The Way the Wind Blows:

Direction of Airflow Energizes Consumers and Fuels Creative Engagement

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(Forthcoming in *Journal of Retailing*)
https://doi.org/10.1016/j.jretai.2019.10.005

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Parts of this article were presented at the 2017 North American conference for the Association for Consumer Research in San Diego, California. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. The authors would like to thank Joanna Arnold, Mahdi Ebrahimi, Gilbert Guerrero, Asit Shah, and Zhe Zhang for their help with data collection.

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Abstract

Retail spaces contain copious sensory information that can affect consumers' shopping behavior. This research investigates a novel, yet ubiquitous, retail atmospheric variable: airflow direction. We examine how the sensory experience of frontal (vs. dorsal) airflow energizes consumers in retail spaces and influences creative engagement. Five studies demonstrate that frontal airflow (air blowing on the front of the body) boosts energetic activation and fuels enhanced performance on creative tasks, compared to dorsal airflow (air blowing on the back of the body). Study 1 establishes the link between frontal (vs. dorsal) airflow and energetic activation in a laboratory setting. Study 2 tests the full model in a laboratory setting to provide initial evidence that frontal (vs. dorsal) airflow enhances creativity and that energetic activation drives this effect. Using a visualization task and an online setting, study 3 conceptually replicates airflow direction's effect on creativity and the mediating role of energetic activation, while study 4 shows evidence of the mediating role of energetic activation via a moderation design. Study 5, an outdoor field study, provides further support for the predicted relationship between airflow direction and creative engagement. The theoretical and practical implications of these findings for retailing are also discussed.

Keywords: airflow, creativity, energetic activation, in-store marketing, technology

Retail atmospherics is one of the most well-studied aspects of retailing (Baker et al., 2002; Bitner, 1992; Spence et al., 2014). The store environment is a key facet of a shopping experience and prior work has examined how consumers respond to a variety of sensory in-store factors, from music (Mattila & Wirtz, 2001) and illumination (Biswas et al., 2017; Steidle & Werth, 2013) to temperature (Cheema & Patrick, 2012) and ambient noise and smells (Biswas, Lund, & Szocs, 2019; Biswas & Szocs, 2019; Bosmans, 2006; Mehta, Zhu, & Cheema, 2012). In the present research, we investigate one element within a retail space that is always prevalent, but not always perceptible: airflow.

In particular, our research examines how the sensory experience of the direction of airflow (frontal vs. dorsal) can energize consumers and influence their creative engagement. In doing so, we seek to offer managerial insights into questions as varied as: If a customer is using a digital kiosk to customize the design of a bedframe or athletic shoe or the ingredients in a fast-food menu item, would a 'smart' fan that generates a light flow of frontal air influence the creativity of the custom-built product? Could IKEA energize consumers and increase their creativity while browsing if they piped frontal airflow along the path of in-store traffic? Would Sephora make consumers feel more energized and, in turn, purchase more creative color palettes and novel items if they fitted their mirrors with tiny fans (as seen on some treadmills) that gently blow air on consumers' faces while they try on lipstick or eyeshadow? How should an outdoor pop-up shop be set up so that consumers can experience airflow in a way that enhances their appreciation of the novel and creative store offerings?

Clearly, when designing a store layout, issues of ventilation and airflow are considered for functional purposes (e.g., to keep the store feeling clean, comfortable, and infused with fresh vs. stale air). There is little empirical evidence, however, about whether and how airflow can be strategically employed by retailers to shape consumer response in retail spaces. To consider the potential of airflow as a retail atmospheric factor, we should take a glimpse at the outdoors. Airflow is abundant and generally more perceptible in outdoor environments and mounting empirical evidence shows that exposure to certain elements of nature is positively correlated with myriad benefits, including greater physical health, mental health, productivity, performance, and creativity (An et al., 2016; Atchley, Strayer, & Atchley, 2012; Berman, Jonides, & Kaplan, 2008; Maas et al., 2009; Plambech & Van Den Bosch, 2015; Ulrich et al., 1991). We propose that indoor airflow can be viewed as a means by which retailers and marketers can garner similar benefits, so as to enhance the consumer's shopping experience.

Airflow, often used interchangeably with wind or breeze in outdoor contexts, is defined as the movement of air in an environment (i.e., the circulation of air in a given space). Three key facets characterize the sensory experience of airflow: speed, temperature, and direction. The speed or velocity of airflow refers to how fast the air is moving and is measured on the Beaufort wind force scale by an instrument called an anemometer. Wind speed ranges from 0 (calm; $<$ 1 mph) to 12 (hurricane force; $\geq$ 73 mph). The temperature of airflow, often referred to as the wind chill factor, is usually lower than ambient temperature, and defined as the perceived drop in temperature due to any cooling effects of the flow of air on exposed skin (Tikuisis & Osczevski, 2003). The last facet is airflow direction: the direction the airflow is moving in. Usually, airflow direction relative to one's spatial position is described as either frontal airflow (i.e. air blowing on the front of one's body) or dorsal airflow (i.e. air blowing on the back of one's body).

Outdoor airflow is more perceptible than indoor airflow, due to the fact that wind can often be strong and fast moving (speed) or uncomfortably cool or warm (temperature). Since most indoor environments are controlled (for similar arguments see Cheema & Patrick, 2012), we assert that the way in which to best bring the beneficial aspects of the outdoors inside when it comes to airflow is to focus on the third facet: airflow direction. The study of airflow direction (keeping speed and temperature constant) is, therefore, a practical one that we will subsequently show has an impact on creative engagement. In particular, our research demonstrates that frontal (vs. dorsal) airflow boosts an individual’s energetic activation, which consequently results in creative engagement (operationalized in our research as improved performance on creative tasks). In the four lab studies we present to support this assertion, the other two sensory facets of airflow—wind speed (maintained at 1.3 m/s and a score of 1 on the Beaufort wind force scale) and temperature (maintained at an ambient room temperature)—are kept constant. Our fifth study, a field study, replicates our hypothesized effects in a natural, outdoor environment.

Our research has myriad practical implications for retailers and marketers. For instance, one important trend in retailing is the creation of immersive, interactive retailing spaces to showcase the goods and services on offer (Heller et al., 2019; Roggeveen & Grewal, 2018). But for consumers to embrace and appreciate this evolving retail space, they need to feel energized. When inside the retail space, they need to shake themselves out of the status quo to engage creatively with the in-store offerings. We suggest that airflow direction can be used strategically to energize consumers and help them navigate these new retail environments with higher creative engagement. At a broader level, it is both important and interesting that factors within man-made environments (like airflow direction) can elicit energetic activation and fuel creative engagement. Indeed, the insight that these outcomes may be fostered by creating the ‘right’ physical environment could help firms and consumers arrange retail stores, offices, schools, and homes in a manner that promotes energetic activation and creative engagement.

Theoretical Background

The spatiotemporal environment in which we live, shop, and work affects us in profound ways. This is perhaps why an increasing amount of research examines the impact of the sensory environment on consumer response (Baker et al., 2002, Bitner, 1992; Cheema & Patrick, 2012; Mehta et al., 2012; Meyers-Levy & Zhu, 2007; Steidle & Werth 2013). Indeed, countless aspects of retail atmospherics—the way a store looks and feels—have been explored (including flooring, temperature, brightness, and noise) in order to study their effect on various factors related to human performance, such as depletion, self-control, and cognitive processing styles (Roggeveen & Grewal 2018). However, the possible interplay between environmental factors (especially in indoor contexts) and a person's energetic activation has, to our knowledge, received minimal attention. In the sections that follow, we present arguments to support the proposed conceptual linkages between airflow direction, energetic activation, and creative engagement.

Airflow Direction Influences Energetic Activation

What is energetic activation? Energetic activation refers to "the degree to which people feel energized" (Quinn, Spreitzer, & Lam, 2012, p. 342), and is commonly referred to as vitality (Nix et al., 1999; Ryan & Frederick, 1997), vigor (McNair, Lorr, & Droppleman, 1971), zest (Peterson et al., 2009), energetic arousal (Thayer, 1989), activation or positive activation (De Dreu, Baas, & Nijstad, 2008), or subjective energy (Marks, 1977). It is conceptually and empirically distinct from caloric or potential energy, sheer positive affect, and tense activation (Nix et al., 1999; Quinn et al., 2012; Ryan & Frederick, 1997). Notably, prior research has suggested that certain behavioral strategies, such as exercise, controlling one's thoughts (e.g., giving oneself a pep talk), taking a shower/splashing water on one's face, listening to upbeat music, resting/sleeping, and eating/drinking something may lead to short-term boosts in energetic activation (Thayer, Newman, & McClain, 1994). In our research, we instead focus on how a specific environmental factor—airflow direction—could alter energetic activation.

Given the impact that airflow has on ease of breathing and general health (Sundell, 2004), the primary focus of prior studies of indoor airflow has been on how the facets of airflow—speed, temperature, or direction—affect air quality (Chung & Hsu, 2001; Jiang & Chen, 2002; Xing, Hatton, & Awbi, 2001). However, there also exist a few initial signs that the sensory experience of airflow might have a psychological impact on individuals. For instance, Bakó-Biró et al. (2012) found that higher airflow velocity (i.e., ventilation rates) in classrooms increased memory and attention. Other research by Tsalamlal et al. (2013) found that when people's arms are exposed to air jets, they feel more pleasant and less aroused in response to low (vs. high) intensity flow rates. But how might the direction of airflow influence energetic activation? We posit that when consumers experience frontal airflow (i.e., air blowing on the front of the body) as opposed to dorsal airflow (i.e., air blowing on the back of the body), it elicits feelings of being energized—feelings akin to those experienced when one is exposed to certain elements of nature.

Over the past several decades, research on the psychological benefits of nature has found evidence that exposure to certain elements of nature and the outdoors can boost energetic activation. For instance, such exposure has been variously shown to increase reported feelings of vitality, vigor, aliveness, and energy (Capaldi, Dopko, & Zelenski, 2014; Capaldi et al., 2015; Fuegen, & Breitenbecher, 2018; Greenway, 1995; Kaplan & Talbot, 1983; Nisbet, Zelenski, & Murphy, 2011; Ryan et al., 2010). Moreover, studies on outdoor environments have found that certain natural movements, such as light breezes, can improve concentration (Hartig et al., 2003; Hartig, Mang, & Evans, 1991; Heerwagen & Gregory, 2008; Kaplan, 1995; Kaplan & Kaplan, 1989). Findings such as these raise the question of how physical aspects of the environment, such as airflow direction, could be used to bring the benefits of the outdoors inside. In other words, how can airflow direction be used in indoor settings to bring about the same energizing benefits seen in outdoor environments? Research on biophilic design offers some guidance.

Biophilic design refers to the practice of incorporating nature and natural elements into built environments so as to reconnect people with nature (Browning, Ryan, & Clancy, 2014). An important aspect of biophilic design is that one must draw upon nature in a way that is restorative and refrain from hindering the functionality of the space (Ryan et al., 2016). Of particular importance to our research is that principles of biophilic design have advocated that certain ambient qualities—such as the sensation of airflow across the skin—are able to prompt positive responses similar to those experienced in nature and create an indoor space wherein one feels energized, active, alive, and invigorated (Browning et al., 2014; Ryan & Browning, 2018; Ryan et al., 2016). Notably, this idea that a stronger, more perceptible sensory experience of airflow across the skin could boost feelings of energy is consistent with prior work that has linked energetic activation to certain somatic, physiological factors (Gailliot & Baumeister, 2007; Johnson, 1986; Ryan & Frederick, 1997; Stewart, Hays, & Ware, 1992) and showed that some physiologically stimulating experiences (e.g., warm temperatures and bright illumination; Cheema & Patrick, 2012; Smolders & de Kort, 2014) can positively influence perceived vitality.

Together, these findings have important implications for airflow direction’s ability to influence energetic activation because research on human physiology suggests people are differentially sensitive to sensory variation and stimulation (e.g., from airflow passing across the skin) on the front (vs. back) side of their body. Specifically, due to differences in the density and type of touch receptors present in the skin over various portions of the human body, humans have greater tactile sensitivity on the front-facing (vs. rear-facing) half of their body (Weber, 1978). In other words, like our other senses, touch appears to be more refined in the anterior (vs. posterior) regions of the body. The skin on the human face, for instance, is highly sensitive to touch, compared to the skin on the back (Myles & Binseel, 2007; Weinstein, 1968). In addition, there are many places on the front of the body that possess better tactile acuity than the corresponding parts on the opposite, dorsal surface: The back of the head is far less acute than the face, the back slightly less acute than the chest and abdomen, and the calf of the leg less acute than the front of the leg (Weber, 1978). Moreover, in a study involving airflow, the front-facing portion of the ear was found to be more sensitive to airflow than the back of the ear (Kojima, Hashimoto, & Kajimoto, 2009). Based on these arguments, the sensation of airflow passing across the skin should be stronger for frontal (vs. dorsal) airflow and, thus, the experience of frontal (vs. dorsal) airflow should prompt greater energetic activation (i.e., an energizing effect akin to that which occurs when one is exposed to certain elements of nature). Indeed, consistent with this prior research on human tactile sensitivity, a pretest we conducted (N = 81; airflow speed and temperature held constant; see Web Appendix for details) showed that participants who experienced frontal (vs. dorsal) airflow felt a significantly stronger, more intense sensation of airflow passing across the skin ($p < .001$). Thus, we formally hypothesize:

H1: Experiencing frontal airflow (vs. dorsal airflow) enhances energetic activation.

Energetic Activation Influences Creative Engagement

Although increased energetic activation would in itself be a significant consequence of experiencing frontal (vs. dorsal) airflow (as felt energy is associated with mental and physical well-being; McNair et al., 1971; Ryan & Frederick, 1997; Stewart et al., 1992; Thayer, 1989), it may also produce important, favorable downstream consequences. For instance, research has shown that energetic activation can increase self-control (Muraven, Gagné, & Rosman, 2008). In our work, we focus on one particular benefit: enhanced creative engagement, operationalized in our studies as performance on creative (both divergent and convergent thinking) tasks.

Creativity is defined as the production of novel and useful ideas, insights, or solutions to problems (Amabile, 1983; Moreau & Engeset, 2016; Sternberg, 2006) and it can be a function of cognitive flexibility and cognitive persistence (De Dreu et al., 2008). In today's consumption environments, the ability to be creative can significantly impact the outcome of many everyday creative behaviors (e.g., crafts, hobbies, DIY projects, fashion, and cooking; Dahl & Moreau, 2007). Moreover, the generation of new product ideas by consumers (Chang & Taylor, 2016), success of self-designed products (Moreau & Herd, 2010), and profitability of do-it-yourself industries (Tratensek & Jensen, 2006) are all affected by consumer creativity. Creativity is also highly valued in corporate settings, as it often drives a company's competitiveness and survival (Florida & Goodnight, 2005). Consequently, many organizations have become increasingly concerned with finding means by which they can foster creativity (Chamorro-Premuzic, 2015).

Our work is situated in an emerging area of research that links the sensory environment to creativity. For instance, Ceylan, Dul, and Aytac (2008) showed that offices are perceived as having higher creative potential when they have more plants, windows, cooler colors, and less structural complexity. Mehta et al. (2012) found that moderate (vs. low or high) ambient noise in an enclosed consumption environment can positively impact creative performance. Other work shows that, by priming the concepts of safety and freedom, dim (vs. bright) illumination (Steidle & Werth, 2013) and high (vs. low) ceilings (Meyers-Levy & Zhu, 2007) facilitate creativity. However, the link between airflow (whether from natural drafts, breezes, or fans) and creativity has remained unexplored. In the present research, we propose that if airflow direction can indeed alter energetic activation (as we predict), then it should fuel people's creative engagement.

The assertion that energetic activation influences creative engagement is based on theory and findings from various literatures. First, findings from the organizational behavior literature show that employees' feelings of energy are associated with higher involvement in creative work (Atwater & Carmeli, 2009; Kark & Carmeli, 2009) and enhanced entrepreneurial passion (Cardon et al., 2009), which provides some evidence that energetic activation and creative engagement are indeed related. Second, past literature on creativity has proposed that cognitive activation (e.g., as measured by "how energetic do you feel?") is a necessary precondition for creativity, and shown that activating (vs. deactivating) states can stimulate creative performance by enhancing cognitive flexibility, increasing cognitive persistence, or some combination thereof (De Dreu et al., 2008). Consistent with these findings, the self-determination literature has argued that greater vitality is associated with enhanced brain functioning and cognitive flexibility (Deci & Ryan, 1985, 2000) and shown that increased energy can enhance task persistence (Moller, Deci, & Ryan, 2006; Ryan, Koestner, & Deci, 1991). Together, this research further supports energetic activation as a driver of creative engagement.

However, though the aforementioned research indirectly supports the idea that increased energetic activation leads to enhanced creative engagement, little research has directly tested this prediction. One notable exception is work by Chen and Sengupta (2014), which has explicitly tested and shown empirical evidence of energetic activation's ability to enhance creativity. Specifically, in this research, participants assigned to consume or obtain a vice product (vs. given a free choice to consume or obtain a vice or virtue product) expressed greater vitality, which consequently explained their enhanced performance on an unrelated creativity task. In the present research, we predict a similar, mediating role of energetic activation in explaining the positive effect of frontal (vs. dorsal) airflow on creative engagement.

H2: Experiencing frontal (vs. dorsal) airflow enhances performance on creative tasks.

H3: Energetic activation mediates the effect of airflow direction on creative engagement.

Overview of Studies

We present five studies conducted in the lab, online, and in the field to test our hypotheses. Relying on self-reported energetic activation, we found that participants who experienced frontal (vs. dorsal) airflow felt more energized (studies 1-3). Participants who experienced frontal (vs. dorsal) airflow also performed better on creative tasks—they conceived more creative alien animals (study 2), scored higher on a remote associates test (study 3), more strongly preferred creative product offerings (study 4), generated more creative travel destinations (study 5), and chose a more creativity-intensive kite project (study 5). We also obtained evidence that this effect of airflow direction on creative engagement was driven by energetic activation through both mediation (studies 2 and 3) and moderation (study 4), while myriad alternative explanations for these effects were ruled out (studies 1, 3, and 4).

Study 1

The primary objective of study 1 was to demonstrate the effect of airflow direction on energetic activation in a controlled, lab experiment. Specifically, we tested the prediction that frontal (vs. dorsal) airflow boosts energetic activation. Study 1 also examined several alternative accounts. Namely, it could be argued that any effects of airflow direction could be due not to differences in energetic activation (as predicted), but instead due to differences in tense activation (e.g., anxiety) or hedonic tone (e.g., happiness)—constructs that have been identified as distinct from energetic activation (McNair et al., 1971; Nix et al., 1999; Ryan & Bernstein, 2004; Ryan & Frederick, 1997). One might also argue the effects of airflow direction are instead due to some difference in the extent frontal (vs. dorsal) airflow activates thoughts related to facing obstacles and working against an opposing force or to some difference in the extent dorsal (vs. frontal) airflow makes people feel like an external force is pushing them. Thus, study 1 also measured these constructs to rule them out as alternative accounts for our observed effects.

Participants and Procedure

Eighty-six undergraduate students (62.8% female; $M_{Age} = 23.41$, $SD_{Age} = 4.88$) participated in exchange for extra course credit. The study was a 2-cell (airflow direction: frontal vs. dorsal) between-subjects design.

When participants arrived at the lab, we randomly assigned them to either the frontal airflow or dorsal airflow condition by having them take surveys in one of two rooms. The rooms were identical in terms of dimensions, décor, color, lighting, and temperature. In each room, there was also a tower fan (the fans in each room were identical) positioned 8 ft. away from the table where participants would be sitting and that was turned on before participants entered the room. All fans were blowing at a velocity of 1.3 m/s (a score of 1 on the Beaufort wind scale and described as ‘light air’; Huler, 2004) and we used a professional anemometer to monitor the airflow speed and temperature before and after each participant (to ensure these factors remained constant across participants and conditions). To manipulate airflow direction (see Web Appendix for room diagrams), the fan in the frontal airflow condition was positioned to blow air at participants’ anterior side (i.e., participants were facing the airflow), whereas the fan in the dorsal airflow condition was positioned to blow air at participants’ posterior side (i.e., participants were facing away from the airflow). After being seated at the table in the room, we told all participants they would be completing several ostensibly unrelated surveys. They were also told (as a cover story) that another group of researchers had decorated and arranged the room for studies they would be running later in the day and to please not touch any of the décor.

As part of the first survey, participants completed two self-report indices of energetic activation. For the first index, they reported their agreement with the following statements about how they currently felt (1 = *not at all true*, 7 = *very true*; Ryan & Frederick, 1997; Ryan et al., 2010): “I feel so alive that I just want to burst,” “I have energy and spirit,” “I feel alive and vital,” and “I do not feel energetic (reverse-coded).” We averaged these four items to form our first energetic activation index (α = .87). For the second index, participants reported the extent they currently felt “active,” “energetic,” “vigorous,” “vital,” “full of pep,” and “lively” (1 = *not at all*, 7 = *extremely*; Nix et al., 1999; Thayer, 1989). We averaged these six items to form our second energetic activation index (α = .94).

Participants also responded to measures of tense activation and hedonic tone (Matthews, Jones, & Chamberlain, 1990). For tense activation, they reported (1 = *not at all*, 7 = *a lot*) “To what extent do you currently feel…” 1) anxious, 2) nervous, 3) jittery, 4) tense, 5) calm, 6) composed, 7) restful, and 8) relaxed; for hedonic tone they reported (1 = *not at all*, 7 = *a lot*) “To what extent do you currently feel…” 1) happy, 2) satisfied, 3) contented, 4) cheerful, 5) sad, 6) sorry, 7) depressed, and 8) dissatisfied. For each scale, the four latter items were reverse-coded and the eight items then averaged to form a tense activation index (α = .86) and hedonic tone index (α = .86), respectively. We then had participants complete a 5-item index (α = .87) that assessed the extent they were currently thinking about facing obstacles and having to work against an opposing force (“I am having to work against some opposing force,” “There are obstacles I must overcome,” “There are obstacles that I’m facing,” “An external force is obstructing me,” “I am currently facing obstacles”; 1 = *not at all*, 7 = *very much*). We also measured the extent they felt: “I am being pushed by some external force” (1 = *not at all*, 7 = *very much*). Participants also completed an 18-item dispositional need for cognition (NFC) scale

(Cacioppo, Petty, & Kao, 1984). This NFC scale was included so that we could perform an added robustness check and test if the effect of airflow direction on energetic activation held even when controlling for differences in people's predisposition toward mental engagement.

In a second survey, participants were told (as a cover story) that the university was considering renovating some rooms in the business school, including the one they were sitting in. In line with the cover story (and to ensure the airflow direction manipulation was not influencing perceptions of other aspects of the room), participants reported their perceptions of the room's general pleasantness ("The environment in this room is pleasant," 1 = *strongly disagree*, 7 = *strongly agree*), lighting (1 = *very dark*, 7 = *very bright*), noise level (1 = *not noisy at all*, 7 = *very noisy*), and temperature (1 = *very cold*, 7 = *very hot*). Last, we collected demographics.

Results and Discussion

Room environment. One-way ANOVAs were conducted on participants' reports of the room's general pleasantness, lighting, noise, and temperature (see Web Appendix for means and standard deviations). The results showed that participants in the frontal and dorsal airflow conditions perceived the room as equally pleasant ($F(1, 84) = .10$, $p = .75$), equally bright ($F(1, 84) = .76$, $p = .39$), equally noisy ($F(1, 84) = 1.45$, $p = .23$), and of equivalent temperature ($F(1, 84) = .42$, $p = .52$). Thus, although airflow direction was manipulated, this manipulation did not also affect participants' perceptions of these other aspects of the room environment.

Tense activation, hedonic tone, facing obstacles/opposing force, and feeling pushed. We conducted one-way ANOVAs on the tense activation index, hedonic tone index, facing obstacles/opposing force index, and participants' reports of feeling pushed by some external force (see Web Appendix for means and standard deviations). The results showed no differences between the frontal and dorsal airflow conditions in tense activation ($F(1, 84) = .16$, $p = .69$), hedonic tone ($F(1, 84) = .14$, $p = .71$), thinking they were facing obstacles and working against an opposing force ($p = .42$), or feelings of being pushed ($F(1, 84) = .32$, $p = .57$).

Energetic activation. We conducted one-way ANOVAs on the two indices of energetic activation. As predicted, the results of both analyses revealed that participants in the frontal airflow condition currently felt more energized than did those in the dorsal airflow condition (first energetic activation index: $M_{frontal} = 5.14$, $SD_{frontal} = 1.25$ vs. $M_{dorsal} = 4.21$, $SD_{dorsal} = 1.67$; $F(1, 84) = 8.42$, $p = .01$; second energetic activation index: $M_{frontal} = 4.83$, $SD_{frontal} = 1.37$ vs. $M_{dorsal} = 3.98$, $SD_{dorsal} = 1.67$; $F(1, 84) = 6.55$, $p = .01$). Ancillary analyses showed that the effect of airflow condition remained significant even when participants' dispositional NFC was included as a covariate (first energetic activation index: $F(1, 83) = 8.58$, $p < .01$; second energetic activation index: $F(1, 83) = 6.76$, $p = .01$).

Discussion. Conducted in a controlled lab setting, study 1 demonstrated that airflow direction can influence energetic activation. Specifically, participants who experienced frontal (vs. dorsal) airflow subsequently reported that they felt more energized (e.g., "alive and vital", "energetic"). Study 1 also helped to rule out several other alternative accounts, as it was shown that tense activation, hedonic tone, thoughts about facing obstacles and working against an opposing force, and feelings of being pushed by some external force did not significantly differ across conditions (nor did perceptions of the room's pleasantness, lighting, noise, or temperature). Thus, these alternative factors could not account for our observed effects.

We also conducted a follow-up laboratory study (follow-up study A; N = 132; see Web Appendix) that included an additional airflow comparison condition and was designed to conceptually replicate the findings of study 1. Namely, in addition to including a frontal airflow and dorsal airflow condition, this follow-up study also included a no airflow control condition to demonstrate that frontal airflow is indeed increasing energetic activation, rather than dorsal airflow decreasing it. Thus, to manipulate airflow direction, we randomly assigned participants to take surveys in one of three rooms. The set-up for the frontal and dorsal condition rooms was identical to that used in study 1; the set-up for the control condition room was the same except the fan in this room was blowing air at the nearest wall (i.e., no airflow was blowing on participants from any direction). Our prediction was that frontal airflow would be more subjectively energizing than either dorsal airflow or no perceptible airflow from any direction.

We conducted a series of one-way ANOVAs on participants' energetic activation, tense activation, hedonic tone, and perceptions of the room's general pleasantness and lighting. As expected, the results showed that participants the frontal airflow condition currently felt more energized than did those in the dorsal airflow (p = .04) or control airflow conditions (p = .04). The control and dorsal conditions did not differ (p = .94). The results also showed that neither tense activation (p = .75), hedonic tone (p = .24), nor perceptions of room brightness (p = .41) and pleasantness (p = .35) differed across conditions. Importantly, in showing that those in the frontal airflow condition felt more energized than did those in either the control (i.e., no airflow) condition or dorsal condition, this study demonstrated that frontal airflow increases energetic activation above some baseline level (as opposed to dorsal airflow merely decreasing it).

Study 2

The primary objective of study 2 was to demonstrate the effect of airflow direction on creative engagement and the mediating role of energetic activation in an indoor setting using actual airflow. We tested the prediction that participants in a frontal (vs. dorsal or control) airflow condition would perform better on a creativity task and that this effect would be due to the energetic activation experienced by participants.

Participants and Procedure

One hundred eighty-two undergraduate students (60% female; M_{Age} = 21.77, SD_{Age} = 3.02) participated in exchange for extra course credit. The study used a 3-cell (airflow direction: frontal vs. dorsal vs. control) between-subjects design.

When participants arrived at the lab, we randomly assigned them to either the frontal, dorsal, or control airflow condition by having them take surveys in one of three experimental rooms. The cover story, instructions, room set-up, and airflow direction manipulation were the same as those used in studies 1 and follow-up study A. Ten participants (five frontal, five dorsal) were excluded due to failure to follow instructions and complete the manipulation (i.e., they altered the speed or position of the fan or moved their chairs). After completing some filler items, participants responded to the same 4-item energetic activation index used in study 1 (α = .74; Ryan & Frederick, 1997; Ryan et al., 2010). In the next survey, participants completed a drawing task that served as our measure of creative engagement. For this task (Ward, 1994), participants imagined going to another planet, somewhere else in the galaxy very different from Earth, and finding an animal there. They then drew two pictures of the animal, a front and a side view, and wrote a description of it. To rule out other aspects of the environment that might serve as alternative accounts for our observed effects, participants also reported their perceptions of the room's ambient noise ("The room is…," 1 = *very noisy*, 7 = *not noisy at all*) and temperature ("The room feels …," 1 = *very cold*, 7 = *very hot*). Last, we collected demographics.

Results and Discussion

Room environment. We conducted one-way ANOVAs on participants' perceptions of the room's ambient noise and temperature (five participants did not respond to these items, leaving 167 participants for these analyses; see Web Appendix for means and standard deviations). The results showed that participants in the frontal, dorsal, and control airflow conditions perceived the room as equally noisy ($F(2, 164) = .79$, $p = .46$). As for temperature ($F(2, 164) = 7.79$, $p < .01$), participants in the frontal and dorsal airflow conditions perceived the room as equally cool ($t(164) = .46$, $p = .65$). However, consistent with the notion of a wind chill factor (Tikuisis & Osczevski, 2003), those in the control condition (recall that this condition had the fan blowing at the wall, not at participants) thought the room was warmer than did those in the frontal ($t(164) = 3.66$, $p < .01$) and dorsal airflow conditions ($t(164) = 3.28$, $p < .01$).

Energetic activation. A one-way ANOVA conducted on the energetic activation index showed the predicted effect of airflow direction ($F(2, 169) = 4.15$, $p = .02$). Specifically, participants reported feeling more energized in the frontal airflow condition (M = 3.96, SD = 1.11) than they did in either the dorsal (M = 3.46, SD = 1.19; $t(169) = -2.46$, $p = .02$) or control airflow conditions (M = 3.42, SD = 1.07; $t(169) = -2.48$, $p = .01$). The dorsal and control airflow conditions did not significantly differ ($t(169) = -.20$, $p = .84$).

Creative engagement. Two independent judges who were blind to our hypotheses and the experimental conditions coded the creativity of the alien animal pictures based on (a) the presence of asymmetry, (b) the lack of usual/typical Earth animal appendages (i.e., no legs, no arms, no wings, and no tail), (c) the lack of usual/typical Earth animal sense organs (i.e., no eyes, no ears, no nose, and no mouth), (d) presence of unusual/atypical appendages (e.g., unusual or atypical appendage use, ability, configuration, or number), and (e) presence of unusual/atypical sense organs (e.g., unusual or atypical sense organ use, ability, configuration, or number). One creativity point was awarded for each criterion, with a possible total creativity score of five (see Ward, 1994 for full coding and scoring instructions). The reliability of the coders' creativity ratings was sufficiently strong ($\alpha = .81$). To test our prediction that airflow direction (frontal vs.

dorsal vs. control) would influence creativity, we conducted a one-way ANOVA on participants' overall alien animal creativity score. The results showed the predicted effect of airflow direction ($F(2, 169) = 3.86$, $p = .02$): Participants in the frontal airflow condition ($M = 1.00$, $SD = .87$) generated more creative creatures than did those in either the dorsal ($M = .63$, $SD = .81$; $t(169) = -2.53$, $p = .01$) or control airflow conditions ($M = .65$, $SD = .79$; $t(169) = -2.20$, $p = .03$). The dorsal and control conditions did not significantly differ ($t(169) = .14$, $p = .89$).

Mediation analyses. To test our prediction that energetic activation mediates the effect of airflow direction (i.e., frontal vs. dorsal vs. control) on creativity, we conducted two mediation analyses using PROCESS model 4 (10,000 resamples) and procedures for performing mediation analyses with a multi-categorical independent variable (Hayes, 2017). The first analysis included airflow condition (frontal = 0, dorsal = 1) as the independent variable, the energetic activation index as the mediator, and the alien animal creativity score as the dependent variable. The remaining airflow condition—the control condition—was included as a covariate. The second analysis was the same, except that airflow condition (frontal = 0, control = 1) was the independent variable and the dorsal airflow condition was a covariate. The results for both analyses revealed the predicted mediation: The indirect effect from airflow condition to creativity through energetic activation was indeed significant (frontal vs. dorsal: $b = -.10$; 95% CI = [-.23, -.02]; frontal vs. control: $b = -.11$; 95% CI = [-.23, -.03]).

In light of our earlier results that showed participants' perceptions of temperature differed across conditions (i.e., the control condition felt the room was warmer than the frontal and dorsal conditions did), we conducted ancillary mediation analyses to more definitively rule out perceived temperature as an alternative explanation for our observed effects. The results of these analyses showed that even when controlling for the effect of perceived temperature (by including it as a covariate in the aforementioned mediation analyses), the mediating role of energetic activation is still significant (frontal vs. dorsal: b = -.08; 95% CI: [-.20, -.01]; frontal vs. control: b = -.10; 95% CI: [-.24, -.03]). Moreover, when the aforementioned mediation analyses are instead run with perceived temperature as the mediator and energetic activation as the covariate, the indirect effect of perceived temperature on creativity is not significant (frontal vs. dorsal: 95% CI: [-.01, .06]; frontal vs. control: 95% CI: [-.06, .12]). These analyses offered evidence that perceived temperature could not adequately explain airflow direction's effect on creativity.

Discussion. Study 2 examined the effect of airflow direction on energetic activation and creative engagement in an indoor laboratory setting. In line with our predictions, the results of study 2 showed that participants in the frontal (vs. dorsal or control) airflow condition were more creative in their generation of alien animals and also felt more vital and energized. Moreover, study 2 provided support for the mediating role of energetic activation: Participants in the frontal (vs. dorsal or control) airflow condition performed better on the creativity task because they currently felt more energized. Notably, an ancillary study we conducted (N = 177; 51% female; $M_{Age} = 21.66$, $SD_{Age} = 2.73$) helped rule out the possibility that the effect of airflow direction on creativity observed in study 2 was due to order of presentation effects (i.e., assessing energetic activation prior to creativity). This study used the same frontal (vs. dorsal vs. control) airflow manipulation and survey procedures used in study 2, with the exception that energetic activation was not assessed (i.e., only creativity was assessed—using the same alien animal task from study 2). And the results showed the predicted effect of airflow direction ($F(2, 174) = 5.08$, $p <. 01$): Participants in the frontal airflow condition (M = 1.26, SD = .98) generated more creative creatures than did those in the dorsal (M = .91, SD = .87; $t(174) = -2.32$, $p = .02$) or control airflow conditions (M = .77, SD = .70; $t(174) = 3.06$, $p < .01$). The dorsal and control conditions did not differ ($t(174) = .84$, $p = .40$). Thus, even when energetic activation was not assessed prior to creativity, frontal (vs. dorsal or control) airflow increased creative engagement.

Study 3

The primary objective of study 3 was to test the full conceptual model and conceptually replicate the results of study 2. We sought to demonstrate that frontal (vs. dorsal or control) airflow increases creative engagement (using a different task) and that this effect is mediated by energetic activation. A key variation from the prior studies is that study 3 was conducted online to examine if the effect of airflow direction on energetic activation previously observed with actual airflow could be conceptually replicated via the visualization of the experience of frontal (vs. dorsal or control) airflow. Prior research has shown that engaging in mental imagery can provoke physiological and affective responses consistent with those typically elicited by the situation being visualized (Grossberg & Wilson, 1968; Lang, 1979; Pearson et al., 2015). Of particular relevance to this study is the finding that simply looking at images of nature or visualizing oneself in the outdoors can confer energizing benefits parallel to those that one can receive from actual exposure to certain elements of nature (Berman et al, 2008; Berto, 2005; Ryan et al., 2010). We expect that visualizing the experience of frontal (vs. dorsal or control) airflow will similarly prompt energetic activation and, in turn, boost creative engagement.

Participants and Procedure

One hundred fifty-three Mechanical Turk panelists from across the United States (40.5% female; $M_{Age} = 39.79$, $SD_{Age} = 12.64$) completed the online study for $1.50. The study was a 3-cell (airflow direction: frontal vs. dorsal vs. control) between-subjects design.

In the first survey, we randomly assigned participants to either the frontal, dorsal, or control airflow condition. To manipulate airflow direction, participants completed a mental imagery task in which they visualized themselves in a given situation. Participants in the frontal [dorsal] airflow condition were told to “imagine that you are sitting at a table in a room in your home. It is a comfortable 72 degrees and there is a fan nearby that is gently blowing air toward your face/the front of your body [your back/the back of your body].” Participants in the control condition were told to “imagine that you are sitting at a table in a room in your home. It is a comfortable 72 degrees.” All participants were told to “take a little time to imagine yourself as vividly as you can in the situation described. Think about what it feels like to be in this situation, how your body feels, and what you are experiencing. Then, write down your thoughts below.”

In a second survey, participants completed an ostensibly unrelated test of integrative orientation to assess creative engagement. We used a widely known test of creative thinking: the Remote Associates Test (RAT; Mednick, 1962). This task assesses one’s ability to connect seemingly unrelated concepts. In this task, participants saw 12 RAT items. Each item consisted of three words that were all related in some way to a fourth word. Participants were asked to identify the fourth word (e.g., for the words “falling,” “dust,” and “actor,” the correct response is “star”). The number of correctly solved RAT items was our measure of creative engagement.

In a third survey, participants completed a measure of energetic activation (McNair, Lorr, & Droppleman, 1971; Nix et al., 1999; Thayer, 1989): They reported the extent they currently felt (1 = *not at all*, 7 = *extremely*) “energetic,” “active,” “lively,” “vigorous,” “full of pep,” “vital,” and “alert” (energetic activation index: α = .96). Participants also reported their tense activation (Thayer, 1989): The extent they currently felt (1 = *not at all*, 7 = *extremely*) “jittery,” “tense,” “fearful,” “intense,” and “clutched up” (tense activation index: α = .93). Hedonic tone was also measured (“I currently feel…” “happy,” “content,” “pleased,” and “satisfied”; 1 = *not at all*, 7 = *extremely*; hedonic tone index: α = .96; Nix et al., 1999). As in study 1, participants also reported the extent (1 = *not at all*, 7 = *very much*) they were currently thinking about facing obstacles or having to work against an opposing force ('Thinking about…" "having to work against some opposing force," "obstacles I must overcome," "obstacles that I'm facing," "an external force that is obstructing me," and "how I am facing obstacles"; obstacles/opposing force index: α = .95) as well as whether they felt they were being pushed by some external force ("I am being pushed by some external force," "There is an external force pushing me forward," "I can take it easy because I am being pushed by some external force"; feeling pushed index: α = .95). Since our participants were located across the country, we also asked them about the current outdoor temperature and weather conditions at their location ("sunny," "cloudy/overcast," "rainy"; 0 = *no*, 1 = *yes*) to ascertain whether these factors moderated our predicted effects. Last, participants reported their demographics and were asked to guess the purpose of the study/the predictions being tested (no participants correctly guessed the study purpose/predictions).

Results and Discussion

Tense activation, hedonic tone, obstacles/opposing force, and feeling pushed. One-way ANOVAs were conducted on the tense activation index and hedonic tone index (see Web Appendix for means and standard deviations). The results showed no differences across the frontal, dorsal, and control conditions in tense activation (F(2, 150) = .12, *p* = .89) or hedonic tone (F(2, 150) = .96, *p* = .39). One-way ANOVAs conducted on the obstacles/opposing force index and feeling pushed index similarly showed that participants in the frontal, dorsal, and control airflow conditions were thinking equally about facing obstacles/working against an opposing force (F(2, 150) = .15, *p* = .86) and felt equally pushed by some external force (F(2, 150) = .99, *p* = .38).

Energetic activation. We conducted a one-way ANOVA on the energetic activation index (F(2, 150) = 3.74, *p* = .03). As predicted, participants in the frontal airflow condition (M = 4.69, SD = 1.51) felt more energized than did those in the dorsal (M = 3.97, SD = 1.52; t(150) = -2.33, *p* = .02) or control airflow conditions (M = 3.95, SD = 1.62; t(150) = -2.41, *p* = .02). The dorsal and control conditions did not significantly differ (t(150) = -.08, *p* = .94).

RAT. A one-way ANOVA showed a significant main effect of airflow direction on RAT performance (F(2, 150) = 3.44, *p* = .04). As predicted, participants in the frontal airflow condition (M = 7.51, SD = 3.54) correctly solved more RAT items than did those in the dorsal airflow condition (M = 5.94, SD = 3.12, t(150) = -2.34, *p* = .02) or the control airflow condition (M = 6.04, SD = 3.49, t(150) = -2.19, *p* = .03). The dorsal and control conditions did not significantly differ (t(150) = .15, *p* = .88).

Mediation analyses. Using PROCESS model 4 (10,000 resamples) and following procedures for mediation analyses with multi-categorical independent variables (Hayes, 2017), we conducted two mediation analyses to test our predicted model. In the first analysis, airflow condition (frontal = 0, dorsal = 1) was the independent variable, the energetic activation index was the mediator, and the number of correct RAT items was the dependent variable. The other airflow condition—the control condition—was included as a covariate. The second analysis was the same, except airflow condition (frontal = 0, control = 1) was the independent variable and the dorsal condition was a covariate. When using PROCESS, mediations are significant if the interval between the upper and lower limits of a bootstrapped 95% confidence interval (CI) does not contain zero. The results for both analyses showed the predicted mediation: The indirect effect from airflow condition to creativity through energetic activation was significant (frontal vs. dorsal: b = -.25; 95% CI = [-.72, -.01]; frontal vs. control: b = -.26; 95% CI = [-.74, -.03]).

Follow-up analyses (see Web Appendix) showed that neither current outdoor temperature nor weather (sunny, cloudy/overcast, or rainy) moderated the mediating effect of airflow condition on creative engagement (the index of moderated mediation for all moderated mediation analyses with temperature/weather as the moderator: *p*s = NS).

Discussion. Using a different operationalization of creative engagement (a RAT) and an online setting (with visualized airflow), the results of study 3 conceptually replicated the findings of study 2 and provided additional evidence for our full conceptual model. In line with our predictions, study 3 showed that frontal (vs. dorsal or control) airflow enhanced creative thinking and mediation analyses showed that this effect was driven by the greater energetic activation experienced by those in the frontal airflow condition. Thus, it appears that just as the energizing benefits of nature can be obtained through mental visualization (Ryan et al., 2010), so too can the energizing effects of frontal airflow. Moreover, as in study 1, neither tense activation, hedonic tone, thoughts about obstacles/working against opposing forces, nor feelings of being pushed by a force could account for the observed effects, as these factors did not differ across conditions.

Study 4

The first objective of study 4 was to show support for our proposed energetic activation mechanism using a different experimental design: moderation. Thus, study 4 manipulated participants' energetic activation (i.e., high vs. low) after manipulating airflow direction (frontal vs. dorsal). If our theory that energetic activation drives the effect of airflow direction on creative engagement is indeed correct, then we would expect creative engagement for those in the dorsal airflow condition to be enhanced by a subsequent energetic activation intervention. In contrast, a subsequent energetic activation intervention should not significantly boost creative engagement for those in the frontal airflow condition since they have already been energized by the frontal airflow (i.e., there should be an energetic activation ceiling effect). In other words, for the high energetic activation condition, we expect no significant difference in creative engagement between the frontal and dorsal airflow conditions. However, for the low energetic activation condition, we expect to replicate the results of the prior studies, such that those in the frontal (vs. dorsal) airflow condition would exhibit greater creative engagement.

The second objective of study 4 was to operationalize creative engagement using a more managerially relevant measure: likelihood of buying a more (vs. less) creative product. Prior research suggests that creative, innovative consumers are more likely to adopt novel products (Hirschman 1980; Mehta et al, 2012). Thus, if frontal (vs. dorsal) airflow enhances consumer's creative engagement, it should also enhance their appreciation for creative, novel products (i.e., their likelihood of buying a more vs. less creative, innovative product).

Participants and Procedure

Three hundred twenty-four Mechanical Turk panelists from across the United States (52.2% female; M_{Age} = 45.81) participated for $1.50. Study 4 used a 2 (airflow: frontal vs. dorsal) x 2 (energetic activation: high vs. low) between-subjects design.

As a cover story, participants were told they would be taking a series of ostensibly unrelated surveys. In the first survey, we randomly assigned participants to either the frontal or dorsal airflow condition and airflow direction was manipulated using the same mental imagery task used in study 3. In the second survey, we manipulated participants' level of energetic activation (high vs. low) using an existing manipulation from Ryan et al. (2010) in which participants were shown a set of four photographic images depicting either natural outdoor settings or scenes of manmade or built environments (i.e. buildings) and asked to vividly visualize themselves in these settings/scenes. Ryan et al. (2010) showed that participants subsequently felt more energized and vital after being exposed to the nature (vs. buildings) images. Thus, participants in our study were randomly assigned to see either four images depicting nature scenes (i.e., the high energetic activation condition; images included a desert with surrounding cliff edges, a night lake scene, an ice/glacier arch, and a redwood tree forest) or four images depicting non-nature/buildings (i.e., the low energetic activation condition; images included a city street with buildings on either side, a night road scene, a bridge, and skyscrapers). As in Ryan et al. (2010), images depicted either entirely manmade environments or entirely nature environments, were loosely matched to an opposite-condition image (on color, layout, complexity, brightness), were high in quality and clear, and did not depict affectively-imbued content (e.g., academic contexts, firehouses, restaurants, or animals). Participants were asked to engage in a visualization task for each of their four pictures (each visualization task lasted 90 seconds), and the task instructions (for both conditions) encouraged them to attend to the environment shown in the photo, to notice colors and textures, and to imagine sounds and smells.

In the third survey, participants completed our key creative engagement measure. Specifically, participants were shown eight pairs of different products (as in Mehta et al, 2012; see Web Appendix). Each product pair offered two options from the same product category (e.g., two running shoe options, two chair options) one of which was creative and innovative and one that was more traditional. It should be noted that two of the product pairings differed for male and female participants due to some products being gender-specific (i.e., men saw a facial razor pairing and a cologne pairing, females instead saw a lipstick pairing and makeup palette pairing; because there was no gender x airflow condition x energetic activation condition interaction [p = .63], gender x airflow interaction [p = .21], or gender x energetic activation interaction [p = .71] all subsequent analyses are collapsed across gender). Full-color pictures, along with some product information for the two options in each pair, were presented together on the same screen. Participants indicated their likelihood of buying the creative, innovative option over the traditional one on a 7-point scale (1 = *not at all*, 7 = *very much*). After completing the product preference task, participants reported their current energetic activation ($\alpha = .96$), tense activation ($\alpha = .93$), and hedonic tone ($\alpha = .93$) as in study 3. Last, we collected demographics.

Results and Discussion

Energetic activation, tense activation, and hedonic tone. The energetic activation index was submitted to a 2 (airflow: frontal vs. dorsal) x 2 (energetic activation: high vs. low) moderation analysis in PROCESS (model 1; 10,000 resamples). The results showed a moderately significant overall interaction between airflow condition and energetic activation condition ($p = .054$). As predicted, follow-up analyses on the interaction showed that, among participants in the low energetic activation (i.e. buildings images) condition, participants who were in the frontal airflow condition (M = 4.67, SD = 1.56) felt significantly more energized than did participants who were in the dorsal airflow condition (M = 4.14, SD = 1.55; b = -.53, 95% CI [-1.02, -.04]). In the high energetic activation (i.e., nature images) condition, participants in the frontal airflow (M = 4.49, SD = 1.65) and dorsal airflow (M = 4.63, SD = 1.56) conditions felt equally energized (b = .14, 95% CI [-.33, .62]). We also conducted similar moderation analyses for the tense activation index and hedonic tone index. As expected, these analyses showed no significant interactions between airflow condition and energetic activation condition for either tense activation ($p = .40$) or hedonic tone ($p = .28$).

Creative engagement. Each participant's buying-likelihood scores for the eight product pairings were averaged to create a buying-likelihood index; higher scores indicated a greater likelihood of adopting a creative, innovative product. This buying-likelihood index was submitted to a 2 (airflow: frontal vs. dorsal) x 2 (energetic activation: high vs. low) moderation analysis in PROCESS (model 1; 10,000 resamples). As predicted, the results showed a significant airflow condition x energetic activation condition interaction (p = .03; b = -.53, 95% CI [-1.01, -.05]). Follow-up analyses on the interaction showed that, among participants in the low energetic activation (i.e. buildings images) condition, those who were in the frontal airflow condition (M = 4.30, SD = 1.05) indicated a higher likelihood of buying the creative, innovative products than did those who were in the dorsal airflow condition (M = 3.90, SD = 1.10; b = -.39, 95% CI [-74, -.05]). In the high energetic activation (i.e., nature images) condition, participants in the frontal airflow (M = 4.19, SD = 1.10) and dorsal airflow (M = 4.32, SD = 1.12) conditions were equally likely to buy the creative products (b = .13, 95% CI [-.20, .47]).

Discussion. The results of study 4 provide further support for our theorizing that frontal (vs. dorsal) airflow leads to greater energetic activation, thereby enhancing creative engagement. Specifically, study 4 manipulated both airflow direction and energetic activation to demonstrate the mediating role of energetic activation through moderation. For participants who did not receive an added energetic activation intervention after having airflow direction manipulated (i.e. those who saw the buildings images), we observed the same effects as prior studies: Frontal (vs. dorsal) airflow resulted in a greater likelihood of buying creative products. However, for participants in the high energetic activation intervention condition (i.e., those who saw the nature images), frontal (vs. dorsal) airflow resulted in an equal likelihood of buying creative products. In other words, consistent with our theory that frontal (vs. dorsal) airflow boosts creative engagement via increasing energetic activation, the high energetic activation intervention served to raise the creative engagement of those in the dorsal airflow condition up to the level experienced by those in the frontal airflow condition. Since participants in the frontal airflow condition already felt energized due to the airflow direction, the subsequent energetic activation intervention did not confer any additional boost to their creative engagement.

Study 5

Study 5 sought to complement our extant findings by investigating the predicted effect of airflow direction on creative engagement in an outdoor field setting. For this study, creative engagement was operationalized in two ways: 1) as the extent to which people spontaneously generated more creative travel destinations during an imagination task and 2) whether people selected a do-it-yourself kite-making project (a type of constrained creative activity; Dahl & Moreau, 2007) that required greater creative engagement. We predicted that participants in the frontal (vs. dorsal) airflow condition would generate more creative travel destinations and be more likely to choose a kite-making project that required greater creative engagement.

Participants and Procedure

This study was conducted during an annual kite festival at a public park in a major North American city. Sixty-six adults (59% female; $M_{Age} = 35.22$, $SD_{Age} = 9.86$) participated in exchange for a piece of candy. On the day of the kite festival, the average temperature was 78°F and there was a light breeze blowing (measured as 2-3 on the Beaufort wind force scale). The experiment used a 2-cell (airflow direction: frontal vs. dorsal) between-subjects design.

During the kite festival, two research assistants approached potential adult participants and informed them that they were conducting a short survey and offering free candy in exchange for participation. To manipulate airflow direction, the research assistants approached each participant from a direction that led the participant to face into (vs. away from) the wind during the survey. The direction of approach was random and the assistants recorded the airflow (wind) direction. Two participants were excluded because of fluctuations in airflow direction during the survey. To help control for other aspects of the environment, data collection occurred in an open, grassy area lined with trees (so the scenery and view would be similar regardless of the direction participants were facing) and research assistants ensured that all participants were standing in a comfortable position (e.g., not experiencing any visual, auditory, or physical discomfort when interacting with the research assistant), regardless of the direction they were facing.

After agreeing to participate and collecting demographics, participants were asked the following open-ended question: “Imagine that you could travel anywhere right now. Where would you like to go?” After responding, participants were told that, as a thank you gift, they could take home instructions for one of three do-it-yourself kites. They were informed that the kites differed in their level of involvement, ranging from easy to medium to hard (1 = *easy*, 2 = *medium*, 3 = *hard*; these levels of involvement were visually reinforced on the kite instructions). Participants’ choice of kite was used as a behavioral measure of creative engagement (with the choice of a more involving kite project serving as an indicator of greater creative engagement).

Results and Discussion

Creative engagement (travel). Two independent judges blind to our hypotheses rated the creativity of the travel destinations that participants provided: Each travel destination was rated on its novelty (how “ordinary” and “extraordinary” it was; 1 = *not at all*, 5 = *very much*). The two coders’ ratings of ordinariness and extraordinariness were then separately averaged (ICC for interrater reliability: $r_{extraordinary} = .96$, $r_{ordinary} = .94$). We then averaged the ordinary item (reverse-coded) and the extraordinary item to form an extraordinary destination index ($r = .88$). A one-way ANOVA conducted on the extraordinary destination index showed that participants in the frontal airflow condition ($M = 3.56$, $SD = 1.00$) generated more extraordinary destinations than did those in the dorsal airflow condition ($M = 2.88$, $SD = 1.35$; $F(1, 62) = 5.30$, $p = .02$).

We also asked another three independent judges to rate the travel destinations based on how "creative" each destination was (1 = *not at all*, 5 = *very much)*. The three coders' ratings of creativity were then averaged to form a destination creativity index (ICC for interrater reliability: r = .84). A one-way ANOVA conducted on this creativity measure showed that participants in the frontal airflow condition (M = 2.93, SD = 1.01) generated more creative travel destinations than did those in the dorsal airflow condition (M = 2.35, SD = .75; F(1, 62) = 6.61, *p* = .01).

Creative engagement (kite choice). We conducted a one-way ANOVA on the level of do-it-yourself kite participants chose to take home. As predicted, compared to participants in the dorsal airflow condition (M = 1.55, SD = .68), those in the frontal airflow condition (M = 2.06, SD = .83) chose a harder kite project that required greater creative engagement (F(1, 62) = 7.31, *p* = .01). We also conducted a chi-square test on participants' choices of the easy, medium, and hard kites, which showed a significant difference across conditions ($\chi^2(2) = 7.16$, *p* = .03). As predicted, participants in the frontal airflow condition (36.36%) chose the hard kite significantly more often than did those in the dorsal airflow condition (9.68%; *p* = .01). Similarly, participants in the frontal airflow condition (30.30%) chose the easy kite significantly less often than did those in the dorsal airflow condition (54.83%; *p* = .05). The frontal (33.33%) and dorsal airflow (35.48%) conditions exhibited equal likelihood of choosing the medium difficulty kite (*p* = .86).

Discussion. The results of study 5 provide added support, in a field setting, for our conceptual model. Specifically, study 5 illustrated that airflow direction impacts creative engagement. Not only did participants in the frontal airflow condition generate more creative and extraordinary travel destinations than did those in the dorsal airflow condition, they were also more likely to choose a kite-making project that required a higher level of creative engagement.

General Discussion

Building upon prior retail atmospheric research, this research examines a ubiquitous in-store factor that has thus far been unexplored in the literature: airflow direction. We predicted and found, across five studies, that airflow direction—frontal airflow versus dorsal airflow or no airflow—can positively influence creative engagement and that energetic activation mediates this effect. Our findings were obtained and replicated in different settings (in a controlled lab setting with actual airflow, online, and outdoors at a kite festival) using a variety of measures of creative engagement (creative alien drawings, a remote associates test, preferences for buying more (vs. less) creative products, creative travel destinations, and choice of a kite project that requires more creative engagement). We also ruled out myriad alternative explanations for our observed effects (from hedonic tone, tense activation, thoughts about facing obstacles, and feeling pushed by an external force to perceptions of room pleasantness, lighting, noise, and temperature).

Theoretical and Practical Contributions

Although not the subject of much academic research, the movement of air (wind or airflow) has inspired a wide range of creative pursuits. It has been the subject of songs (e.g., Bob Dylan's "Blowin' in the Wind" and Rush's "The Way the Wind Blows") and poetry (e.g., A.A. Milne's "Wind on the Hill," and Emily Dickinson's "The Wind Took up the Northern Things"). It is captured in sculpture (Penny Hardy's "You Blew Me Away" and Max Patte's "Solace of the Wind") and anthropomorphized in folktales (e.g., Aesop's "The North Wind and the Sun" and the Native American legend "Gluscabi and the Wind Eagle"). Indeed, our exploration of the relationship between airflow direction and creativity not only contributes to a larger stream of research based on the premise that people are susceptible to the environments in which they operate, but is also supported by evidence that creative output might be inspired by (direction of) airflow.

This research makes three key theoretical contributions. First, it contributes to the retail atmospherics literature by introducing a novel factor—direction of airflow—whose ubiquity is undeniable, but that has been largely ignored in empirical research. Second, by identifying a link between this aspect of the physical environment and energetic activation, we contribute to prior work on the relationship between somatic factors and vitality (Gailliot & Baumeister, 2007; Johnson, 1986; Ryan & Frederick, 1997; Stewart et al., 1992). Moreover, since feelings of energy are renewable (Schwartz & McCarthy, 2007), documenting airflow direction's ability to energize consumers makes a particularly constructive contribution to the energy-as-resource literature. Third, although considerable research has identified various personality and situational factors that affect creative abilities (Burroughs & Mick, 2004; Friedman & Förster, 2001; Moreau & Herd, 2010), there is growing interest in the role of physical environments in fostering creative engagement. By identifying frontal airflow as a novel driver of creativity, our work contributes to the burgeoning literature that seeks to show how the sensory features of the environment can profoundly affect people's creative performance (Ceylan et al., 2008; Dul, Ceylan, & Jaspers, 2011; Mehta et al., 2012; Meyers-Levy & Zhu, 2007; Steidle & Werth, 2013).

Beyond the aforementioned theoretical contributions to existing research, our work has valuable practical significance for both organizations and consumers. In today's technology-driven economy, everyday creativity is an imperative (Richards, 2007). For instance, consistent with our findings in study 4, prior research has established that consumer creativity matters for the evaluation of new products (Mehta et al., 2012; Hirschman, 1980) and for the design of self-created products (Mochon, Norton, & Ariely, 2012). There is also an indirect cost incurred by retailers and marketers when non-creative consumers are unable to operate and use objects. For instance, when a hotel shower does not come on, they might call customer service instead of figuring out how it works, adding to operating costs. Thus, our findings suggest novel interventions that consumers might use when they are seeking innovative or creative solutions to problems, from repositioning a fan to taking a walk outdoors while facing the wind.

However, our findings are also relevant for the employees who work in retail environments. Many firms believe creative capital is an organization's most vital asset (Florida & Goodnight, 2005) since it is the creative thinkers whose ideas are transformed into innovative products, services, and processes. Firms, like IDEO, for instance, design their workplace environments to foster creativity. Though employee creativity is critical for any type of organization, the role of creative frontline employees in retailing is key if one aims to produce superior customer experiences (Coelho & Augusto, 2010). In many circumstances, service employees are given a goal or task, but the specific means to achieve that goal are not offered. However, the service employee is still expected to perform and/or solve the task in a creative manner (Hallak et al., 2018; Kelley, Longfellow, & Malehorn, 1996). That is why managers pay special attention to selecting creative employees in the recruitment process and to arranging the work environment in ways that promote creative behaviors. Our findings suggest that at times when creativity is vital, employees might utilize airflow direction to their advantage.

Despite the fact that energetic activation has not been a subject of research in a retailing context, the critical role it plays is quite evident. There is ample empirical research supporting the positive relationship between employee energetic activation and work engagement and involvement in creative work (Atwater & Carmeli 2009; Van den Broeck et al. 2008). Thus, as it is in other organizations, the concept of energetic activation (on its own) is vital in retail environment, where service providers need to be highly engaged and energized in their interactions with customers.

Limitations and Future Research Directions

In this research, we kept airflow direction constant, either frontal or dorsal or no airflow, to be able to rigorously test the idea that airflow direction influences creativity. Future research might investigate other directions or patterns of airflow. For instance, since ceiling fans are prevalent in some homes and offices and oscillation is often an option in today's ventilation settings, it would be interesting to determine whether these forms of airflow direction will produce similar or different results. As another example, future research might also investigate the experience of airflow during different types of movement. When moving forward in an airport conveyor, upward in an escalator, or driving with the windows down, does the effect of airflow (e.g., frontal vs. dorsal) get amplified by the direction of movement? This type of multi-sensory experience would be a fascinating area for future work.

Future research might also examine whether other ambient factors that we held constant across airflow conditions (e.g., lighting level or temperature) moderate the effect of airflow direction on energetic activation and creativity. Moreover, given that the salience of ambient factors can sometimes alter their impact on consumer response (e.g., Bosmans, 2006), might the extent to which consumers are conscious (vs. unconscious) of airflow or airflow direction moderate the observed effects? Indeed, perhaps we did not see any differences in the present research between the dorsal airflow and no airflow control conditions because dorsal airflow needs to be much stronger, more forceful, and more salient before any effects can be observed.

While our work finds that frontal airflow is energizing and enhances creative engagement, it does not explore exactly how this energizing exerts its influence (see Tice et al., 2007 and Choi & Fishbach, 2011 for a similar treatment of energy and resources). Energetic activation is associated with improved physical functioning, cognitive flexibility, and cognitive persistence—all factors linked to enhanced creativity (Deci & Ryan, 1985, 2000; De Dreu et al., 2008; Moller et al., 2006; Ryan et al., 1991; Weinstein & Ryan, 2009). Thus, in our research, does energetic activation increase people's cognitive ability to perform creative tasks and/or their motivation to perform them? Whether people who experienced frontal airflow were more motivated or better able to perform the creative tasks remains a question for future research.

Finally, although we mainly relied on insights from nature, biophilic design, and human physiology (e.g., touch receptors) to understand the influence of airflow direction on energetic activation, there could be other explanations. For instance, it is possible that the positive psychological response to frontal airflow has evolutionary underpinnings. Since prehistoric times, humans have learned there are benefits to frontal airflow during hunting and foraging: The hunter can better hear and smell his prey and track it more easily, and the hunter or forager is less likely to be detected by its prey or become prey to other predators (Cherry & Barton, 2017). Even modern-day hunters often carry a puffer bottle full of powder that helps them visibly map the direction of the wind and orient themselves during a hunt (Herschede, 1984). Thus, perhaps these primal associations with airflow direction still affect people's response to frontal airflow.

Conclusion

Despite the pervasive presence of airflow, our understanding of its impact on human motivation and information processing is limited. The current research is a first step in investigating the effect of a specific airflow element—airflow direction—on creative engagement and the process mechanism (i.e, energetic activation) underlying the effect. Being creative and energized are two highly desired and highly valued attributes, yet they seem to be highly difficult to achieve. Nevertheless, as we have shown, an environment designed to allow for the 'right' direction of airflow might help boost felt energy and fuel creative performance.

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The Way the Wind Blows:

Direction of Airflow Energizes Consumers and Fuels Creative Engagement

Web Appendix

TABLE OF CONTENTS

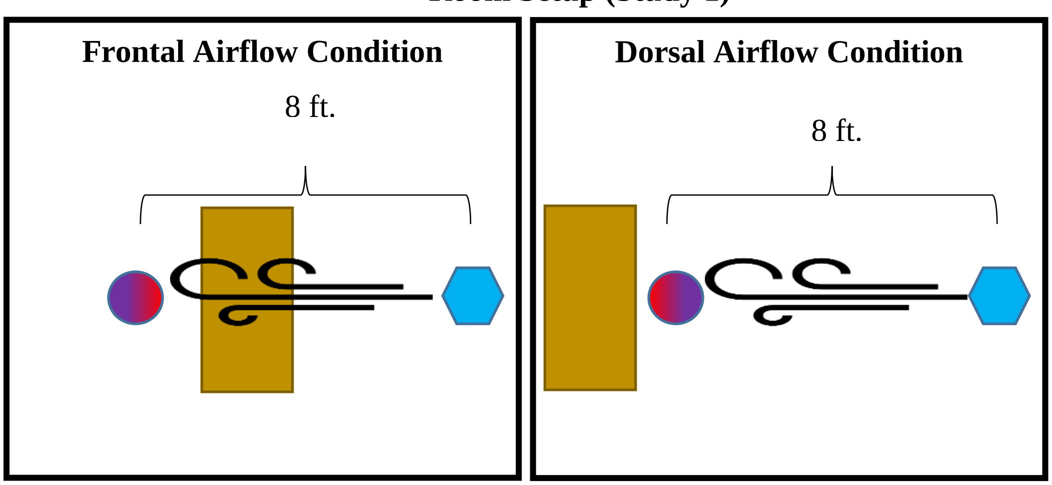
Airflow Sensation Pretest

Prior research on human physiology suggests that (due to differences in the density and type of touch receptors that are present in the skin over various portions of the human body) humans have greater tactile sensitivity on the front-facing (vs. rear-facing) half of their body (Kojima, Hashimoto, & Kajimoto, 2009; Myles & Binseel, 2007; Weber, 1978; Weinstein, 1968). The objective of this pretest was to obtain added empirical evidence for this contention and demonstrate that (when airflow speed and temperature are held constant) the sensation of airflow passing across the skin is perceived as stronger and more intense for people who are experiencing frontal versus dorsal airflow.

Eighty-one undergraduate students (63.0% female; $M_{Age} = 23.44$, $SD_{Age} = 5.01$) participated in exchange for extra course credit. The pretest was a 2-cell (airflow direction: frontal vs. dorsal) between-subjects design. Participants were randomly assigned to either the frontal airflow or dorsal airflow condition and asked to answer some survey questions in one of two rooms. The rooms were identical in terms of dimensions, décor, color, lighting, temperature, and furniture. In each room, there was also a tower fan (the fans in each room were also identical) that was positioned 8 ft. away from the table where participants were seated and that was turned on before participants entered the room. The fans were blowing at a velocity of 1.3 m/s on the Beaufort wind scale (described as ‘light air’; Huler, 2004) and an anemometer monitored airflow speed and temperature before and after each participant (to ensure these factors remained constant across participants and conditions). To manipulate airflow direction, the fan in the frontal airflow condition was positioned to blow air at participants’ anterior side (i.e., participants were facing the airflow), the fan in the dorsal airflow condition was positioned to blow air at participants’ posterior side (i.e., participants were facing away from the airflow).

As a cover story, participants were told that the university was thinking about renovating some of the rooms in the business school building (including the one they were currently sitting in). Participants were then asked to respond to several filler questions that asked about their general opinion of the room (e.g., “I would describe the environment in the room as...”; “I would describe the room decor as...”; 1 = *very unpleasant*, 7 = *very pleasant*). Participants’ responses to the filler questions did not significantly differ across the frontal airflow and dorsal airflow conditions ($ps > .54$). Embedded among these filler items were our two key measures of the perceived sensation of airflow across the skin: “From where you are currently sitting in this room, how intense is the sensation of airflow/air passing across your skin?” (1 = *not at all*, 7 = *very*) and “To what extent can you currently feel air/airflow passing across your skin?” (1 = *not at all*, 7 = *very*). Responses to these two items were averaged ($r = .79$) to form an airflow sensation index. We then conducted a one-way ANOVA with the airflow sensation index as the dependent variable. The results shows that, as predicted, participants in the frontal airflow condition ($M = 5.43$, $SD = 1.04$) reported feeling a stronger, more intense sensation of airflow passing across the skin than did participants in the dorsal airflow condition ($M = 3.57$, $SD = 1.51$; $F(1, 79) = 40.92$, $p < .001$). These results are consistent with prior research that has found evidence that humans have greater tactile sensitivity on the front-facing (vs. rear-facing) half of their body (Kojima et al., 2009; Myles & Binseel, 2007; Weber, 1978; Weinstein, 1968).

Room Setup (Study 1)



Legend

= Participant (red is the participant's face; purple is the participant's back)

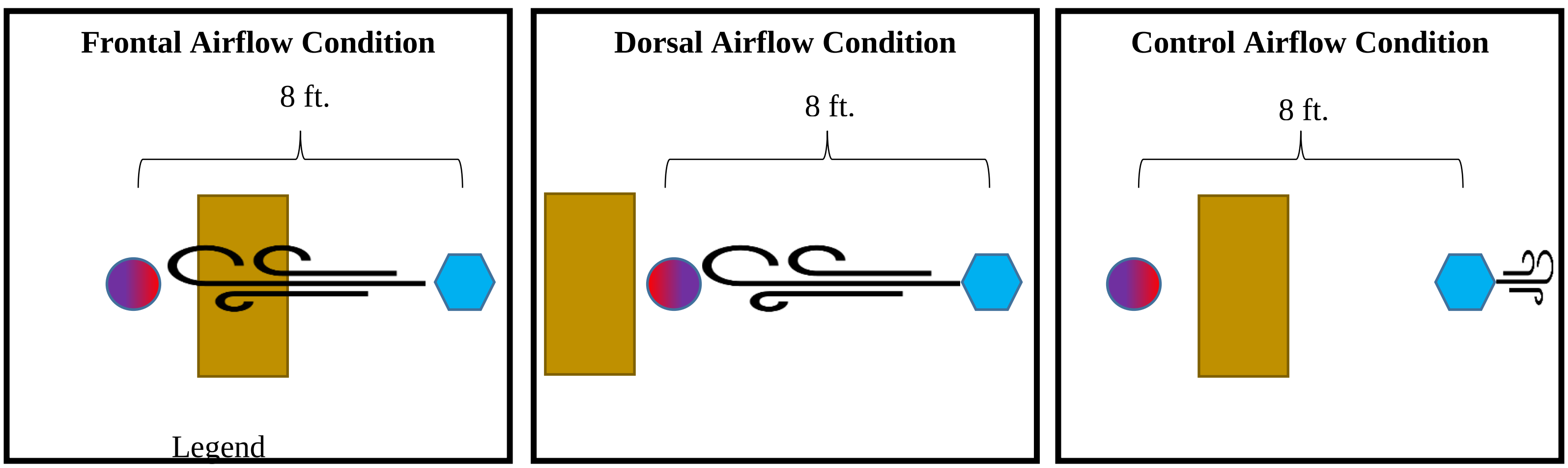
= Table = fan = airflow

Anemometer reading

Airflow velocity = 1.3 m/s; Beaufort scale = 1

Controlled room temperature = 72 ° F

Room Setup (Follow-Up Study A and Study 2)



Legend

= Participant (red is the participant's face; purple is the participant's back)

= Table = fan = airflow

Anemometer reading

Airflow velocity = 1.3 m/s; Beaufort scale = 1

Controlled room temperature = 72 ° F

Follow-up Study A

The primary objective of follow-up study A was to conceptually replicate the relationship between energetic activation and airflow direction observed in study 1 (frontal vs. dorsal). In addition to including a frontal airflow and dorsal airflow condition, follow-up study A also included a no airflow control condition to demonstrate that frontal airflow is indeed increasing energetic activation, rather than dorsal airflow decreasing it. Thus, we expect frontal airflow to be more subjectively energizing than either dorsal airflow or no perceptible airflow from any direction. Follow-up study A also helped to further rule some of the alternative accounts examined in study 1 (i.e., tense activation and hedonic tone). Thus, follow-up study A aimed to show that airflow direction influences energetic activation, but not these other constructs.

Participants and Procedure

One hundred thirty-two undergraduate students (55% female; $M_{Age} = 21.88$, $SD_{Age} = 2.50$) participated in exchange for extra course credit. The study was a 3-cell (airflow direction: frontal vs. dorsal vs. control) between-subjects design.

When participants arrived at the lab, we randomly assigned them to either the frontal airflow, dorsal airflow, or control airflow condition by having them complete surveys in one of three rooms. The rooms were identical in terms of dimensions, décor, color, lighting, and temperature. In each room, there was also a tower fan (the fans in each room were identical) positioned 8 ft. away from the table where participants would be sitting and that was turned on before participants entered the room. All fans were blowing at a velocity of 1.3 m/s (a score of 1 on the Beaufort wind scale and described as ‘light air’; Huler, 2004) and we used a professional anemometer to monitor the airflow speed and temperature before and after each participant (to ensure these factors remained constant across participants and conditions). To manipulate airflow direction, the fan in the frontal airflow condition was positioned to blow air at participants' anterior side (i.e., participants were facing the airflow), the fan in the dorsal airflow condition was positioned to blow air at participants' posterior side (i.e., participants were facing away from the airflow), and the fan in the control condition was blowing air at the nearest wall (i.e., no airflow was blowing on participants from any direction).

After sitting at the table, participants were told (as a cover story) that another group of researchers had decorated and arranged the room for studies they would be running later in the day and to please not touch any of the décor (three participants—one from each condition—failed to follow these instructions and altered the speed and/or positioning of the fan; thus their responses were not included in the analyses). Participants were then asked to take several ostensibly unrelated surveys. In the first survey, to give participants additional time to fully acclimate to the room's controlled ambient stimuli (e.g., temperature and lighting), participants answered filler questions that about their college experience and evaluated images of color patterns. Then, under the pretext that "the business school is considering renovating some of the survey rooms, including the one you are sitting in" (and to ensure the airflow manipulation was not influencing perceptions of other aspects of the room), participants reported their perceptions of the room's general pleasantness ("The environment in this room is pleasant," 1 = *strongly disagree*, 7 = *strongly agree*) and lighting ("The room is …," 1 = *very dark*, 7 = *very bright*).

Participants then responded to our key measure of energetic activation (Matthews, Jones, & Chamberlain, 1990): "To what extent do you currently feel…" 1) energetic, 2) active, 3) vigorous, 4) alert, 5) unenterprising, 6) sluggish, 7) passive, and 8) tired (1 = *not at all*, 7 = *a lot*). Participants also responded to measures of tense activation (Matthews et al., 1990): "To what extent do you currently feel…" 1) anxious, 2) nervous, 3) jittery, 4) tense, 5) calm, 6) composed,

7) restful, and 8) relaxed (1 = *not at all*, 7 = *a lot*). Participants next responded to measures of hedonic tone (Matthews et al., 1990): "To what extent do you currently feel…" 1) happy, 2) satisfied, 3) contented, 4) cheerful, 5) sad, 6) sorry, 7) depressed, and 8) dissatisfied (1 = *not at all*, 7 = *a lot*). For each scale, the four latter items were reverse-coded and the eight items then averaged to form an energetic activation index ($\alpha = .76$), tense activation index ($\alpha = .84$), and hedonic tone index ($\alpha = .84$), respectively. Last, participants reported their demographics.

Results and Discussion

Room environment. One way ANOVAs were conducted on participants' reports of the room's general pleasantness and lighting. The results revealed that participants in the frontal airflow (M = 4.53, SD = 1.03), dorsal airflow (M = 4.66, SD = 1.39), and control airflow (M = 4.90, SD = 1.27) conditions perceived the room as equally bright ($F(2, 126) = .89$, $p = .41$; frontal vs. dorsal: $t(126) = .48$, $p = .64$; frontal vs. control: $t(126) = 1.32$, $p = .19$; control vs. dorsal: $t(126) = .88$, $p = .38$). Participants in the frontal airflow (M = 4.81, SD = 1.58), dorsal airflow (M = 4.94, SD = 1.31), and control airflow (M = 5.23, SD = 1.04) conditions also perceived the overall room as equally pleasant ($F(2, 126) = 1.05$, $p = .35$; frontal vs. dorsal: $t(126) = .43$, $p = .67$; frontal vs. control: $t(126) = 1.41$, $p = .16$; control vs. dorsal: $t(126) = 1.02$, $p = .31$). Thus, although airflow direction in the room was manipulated, this manipulation did not also affect participants' perceptions of these other aspects of the room environment.

Energetic activation. To test our prediction that airflow direction would influence people's energetic activation, we conducted a one-way ANOVA on the energetic activation index. As predicted, the results of this analysis showed that participants in the frontal airflow condition (M = 4.63, SD = .93) currently felt more energized than did those in the dorsal airflow (M = 4.22, SD = .91) or control airflow conditions (M = 4.20, SD = 1.02; $F(2, 126) = 2.84$, $p =$

.06; frontal vs. dorsal: t(126) = -2.07, *p* = .04; frontal vs. control: t(126) = -2.06, *p* = .04). The control and dorsal conditions did not differ (t(126) = -.09, *p* = .94). Notably, this pattern of results held even when controlling for participants' perceptions of room brightness and pleasantness (frontal vs. dorsal: *p* = .04; frontal vs. control: *p* = .03; dorsal vs. control: *p* = .87).

Tense activation and hedonic tone. One-way ANOVAs were conducted on participants' reports of tense activation and hedonic tone. The results revealed no differences across the frontal, dorsal, and control airflow conditions in tense activation ($M_{frontal}$ = 2.85, SD = 1.15 vs. M_{dorsal} = 3.01, SD = 1.09 vs. $M_{control}$ = 2.86, SD = .98; F(2, 126) = .29, *p* = .75; frontal vs. dorsal: t(126) = 0.66, *p* = .51; frontal vs. control: t(126) = .01, *p* = .99; control vs. dorsal: t(126) = -.64, *p* = .52) or hedonic tone ($M_{frontal}$ = 5.31, SD = 1.05 vs. M_{dorsal} = 5.06, SD = 1.03 vs. $M_{control}$ = 5.40, SD = .91; F(2, 126) = 1.44, *p* = .24; frontal vs. dorsal: t(126) = -1.22, *p* = .22; frontal vs. control: t(126) = .41, *p* = .69; control vs. dorsal: t(126) = 1.61, *p* = .11).

Discussion. Conducted in a controlled lab setting and using a self-report measure of energetic activation, the results of follow-up study A conceptually replicated the results of study 1 and provided further support for the hypothesis that frontal airflow can increase energetic activation. Importantly, in showing that those in the frontal airflow condition felt more energized than did those in either the control (i.e., no airflow) condition or dorsal condition, this study also demonstrated that frontal airflow increases energetic activation above some baseline level (as opposed to dorsal airflow merely decreasing it). Follow-up study A also provided a test of theory specificity and helped further rule out several alternative accounts, as it was also shown that tense activation and hedonic tone did not significantly differ across conditions (nor did perceptions of the room's general pleasantness or lighting). Thus, these alternative factors could not account for our observed effects.

Filler Task (Follow-Up Study A and Study 2)

[In the unrelated survey that was used at the beginning of follow-up study A and study 2, participants answered filler questions that asked them to evaluate their college experience and some images of color patterns.]

Please indicate your level of agreement with the following statements about yourself (1 = *strongly disagree*, 7 = *strongly agree*):

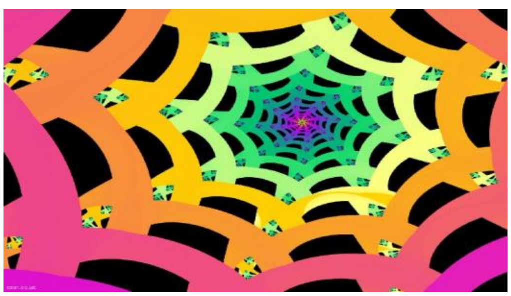
1) In general, my college experience is very positive.
2) I feel college prepares me for my future job.
3) I am satisfied with my social life in college.

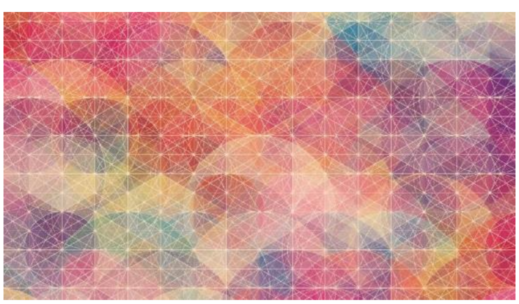
The next task in today's study involves simply evaluating a series of pictures. Please click to begin.

[Students were shown five pictures asked the following question after each picture:]

Please indicate how much you enjoy the above picture (1 = *not at all*, 7 = *very much*).

[Here are the pictures that were used.]





Alien Animal Coding Procedure (Study 2)

Drawing task instructions:

Participants were given colored pencils/markers and blank sheets of paper on which they were to draw pictures of imaginary alien animals. They were first asked to imagine going to another planet, somewhere else in the galaxy that was very different from Earth, and to imagine finding an animal there. They were told to draw a front and side view of the animal. After completing their drawings, participants were asked to write a description of their animal. The purpose of these descriptions was to uncover any important nonvisible properties of the animal as well as to help disambiguate any visible aspects of the drawings that could have been unclear.

Drawing task coding procedure (see Ward, 1994 for full creativity coding instructions):

The drawings were coded in terms of the properties of the alien animal. Coders were instructed to use the drawings as the primary source of making their judgments, but use descriptions to clarify any ambiguities. As an example, thin tubular structures extending from the underside of the creature toward the bottom of the page (or ground) were coded as legs as long as the subject's verbal responses indicated that they were legs or those structures had enlarged areas at the ends that subjects labeled as feet. This approach reduced the likelihood of coding tentacles or some other novel structure as the more common property of legs. Occasionally, subjects gave functional information rather than an attribute name (e.g., “it has good eyesight”). These functional descriptions were used to confirm the perceptual information available in the drawings.

Possible creativity scores ranged from 0 to 5. A creature received a creativity point for each of the following:

1) Asymmetry (i.e., the animal does not exhibit bilateral symmetry)

2) Lack of major appendages (i.e., no legs, wings, tails, or arms)

3) Lack of major sense organs (i.e., no eyes, ears, mouth, or nose)

4) Unusual appendages (i.e., the animal possessed an appendage attribute that is not characteristic of most typical animals on Earth [e.g., suction cups or wheels for feet; pouches for holding young], an unusual use for a characteristic appendage [e.g., taking in nourishment through the legs], an unusual configuration for a characteristic appendage [e.g., wings that are on the bottom of the creature as opposed to the top/side], an exaggerated/atypical ability for a characteristic appendage [e.g., wings that could fly at supersonic speeds], or an unusual number of appendages [e.g., nine legs]).

5) Unusual sense organs (i.e., the animal possessed a sense organ that is not characteristic of most typical animals on Earth [e.g., glowing triangular receptors instead of a mouth or

eyes at the end of long stalks], a novel use for a characteristic sensory system [e.g., a nose that detects sound or detecting odors by way of the skin], an unusual configuration of the senses [e.g., a mouth higher in the head than the eyes], an exaggerated or atypical sensory ability for a characteristic sense organ [e.g., infrared vision detectors], or an unusual number of sense organs [e.g., three eyes]).

Note that a creature could receive a point for lack of major appendages (or sense organs) and also for having unusual appendages (or unusual sense organs). For example, the creature might have no legs, tail, arms, or wings but possess wheels that it uses to move around. Also, note that 'typical' numbers for the appendage categories were considered to be 2 or 4 legs, 2 arms, 2 wings, and 1 tail and 'typical' numbers for the sense organ categories were considered to be 2 eyes, 2 ears, 1 mouth, and 1 nose.

Remote Associate Test (Study 3)

The following is a study of integrative orientation. Integrative orientation consists of the ability to see connections between various stimuli and different kinds of information. You will be presented with three words that are commonly associated with a fourth word. Your task is to identify the fourth word. Example: falling—dust—actor (answer: star).

blank—white—lines	(paper)
magic—plush—floor	(carpet)
thread—pine—pain	(needle)
stop—petty—sneak	(thief)
envy—golf—beans	(green)
chocolate—fortune—tin	(cookie)
barrel—root—belly	(beer)
broken—clear—eye	(glass)
pure—blue—fall	(water)
widow—bite—monkey	(spider)
ink—herring—neck	(red)
bump—throat—sum	(lump)

Study 3 Ancillary Analyses

Outdoor temperature moderated mediation. A moderated mediation analysis with airflow condition (0 = frontal, 1 = dorsal) as the independent variable, current outdoor temperature as the moderator, the energetic activation index as the mediator, and number of correct RAT items as the dependent variable was conducted using PROCESS (model 7; 10,000 resamples; Hayes, 2013). The other experimental condition (control) was included as a covariate. The results of this analysis showed that the index of moderated mediation was not significant (95% CI = [-.01, .05]). This finding suggests that outdoor temperature was not a significant moderator of the observed indirect effect of energetic activation on the relationship between frontal (vs. dorsal) airflow and creative engagement.

A moderated mediation analysis with airflow condition (0 = frontal, 1 = control) as the independent variable, current outdoor temperature as the moderator, the energetic activation index as the mediator, and number of correct RAT items as the dependent variable was conducted using PROCESS (model 7; 10,000 resamples; Hayes, 2013). The other experimental condition (dorsal) was included as a covariate. The results of this analysis showed that the index of moderated mediation was not significant (95% CI = [-.02, .03]). This finding suggests that outdoor temperature was not a significant moderator of the observed indirect effect of energetic activation on the relationship between frontal (vs. control) airflow and creative engagement.

Sunny weather moderated mediation. A moderated mediation analysis with airflow condition (0 = frontal, 1 = dorsal) as the independent variable, presence of sunny weather (0 = no, 1 = yes) as the moderator, the energetic activation index as the mediator, and number of correct RAT items as the dependent variable was conducted using PROCESS (model 7; 10,000 resamples). The other experimental condition (control) was included as a covariate. The results of this analysis showed that the index of moderated mediation was not significant (95% CI = [-.67, .27]). This finding suggests that presence of sunny weather was not a significant moderator of the observed indirect effect of energetic activation on the relationship between frontal (vs. dorsal) airflow and creative engagement.

A moderated mediation analysis with airflow condition (0 = frontal, 1 = control) as the independent variable, presence of sunny weather (0 = no, 1 = yes) as the moderator, the energetic activation index as the mediator, and number of correct RAT items as the dependent variable was conducted using PROCESS (model 7; 10,000 resamples). The other condition (dorsal) was included as a covariate. The results of this analysis showed that the index of moderated mediation was not significant (95% CI = [-.84, .16]). This finding suggests that presence of sunny weather was not a significant moderator of the observed indirect effect of energetic activation on the relationship between frontal (vs. control) airflow and creative engagement.

Cloudy/overcast weather moderated mediation. A moderated mediation analysis with airflow condition (0 = frontal, 1 = dorsal) as the independent variable, presence of cloudy/overcast weather (0 = no, 1 = yes) as the moderator, the energetic activation index as the mediator, and number of correct RAT items as the dependent variable was conducted using PROCESS (model 7; 10,000 resamples). The other condition (control) was included as a covariate. The results of this analysis showed that the index of moderated mediation was not significant (95% CI = [-.10, .84]). This finding suggests that presence of cloudy/overcast weather was not a significant moderator of the observed indirect effect of energetic activation on the relationship between frontal (vs. dorsal) airflow and creative engagement.

A moderated mediation analysis with airflow condition (0 = frontal, 1 = control) as the independent variable, presence of cloudy/overcast weather (0 = no, 1 = yes) as the moderator, the energetic activation index as the mediator, and number of correct RAT items as the dependent variable was conducted using PROCESS (model 7; 10,000 resamples). The other experimental condition (dorsal) was included as a covariate. The results of this analysis showed that the index of moderated mediation was not significant (95% CI = [-.48, .41]). This finding suggests that presence of cloudy/overcast weather was not a significant moderator of the observed indirect effect of energetic activation on the relationship between frontal (vs. control) airflow and creative engagement.

Rainy weather moderated mediation. A moderated mediation analysis with airflow condition (0 = frontal, 1 = dorsal) as the independent variable, presence of rainy weather (0 = no, 1 = yes) as the moderator, the energetic activation index as the mediator, and number of correct RAT items as the dependent variable was conducted using PROCESS (model 7; 10,000 resamples). The other experimental condition (control) was included as a covariate. The results of this analysis showed that the index of moderated mediation was not significant (95% CI = [-1.53, .10]). This finding suggests that presence of rainy weather was not a significant moderator of the observed indirect effect of energetic activation on the relationship between frontal (vs. dorsal) airflow and creative engagement.

A moderated mediation analysis with airflow condition (0 = frontal, 1 = control) as the independent variable, presence of rainy weather (0 = no, 1 = yes) as the moderator, the energetic activation index as the mediator, and number of correct RAT items as the dependent variable was conducted using PROCESS (model 7; 10,000 resamples). The other condition (dorsal) was included as a covariate. The results of this analysis showed that the index of moderated mediation was not significant (95% CI = [-.31, 1.26]). This finding suggests the presence of rainy weather was not a significant moderator of the observed indirect effect of energetic activation on the relationship between frontal (vs. control) airflow and creative engagement.

Product Pairings (Study 4)

[Seen by all participants]

A pair of traditional running shoes.

A new running shoe that comes with a modular, removable mid-sole which can easily be changed by the runner whenever a new sole is needed. During the course of training, runners usually have to replace running shoes every 3 months, as the thick foamed mid-sole in the shoe gets compressed and loses the resiliency, which provides critical support needed for the runner's feet. This prolongs the life of the shoes by several months and allows the runners to train in the shoes with which they have become comfortable.

A traditional backpack made from lightweight nylon.

A new backpack made of fiber from the leaves of the pineapple plant. The long fibers are extracted from the pineapple leaves through a process called decortication. The fibers then get de-gummed and undergo an industrial process to become a non-woven mesh, which is then used in the construction of the backpack. This unique material source and process is what gives the backpack its leather-like appearance, creating a textile that is soft, flexible, and durable.

A traditional spice rack carousel.

A new spice rack carousel with removable spice compartments, which provides a unique way to store and sort cooking spices. Each canister not only allows you to shake or pour your spices out, but has also been engineered to automatically dispense your desired measurement. Simply twist the canister dial for every 1/4 tsp needed for your recipe and the canister will dispense a perfect measurement.

Set of traditional kitchen tongs and masher.

A set of new kitchen tongs and masher with an original design. The tongs are click-lock tongs that have a bend in their handles to sit them up off your kitchen table and/or to rest them on the edge of your pan. The tongs can be opened with the push of a click button at the end of the tongs (just like a "clicky" pen). Hold the tongs closed and push the click-button again to lock them closed. The masher features a unique spring design that prevents jarring on the wrist by absorbing the downward force. When pushed down, the spring flattens, which forces the food through the thin gaps in the coils, creating smooth mash in just one press.

A traditional table and chair set

A new table and chair set, which is a piece of multi-functional and adaptable furniture. It can be a coffee table, a desk, two stools and a lamp. All of these elements can be extended by the simple introduction of another part to suit the user's need. These parts then collapse back down to their most basic form, allowing them to be returned to the case that they are stored inside.

Traditional reclining chair with polyurethane upholstery.

A new reclining chair upholstered in a leather-like material made from apple skins and cores. Apple pectin is an industrial waste product which can be used to create a durable cellulose-based material that can be naturally dyed and tanned. The apple skins and cores are first dried and then reduced to powder, which is sent to a factory where it is coagulated with polyurethane and coated on a cotton and polyester base.

[Seen by males only]

A traditional mass-produced cologne with a fresh woody fragrance (blended scents include leafy green notes, citrus, cedarwood, and amber)

A new custom cologne, which can be created from any combination of over 30 different scents (including citrus, bergamot, ginger, vetiver, cedarwood, and amber). Given that there is an art and a science to putting scents together in a pleasing way, purchasers of a custom cologne will work with experienced consultants. These consultants will help them layer, mix, and match scents to create a one-of-a-kind blend. Once the ingredients for the novel cologne have been selected, a professional consultant will mix, package, and deliver the cologne to the consumer.

A traditional high-end razor with disposable cartridges.

A new high-end heated razor with disposable cartridges. This razor activates and delivers instant warmth at the push of a button. It features adjustable temperature levels to achieve optimal comfort and distributes soothing warmth to the skin. Four intelligent heat sensors consistently maintain even warmth at the chosen temperature through each shaving stroke, while built-in safety features ensure a safe level of heat.

[Seen by females only]

A traditional matte lipstick.

A new lipstick, which is infused with real flowers. When applied, these lipsticks start out as a light pink tint, but then change color depending on your temperature and body pH.

A traditional makeup palette in 4 shades.

A new makeup palette in 4 holographic shades. The state-of-the-art holographic shades are made from 360-degree refractive pearls, dipped in a proprietary prismatic coating, which catch the light from every angle when applied. It can be used to achieve a luminizing spectrum of radiant, special effects.

Do-It-Yourself Kite Instructions (Study 5)

[Upon completion of the survey, participants were informed that, as an additional gift for participating, they could choose one of the following instructions for a do-it-yourself kite. Before making their selection, participants were verbally informed that these do-it-yourself kites ranged from easy to medium to hard (these labels appeared on the physical kit instructions as well).]

Easy Kite:

Bumblebee Paper Kite

Difficulty Level: Easy

Materials Needed:
- Single-hole puncher
- Scotch tape
- Stapler
- Copier paper (any color)
- Ruler
- Pencil
- Kite string

Step 1: Fold the paper in half

Step 2: Measure and mark an A at 2.5" and a B at 3.5" along the fold

Step 3: Pull one side of the open corner closest to the A down to the A and staple it. Now do the same to the other side.

Step 4: Reinforce the B line with Scotch tape. Then, punch a hole through the B line. Do not put the hole punch too close to the fold.

Step 5: Take at least 15 ft. of kite string. Put one end through the hole and tie it with a double knot.

Step 6: Go fly a kite! Swing it around your head—it should float. If it spins, attach a lightweight plastic tail at the end.

Medium Kite:

Diamond Kite

Difficulty Level: Medium

Materials Needed:

- Kite string (30 lb. strength)
- Black marker pen
- Ruler
- Scissors
- 2-ply plastic trash bag (at least 2 ft. wide and 4 ft. tall; must not be black)
- Electrical insulation tape
- Hack saw or fine-toothed wood saw
- Two 48 inch long round wooden dowels (1/4 inch diameter if using poplar; 3/16 inch if using oak)

Step 1· Measuring the Sail

Place your bag flat on the floor, the closed end at the top. Starting from just below the top left corner, measure and mark 3 dots on the plastic.

Step 2· Cutting the sail

Use your ruler to connect the dots with the black pen. Flip the plastic over. You should be able to see the black lines you drew on the other side. Trace over all of these lines.

Now, cut along the top and *right* seam of the bag and open it up to show the complete sail outline (see below):

Cut along all the black lines (see below):

Step 3· Adding the Spars

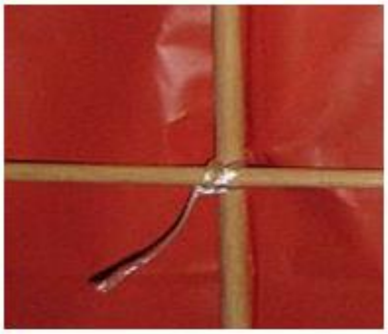
Lay one of your dowels down the center-line of the sail (line it up with the top sail corner and saw off the extra portion hanging off the bottom corner (see the below photo where the dowel has not yet been cut):

Cut a 2 inch piece of tape and stick down the dowel to the top sail corner (see below). Cut another 2 inch piece of tape and stick down the dowel to the bottom sail corner. Note: For added strength, you can attach a second piece of tape to each corner (place the second piece at a right angle to the first).

Lay your second dowel horizontally so that it lines up with the two remaining sail corners. Tape the dowel to the corners of the plastic as you did with the first dowel (see the image on the right).

Flip the page over for more steps!

Step 4: Attach the Flying Line
Poke a hole in the plastic sail, right over where the dowels cross each other. Thread the free end of your flying string through the hole, and tie it firmly around the crossing-point (see the image below).



Step 5: Attach the Tail
From spare scraps of sail plastic, make up a long narrow strip no shorter than five times the length of the kite itself. The strip should be about 2 inches wide. Thread one end of the tail around the bottom of the vertical dowel (see below). Tie the tail to the dowel with a simple knot.

Step 6: Go Fly a Kite!

Hard Kite:

Box Kite

Difficulty Level: Hard

Materials Needed:

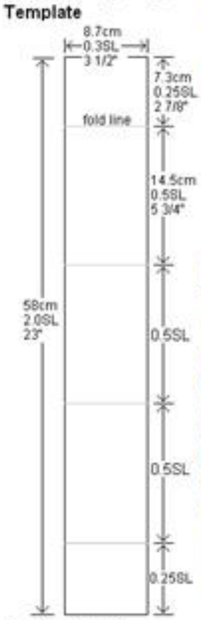
- Kite string (30 lb. strength)
- Black marker pen
- Ruler
- Scissors
- Wood glue
- 1-ply plastic trash bag (at least 2 ft. wide and 4 ft. tall; must not be black)
- Electrical insulation tape
- Six 12 inch bamboo BBQ skewers (must be fairly straight)
- Clear sticky masking tape

Step 1- Preparing the Frame

Find your four straightest BBQ skewers (check this by rolling them across a table top, one by one). In addition, try to ensure that 2 of those skewers have very similar *flexibility*. Either bend them by hand to judge this or suspend the ends and put a weight in the middle (getting this right will help the kite to fly straight). Put a mark on these 2 skewers so you know which ones they are. They are the top 2 skewers in the photo on the right. Snip the sharp point off one skewer, then measure it to establish '1 skewer length' (1.0SL) for your kite. Snip the points off 3 more skewers, so that they are exactly the same length as the first one. These 4 skewers will now be referred to as the 'spars.' Take the remaining 2 skewers, and snip one of them to exactly 0.7SL long. Make the other one just 0.5cm (1/4") *longer*. These are the 'cross pieces'. The longer one will be trimmed to fit, later.

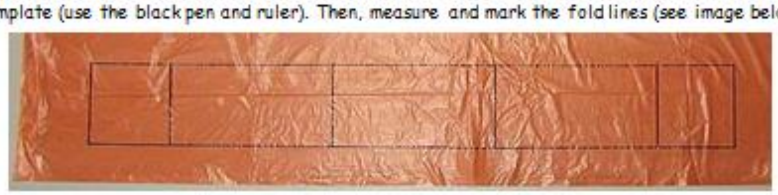
Step 2- Preparing the Sail

Template

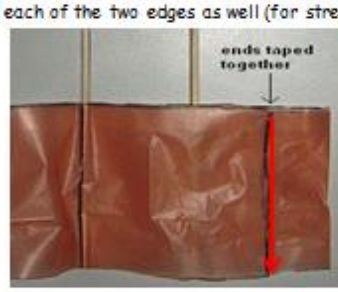


SL = Skewer Length

The template (see left) represents one "cell" of the kite laid out flat. Take the plastic bag and lay it flat on the table. Near one edge of the bag, mark and measure a rectangular outline according to the template (use the black pen and ruler). Then, measure and mark the fold lines (see image below).



Flip the bag over and trace over all the black lines you drew on the other side (use the ruler). Then, cut the bag down one of the long sides and open it up. Cut around the 2 rectangular outlines with scissors. Arrange the 4 bamboo spars so that they cover up the fold lines (see below left). Make sure the spars with the black marks are positioned as in the photo. Tack down all 8 corners of the sail with small pieces of clear tape. This will keep the plastic from shifting while you do the following: Lay down 4 long horizontal pieces of clear tape from left to right, securing the spars to the plastic (see arrows). Remove everything from the table top, either pulling off or trimming away the small square bits of tape at the corners. Fold the sails in half (from left to right) so that the short edges are together. Stick the edges together with tape. The photo on the bottom right is a close up of one of these edges being taped (see arrow). Now, carefully lay tape along the *inside* of each of the two edges as well (for strength).



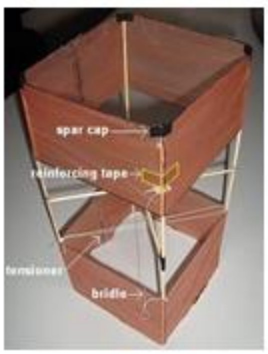
Flip over for more steps!

Step 3· Attaching Cross Pieces

Fit the shorter bamboo cross piece between the *unmarked* spars (see photo on top right). Wrap a small square piece of electrical insulation tape around where each tip touches the spar. Trim the longer cross-piece a little at a time until you can slide it completely into position between the *marked* spars. It's ok if the marked spars are pushed apart just a little. Put a drop or 2 of wood glue at each end to secure it, as in the *bottom* photo. At this point, the 2 cross-pieces should be holding the kite open, with all the plastic panels under a little bit of tension. When the glue is dry, flip the kite over and add some more glue to strengthen those joints on the other side.

Step 4· Final Odds and Ends

Poke 2 holes in the plastic of one cell, 0.2SL from the *tip* of an *unmarked* spar. One hole on each side of the spar. Cut off a length of 20 pound flying line, about the length of one skewer, and tie a small Loop Knot into *both ends*. Attach one end of the line to the kite, by passing it through one hole and out the other, and then through the loop at the other end. This is your "bridle." Reinforce the sail near the towing point, with a short strip of sticky tape (see photo below). Cut off 4 squares of electrical insulation tape and cap the spar tips nearest the attached bridle (see photo below). Now take some more flying line and tie a loop of around the 2 *marked* spars, which you can also see in the photo, labeled 'tensioner'. Try to pull just enough tension into it to keep the lines straight, and then tie the string off. Put a small drop of glue on the tensioner knot. Also put some glue where the cross-pieces touch each other, to keep everything stiffer.

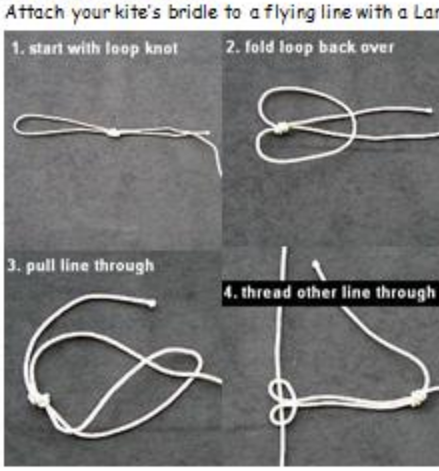


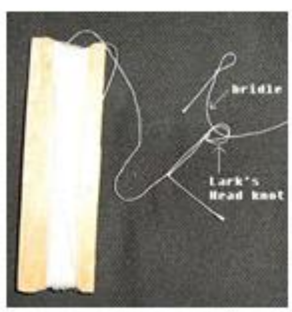
Step 5· Attaching the Tail

Cut off several loops of plastic from a dark garbage bag, and knot them together to a length of at least 3SL. The width should be about the same as 2 adult fingers, or a little more. With sticky tape, attach one end of the tail to the lower tip of the spar to which the bridle is attached (see photo at right).

Step 6· Go Fly a Kite!

Attach your kite's bridle to a flying line with a Lark's Head knot (see photos below) and then head outside!





Summary of Key Results (Studies 1-5)

Study 1

	Frontal condition (n = 42)	Dorsal Condition (n = 44)	F value	*p* value
Energetic activation index #1	5.14 (1.25)	4.21 (1.67)	8.42	.01
Energetic activation index #2	4.83 (1.37)	3.98 (1.67)	6.55	.01
Tense activation index	3.01 (1.19)	3.12 (1.27)	.16	.69
Hedonic tone index	5.03 (1.11)	5.12 (1.15)	.14	.71
Facing obstacles/opposing force	4.21 (1.59)	3.94 (1.50)	.67	.42
Feeling pushed	3.19 (1.92)	2.95 (1.95)	.32	.57
NFC	3.34 (.64)	3.41 (.77)	.24	.62
Room general pleasantness	5.12 (1.42)	5.02 (1.39)	.10	.75
Room lighting	4.43 (1.11)	4.23 (1.03)	.76	.39
Room noise	2.19 (1.38)	2.57 (1.52)	1.45	.23
Room temperature	3.98 (.87)	4.09 (.77)	.42	.52

Follow-up Study A

	Frontal condition (n = 43)	Dorsal Condition (n = 47)	Control Condition (n = 39)	F vs. D t-test value	F vs. C t-test value	D vs. C t-test value	*p* value F vs. D / F vs. C / D vs. C		
Energetic activation index	4.63 (.93)	4.22 (.91)	4.20 (1.02)	-2.07	-2.06	-.09	.04	.04	.94
Tense activation index	2.85 (1.15)	3.01 (1.09)	2.86 (.98)	.66	.01	-.64	.51	.99	.52
Hedonic tone index	5.31 (1.05)	5.06 (1.03)	5.40 (.91)	-1.22	.41	1.61	.22	.69	.11
Room general pleasantness	4.81 (1.58)	4.94 (1.31)	5.23 (1.04)	.43	1.41	1.02	.67	.16	.31
Room lighting	4.53 (1.03)	4.66 (1.39)	4.90 (1.27)	.48	1.32	.88	.64	.19	.38

Study 2

	Frontal condition (n = 62)	Dorsal Condition (n = 63)	Control Condition (n = 47)	F vs. D t-test value	F vs. C t-test value	D vs. C t-test value	*p* value F vs. D / F vs. C / D vs. C		
Alien animal creativity	1.00 (.87)	.63 (.81)	.65 (.79)	-2.53	-2.20	.14	.01	.03	.89
Energetic activation index	3.96 (1.11)	3.46 (1.19)	3.42 (1.07)	-2.46	-2.48	-.20	.02	.01	.84
	(n = 58)	(n = 62)	(n = 47)	---	---	---	---	---	---
Room noise	4.52 (1.99)	4.74 (2.16)	5.00 (1.63)	.63	1.26	.68	.53	.21	.50
Room temperature	2.98 (.91)	3.06 (1.16)	3.68 (.76)	.46	3.66	3.28	.65	< .01	< .01

Study 3

	Frontal condition (n = 51)	Dorsal Condition (n = 51)	Control Condition (n = 51)	F vs. D t-test value	F vs. C t-test value	D vs. C t-test value	*p* value F vs. D / F vs. C / D vs. C		
RAT performance (number of items correctly solved)	7.51 (3.54)	5.94 (3.12)	6.04 (3.49)	-2.34	-2.19	.15	.02	.03	.88
Energetic activation index	4.69 (1.51)	3.97 (1.52)	3.95 (1.62)	-2.33	-2.41	-.08	.02	.02	.94
Tense activation	1.95 (1.27)	2.03 (1.26)	1.91 (1.43)	.33	-.15	-.48	.74	.88	.63
Hedonic tone	5.27 (1.14)	4.98 (1.14)	5.10 (1.03)	-1.38	-.80	.58	.17	.43	.56
Facing obstacles/opposing force	3.12 (1.83)	2.94 (1.52)	3.04 (1.69)	-.54	-.25	.29	.59	.81	.77
Feeling pushed	2.47 (1.64)	2.16 (1.54)	2.09 (1.54)	-1.09	-1.31	-.23	.28	.19	.82

Study 4									
	High Energetic Activation (Nature Pics)		Low Energetic Activation (Bldg Pics)		*p* values			F vs. D when…	
	Frontal (n = 78)	Dorsal (n = 87)	Frontal (n = 88)	Dorsal (n = 71)	Airflow Main Effect	Picture Main Effect	Airflow X Picture	Nature	Bldg
Likelihood buy creative product	4.19 (1.10)	4.32 (1.12)	4.30 (1.05)	3.90 (1.10)	.43	.53	.03	.43	.03
Energetic activation index	4.49 (1.65)	4.63 (1.56)	4.67 (1.56)	4.14 (1.55)	.56	.46	.05	.56	.03
Tense activation	1.70 (1.17)	1.77 (1.22)	1.72 (1.39)	1.57 (0.81)	.70	.90	.40	.70	.41
Hedonic tone	4.93 (1.63)	5.00 (1.44)	5.01 (1.54)	4.71 (1.57)	.77	.74	.28	.77	.22

Study 5					
	Frontal condition (n = 33)	Dorsal Condition (n = 31)	χ^2	t-test value	*p* value
Extraordinary destination index	3.56 (1.00)	2.88 (1.35)	---	-2.30	.02
Destination creativity index	2.93 (1.01)	2.35 (.75)	---	-2.57	.01
Level of DIY kite chosen	2.06 (.83)	1.55 (.68)	---	-2.70	.01
DIY kite instruction choice	36.36% (hard), 33.33% (medium), 30.30% (easy)	9.68% (hard), 35.48% (medium), 54.83% (easy)	7.16	---	.03 (overall χ^2) .01 (hard), .86 (medium), .05 (easy)

Note: Standard deviations are displayed in parentheses next to the means. F vs. D = frontal airflow versus dorsal airflow condition, F vs. C = frontal airflow versus control airflow condition, and D vs. C = dorsal airflow versus control airflow condition.

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