



Eliminating the Local Warming Effect

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Abstract

A growing body of work shows that perceived deviations in daily local temperatures alter individuals' global warming beliefs and concerns (e.g., Krosnick et al. 2006, Semenza et al. 2008, Li et al. 2011, Zaval et al. 2014). Little research, however, explores the conditions under which this "local warming" effect occurs. Here, Druckman presents an experiment that shows how a simple prompt—that reminds individuals to remember how the weather felt over the past year—eliminates the local warming effect. Specifically, the prompt severs the relationship between perceptions of the daily temperature with estimates of last year's temperature deviations, which is the basis on which many base their global warming opinions. While the results do not reveal the frequency that local warming effects occur overall, they do demonstrate the limits of the effect. Additionally, the findings suggest ways to rhetorically counteract the effect.

Public opinion about the existence and salience of global warming plays an important role in the construct of public policy. Elected oriented politicians rarely implement new policies in the face of public opposition. A sizable literature has sought to explain the origins and nature of global warming opinions. One notable finding is that individuals often base their beliefs about global warming on their *present assessments of local temperature*: relatively warm temperatures lead individuals to increase their belief in and concern about global warming. Egan and Mullin (2014: 89) state that the “evidence for the effect of weather on public opinion regarding climate change is now overwhelming.”¹

Perhaps the most compelling demonstration of the “local warming” phenomenon comes from Zaval et al. (2014). The authors present a series of ingenious studies that show, rather conclusively, that when individuals perceive the day’s local temperature to be warmer than usual, they then overestimate the number of warm days through the year, which, in turn, leads them to increase their beliefs about the existence of global warming and their concern about global warming (also see, e.g., Krosnick et al. 2006, Semenza et al. 2008, Li et al. 2011). Moreover, information about the distinction between weather (e.g., a constantly changing dynamic) and climate (e.g., average weather over time and space), or changes in terminology (e.g., global warming versus climate change) do not vitiate the impact of local temperatures on beliefs. The effect is substantively significant, rivaling the impact of age, race, and education on global warming attitudes (Egan and Mullin 2012: 796).

For many this dynamic is concerning; Egan and Mullin (2012: 806) state, “[g]lobal climate change is one of the most important public policy challenges of our time... [people] use fluctuations in local temperature to reassess their beliefs about the existence of global warming... a discovery

¹ Others find mixed evidence on the impact of climate changes on beliefs; however, much of the inconsistent evidence concerns actual and not perceived climate shifts: “studies tend to find that perceptions of weather have greater influence on climate change perceptions than do actual weather” (Marquart-Pyatt et al. 2014: 249).

that should trouble anyone interested in engaging the public in a thoughtful debate about global warming” (also see Weber and Stern 2011: 318). In short, opinions are not a useful foundation for policy since they are based on “normatively irrelevant factors” (Zaval et al. 2014: 143).

While work documenting the local warming effect is superb, the general dynamic is not that surprising. It coheres with a large literature that shows people base survey responses on whatever information most quickly comes to mind. The easy availability of today’s temperature in memory triggers people to then remember other warm days in the past, overestimate the frequency of warm days through the year and increase their belief in and concern about global warming. What is at work is attribute substitution where individuals base beliefs on what is salient in mind regardless of its “objective” relevance (e.g., Kahneman and Frederick 2002). That said, the effect may not be as robust as it appears: it depends on how the survey question is asked. Attribute substitution can be counter-acted via individual motivation and/or the information environment (e.g., Druckman 2004, Bless et al. 2004). In the case of the local warming effect, one approach is to ensure the availability of other memories such as temperature trends over the past year (Graber 2014: 16).

To test this possibility, I implemented an experiment with two randomly assigned conditions. The “non-prompt” condition replicates Zaval et al.’s (2014) study 4. Participants answered the same four questions as in Zaval et al.: an assessment of today’s temperature on a 5-point scale from much colder to much warmer than usual, an assessment of over the past year what percentage of days seemed to have been warmer than usual, and their beliefs about whether global warming was occurring and their concern about global warming (both on 4-point scales).

The second condition was identical except the question asking respondents to estimate the past year’s temperatures included: “When thinking about temperatures over the last year, remember that temperature patterns vary; indeed consider last winter compared to today. Thus think not only of

the feeling today but also how you felt throughout the year.”² The question is if receipt of the prompt severs the relationship between today’s temperature and last year’s estimate.

I implemented the study on a convenience sample (as were Zaval et al.’s 2014 studies) in Evanston, IL on September 29, 2014; potential respondents were asked to complete a brief questionnaire (on using convenience samples for experimental inference, see Druckman and Kam 2011). A pre-requisite for participation was that the individual had lived in the area during the prior winter. The temperature on the day of the study registered a relatively high 80 degrees, compared to a normal high of 70 degrees (the preceding few days also had been warm;

<http://www.accuweather.com/en/us/evanston-il/60202/september-weather/332844?monyr=9/1/2014>). Of relevance also is that the prior winter was the coldest in the last 30 years and led to a number of school closings, atypical for the area (<http://wgntv.com/2014/02/07/winter-2013-14-ranks-as-chicagos-coldest-in-30-years/>).

I present the results in Table 1, with a column for each condition. The first row reveals that, not surprisingly given the warmth of the day, the average, for both groups, on the “today’s temperature” (TT) question was near “somewhat warmer” (a “4” on the scale).³ The next two rows reveal significant differences in the percentage of warm days (PDW) last year, and more importantly, the correlation between PDW and TT.⁴ Today’s temperature substantially correlates with past year’s estimates for the non-prompt group (.38) at a level similar to what Zaval et al. (2014: 145) report. This relationship does *not* exist in the prompt group. The next two rows reveal

² This prompt emphasizes “feeling” which is important since Zaval et al. show that it is sensory input of today’s temperature that matters and not just ease of memory.

³ No participants rated it as “much colder” and only six rated it as “somewhat colder.”

⁴ The PDW scores are higher than one might expect with a median of 30 and a mode of 20. There also was chunking around the scores of 10, 20, 30, and 40. This may reflect the complexity of survey questions asking for past frequency estimates (e.g., Tourangeau et al. 2000: 145-160).

strong relationships between global warming belief and concern with PDW, with similar correlations for both groups (and similar to Zaval et al. 2014: 145).

As explained, PDW is higher in the non-prompt group – because it is driven by the high TT on that day – and the consequence is higher belief and concern scores. In other words, PDW drives beliefs and concerns, regardless of the prompt, but the prompt severs the connection that lead today's temperature to drive up PDW. The downstream effect of the prompt is to vitiate global warming beliefs and concern. The final four rows show that TT correlates with beliefs and concern in the non-prompt condition but not in the prompt condition; and then, in multiple regressions, PDW affects beliefs and concerns rather than TT (even for the non-prompt condition). The bottom line is:

- Without a prompt, today's temperature shapes the perceived number of warm days last year, which in turn, affects global warming beliefs and concerns.
- With a prompt, todays' temperature has no effect on the perceived number of warm days last year. Perceived number of warm days shapes global warming beliefs and concerns, but beliefs and concerns are not influenced by today's temperature.

That PDW continues to have an influence across conditions is intriguing and may suggest relatively salubrious opinion formation processes given that perceptions of local weather trends tend to be accurate (Howe et al. 2012). The results do not mean local warming effects do not occur a la Zaval et al's (2014) impressive evidence. Instead, they suggest that the effect may not be as robust as often thought. To the extent that the local warming effect is troubling, the antidote does not lie with increasing the provision of information (e.g., see Zaval et al. 2014, Druckman et al. n.d., Kahan 2014, n.d.). Rather the key is to recognize the realities of opinion formation (e.g., the use of simple cues) and react by re-framing global warming communications. This may, indeed, lead to opinions that many view as more “reasonable.”

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Methods

Participants were recruited in person by approaching each potential respondent and asking whether he/she would complete a brief survey. Participants then completed a paper survey with no identifying information. Each participant was randomly assigned to the non-prompt or prompt condition.

The precise question wordings are as follows. “Is the local temperature today colder or warmer than usual for this time of year?,” with answers being “much colder,” “somewhat colder,” “about the same,” “somewhat warmer,” “much warmer.” “Over the past year, what percentage of days seemed to be warmer than usual for that time of year, compared to the historical average?” “How convinced are you that global warming is happening?,” with answers being “not at all convinced,” “a little convinced,” “somewhat convinced,” “completely convinced.” “How personally worried are you about global warming?,” with answers being “not at all worried,” “a little worried,” “somewhat worried,” and “a great deal worried.”

Competing Financial Interests

The author declares no competing financial interests.

Table 1: Experimental Results Showing the Prompt Eliminates the Local Warming Effect

	No Prompt (N = 59)	Prompt (N = 61)
Today's Temperature (TT) Average (5 point scale)	3.93 (std. dev. = .93)	3.81 (.83)
Percentage Days Warmer (PDW) Average (percentage)	38.24** (20.64)	31.84** (19.45)
PDW and TT correlation	.38***	.09
Global Warming Belief (GWB; 4 point scale) and PDW correlation	.35***	.37***
Global Warming Salience (GWS; 4 point scale) and PDW correlation	.34***	.35***
GWB	3.09*** (.97)	2.56*** (.83)
GWS	2.70** (1.06)	2.38** (.92)
GWB and TT correlation	.31**	-.05
GWS and TT correlation	.30**	-.06
GWB Regressed on TT and PDW	TT: .22 PDW: .01* Constant: 1.73** $R^2 = .16$	TT: -.08 PDW: .02*** Constant: 2.34** $R^2 = .15$
GWS Regressed on TT and PDW (entries are regression coefficients)	TT: .22 PDW: .01* Constant: 1.30** $R^2 = .15$	TT: -10 PDW: .02*** Constant: 2.23*** $R^2 = .10$

*** $p \leq .01$; ** $p \leq .05$; * $p \leq .10$ (one-tailed tests).