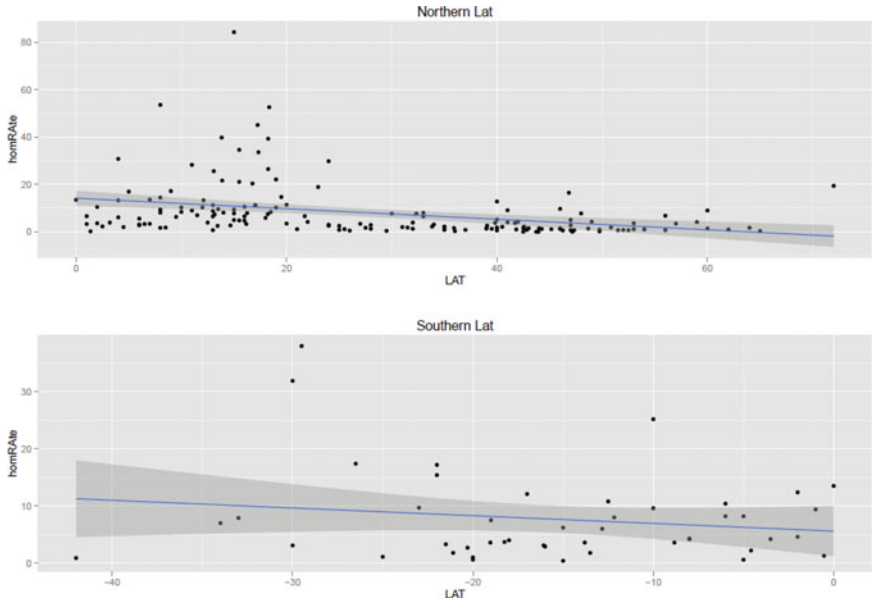

Figure 1. (Fuentes et al.). Homicide rate with respect to latitude for each country.

Theory is not sufficient. By purposefully removing key historical and ecological variables and attempting to reduce the complex suites of behaviors in aggression and conflict to simplistic few-variant causal factors (average temperature and seasonal variation in temperature), the relevance of such gross model predictions is called into question.

There is substantial paleoanthropological research into the question of how climate affects humans and our ancestors. Adaptation to increasing climactic variability/unpredictability appears to be a core process for early *Homo* (Anton et al. 2014), suggesting that our species as a whole is pre-adapted to climate variability. Geographers and paleoclimatologists argue that economic transformations and conflicts are associated with temperature declines (Büntgen et al. 2013), whereas periods of prosperity are linked to wet and warm summers (Büntgen et al. 2011). Moreover, the advent of agricultural communities at the beginning of the Holocene reduced the amount of resource unpredictability, but increased the opportunities and frequencies of conflict over resources (Ferguson 2013, Bowles & Choi 2013), complicating the assertions of the proposed model.

To be fair, Van Lange et al. do offer a section on "caveats" recognizing the potential for socioeconomic and political-historical factors to play a role. But their treatment of these possibilities is superficial and relies on statements such as "over time, cultures have evolved such that economic growth and prosperity decrease as distance to the equator decreases" (sect. 5.1, para. 1). Archeologically and historically speaking this is false, as the Mayan, Incan, Egyptian, Majapahit, and many other major civilizations demonstrate. If the authors mean for the CLASH model to reflect only the past two to three centuries, then they cannot seriously propose that it reflects evolutionary processes. Many of the countries in equatorial regions today are postcolonial nations and, thus, have historical ties to other nations and economic processes that create and/or amplify a wide range of structural inequalities. These regions are often underdeveloped with respect to economic and health infrastructures, making it likely that historical contingencies (Furtado 1964), rather than climate, are particularly important causal factors in lower life expectancy, higher homicide rates, and more aggression. Until these confounding variables can be addressed, we remain skeptical of the CLASH model.

In sum, if a model seeks to be evolutionary, as the CLASH model does, data and theory that offer both temporal depth and evolutionarily relevant contexts cannot be ignored.

Does distance from the equator predict self-control? Lessons from the Human Penguin Project

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Abstract: We comment on the proposition "that lower temperatures and especially greater seasonal variation in temperature call for individuals and societies to adopt … a greater degree of self-control" (Van Lange et al.,

sect. 3, para. 4) for which we cannot find empirical support in a large data set with data-driven analyses. After providing greater nuance in our theoretical review, we suggest that Van Lange et al. revisit their model with an eye toward the social determinants of self-control.

Van Lange et al. formulated a theoretical model in which they proposed climate as a predictor of self-control (and aggressive behavior). We comment on the proposition "that lower temperatures and especially greater seasonal variation in temperature call for individuals and societies to adopt … a greater degree of self-control" (sect. 3, para. 4), which, they argue, is due to a slower life history strategy. In developing their theoretical position, the authors propose distance from the equator as a predictor of self-control. They advocated a "data-driven" approach, allowing one "to derive precise estimates of the variance accounted for by various predictor variables" (sect. 5.3.1, para. 2). In our Human Penguin Project (HPP; available at: https://osf.io/2rm5b/), we collected latitude, self-control, and a variety of important social predictors from 12 countries with varying distances from the equator. These variables allowed us to test the proposed relationship between distance from the equator and self-control. The social predictors included variables such as social network quality and size and variables that are crucial for Life History Theory, like people's attachment styles (Del Giudice 2008). Together, we provide the very first test of the authors' proposed model through data-driven analyses (a method called *supervised machine learning;* for more technical discussions, see Breiman [2001]; IJzerman et al. [2016]; Yarkoni & Westfall [2016]) as proposed by the authors, and in a more traditional null hypothesis significance testing confirmatory manner (a mediation analysis).

We analyzed data from 1507 participants from 12 countries on three different continents, with countries at varying levels of distance from the equator. The underlying analytical details (including a detailed explanation of supervised machine learning) are reported online (https://osf.io/gtj38/). Our method is very powerful and robust, as it validates the model internally as it tests the strength of the model and the size of the error. We found distance from the equator to be a significant predictor of self-control (Tangney et al. 2004), but barely so: It was the 14th predictor in our list and comparable in prediction power to whether participants spoke Serbian or not (the 13th predictor).[2] As we could compare the strength of different predictors, our analyses revealed that the power to predict self-control was much greater for such variables as attachment anxiety, proneness to feeling nostalgia (a complex social emotion), social network size, level of complex social integration, and participants' attachments to their homes. Plotting these variables, controlling for the remainder of the model, further confirmed the stronger relationship of social determinants over distance from the equator (https://osf.io/vzwbe/).

Was distance from the equator then a reliable predictor of climate? We think so: Equator distance correlated strongly with the minimum temperature of that day ($r = 0.90$, $N = 1463$). We further explored whether attachment anxiety would mediate the relationship between equator distance and self-control; attachment anxiety (a strong predictor of self-control) could be indicative of differing life history strategies (Del Giudice 2008). There was no such relationship, as distance from the equator failed to be related to attachment anxiety ($t = 0.02$, $p = .99$), with a nonsignificant mediation onto self-control (95% confidence interval [CI]: 0.0007 to 0.0007). To be sure, we also tested for attachment avoidance, which also was not predicted by equator distance ($t = 0.02$, $p = .85$, 95% CI: 0.0003 to 0.0004). We thus find little evidence that distance from the equator matters for predicting self-control and life history strategies, and our analyses support the idea that the social environment is much more important in predicting self-control.

How could this be so? The authors reviewed evidence that seemed supportive of their relationship between climate and self-control. However, our reading of the literature suggests more nuance. Warmer water temperatures are indeed associated with faster growth, earlier death, and higher risk acceptance for some animals (all indicative of a faster life history trajectory [Holt & Jørgensen 2014]). But in contrast, warm-blooded mesopelagic fish (which live in an extremely *cold* environment) *also* exhibit a precocious maturation comparable to that of other animals in *warmer* environments (Miya & Nemoto 1986). And life history strategies cannot be easily extended from animals to humans. Humans are more unusual in that both slow and fast life history strategies can involve effortful control and impulsivity (Del Giudice 2015). Furthermore, warmer temperatures are not just related to aggression; a wealth of evidence in humans indicates that higher temperatures can also relate to *prosocial* behavior (cf. IJzerman et al. 2015a).

Furthermore, the authors neglected the fact that self-control via internalized norms is not linked to time horizon, but to a feeling of *obligation*. It is thus strongly influenced by the relevance of goals (Lindenberg 2013). For example, Dutch males scoring higher on honor concerns respond more aggressively when insulted, but less aggressively when not insulted (IJzerman et al. 2007). A recent study also indicated that the relationship between armed conflict and heat waves or droughts is due to the fact that heat waves or droughts exacerbate existing ethnic strife (Schleussner et al. 2016). Goal relevance, rather than a lack of self-control, strengthens aggressive responding in these cases.

In short, a broader consideration of the literature speaks against most of the propositions of their theoretical model. Most critically our data, which were suited for testing many of their claims, do not provide empirical support, likely because their theoretical model is *underfitted,* with the link between climate and self-control being underspecified. It is thus not surprising that the HPP provided evidence against their model, which we take as a strong suggestion for the authors to revisit their proposed link between climate and self-control.

In reformulating their model, we further advise that they give greater weight to established theories on the complex relationships between self-control, life-histories, culture, social organization, and violence, such as the literature mentioned previously, as well as literature on the development of culture (Diamond 1999) and the antecedents of violence (Fiske & Rai 2015). These theories support our results that the social environment rather than climate predicts self-control, and we suspect it is this social environment that mostly predicts aggressive behaviors. Cultures are not *individuals writ large;* they invariantly are complex and cannot be reduced to a simple main-effect model.

NOTES

1. Hans IJzerman is the lead author of this article and Siegwart Lindenberg the last. All other authors are listed alphabetically. Address correspondence to Hans IJzerman.

2. Notably, when testing *solely* for the correlation between distance from the equator and self-control, we find a significant correlation ($r = 0.12$, $N = 1484$). However, our machine learning approach did not detect a similar pattern, and we think the correlation is spurious and overfitted (Yarkoni & Westfall 2016).

Where the psychological adaptations hit the ecological road

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