online	4 - Included	10
Channel 4 News	Excluded - Video	-
Metro	5 - Included	6
Sun	6 - Included	6
Telegraph	7 - Included	6
Commercial radio news	Excluded - Not a specific source	-
Other regional or local newspaper website	Excluded - Not a specific source	-
Regional or local newspaper	Excluded - Not a specific source	-
The Times	8 - Included	6
GB News 24 hour news	Excluded - Video	
Mirror	9 - Included	5
MSN News	Excluded - Not original source, only links	-
ITV News online	10 - Included	3

Note. Consumership is according to the Reuters report (Newman et al. 2024). Last column is the number of articles (out of the pool of 100 stimuli) that come from the source.

Selecting disruptive climate protest articles

Definition of disruptive protest

We define disruptive protest as follows:

> Disruptive protest is protest that appears to be aimed at interrupting the functioning of some other activity generally regarded as legitimate (whether that is fossil fuel operations, road transport, sport, government operations, cultural displays, etcetera) as a means to draw attention to a cause or as a means to prevent the activity. Disruption is not dependent on the actual scale of disturbance of economic or social life.

For example, a registered march in a city can cause great inconvenience, but because the disruption is a side-effect of the marchers' primary intention to amplify their communications by gathering in numbers, we do not regard this as disruptive protest. On the other hand, tactics such as tax strikes and school strikes are included in the definition, because they are ultimately aimed at disrupting the activities of collecting taxes and schooling. We use this definition and these examples to guide both LLM and human coders when screening articles for eligibility.

Article search

We retrieved potential treatment articles by searching the website of each source via Google using search terms centred on the three groups responsible for almost all disruptive climate protests in the UK in the past two years (in pilot work, we never found additional relevant articles with other search terms). We searched for "Extinction Rebellion", for "Just Stop Oil", and for a combination of "Greenpeace" and qualifier terms: "protest OR activists OR demonstration OR disruption OR blockade". The qualifiers are necessary for Greenpeace because in contrast to the other two organisations, piloting revealed that it is very often mentioned in articles not mentioning disruptive protest, which can burden the subsequent screening process.

We covered two years of media content going back from September 30th 2025.[4] A two-year period ensured heterogeneity in the types of protest covered, while being short enough to avoid the content to feeling outdated to participants. To define the search terms, article screening criteria, and a final list and codebook of protest/article features, we piloted all of these elements on articles between two and four years old. We did not use material from the real search period, so that these elements should be decided on without any direct evidence on how they might impact the results when applied to the actual search period. This would limit our degrees of freedom in influencing the final result.

4. A week's worth of articles from the beginning of the period was unintentionally left out of the sample, however.

Article screening

Articles are screened into the population of possible treatments if they owe their existence to a specific disruptive climate protest, or a small number of such protests all closely linked in theme, time and protest method. In other words, in a counterfactual world where climate protesters had not used disruptive methods at a specific protest (or multiple similar protests), the article could not exist in a form where the message was hardly changed.

This means that we exclude articles that merely mention disruptive protest(s) in passing as they discuss an environmental issue. We also exclude articles that owe their existence to disruptive protests in general, but that do not revolve around a specific protest, for example articles that portray a single activist with all the protests they have participated in. In an alternative analysis (see Methods section, Effect of all articles owing their existence to disruptive protests), we also include such general articles. We do this in order to estimate the overall effect of the existence of disruptive protest via media coverage

We further leave out some article types whose format would make them difficult or impossible to process using our pipeline (letters to the editor; pages that are collections of short updates or links to other articles; articles that consist of a short caption connected to a video; and articles that are not in English (e.g., Welsh) or clearly originate from a non-UK edition of the news outlet). Out of the population of screened-in articles for each news source, we randomly select a number of them to serve as stimuli. This number is proportional to the source's readership (see Table 1), so that the final pool of stimuli contains 100 articles. Supplementary Appendix B includes the full description of our article screening rules, and how we used a combination of validated LLM screening and human screening to apply these rules.

Creating the treatments

Summarization

We used the Anthropic-developed LLM Claude to summarise the stimulus articles down to 300 words when the original is greater than 350 words (75 of the 100 articles covering specific protest and all 10 of the more general articles).[5] This resulted in a median article length of 333 words (IQR 303 to 364) for the specific protest articles used in the main analyses. We judged this as a reasonable length to ask participants to read in a survey, while being long enough to preserve key information.

Without summarization, the articles would be highly variable in length, making it difficult to compensate respondents fairly for their time if they read articles fully. On the other hand, if longer articles cause some respondents to only skim the article, then we would lose control over which information from the article influenced attitudes. Most importantly, the article feature raters

5. We always used Claude Sonnet 4.0, except in piloting where earlier versions of Claude Sonnet were used.

(research assistants and crowd coders) might have based their ratings on more or different content than the skimming respondents. If we had opted not to summarise, and if we had then found null effects of protest features on attitudes, then this would have complicated their interpretation.

Human filtering and quality control

One of the authors conducted a quality check on each selected article. First, they manually confirmed that the article matched the screening criteria above—if not, the article was substituted with another randomly selected article from the same source. Second, they checked summaries for two types of issue - shifts in article balance (pro- or anti-protester) and issues reducing summaries' plausibility as real media articles. Summary checking was based on a full manual examination of pre- and post-summary article versions, supplemented with LLM-generated reports, as an LLM can usefully critique its own work. Of the 110 articles, 26 required correction of issues other than trivial formatting, i.e., balance or plausibility issues. Balance shifts towards a more anti-protester stance were identified in 8 articles and in other opposite direction in 9 articles; plausibility issues were identified in 9 articles. In all cases except 2, these issues were corrected using a standard prompt sequence which fed the identified issues back into the LLM and asked for a re-summary; for 2 issues of plausibility manual editing was used.

Supplementary Appendix C includes details on how we originally (in the piloting stage) validated the LLM's ability to summarise without measurably creating differences from the originals on key characteristics. The paper's Technical Materials [available on Github for double-blind peer review] contains full documentation of the article sampling, summarising, and production process.

Treatment presentation

Treated participants saw a summarised version of one news article. Above it, they saw the logo of the news source, the original headline and (if present) subtitle. We presented the three first pictures that were included in the original article, at the top, middle and bottom of the summary, along with the original captions. We ensured that the layout of this page resembled a real news article.

Control group

Control group participants see no media content. An alternative approach could have been to expose control group participants to media content about non-disruptive protests. There are two main reasons behind the choice of a pure control group. First, disruptive protests receive far more media attention than non-disruptive protests (Wouters 2013; Scheuch et al. 2024). In fact, had the protests covered in this study been non-disruptive, then they almost certainly would have received no coverage at all, especially given their size (Wouters 2013). Therefore, the comparison between reporting of disruption and no reporting at all has more ecological relevance.

Second, if we were to use a stimulus sampling approach for the non-disruptive articles as well, then they would very likely differ from the disruptive articles on more than just the level of disruptiveness (cf. Fong and Grimmer 2023). Conversely, if we wanted to make sure that the treatment and control only differ on disruptiveness, we would have to create control group articles that omit or replace the disruptive elements from the treatment article, often resulting in highly artificial articles.

Variables measured

Outcomes

We measured five outcomes among all respondents in both survey waves, in order to test our hypotheses H1—7. Where possible, we selected items that are known to have high correlations with other items/scales measuring the same concept; and whose response distributions make them less likely to be subject to floor or ceiling effects. For example, as climate policies often get strong support in surveys, we deliberately chose more controversial policies. Supplementary Appendix E contains further details such as item sources and full response scales, as well as the existing literature that all items are based on. The items are:

- Salience of climate change, i.e. mentioning climate or the environment in open-ended responses to the question: "What do you think are the three most important problems the UK is facing right now?" (binary, 0 or 1).
- Concern about climate change, two items: (scale 1-7)
  - "I worry about the effects of climate change in my lifetime in this country."
  - "Climate change is one of the greatest threats facing humanity."
- Support for three specific climate change policies: "How much would you oppose or support the following policies?" (scale 1-7)
  - "Phasing out the sale of new petrol and diesel vehicles by 2035."
  - "A 1% increase in the basic rate of income tax to invest in a new generation of renewable energy."
  - "Phasing out the sale of new gas boilers and replacing them with electric heat pumps."
- Intentions to take climate-related collective action in the next year, three items: "Below are three actions. How likely are you personally to do each action within the next year?" (scale 1-7)
  - "Talk with others about environmental issues (e.g., spouse, partner, parent(s), children, or friends)."

  - "Use online tools (e.g., blogs, Instagram, YouTube, TikTok, Twitter) to raise awareness about environmental issues."
  - "Be involved with an environmental group or political party (e.g., volunteer, summer job, etc.)."

- Environmentalist identity, one item: "Please select how much you agree or disagree with the following statement: 'I see myself as an environmentalist.'" (scale 1-7)

Cronbach's alpha of the multi-item scales are .91 (Concern), .82 (Policy support) and .78 (Behavioral intentions).

H1-–5 describe the average effect of the treatment on each of these outcomes, and H6–7 investigate a mediation effect via environmentalist identity on the other attitudes. We take a different approach for the tests of H8–23, where we describe the connection between the features of protests/articles and their effects on attitudes. Here, we combine all concern, policy support, and behaviour items into a single scale measuring environmental attitudes (omitting issue salience and environmentalist identity). We do this because we are less interested in the nuances of the different attitude items; because scaling increases statistical power by reducing measurement error; and to avoid an overwhelming number of statistical comparisons.

We leave out salience because its correlation with the other items is weaker in comparison, reinforcing the notion that it is a theoretically separate concept (cf. Bromley-Trujillo and Poe 2020), and environmentalist identity because of different relevant theory (see Introduction). The items making up the scale have a combined Cronbach's alpha of .89 (based on wave 1 measurements). We average items after standardizing them to z-scores.[6]

Background variables

We collected participants' age, sex and political orientation as part of quota sampling. In addition, we collected education for the purpose of sample description. We also measured left-right ideology self-placement (seven-point scale) for a supplementary analysis where responses are weighted by the likelihood of the respondent encountering the news article they were presented with in real life (see Analyses subsection Alternative analysis: weighting by source and ideology). See Supplementary Appendix E for response options.

Protest and article features

We measured a range of features of each protest and article. These are used as independent variables in an analysis of hypotheses H8–23, where we determine which traits of the articles are most correlated with their effect on public opinion.

6. In Wave 2, we standardise by the means and standard deviations of the items in Wave 1.

Rating methodology The "objective" features of the protests, such as the estimated number of protesters present, were coded by two research assistants and averaged. For binary features, in the handful of cases where coders disagreed, the authors made a judgement call (before collecting any experimental data). Other features are the count of words in each article dedicated to an aspect of disruption. These were coded by Claude (see details in Technical Materials), as pilot tests showed it to have better performance than a research assistant.[7]

Finally, a number of features involve subjective judgements, and we expected different people to assess them differently even when confronted with the same information. For example, when evaluating the level of disruption caused by a protest, some people may give more weight to disruption to drivers, whereas others care more about businesses. We crowd-sourced these feature ratings by asking ca. 14 participants from a pool of nationally representative UK Prolific participants (quota-sampled by Prolific on age, sex and political orientation, $n = 289$) to score each article.

Of course, the fact that these features are subjective could mean that they have limited explanatory power. For instance, if participants disagree about the level of disruption caused by a protest action, then those participants' opinions may also be affected differently. We still choose to use the average of these subjective ratings as a possible determinant of the protest's public opinion effects because this approach indicates whether protests *generally* perceived as (e.g.) very disruptive have more negative public opinion effects. Once averaged across coders, we found that the ratings are indeed highly reliable measures of the underlying traits of the protests/articles (see Appendix D.

Supplementary Appendix D contains more details about the rating process. Besides the features named below, we pilot-tested several other theoretically important characteristics. Among those is the radicalness of the policy demand, as radical flank theory predicts that radical demands make moderate demands look more acceptable (though experimental evidence indicates radical flank effects for radical tactics but not radical demands, Simpson, Willer, and Feinberg 2022). Another is the demographics of the protesters—whether they are students, older people and so on. Despite their theoretical importance, pilot testing showed that these features were either too difficult for raters to code or too rarely mentioned to justify inclusion. Our Technical Materials [currently available on Github for double-blind review]) report the result of two pilot studies used to assess the features (and coding instructions).

We divide features into four blocks: physical features of the protest, features of the article, judgements of the protest features, and attitudes towards the protest. In the analyses, we add these variables block by block to a model predicting environmental attitudes. The reason is that we believe variables

7. Specifically, we asked both Claude and a research assistant to code 50 articles to give us the number of words dedicated to the disruptive consequences of the protest (coders tagged start and end of relevant passages; non-LLM code counted words). We then evaluated the ten articles on which Claude and the assistant disagreed the most. In all cases, we judged Claude's judgement to be identical or close to our own expert rating.

from earlier blocks might cause variables from later blocks. For example, the tactics used could inform crowd-rated acceptability of the protest. The section "Effect by protest/article features" below describes the analytical approach in detail.

Block 1: Objective features of the protest. We asked two research assistants to code the following objective features of each protest:

- Number of protesters (8-point scale: 1, 2-3, 4-10, 11-30, 31-100, 101-300, 301-1000, More than 1000).
- Level of disruption caused to various target categories (5-point scale from None at all to A great deal):
  - Business operations usually perceived as environmentally damaging.
  - The general public going about their everyday lives.
  - Government and local authorities.
  - A cultural or sporting event or institution.
- Disruption tactics used (binary, multiple answers allowed):
  - Blockade.
  - Protesters physically attached to or on top of something.
  - Temporary physical alterations or vandalism.
  - Interrupting an event or speech.

Block 2: Features of the article. We asked two research assistants to rate the following feature of the article describing the protest:

- Tone of portrayal of protest (5-point scale from Very hostile to very sympathetic).

We also used Claude to code:

- Number of words in the article dedicated to the message of the protest.
- Number of words in the article dedicated to the disruption and its effects.
- Number of words in the article dedicated to negative comments.

Block 3: Judgements of protest features. We asked crowd-sourcing participants to give the following subjective ratings of the features of the protest:

- Perceived amount of overall disruption caused (5-point scale from None at all to A lot).
- Protesters seeming ordinary (5-point scale from Not at all like ordinary people to Very much like ordinary people).

Block 4: Attitudes towards the protest. Finally, we asked crowd-sourcing participants to indicate the following attitude towards the protest:

- Acceptability of protest (5-point bipolar scale from Very unacceptable to Very acceptable).

Analyses

In all analyses, we control for the level of the outcome in Wave 1 to increase the precision of the estimates. We also include random effects of articles. All hypothesis tests are bidirectional. We report both uncorrected p-values and p-values with multiple testing corrections. Supplementary Appendix G describes our models and multiple testing approach in detail.

Effect of a typical media article

To calculate the effect of a typical media article about disruptive climate protest, we simply compare the means of the treated and control group on each outcome, controlling for the respondent's outcome in Wave 1. Since articles are sampled by the audience size of the outlet, this estimate takes into account that in the real world, some outlets are less likely to be read than others.

Alternative analysis: weighting by source and ideology

It is also possible to take into account the likelihood that a respondent of a particular ideology would read a particular article. For example, a right-wing UK resident reading The Guardian is a relatively rare occurrence. To do this, we assign each observation a weight based on readership-by-ideology data from the Reuters Institute Digital News Report (Newman et al. 2024). Given a respondent's ideology and the news source they were treated with, their weight will be the probability that a Reuters survey respondent with that ideology consumes that news outlet.

This weighting scheme means that ideological groups of respondents can also be down- or upweighted as a whole. If, say, respondents in the political centre consume less news, then they would also be less likely to consume any given one of our news sources. As a result, they would receive less weight as a group. This is appropriate because it means that each observation is weighted by its likelihood of occurring in the real world. In order to provide context for this analysis, we also check heterogeneous treatment effects by ideology (without weighting). Here, we expected null effects, in line with the literature (Bugden 2020; Kenward and Brick 2024; Feinberg, Willer, and Kovacheff 2020; Vandeweerdt 2025).

Mediation by environmentalist identity

We also investigate whether environmentalist identity mediates any effect of the treatment on a compound environmental attitude scale (made up of the concern, policy, and behavioural intention items). The assumptions for a mediation analysis to have a causal interpretation are difficult to meet even in an experiment (Bullock, Green, and Ha 2010), but our two-wave design helps make these assumptions more likely. In a nutshell, the mediator must be as-if random once we control for the treatment and any covariates (Imai, Keele, and Yamamoto 2010). Because we are able to measure change in both the mediator (identity) and the outcome (environmental attitudes), the only confounders that can interfere with as-if randomness are ones that also change between waves. This is a much weaker assumption than environmentalist identity and attitudes being uncorrelated between people, but violations are still possible. For example, perhaps the news articles that were particularly likely to affect environmentalist identity were also more likely to affect some other, unknown variable that is the true mediator of the attitudinal effect. We should therefore interpret the results of this analysis with caution.

Effect by protest/article features

The second analysis indicates which features of a protest, or of an article describing the protest, correlate with stronger effects on environmental attitudes. For this analysis, we use the treated respondents only. The outcome here is a compound environmental attitude scale made up of all outcomes except salience and identity. We control for the same scale of outcomes from Wave 1.

Drawing conclusions about the causal effect of features is challenging, because features are of course not randomly allocated to protests. Instead, there are causal relationships between them. We therefore estimate four models, where variables are added block by block. That is, we start with a model including only features of the protest reported as objective, e.g., number of participants (Block 1). Next, we estimate a model that also includes features of the article such as the tone of the reporting (Blocks 1 + 2). We use this model to estimate the effects of these more subjective article features. We continue like this, each time adding a block of variables that we assume to be further down the causal chain, and interpreting the coefficients of the variables in that newly added block only.

The logic behind this comes from a combination of three facts. First, we think that some of the variables in each block are likely to be affected by variables in the previous block(s), but causal paths within blocks or from later to earlier blocks are less likely. Second, when estimating the effect of a feature, we do not want to control for any variables downstream from it ("post-treatment" variables or "bad controls", Angrist and Pischke 2009, p 46-49). And third, we do want to block spurious, "back-door" paths between features and environmental attitudes (Cinelli, Forney, and Pearl 2024).

Figure 1 shows our assumptions about the causal connections between protest

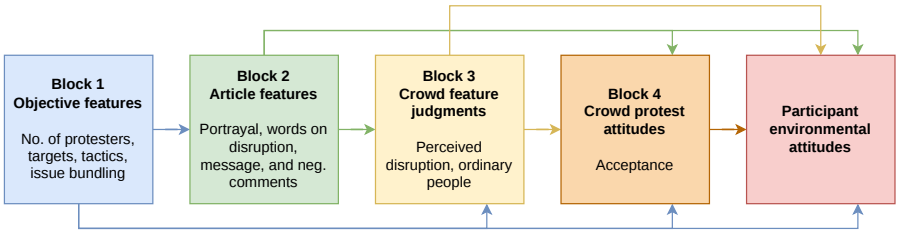

Figure 4: Assumptions About Causality Between Protest/Article Features And Participants' Environmental Attitudes.

Note. Arrows between blocks mean that any of the variables in the originating block may cause any of the variables in the destination block.

features and protests' effects on environmental attitudes. The assumption is that there are no other paths among the protest features than these. So, for instance, the perceived overall level of disruption involved in a protest (in Block 3) could cause it to be more or less acceptable (in Block 4), which could in turn change the environmental attitudes of a participant reading about it. In addition, disruptiveness may also drive readers' environmental attitudes directly. Controlling for acceptability as we estimate the effect of perceived disruption would take away the causal meaning of that effect estimate. On the other hand, controlling for perceived disruption as we estimate the effect of acceptability is appropriate. That is because we do not want our estimate to pick up on the back-door path—namely, the part of the association between acceptability and environmental attitudes that is due to both of them being caused by disruptiveness.

This strategy does not fully remove concerns about the causal meaning of the estimates. In particular, it hinges on the assumption that there are no causal paths within blocks, or from a later block back to an earlier block. Nonetheless, we believe these assumptions to be more plausible than the alternatives. Using a separate model for each protest feature would assume there are no back-door paths—i.e., no features that drive other features while also having a direct effect on attitudes. Modelling all features at once, on the other hand, would assume that none of them are "bad controls"—i.e., none of them mediate each other's effect on attitudes.

Effect of all articles owing their existence to disruptive protests

As mentioned above, the criterion for including articles in the population of potential treatment articles is that in a counterfactual world where climate protesters had not used disruptive methods as part of a specific protest (or several similar ones), the article could not exist in a form where the primary

message was hardly changed. We also investigate what happens when we include all articles that meet a more general criterion: in a counterfactual world where climate protesters never used disruptive methods at all, the article could not exist in its current form.

Rather than being about specific protests, these articles could be, for example, a portrait of one activist and all the actions they have been a part of, or about police treatment of disruptive activists. Even if these articles do not repeat any environmental messaging, they could influence attitudes because they still portray the environmental movement in some (typically positive or negative) way. As a result, they could strengthen or weaken audiences' environmental attitudes in the same way that articles covering specific protests do.

So, to fully evaluate the overall effect of disruptive environmental protest, it is also relevant to consider how it influences public opinion through these less direct channels. In order to conduct this analysis, we use the articles that were manually filtered out of the treatment sample because they met the general criterion but not the narrow, "specific protest" one. We recruited an additional 257 respondents for this part of the experiment (at the same time and using the same methods as our recruitment for the main experiment). So, just like the articles in the main analyses, these articles were each viewed by ca. 26 respondents. When we pool these respondents with all respondents from the main analysis, we can answer the question: "how does the existence of disruptive climate protest as a whole influence public opinion in the UK?"

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