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How concerning is Lucifer? Insights from an experimental study of public responses to heat event naming in England and Italy

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Abstract

Summer 2023 saw record high temperatures across several European countries with these heat events being unofficially dubbed Cerberus and Charon. This has led to discussion about whether naming severe heat events is an effective way to convey the risks posed. In online experiments with regionally representative sample of members of the public in England and Italy, we assessed the effect of giving a heat event a mythological, non-mythological or no name on anticipated severity, concern, trust/confidence and behavioural intention. We find that while naming alone does not have a strong effect on anticipated response to severe heat events in either country, going against the established trend of using mythological names in Italy could diminish concern.

KEYWORDS

Europe, heatwaves, weather event naming, weather risk communication, weather warnings

1 | INTRODUCTION

During summer 2023, Europe saw record-breaking temperatures across several countries, with the names Cerberus and Charon (Caronte) being given to these events in the media (BBC, 2023). As severe heat events are expected to continue to increase in frequency across Europe as a result of climate change (Bednar-Friedl et al., 2022), effective communication about heatwave risk and the steps members of the public can take to reduce their risk of harm is of considerable importance. To date, only Spain has officially implemented a naming system for heat events, with this system using non-mythological 'everyday' names such as Zoe (Metzger et al., 2024). However, the question of whether the—currently unofficial—practice of giving heat events threatening names helps or hinders risk preparedness has been discussed in the media (Guardian, 2023), but a lack of empirical evidence exists as to what effect—if any—this has on risk perception and preparedness. In this article, we report on the findings of an online experiment undertaken with large national samples in England and Italy to better understand the effect of heat event naming on risk perception, trust in warnings and intended actions in countries with difference experiences of severe heat events and traditions of weather event naming.

1.1 | The naming of weather events

Globally, the naming of severe weather events has a long history, with for instance, tropical cyclones in the Atlantic (hurricanes) being named for over 200 years (Nation

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Oceanic and Atmospheric Administration, 2024). In 1953, the practice of naming tropical cyclones based on alphabetical lists was adopted by the US National Hurricane Center, with the World Meteorological Organisation coordinating naming internationally since the 1970s.

In more recent years, some countries have adopted the practice of naming a broader range of storms. In the UK for instance, storms identified as having the potential to cause damage or disruption have been named since 2015. Each year, a list of storm names is agreed by Met Éireann, the UK Met Office and Koninklijk Nederlands Meteorologisch Instituut (KNMI), with members of the public being able to suggest names (Met Office, 2024a). A key objective of this is to improve communication with the general population through the media and agencies involved in risk reduction, ensuring that warning messaging remains consistent (Met Office, 2024a).

To date, a small but growing number of studies have examined the relationship between naming and how severe weather risks are perceived and acted upon. To our knowledge, only one published investigation has to date examined public responses to heat event naming, finding those recalling the name of Spain's 2022 Heatwave Zoe were more likely to report undertaking protective behaviours in response to the event (Metzger et al., 2024). However, a larger body of work has focussed on storm naming. A recent Eastern Mediterranean study found that self-reported support for storm naming was associated with greater individual preparedness (Kotroni et al., 2021), although it did not directly compare responses to named and unnamed events. Social media analysis has also linked naming to public engagement with weather events. Analysis of social media activity surrounding Storm Doris, a UK 2017 winter storm, found that the name 'Storm Doris' was tagged in a high proportion of messages about the storm, indicating that the name was salient (Charlton-Perez et al., 2019). Comparing traffic flow data from Storm Doris to a similar unnamed storm in 2014, the same study also found some indication that traffic behaviours during Storm Doris were more cautious (i.e. lower traffic than usual during strongest winds), although this cannot be conclusively attributed to the naming of the storm. Another study looking at social media responses to warnings associated with named storms indicated that the names themselves often receive a lot of attention, sometimes humorous, independent of content related to associated weather impacts (Spruce et al., 2020).

Work experimentally examining the effect of storm naming on risk perception and behavioural intention has however had mixed results. A study of US winter storm naming found no statistically significant difference in perceived severity and susceptibility between participants assigned to named versus unnamed communications (Rainear et al., 2017). In later work, this time examining US naming of tropical storms, Lin et al. (2018) found a small negative effect of naming on severity, with reported severity being higher for an unnamed storm than storms given names assessed as having greater or lesser emotional salience. In both cases, however, the authors acknowledge that the student samples used may not be representative of the broader population.

In terms of the type of name assigned to weather events, the potential effects of name characteristics in particular remains under-researched. While the gendered naming of hurricanes has been discussed in academic literature, findings on this topic remain inconclusive. One study examining the damage associated with female and male named hurricanes concluded that female named hurricanes were associated with greater damage, theorising that this was due to female named events being treated less seriously (Jung et al., 2014). However, these conclusions have been disputed on the basis that the analysis did not control for the fact that between 1958 and 1979, all hurricanes were given female names, thus potentially confounding the effect of gender with changes over time, including improvements in infrastructure that might help to reduce harm (Maley, 2014; Malter, 2014). Subsequent analyses of the same series of storms controlling for this failed to find this effect (Maley, 2014; Malter, 2014).

Outside of Spain, where official heatwave naming uses names that might be found amongst general populations, a characteristic of unofficial heatwave nomenclature in Europe is that the names associated with heat events in the media have typically been related to imposing figures from mythology or ancient history (e.g. Cerberus, Nero). In the English language media, these names have recently been used to refer to heatwaves directly (e.g. 'Heatwave Cerberus'), while in Italian language media, the name is given to the anticyclone causing the heatwave (e.g. 'Anticiclone Cerbero'). Many of the names themselves originate with the privately run Italian weather site Ilmeteo.it. Controversy has however arisen as a result of different bodies giving these events different names (Reggiani, 2013). For instance, in 2012, IlMeteo.it dubbed an anticyclone Scipione (in reference to the Roman general Scipio), while the Institüt für Meteorologie of the Freie Universität Berlin named this event Stefan. In addition to highlighting important discussions surrounding the matter of who should be responsible for naming heat-related events, and whether names assigned by academic institutions should take precedence (Reggiani, 2013), it also raises the question as to whether imposing names from mythology and classical history elicit different responses from the public than do

more 'everyday' names or not assigning names to events at all.

The use of imposing names from myth or history could act as a signal that the associated event is important, but some names would, in addition, have negative connotations. According to the affect heuristic (Slovic et al., 2002), memories relating to a stimulus can be tagged with positive or negative affective information and the 'sense' of affective information relating to the stimulus can be an input to an individual's judgement.

The goal of the work reported in this article was to experimentally test the effect of heat event naming in two locations: England and Italy, with different histories in terms of weather event naming and experience of severe heat events. In England, where average minimum and maximum daily air surface temperatures in July range between 12 and 21°C (in the period 1991–2020; Met Office, 2024b), storms are officially named, but heatwaves are not. In Italy, where average minimum and maximum July temperatures range between 18 and 27°C (in the period 1991–2020; World Bank, 2024), storms are not officially named, but the unofficial practice of assigning names from mythology and ancient history to heatwaves has been popularised for over a decade in the media. Italy is estimated to have experience the highest overall rate of heat related mortality in Europe during summer 2022 at 295 per million (95% CI of 226–364), while for the United Kingdom, this was lower at 52 per million (95% CI of 6–100) (Ballester et al., 2023). Keeping in mind the distinction in heat impacts experienced in the two countries as well as their different histories with respect to weather event naming, we principally undertook this work to address the following research question:

- Does giving mythological names with threatening connotations (Lucifer/Lucifero) or non-mythological names (Arnold) names to severe heat events affect perceived risk, trust/confidence in warnings and behavioural intentions relative to unnamed events in a country with and a country without a history of heat event naming?

With storm naming having been officially established in the UK since 2015, we also wanted to explore (i) how residents in England perceive current practices of weather event naming and their opinions on heatwave naming and (ii) whether those with more favourable opinions of weather event naming would perceive named heatwaves to be more threatening. Hence, for the English sample, we also explored the following:

- What do the public in England think of the current approach to naming weather events and what are their opinions on adopting heat event naming?
- Are effects of heat event naming on anticipated heatwave concern dependent on opinion of weather event naming?

2 | METHODOLOGY

2.1 | English survey

Between 11th–28th August 2023, 2152 residents in England over the age of 18 (51.2% female) with a mean age of 45.7 (standard deviation = 15.9) were recruited though the market research company Cint to take part in an online experiment. The sample of participants was regionally representative for all regions of England with the exception of Yorkshire and the Humber, where participants were oversampled to provide comparability with an earlier round of data collection on heat protection behaviours in the region. Age distribution in the sample was broadly representative of the country as a whole, with the exception of the oldest age groups (75–84 and 85+), being lower than the population percentage (see Table S1 for regional breakdown and Table S3 for age distribution).

2.2 | Italian survey

A sample of 1981 Italian residents over the age of 18 (49.2% female) with a mean age of 40.6 (standard deviation = 13.2) were recruited through Cint to take part in an Italian language version of the survey between 13th and 17th November 2023. The sample was generally representative in terms of region and gender but skewed younger than the national distribution (see Table S2 for regional breakdown and Table S4 for age distribution).

2.3 | Procedure

In both the English and Italian surveys, participants were randomly assigned to one of three groups in terms of the name given to the heatwave:

- No name (control)
- Mythological/threatening name (Lucifer/Lucifero)
- Non-mythological/Non-threatening name (Arnold)

Participants first answered a series of questions about their general perceptions and experience of hot weather and climate change (Table 1). In responding to questions about recent experiences, English participants were asked to think back to June 2023, while Italian participants were asked to recall July and August, reflecting the

TABLE 1 Mean (standard deviation) ratings of perceived (a) typicality, pleasantness, consequences of increased hot weather for one's country and climate change concern in England and Italy.

	England, Mean (SD)	Italy, Mean (SD)
Perceived (a)typicality of summer temperatures[a] (1 = much colder than normal, 5 = much warmer than normal)	3.80 (0.95)	4.06 (0.78)
Perceived pleasantness of summer temperatures[a] (1 = very unpleasant, 5 = very pleasant)	3.04 (1.20)	2.25 (1.10)
Perception of hot weather increases due to climate change being positive or negative for one's country (1 = very negative, 5 = very positive)	2.49 (0.96)	1.79 (0.90)
Climate change concern (1 = very unconcerned, 5 = very concerned)	3.56 (1.18)	3.89 (1.11)

[a]Questions were asked only to those who reported recalling summer temperatures for June 2023 for the English sample ($n = 1683$, 78.2% of total) and July and August for the Italian sample ($n = 1836$, 93.0% of total).

months during which temperatures had been higher than normal. Depending on the group that they had been assigned to, participants were instructed to imagine that next summer, they were to receive a warning that a heatwave was about to affect their country. In the English survey, the event was referred to as a heatwave/Heatwave Lucifer/Heatwave Arnold, reflecting phrasing used in the English language media. In the Italian survey, the event was referred to as a heatwave/a heatwave caused by anticyclone Lucifer (anticiclone Lucifero)/a heatwave caused by anticyclone Arnold (anticicolone Arnold), reflecting the fact that the anticyclone rather than the resulting heatwave has been unofficially named in the Italian language media.

Participants indicated on sliding scales of 0 to 100 how severe they would anticipate the heatwave to be (0 = not severe at all, 100 = very severe), how concerned they would be (0 = not concerned at all, 100 = very concerned) and how much they would trust the warning (0 = would not trust at all, 100 = would trust completely). It should be noted that due to linguistic differences in the way in which warnings might be talked about (i.e. what 'makes sense'), the trust measure in the Italian survey related to perceived confidence in the reliability of the forecast (attendibilità) rather than trust in an issuing individual or institution (fiducia).

A series of questions about how likely participants thought that they would be to undertake a series of heat protective behaviours on a scale of 1 = very unlikely, 5 = very likely (see Table S7 for full descriptives on reported likelihood of undertaking individual behaviours) were then asked. A 'behavioural intention' score was calculated based on the mean likelihood of undertaking the behaviours (Cronbach's alpha: England = 0.83, Italy = 0.85). Participants in the English sample were additionally asked about their thoughts on the naming of weather events (Figure 2). As these were related directly to opinions of UK storm naming and whether this approach should be extended to heatwaves, these were not presented to the Italian sample.

3 | ANALYSIS

Statistical analyses were performed using IBM SPSS 29, with Hayes' (2017) PROCESS add-on for SPSS used for moderation analyses. In analysing the data collected in this experiment, we assessed whether the three groups differed in terms of anticipated severity of heatwave, anticipated concern, anticipated trust/confidence in reliability and behavioural intention using multivariate analysis of variance (MANOVA) test for each country. As the MANOVA tests were significant for both England (Wilks' Lambda = 0.98, $F = 4.37$, $p < 0.001$) and Italy (Wilks' Lambda = 0.99, $F = 2.31$, $p = 0.018$), follow-up univariate analyses of variance (ANOVAs) were performed with post hoc Bonferroni comparisons to identify where specific between-group's differences lay for each dependent variable.

Stepwise ordinary least squares regression was used to assess the extent to which heatwave naming, represented using dummy variables, affected anticipated concern when controlling for age, gender, general climate concern, perception of climate heat impacts as being positive versus negative for the country, perceived pleasantness of summer 2023 temperatures and perceived atypicality of summer 2023 temperatures. As perceived (un)pleasantness and (a)typicality of summer 2023 temperatures was included in Step 2, the analysis was restricted to only those who reported recalling summer 2023 temperatures (England: $n = 1683$, 78% of sample; Italian sample: $n = 1836$, 93% of sample). Simple associations between age, gender and measures of anticipated responses can be found in supplementary material (Tables S5 and S6).

For the English sample, principal components analysis (PCA) with promax rotation was used to assess whether responses to the questions on opinions about weather event naming loaded onto one or more underlying constructs. The data met underlying assumptions for PCA with *Kaiser–Meyer–Olkin (KMO) measure of*

sampling adequacy = 0.85 and Bartlett's test of sphericity being statistically significant ($X = 6317$, $p < 0.001$) The analysis indicated that items loaded onto two underlying components with eigenvalues >1, accounting 45.3% and 18.3% of overall variance respectively (see Table S9 for component loadings). An inspection of the pattern matrix indicated that items loading onto the first construct aligned with perceiving weather event naming positively, the second with perceiving it to be sensationalistic. We assessed whether the effect of heat event naming on anticipated concern was moderated by opinions on the naming of weather events using the PROCESS add-on module for SPSS (Model 2 for multiple moderation), a regression-based approach, which allows one to examine whether the association between an independent variable and a dependent measure is affected by two potential moderating variables (Hayes, 2017). In this case, we explored whether perceiving weather event naming to be positive or sensationalistic moderates the effect of the giving heatwaves mythological or non-mythological names relative to a no name baseline.

4 | RESULTS

4.1 | Perception of recent hot weather in England and Italy

As noted, in summer 2023, Italy experienced record temperatures in July (United Nations Office for Disaster Risk Reduction, 2023), with high temperatures extending into August (Copernicus, 2023). England experienced the warmest average June temperatures on record in 2023, with an amber heat warning being issues during this month, although weather during July and August was unsettled (Met Office, 2023).

Amongst the English sample, 78% ($n = 1683$) reported being able to recall June 2023 summer temperatures, while 93% ($n = 1836$) of Italian participants reported recalling July and August 2023. Table 1 summarises average ratings of perceived pleasantness and (a)typicality of summer temperatures in 2023, belief about whether longer term increases in hot weather due to climate change would be positive or negative for one's country, and general climate change concern. In all cases, a rating of 3 indicated indifference. Across both countries, average mean ratings suggested that participants tended to perceive temperatures as being warmer than normal for the month(s) specified (June in England, July and August in Italy), future increases in hot weather due to climate change as being negative for the country and climate change as concerning. On average, Italian participants rated the focal month(s) as unpleasant, while English participants tended to rate it as neither pleasant nor unpleasant, possibly reflecting the fact that while 2023 saw the warmest June on record in the UK, July—which is usually the warmest month of the year—had seen cooler and wetter conditions than average (Met Office, 2024b), potentially leading to June temperatures being perceived more favourably in comparison.

4.2 | The effect of heat event naming

Figure 1 illustrates mean ratings of perceived severity, concern and trust/confidence for participants randomly assigned to view a message about a heat event with either a mythological name (Heatwave Lucifer/A heatwave caused by Anticyclone Lucifero), non-mythological name (Heatwave Arnold/A heatwave caused by Anticyclone Arnold) or no name ('a heatwave'). Table 2 reports on the statistical comparison of the groups. Due to differences in how warnings may be discussed in English versus Italian ('what makes sense'), the English survey asked participants how much they would trust the warning, while the equivalent measure in the Italian survey asked participants about their confidence in the reliability of the forecast (attendibilità), rather than using a more direct translation of the English word trust (fiducia), which might be more typically used to imply trust in an individual or institution.

For English participants, mean ratings of anticipated severity, concern and trust were slightly higher for 'Heatwave Lucifer' than for 'a heatwave' or 'Heatwave Arnold'. These differences only reached statistical significance for severity (greater for 'Heatwave Lucifer' than both 'Heatwave Arnold' and 'a heatwave') and concern (greater for 'Heatwave Lucifer' than 'A heatwave'). For Italian participants, a heatwave caused by 'anticiclone Lucifero' elicited slightly greater anticipated severity, concern and confidence in the reliability of warning than a heatwave caused by 'anticilone Arnold', with these differences being statistically significant. No difference was found between a heatwave and a heatwave caused by 'anticiolone Lucifero'. No differences in behavioural intention was found for either the English or Italian participants (see Table S8 for means and standard deviations for all conditions).

Table 3 reports stepwise regression analyses assessing the extent to which anticipated concern was predicted by naming when controlling for other measures. In Step 1, naming alone was entered. Reflecting the differing pattern of responses in the two countries, the unnamed control was used as the baseline measure for the English sample, while the unnamed control and the mythologically named event were the baseline for the Italian

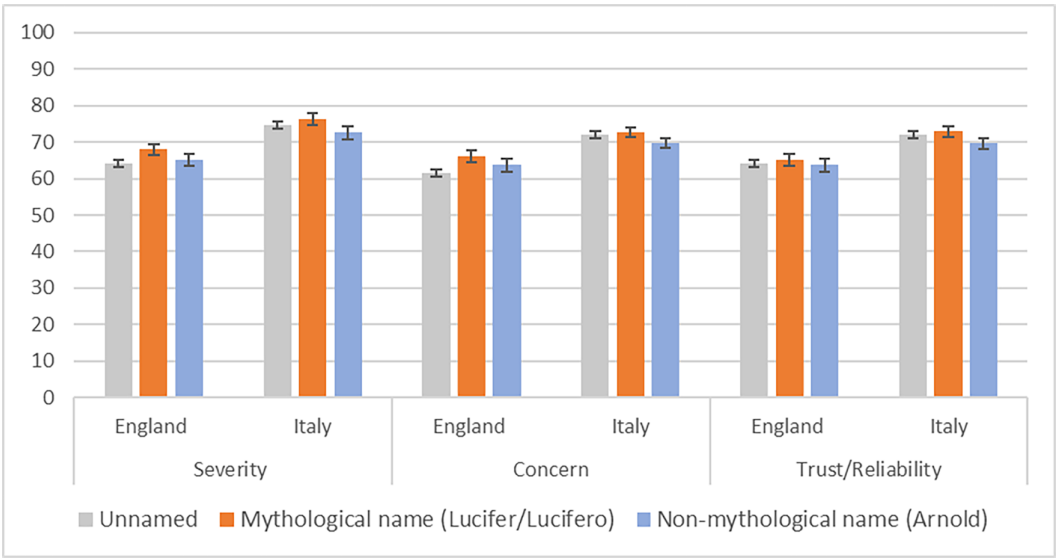

FIGURE 1 Mean ratings of anticipated severity, concern and trust/confidence amongst English and Italian participants in all naming conditions. Error bars represent 95% confidence intervals.

sample. Step 2 entered climate concern, perceived (un) pleansantness of experienced hot weather in 2023, perceived (a)typicality of summer 2023, perception of country level consequences of an increase in heat impacts due to climate change (negative or positive), age and gender. For this analysis, participants were limited to those who reported being able to recall summer temperatures. As can be seen from Table 3, the effect of the name manipulation in Step 1—while statistically significant—accounted for less than 1% of variance in concern in each country. Adding climate concern, perceived (un)pleasantness of recent hot weather, perceived (a)typicality of hot weather and perceived country level consequences of increases in hot weather in Model 2 increased the variance in concern accounted for to 26% of variance for English participants and 35% for Italian participants. The demographic characteristics of age and gender did not make a significant independent contribution to the model for the Italian sample when entered with the other covariates, although being female had a small association with concern amongst the English sample.

4.3 | Perception of weather event naming in England

Figure 2 summarises English participants agreement with eight statements related to views on weather event naming in the UK. A majority of participants agreed that naming storms made people pay more attention to them. However, for all other items, '3: neither agree nor disagree' was both the modal and median responses. There was lowest agreement with statements that naming heatwaves would be beneficial, although again this appeared to reflect indifference rather than disagreement.

TABLE 2 Comparison of anticipated severity, concern, trust and behavioural intention across all naming conditions using multivariate analysis of variance (MANOVA).

	ANOVA *F*-value	Post hoc comparisons (Bonferroni adjusted)
England (Wilks lambda = 0.98, $p < 0.001$)		
Anticipated severity	7.89***	Mythological > unnamed*** Mythological > non-mythological*
Anticipated concern	7.60***	Mythological > unnamed***
Anticipated trust	0.88 ns	—
Behavioural intention	0.36 ns	—
Italy (Wilks' lambda = 0.99, $p = 0.02$)		
Anticipated severity	8.47***	Mythological > non-mythological***
Anticipated concern	3.74*	Mythological > non-mythological*
Anticipated confidence	5.42**	Mythological > non-mythological**
Behavioural intention	1.3 ns	—

Abbreviations: ANOVA, analysis of variance; ns, no significance.
*Significant at $p < 0.05$.**Significant at $p < 0.01$.***Significant at $p < 0.001$.

TABLE 3 Ordinary least squares regression examining predictors of anticipated concern elicited by the heat event message amongst English and Italian participants.

	England ($n = 1679$) *B* (SE)	Italy ($n = 1836$) *B* (SE)
Step 1		
Mythological name (1 = Lucifer/Lucifero)	4.76 (1.40)***	—
Non-mythological name (1 = Arnold)	2.87 (1.45)*	−2.27 (1.07)*
ANOVA	5.86**	4.52*
R^2	0.007	0.002
Step 2		
Mythological name (1 = Lucifer/Lucifero)	6.15 (1.21)***	—
Non-mythological name (1 = Arnold)	3.60 (1.25)**	−1.76 (0.87)*
Climate concern	5.95 (0.46)***	7.43 (0.46)***
Typicality of summer 2023	2.23 (0.55)***	2.07 (0.61)***
Pleasantness of summer 2023	−3.21 (0.44)***	−4.28 (0.44)***
Consequences of heat impacts for country	−4.61 (0.57)***	−1.95 (0.56)**
Gender (1 = female)	2.44 (1.03)*	−0.11 (0.85)
Age	−0.02 (0.03)	−0.06 (0.03)
ANOVA	74.24***	193.39***
R^2	0.26	0.35

Abbreviations: ANOVA, analysis of variance; *B*, unstandardised beta-coefficient; SE, standard error.
*Significant at $p < 0.05$.**Significant at $p < 0.01$.***Significant at $p < 0.001$.

PCA indicated that the items loaded onto two constructs: that could be conceptually defined as perceiving weather event naming as 'positive' or 'sensationalistic' (see Section 2 and Data S1), which had a weak negative association with one another ($r = -0.13$, $p < 0.001$). Summary scales were created for each component by taking the mean of the items loading onto it. It was found that those in the mythological name condition did report a slightly more positive view of event naming (mean = 3.25, SD = 0.87) than those in the no-name (mean = 3.14, SD = 0.90) or non-mythological name (mean = 3.16, SD = 0.88) condition ($F = 3.72$, $p = 0.024$), although there was no effect on perceiving event naming as sensationalistic ($F = 0.52$, $p = 0.60$). Using PROCESS Model 2, we assessed whether perceiving weather event naming as positive or sensationalistic moderated the effect of our naming manipulation. As Table 4 summarises, perceiving weather event naming to be positive or sensationalistic was not found to moderate the effect of naming. However, having a positive view of heatwave naming was directly associated with greater anticipated concern (see Table S10 for full summary of moderation analysis).

5 | DISCUSSION

We undertook this study in order to assess whether assigning names to heat-related meteorological events affected perceived risk, trust and intention to undertake protective behaviours in two locations: England in the UK, where storms are officially named but heat events are not, and Italy, where the unofficial naming of anticyclones that create extreme heat events has been popularised in the media.

Amongst English participants, we found that Heatwave Lucifer elicited greater perceived severity than Heatwave Arnold and the unnamed heatwave, and higher concern than the unnamed heatwave. However, the overall size of the effect was small, accounting for just 1% of variance in the dependent variables. Furthermore, we did not find any effect on anticipated behavioural intentions, indicating that naming the heatwave did not increase intention to protect oneself. Hence, while we can conclude that naming the heatwave threateningly may by itself increase perceived risk, it does raise the question of whether this is meaningful in a practical sense.

In exploring English residents' perception of weather event naming, we did not find overall strong support for or opposition to weather event naming. Nonetheless, a majority did agree with the statement that storm naming makes people pay more attention to them, although only 35% thought that high-risk events should be given threatening names. We found that the statements about weather event naming grouped into two separate factors: support for naming and perceiving naming as sensationalistic, with those perceiving it as sensationalistic having lower support for naming. While it might be expected that perception of weather event naming would influence the effect of the naming condition on participants' responses (e.g. with those reporting support for weather event naming indicting greater concern when heatwave events are named), we did not find this. However, we did find that those in the mythological name condition did report slightly higher positive feelings towards weather event naming. This may indicate that exposure to mythological naming of heat events could lead to a

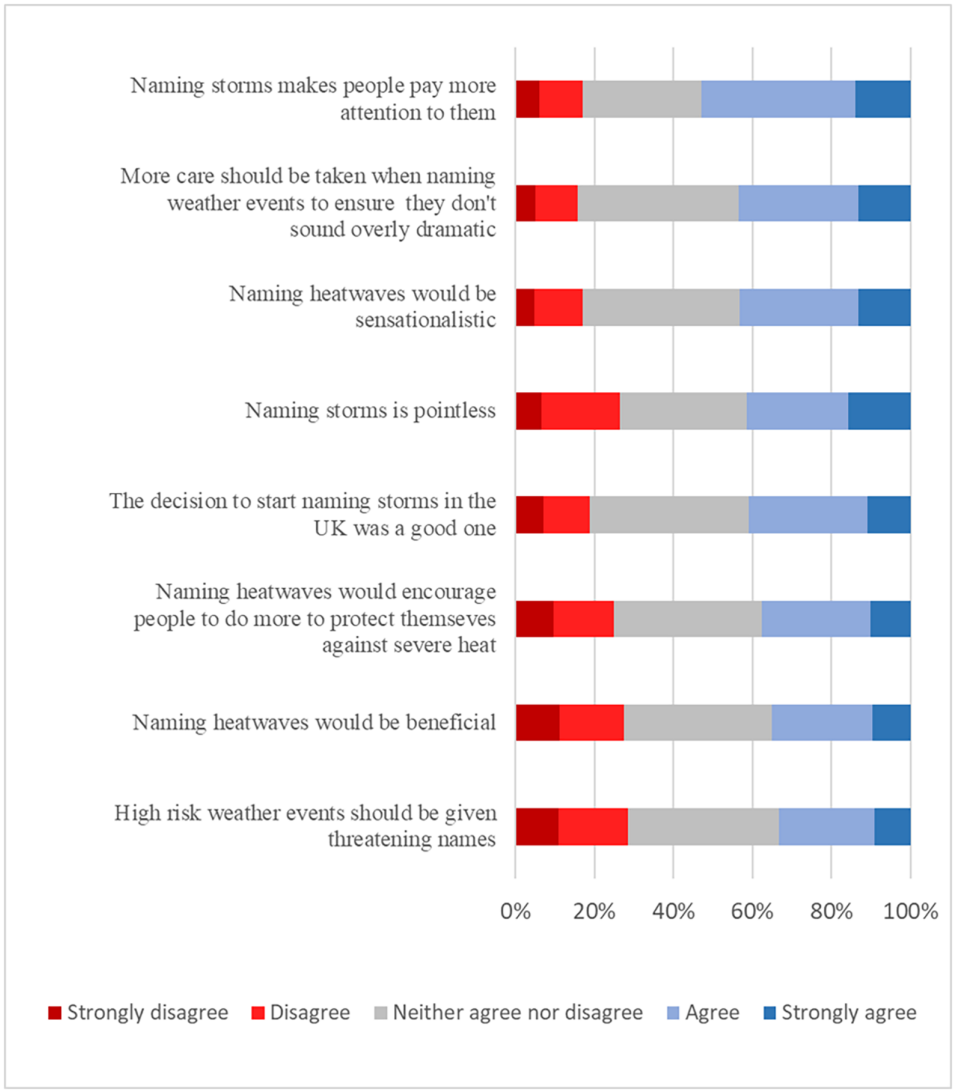

FIGURE 2 Agreement with statements about weather event naming amongst English participants.

slightly more favourable perception of the practice, as has been found in the context of familiarity effects (e.g. Zajonc, 1980). It is also interesting to note that a more favourable perception of weather event naming was directly associated with greater anticipated concern irrespective of whether the event was named. This mirrors Kotroni et al.'s (2021) findings that a more favourable attitude to storm naming corresponds with greater intention to act amongst their Eastern Mediterranean sample. This could suggest that a more favourable view of weather event naming corresponds with greater engagement with the topic of weather, greater attention to weather information in general and/or a more favourable view of weather services, leading to greater concern. Indeed, earlier work on anticipated response to severe wind warnings in the UK has linked both institutional trust (Taylor et al., 2019, 2024) and engagement with weather (Taylor et al., 2019) to perceived risk and protective behavioural intention.

For Italy, we find that a heatwave caused by 'anticiclone Lucifero', elicited greater anticipated severity, concern and confidence than one caused by 'anticiclone Arnold'. Given that the pattern of attributing imposing mythological and classical names to anticylones has been popularised in Italy, it may be that giving it a name uncharacteristic of this leads to a reduction in perceived risk, perhaps being interpreted as an indication that the event will be less severe as it has not been given a name that is imposing or that has negative affective connotations. Again, the overall size of this effect was small, with other factors being more strongly associated with anticipated concern. However, given the potential for different naming conventions being adopted by institutions and media in different countries, as per the example of the anticyclone dubbed Scipione by IlMeteo.com and Stefan by Institüt für Meteorologie outline by Reggiani (2013), it is worth noting that a departure from the regionally familiar convention of mythological/ancient history may

TABLE 4 Summary of moderation tests exploring the extent to which perception of weather event naming as positive or sensationalistic affects the influence of heat event naming condition on anticipated concern amongst English participants.

	Anticipated concern, *B* (SE)
Main effect: Perceive naming as positive	8.35 (0.92)***
Main effect: Perceive naming as sensationalistic	−2.33 (1.13)*
Interaction: Positive × mythological name	0.46 (1.31)
Interaction: Sensationalistic × mythological name	0.68 (1.60)
Interaction: Positive × non-mythological name	−0.12 (1.37)
Interaction: Sensationalistic × non-mythological name	2.81 (1.63)

Abbreviations: *B*, unstandardised beta-coefficient; SE, standard error.
*Significant at $p < 0.05$; ***Significant at $p < 0.001$.

lead to a reduction, albeit small, in how severe the event is anticipated to be. A potential tension between the drive for cross-border consistency in naming of weather events and the emergence of locally meaningful naming conventions has been noted in the broader literature on weather communication, with Nhamo and Chikodzi (2021) highlighting the case of Cyclone Idai, where the official WMO allocated name conflicted with local naming conventions in Chimanimani, Zimbabwe, leading to local dissatisfaction with the official naming of the event. Nonetheless, it is important to stress that in this study, no statistically significant difference was found between the control (no name) condition and the threatening name condition.

5.1 | Limitations and future directions

A core strength of using an experimental design such as this, in which participants are randomly allocated to different groups that each receive information in different formats, is the ability to attribute any differences in risk perception or behavioural intention to the formats themselves. However, an inevitable limitation is that the participants were considering a hypothetical scenario rather than a real event presenting a concrete and immediate risk. Recent work directly comparing with responses to scenario-based experiments with real weather warnings in field experiments found that likelihood of engaging in protective behaviours was slightly lower in the field experiment than the scenario-based experiment, although there was no interaction between warning format and type of study (Weyrich et al., 2020). In this case, authors conclude that while scenario-based experiments are appropriate for studying the effect of different warning messages on response, behaviour is associated with affective (emotional) response, which may be affected by context (e.g. scenario vs. real world where one may experience competing demands and motivations). Our design meant that we were not able to examine other factors that might contextually affect how the naming is perceived and responded to (e.g. being embraced or derided in the media, gaining social media traction, event occurring after another event that was named but turned out to be less severe than anticipated). Likewise, in this study, we examine the effect of heat event naming in a context where all participants are aware of being presented with some form of heat messaging. We therefore cannot draw any conclusions as to whether heat event naming might serve to increase heat risk perception by making public audiences more aware that a severe heat event is expected to occur. Longitudinal analysis of responses to heat events over time may thus allow more robust conclusions to be drawn about the effect of naming on both awareness and response. Gathering data during heat events, as far as ethically possible to do so, as well as conducting post-event studies may also yield a more detailed picture of how experience of the event interacts with messaging, as well as how perceived risk and recall changes over time.

6 | CONCLUSION

Taken together our findings suggest that in the focal countries, the simple allocation of a threatening/mythological name does appear to lead to a small overall increase in perceived severity and concern relative to no name (England) or a non-threatening name (Italy). However, as this effect is very small, our findings cannot be said to support either the official adoption or rejection of heat event naming. Nonetheless, in considering the Italian context in particular, where conflicting names for events have arisen in the past, we find that if naming departs from the established trend of using mythological/ancient historical names, where it exists, may lead to a slight reduction in perceived risk.

AUTHOR CONTRIBUTIONS

Barbara Summers: Conceptualization; investigation; methodology; formal analysis; project administration; writing – review and editing; data curation. **Andrea Taylor:** Conceptualization; investigation; methodology; formal analysis; writing – original draft; writing – review

and editing; data curation. **Pietro Bellomo:** Conceptualization; methodology; writing – review and editing; investigation. **Suraje Dessai:** Conceptualization; investigation; methodology; writing – review and editing.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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