Weather on the Brain I: A Theoretical View on Needs to Think About Weather

Matthew J. Bolton and Angela Louise Lazzaro¹

¹College of Arts and Sciences, Saint Leo University, Saint Leo, FL

Correspondence concerning this paper should be sent to Matthew Bolton, College of Arts and Sciences, Saint Leo University, Saint Leo, FL 33574. Email:

Matthew.Bolton@email.saintleo.edu

First preprinted 2021. Updated January, 2022.

Abstract

This paper explores the theoretical nature of a proposed psychological construct—need for cognition about weather. Whereas nature connectedness concerns a sense of communion with rivers, lakes, trees, and so forth, some people manifest a more specific form of connection directed to the weather which occurs in nature. We propose that needs to think about weather develop based on different features of the individual's living environment at points across the lifespan, and due to their unique psychological configuration, and lead in turn to either aversion or fascination for weather. Theory, evidence, and applications of this potential construct, and the relationship between nature and weather connectivity, are discussed.

Keywords: Need for cognition, nature connectedness, weather, phenomenology

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The biophilia hypothesis (Gunderson, 2014; Kellert & Wilson, 1993) considers humankind to have historically had a tendency to focus on and affiliate with the natural world. Researchers have broadly quantified this sense of a connectedness to nature, encompassing a *unity* or *oneness* with nature. People who experience this believe that nature is to some extent part of their identity, and seek to integrate themselves with it (e.g., Martin & Czellar, 2016; Mayer & Frantz, 2004; Mayer et al., 2009; Nisbet & Zelenski, 2013). The observation that some people manifest this trait such that they feel unity with the *weather* motivates us to explore ideas around the need, or needs, to think about the meteorological aspects of nature. This goes beyond mere protective action against weather hazards—the dominant weather-cognition topic of study today.

Whereas *need for cognition* generally refers to the enjoyment of effortful thinking (e.g., Petty et al., 2009), we propose there exists a *need for cognition about weather* which functions in conjunction with nature connectedness. That is, some people are intrinsically motivated to think in such ways as to experience a more sustained, further-actualized way of being-in-communion with the weather existing in wider natural contexts. These may be spiritual (Stewart & Bolton, 2021), technological or epistemic-informational (Bolton et al., 2021), job-related (Hoffman et al., 2017), or take other forms. Sometimes, one's weather-cognition need is briefer and more situational, constrained to dangerous events (Lindell & Perry, 2011; Stewart, 2009; Stewart et al., 2012). Hereafter, we discuss biophilia conceptually and examine how related weather-psychology constructs may be associated with various needs for cognition about weather.

Definitions and History of Biophilia

Humanistic psychoanalyst Erich Fromm drew on the ideas of Sigmund Freud, concerning individual-level safety-seeking, collective pro-sociality, and cooperation for the furthering of humanity (Freud, 1959; Gunderson, 2014), in originating *biophilia* to describe the “tendency of all living organisms to *live*” (italics ours; Fromm, 1964, p. 44). Biophilia, for Fromm, involves an orientation towards “the passionate love of life and of all that is alive... the wish to further growth, whether in a person, a plant, an idea, or a social group” (Fromm 1973, p. 406), and “...a love for nature as well as a love for humanity (Fromm, 1994, p. 101). It entails a persistent concern for nature’s growth and prosperity while responding to and meeting its needs, and respecting that nature has an inherent independence from human interests—knowing without dominating it (Gunderson, 2014).

Recent formulations (Lumber et al., 2018; Kellert, 1997, 2009; Kellert & Wilson, 1993; Wilson, 1984) position biophilia as an innate and naturally-selected love of nature which evolved within cultural context. Although work in this area is useful for environmentalism (e.g., Hughes et al., 2018; Lumber et al., 2018; Richardson et al., 2020; Richardson et al., 2020), and human well-being factors (e.g., Capaldi et al., 2014; Capaldi et al., 2015; Cleary et al., 2017; Richardson et al., 2021), the theoretical stance that love of nature is evolutionary has been severely criticized due to its untestable hypotheses and anecdotal and tentative evidence (e.g., Gullone, 2000; Joye & De Block, 2011; Kellert, 2009; Simaika & Samways, 2010; Van den Born et al., 2001). Thus, we take the Frommian biophilia perspective.

The Development of Needs for Cognition About Weather

There are many ways and reasons to think about nature and the weather within it. Most broadly, *weather salience* is a general psychological attention to the weather and climate of one’s place that is both intrinsic and external to the individual, which is activated when one has a need

to think about the weather (Stewart, 2009; Stewart et al., 2012; Stewart & Bolton, 2021). From living-with and alongside the weather comes *epistemic weather curiosity* related to a need for forecast, hazard, and other scientific details (Bolton et al., 2021); and *perceptual weather curiosity* for wide and varied weather experiences (Stewart, 2017; Stewart & Bolton, 2021).

Perceptual weather curiosity and various needs for cognition about weather involve bodily, sense-based mechanisms: The human body is equipped with perceptual faculties which allow us to make sense of the world and attune us to the weather prior to any cognitive mechanism (Carlson & Birkett, 2017; Mazza et al., 2012; Parkhurst et al., 2002; Stewart, 2009; Stewart & Blau, 2019; Stewart & Bolton, 2021). Nevertheless, environmental connectedness exists along a continuum. While some people are disinterested in or not as connected with nature, another form of environmental thinking involves biophobia: the tendency to avoid nature and natural living things (such as spiders, snakes, or wild animals; Ulrich, 1993). Thus, people are generally inclined to think about nature and the weather within it in terms of approach or avoidance. These are frames we can further interpret through the lenses of lived experiences with weather and socio-cultural influences upon weather interest and knowledge.

Lived Experiences with Weather

People seek to approach or avoid weather in its myriad forms. They experience it, subjectively, in innumerable ways. Orr (1993) and Kellert (1997) suggested that biophillic and biophobic beliefs, feelings, and tendencies arise in childhood due to positive or negative nature experiences. Evidence for this is emerging (Bolton et al., 2020; Hoffman et al., 2017 on weather salience and interest; e.g., LeBeau et al., 2010; Passmore et al., 2021; Pensini et al., 2016; Rosa et al., 2018; Richardson et al., 2019 on nature connection).

A popular media depiction of approach-motivated weather interest occurs in *Twister* (1996). Helen Hunt's character, in the movie's opening minutes, is drawn to storm chasing and fascination with meteorology by childhood experience with a tornado. Rather than being traumatized by her father dying due to the tornado, she feels compelled to understand how tornadoes work. Although this portrayal is fictional, increases in weather salience and positively-oriented weather interest in childhood and adulthood following experiences of both non-severe and severe-and-dangerous atmospheric phenomena and nature elements are commonly reported, anecdotally, by meteorologists and members of the general public. What's more, people exposed to weather information often subsequently desire to know more (Bolton et al., 2021), childhood experiences of nature portend adult nature connectedness (e.g., Passmore et al., 2021; Richardson et al., 2019), and perceptual curiosity predicts interest in experiencing different weather conditions (Stewart, 2017). In contrast, we view avoidance-motivated weather-cognition as stemming from psychological as well as physical impacts of living through dangerous weather events, and from trait anxiety in conjunction with specific configurations of trait environmental sensitivity.

Storm fear, anecdotally the most common meteorological phobia (see Coleman et al., 2014; Watt & DiFrancescantonio, 2012; Westefeld, 1996; Westefeld et al., 2006 for empirical evidence), falls under the natural environment phobia classification in the *Diagnostic and Statistical Manual, 5th Edition* (American Psychiatric Association; APA, 2013). While storm phobias alone have the lowest prevalence of the natural environment specific phobias (roughly 2-3% of the American population; LeBeau et al., 2010), fears of height, water, and storms combined have the highest subtype prevalence rate of the specific phobias (ranging from 8.9-11.6% of the American population; APA, 2013; LeBeau et al., 2010). They seem officially

underreported due to *DSM* criteria and confusion with other environmental elements like earthquakes and wildfire, and animal-related phobias which fit another *DSM* classification (APA, 2013; Coleman et al., 2014; Watt & DiFrancescantonio, 2012; Westefeld et al., 2006).

Storm phobias are most common among children and adolescents and, in terms of available gender difference data, women tend to most often express natural environment-type phobias (Coelho et al., 2020; Greening and Dollinger, 1992a, 1992b; Wardenaar et al., 2017; Ollendick & King, 1991). Research and theoretical perspectives suggest weather phobias are caused by a mixture of direct exposure to traumatic and even less-severe but still personally-significant weather events and natural disasters (APA, 2013; Marks, 2002; Watt & DiFrancesantonio, 2012; Bolton et al., 2020; Bolton et al., 2020).

Impacts of living through dangerous weather events may also be physical, and not just in terms of injury but one's physiological-sensory *experience of the event* (Stewart & Blau, 2019; Stewart & Bolton, 2021; Stewart & Oh, 2019). Environmental sensitivity revolving around the capacity to register, process, and respond to stimuli and factors external to the individual influences perception of weather stimuli (Aron, 1996; Aron et al., 2012; Pluess, 2015). In addition, there are genetic factors, anxiety sensitivity, and levels of ongoing stress from external sources, to consider in this context (APA, 2013; Coelho & Purkis, 2009; Marks, 2002; Watt & DiFrancescantonio, 2012).

Socio-cultural Influences on Weather Interest and Knowledge

Socio-cultural research shows that one's environment is important for the development of biophilic tendencies. Individuals with greater degrees of nature connectedness recall spending more time in nature during childhood (Tam, 2013) and that children with highly nature-connected parents experience greater degrees of connectedness as adults (Passmore et al., 2021).

Due to their upbringing, some populations (e.g., Menominee Native Americans) both develop the view that humans are part of nature at an early age and feel psychologically closer to nature than do other populations (Bang et al., 2007; Unsworth et al., 2012). These are cultural aspects which may preclude the development of a more spiritual need for cognition about weather as living-with-the-land leads to folk-understandings of and dependency on observations of weather.

Moreover, foretelling weather conditions is an important survival tactic within certain cultures. For instance, as reported by Bolton (2021a), observational skills are used by farmers in India and Malaysia and by Indigenous peoples who rely on accurate predictions of Earth's changing climate in the Arctic, Africa, and Australia. Māori cultures in New Zealand, and Samoan islanders, meanwhile, have developed sophisticated agricultural and cloud classification and forecasting systems based on their hyper-localized geographic and ecological knowledge (Bolton, 2021a; Stewart & Bolton, 2021). These are not only cultural reasons for a need for cognition about weather, but practical factors related to survival in a strongly Freudian-Frommian biophilia paradigm (Freud, 1959; Fromm, 1973).

Media exposure—such as regularly watching The Weather Channel and local television weather, or watching weather-related and more general natural disaster movies and documentaries—may predict either meteorological biophilia or biophobia, depending on the individual's specific psychological profile (Bacon, 2012; Bolton et al., 2021). Perhaps the opening moments of *Twister* even serve as a model. Then, there are parasocial (Klotz, 2011; Sherman-Morris, 2005, 2006; Sherman-Morris et al., 2020) and interpersonal interactions by which people may become either attracted and curious about, or averse and vigilant towards, weather based on various peer-associated influences (Broeren et al., 2011; Dunne & Askew, 2018). Like anxiety-phobia linkages, these channels for cultural osmosis have a more traditional

social-cognitive-learning, behavioral-reinforcement slant (e.g., Bandura, 1986; Barrett et al., 1996; Bouton et al., 2001; Coelho & Purkis, 2009; Grusec, 1994). They often involve associative stimulus-response learning, whereby the interest and attunement for weather is both an antecedent stimulus and reward which encourages further salience (Bucker & Theeuwes, 2018; Treisman & Gelade, 1980; Yantis, 2005). Even informational learning through media exposure or social discussion can aid understanding for how weather phobia originates and is channeled (Watt & DiFrancescantonio, 2012). Mentoring may play a further role (Bolton, 2020).

A Possible Psychological Profile of the Person Who Needs to Think about Weather

Based on personality research, we might expect that different need for cognition about weather subtypes emerge in the course of both typical and atypical developmental trajectories, through trait and individual difference interactions. These include but are not limited to nature connectedness; personality variables including aspects of openness to experience (associated with a tendency to embrace inner, cognitive events and feelings and in turn manifest interest in new behavioral experiences; Rogers, 1954; Soto & John, 2017) and neuroticism; dispositional anxiety and environmental sensitivities; thrill-seeking; perceptions of weather variability and uncertainty (Bolton et al., 2021); situational cognitive-behavioral factors (usually protective against dangerous conditions); and socio-cultural influences as well as broadly psychological (associative, experiential, and social/peer-associated) learning mechanisms. These may also interact with other characteristics, such as those observed within autism spectrum conditions and cognitive styles based on rationality and systemizing concepts (Bolton et al., 2020; Bolton et al., 2020) to increase or decrease one's need for cognition about weather. Table 1 shows two outcome trajectories based on select traits involved in psycho-meteorological approach and avoidance tendencies. Note that these are not exhaustive lists.

Table 1. Approach and Avoidance-based Need for Cognition About Weather Trajectories.

Selected Approach-based Traits	Selected Avoidance-based Traits
<ul style="list-style-type: none"> • Cognitive style • Dispositional anxiety and environmental sensitivities • Experience with weather events • Personality (e.g., Openness, thrill-seeking, nature connection) • Perceptual and epistemic curiosities • Psychological learning • Socio-cultural influences • Weather salience 	<ul style="list-style-type: none"> • Cognitive style • Dispositional anxiety and environmental sensitivities • Personality (e.g., Neuroticism, nature-indifference) • Psychological learning • Socio-cultural influences • Trauma from lived experience
Outcomes	Outcomes
<ul style="list-style-type: none"> • Weather as a hobby or passion • Increased cognitive-behavioral engagement with weather • Possible desire to become a meteorologist 	<ul style="list-style-type: none"> • Heightened alertness towards and fear for, and greater cognitive-behavioral avoidance of, weather

A third pathway considers that, for some, weather interest begins as *either* positive or negative and flips based on experience or (associative, experiential, or social) learning. Here, Helen Hunt's *Twister* character would find her childhood fear return after the near-death cornfield tornado chase sequence towards the movie's end. Anecdotally, some meteorologists become passionate about the weather in childhood but after years of on-job forecasting and time spent in the field, find themselves affected by weather anxieties. Others initially have weather fears and/or anxieties but overcome these to become meteorologists, and then later see their negative cognitions return. Due to experience or lack thereof, some people will have interest or phobia for one or more weather elements but not others, or may become desensitized due to prolonged and repeated exposure (e.g., Kesling, 2010). Finally, per statistical distribution principles, we expect some to be indifferent (no interest; Stewart, 2009).

Conclusions on Needs for Cognition About Weather

In summary, needs for cognition about weather are associated antecedently with weather salience and both epistemic and perceptual weather curiosities, as higher-level cognitive-perceptual mechanisms which predate the development of weather salience. Our hypothesis is that this individual-differences-based trait may develop for certain individuals based on their unique environment and psychological profile, leading to meteorological biophilia or biophobia.

We believe discerning the trait's viability is essential to research into overarching weather salience-based constructs (Bolton et al., 2020; Bolton et al., 2021; Stewart & Bolton, 2021). It would enable a higher-resolution examination of nature connectedness and even nature-wellbeing factors. One can be connected to nature (e.g., rivers, trees, insects, animals living within the environment) but not weather. One cannot, however, be connected to weather without acknowledging its implicit embeddedness within nature (Stewart & Bolton, 2021). This means that nature-connection measures are necessarily too broad to capture specific *weather*-connectedness. Preliminary and ongoing research (Bolton, 2021b) suggests measuring needs for cognition about weather is possible and fruitful. For now it is important simply to outline what such a construct might entail. We hope this theoretical postulation motivates future thought and proves enlightening for the furthering of both empirical and philosophical-theoretical work at the intersection of meteorology and the embeddedness of people within the natural environment.

Acknowledgements

MJB conceived the paper and was supported academically during this work by a Graduate Fellowship sponsored by the U.S. National Weather Service (NWS) and awarded by the American Meteorological Society (AMS). The views expressed here are those of the authors and do not necessarily reflect the views of the NWS or AMS.

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