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Those prices are HOT! How temperature-related visual cues anchor expectations of price and value

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1. Introduction

For most humans, the local environment can have a major influence on their attitudes and behaviors. Whether it is the ambient smells (Mitchell et al., 1995), sounds (Spangenberg et al., 2005), color (Bellizzi and Hite, 1992) or warmth (Huang et al., 2014), the immediate surrounds play a part in how we feel and the decisions we make. It is no surprise, then, that weather also has the ability to shape what we think, feel and do.

For example, research has shown weather can influence stock returns (Goetzmann and Zhu, 2005; Jacobsen and Marquering, 2008), retail sales (Starr-McCluer, 2000; Steele, 1951), food consumption (Bruno et al., 2017; Lucht and Kasper, 1999), helping behaviors (Cunningham, 1979; Rind, 1996) and willingness to pay (Murray et al., 2010). However, most of the existing research has typically examined the effects of actual weather (Bruno et al., 2017; Goetzmann and Zhu, 2005) and ambient temperature (Bruno et al., 2017; Murray et al., 2010).

The current research aims to extend the findings in this area, with specific focus on the research undertaken by Murray et al. (2010) by testing a novel prediction that weather and temperature cues can lead to anchoring effects, thus influencing consumer behavior in a subtle and indirect manner. Specifically, building on the research by Murray et al. (2010), it is proposed that high (vs. low) temperature cues will increase higher levels of price valuations for a given product or service. In addition to influencing evaluations of price or value, it is anticipated this anchoring effect will be moderated by impulsivity and positive affect will mediate the relationship.

By theoretically and empirically examining the anchoring effects of temperature cues, this research makes three important contributions. First, the current study shows how subtle, indirect visual (temperature) cues cause anchoring effects that guide perception and individual notions of value. Second, it demonstrates how impulsivity attenuates the effect and third, identifies 'positive affect' as an underlying causal mechanism.

2. Theoretical background

In an ideal world, well thought out rational decision making involves relatively complete information about the given situation (Dean and Sharfman, 1996). However, when a person does not have access to complete information, they will use whatever information is available to make a decision (Scitovszky, 1944). In such situations, what people see before them is likely to have a major influence on how they perceive the immediate environment and any decisions they are likely to make. This is because, for many people, vision dominates other sensory modalities when it comes to information gathering (Schifferstein, 2006). As a result, individuals will use their vision and concentrate their sight on places where they can find relevant information (Clement, 2007). When they do this, they are likely to encounter three types of visual stimuli – focal, contextual, and organic – which will independently and jointly influence perception and behavior (Helson, 1947, 1948). These different visual cues can trigger associations that assist the individual with decision making (Spence et al., 2014). Alternately, they may see a visual cue and employ Gestalt-style processing to develop an image of the situation in their mind, which then anchors subsequent image formation, emotional response and evaluation (Lin, 2004).

2.1. Anchoring effects in decision making

The anchoring effect (Tversky and Kahneman, 1974) is a heuristic that occurs when an individual makes a judgment that is biased based on an initially presented value. The findings presented in the seminal study by Tversky and Kahneman (1974) indicate when individuals are asked to make a numeric judgement they look to cues in the local environment – regardless of their relevance to the decision – and use those cues to guide their decision or evaluation of the situation.

Subsequent research has established the prevalence of such anchoring effects across different domains, including general knowledge (Blankenship et al. 2008; McElroy and Dowd, 2007), legal judgments

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(Englich and Soder, 2009; Marti and Wissler, 2000), and purchase decisions (Ariely et al., 2003; Wansink et al., 1998).

In a marketing environment, consumers have been shown to use different external cues as anchors to develop their own concept of price or value (Van Rompay et al., 2012; Berné et al., 2001). For example, it has been shown people will use the ambient surrounds of a store, the social atmosphere that occurs in the presence of other people or visual design elements such as architecture, color, materials and styling to justify their own price expectations (Grewal and Baker, 1994). The influence of the external atmosphere is not constrained to just that of retail stores. For example, Verhoeven et al. (2009), suggest that in a hospitality setting, customers will develop price expectations by using a range of external cues, including other customers, restaurant table decorations and menu styling. However, a more immediate association is often made when consumers use related numerical reference points as price guides. For example, it has been shown people will use advertised prices as anchors for their own reference points (Chandrashekaran and Grewal, 2006; Johnson and Cui, 2013). In turn, individuals will use these internal reference points to determine value (Elaad et al., 2010). The evidence is clear that numerical, price-related visual cues have a profound influence on expected price and value. But what if the visual cues experienced by an individual were not price related? For example, what if the available information to determine price or value was the ambient temperature? According to Tversky and Kahneman (1974), such unrelated visual cues will have an anchoring effect and will bias any subsequent judgements or evaluations.

Previous research (Ahn et al., 2010) has shown both actual temperatures and temperature-related words influence decision making. Specifically, actual heat and heat-related metaphors will increase a consumer's willingness to pay. By proxy, it could be assumed then that heat and heat-related metaphors increase the consumer's perception of price or value. This is because visceral states (warmth/cold) generally seem to influence forecasts of future events (Risen and Critcher, 2011). Part of this comes from the fact heat can create thermal stress on the human body (Hancock, 1989) which can limit the attentional resources available for cognitive tasks (Tong et al., 2011). In situations where the temperature is warm, people may look to available information that requires the least cognitive resources for decision making. For the current research, however, ambient temperature is not the manipulated variable. Instead, it is the appearance of temperature-related visual cues that is expected to create an anchoring effect and bias price or value expectations. Specifically, it is suggested when consumers view a temperature cue, that cue will influence their evaluations of an unrelated product or service. This is because, when making decisions, individuals will often give disproportionate weight to the first information they receive (Hammond et al., 1998). As such, the following hypothesis is proposed:

H1. Participants who view high (vs. low) temperature cues will provide higher (vs lower) evaluations of value.

2.2. The moderating role of impulsivity

Given that anchoring serves as a heuristic in a cognitive process (Tversky and Kahneman, 1974), it is proposed that psychological traits, such as impulsivity, can influence anchoring effects. This is because impulsivity is associated with how an individual seems to react without an objective reasoning (Dickman, 1990), That is, consumers with high levels of impulsivity are more likely to view unrelated visual cues and use them as a heuristic in making decisions (Cheung et al., 2017; Salmon et al., 2014). In contrast, it is expected consumers with low levels of impulsivity are less likely to be influenced by visual cues (Ozer and Gultekin, 2015), as they have less need for heuristics. Based on these findings, it is proposed the anchoring effects of temperature cues will be attenuated when consumers have low levels of impulsivity. Thus, the following hypothesis is proposed:

H2. Low level of impulsivity will attenuate the effects of the temperature cues, such that participants who view high (vs. low) temperature cues will report higher expected values only in high levels of impulsivity condition.

2.3. The mediating role of affect

Prior research (Cao and Wei, 2005; Cunningham, 1979; Murray et al., 2010) has demonstrated the positive association between benign weather—higher temperature and sunlight—and positive affect. Because of this, it is suggested that positive affect will mediate anchoring effects of temperature cues on price valuations. However, in line with the hypothesized moderating effects of impulsivity, it is expected this mediation effect will only occur among consumers with high levels of impulsivity. Shiv and Fedorikhin (1999) provide initial evidence for such predictions by showing that consumers are more likely to make decisions based on their affect (vs. cognition) in high (vs. low) levels impulsivity condition. As such, we propose the following hypothesis:

H3. Positive affect will mediate the effects of temperature cues on price valuations only in high levels of impulsivity condition.

3. Methods

3.1. Study 1

The purpose of Study 1 was to test the hypotheses in a natural, externally-valid context. Specifically, a field experiment was conducted to test how visual (weather) cues influence consumers' price valuations.

3.1.1. Design and procedure

The study was a one-factor, six-level (temperature: 31, 32, 39, 81, 83, 89) between-subject design. Guests at two hotels in the United States participated in exchange for a chance to win an accommodation prize. After removing incomplete responses, the sample consisted of 816 respondents (50% male, M_{age} = 44.03, SD = 13.47).

During the check-in process, guests were told they had a chance to win one additional free night of accommodation. To enter, they had to answer a question, "What is the value of your free night (in dollars)?" Guests entered their information on a computer, which was positioned below a digital thermometer displaying the outside temperature. Data collection occurred on three days in summer at Holiday Inn in Gatlinburg, Tennessee, during the week 10th–17th July 2017. Average advertised room rate for the period was US$162 and outside temperatures on the three days were 81°, 83°, 89° f. Likewise, data was collected on three days in winter at Holiday Inn in Pigeon Forge, Tennessee, during the week 15th–22nd January 2017. Average advertised room rate for the period was US$131. Outside temperatures on the three winter days were 31°, 32°, and 39°f. Both hotels provide similar standard of accommodation and amenities and are located within 10 miles of each other. Age, average number of stays per year, gender, number of people in party and annual income were measured as controls.

3.1.2. Results

To test H1, one-way ANOVA was run with temperature as the independent variable and value as the dependent variable. As expected, results revealed significant differences on the levels of price valuations across different temperature conditions ($F(5, 810) = 68.58$, $p < .001$). Specifically, when outside temperature was warm (81 °, 83 °, 89 °), mean values were \$100.65 (SD = 3.58), \$96.08 (SD = 3.85) and \$103.31 (SD = 3.67) respectively. When outside temperature was cool (31 °, 32 °, 39 °), mean values were \$44.35 (SD = 3.62), \$51.55 (SD = 3.72) and \$40.57 (SD = 3.55) respectively.

The differences on price valuations between summer and winter days were significant (all p's < 0.001),[1] providing support for H1.

Table 1
Summary of results.

Study 1 (mean estimate and standard deviation in brackets)						
Temperature (f)	31	32	39	81	83	89
Price Valuation	$44.35 (3.62)	$51.55 (3.72)	$40.57 (3.55)	$100.65 (3.58)	$96.08 (3.85)	$103.31 (3.67)
Study 2						
Temperature (f)	35	85				
Price Valuation	79.77 (8.70)	110.96 (8.96)				

3.2. Study 2

Study 2 was conducted to replicate the results of Study 1, test the condition under which the predicted effect might be attenuated (H2) and examine the underlying causal mechanism in the process (H3). That is, increasing temperature influences positive affect and leads to higher perceived valuation. However, this indirect effect should only occur among those with high levels of impulsivity.

3.2.1. Design and procedure

This study employed a one-factor, two-level (temperature: 35, 85) between-subject design. Participants were recruited through an online panel in exchange for monetary compensation (n = 101; 62% male; M_{age} = 38.76; SD = 10.58).

Participants were asked to complete two ostensibly unrelated tasks. In the first task, a priming-based approach (adapted from Lerner and Keltner, 2001) was used to draw causal relationships with high internal validity. Participants were told to imagine checking their computer for the day's weather, where the temperature would be either 35 or 85 degrees, depending on condition. They were then told to imagine their activities for the day. Participants reported their affective response on 14 affective items, using a 9-point scale (1 = do not experience the emotion at all; 9 = experience the emotion more than ever before). The positive affect items (cheery, glad, happy, and pleased) were averaged with the reverse-coded negative items (downhearted, gloomy, upset, and sad) (α = 0.97) to form a composite measure of positive affect.

In Task 2, participants were asked to imagine visiting a hotel. Participants were told they had a chance to win a free night at the hotel by answering the question "What is the value of your free night (in dollars)?" Lastly, they completed 12 items (α = 0.98) from Dickman's Dysfunctional Impulsivity Inventory (Dickman, 1990) and several demographic variables, as well as how often they stay at a hotel and purpose (e.g. leisure/business) as control variables.

3.2.2. Results

To test H1, a one-way ANOVA was run to examine the differences of price valuations across two temperature conditions. As expected, the differences were significant ($F(1, 99) = 6.24$, $p < .05$) such that participants in the high temperature condition (M = 110.96, SD = 8.96) reported higher levels of price valuations than did those in the low temperature condition (M = 79.77, SD = 8.70, $p < .05$). These results validated the findings from Study 1.

To test H2, a moderated regression analysis was run (PROCESS Model 1; Hayes, 2013) with 5000 resamples, with temperature, impulsivity, and their interaction as the independent variables, and price valuation as the dependent variable. As expected, there was a significant interaction between temperature and impulsivity (B = 41.42, SE = 4.83, $t(97) = 8.57$, $p < .001$). Specifically, there were positive effects of temperature on price valuations at moderate (3.82) and high levels of impulsivity (5.82): at the mean (B = 30.33, SE = 9.59, 95% CI: 11.3086–49.3589) and one SD above the mean level of impulsivity (B = 112.85, SE = 13.61, 95% CI: 85.8370–139.8582). However, the effect was negative at low levels of impulsivity (1.83): one SD below the mean level of impulsivity (B = −52.18, SE = 13.57, 95% CI: −79.1034 to −25.2568). These results supported Hypothesis 2.

Consistent with predictions, significant differences on the levels of positive affect across two temperature conditions were observed ($F(1, 99) = 65.52$, $p < .001$), thereby supporting the hypothesis (H2). Specifically, participants in the high temperature condition (M = 6.88, SD = 0.26) reported higher levels of positive affect than did those in the low temperature condition (M = 3.93, SD = 0.25, $p < .001$). Results are shown in Table 1.

To test H3, separate bias-corrected bootstrap models were created using PROCESS (Model 14; Hayes, 2013), with 5000 samples taken from existing data. The moderated mediation analysis examined the indirect effect of temperature (high vs. low) on expected value, via positive affect, and moderated by impulsivity. Results revealed the indirect effect was significant at moderate (3.82) and high levels of impulsivity (5.82): at the mean (B = 37.13, SE = 10.16, 95% CI: 19.1266–59.7631) and one SD above the mean level of impulsivity (B = 77.30, SE = 11.78, 95% CI: 56.2462–103.0267). However, as predicted (H3), this indirect effect was non-significant at low levels of impulsivity (1.83): one SD below the mean level of impulsivity (B = −3.04, SE = 13.56, 95% CI: −30.2855–22.8873). These findings provide strong support for Hypothesis 3.

4. Discussion

The current research examined the effect of weather and temperature-related visual cues on consumer valuations of a service product. Study 1 was a field experiment that demonstrated cues signaling outside temperature have an anchoring effect that skews consumer reports of perceived value. In such situations, when cues indicate the outside temperature is high/low, consumers consider the value of a free night's accommodation as correspondingly high/low. The findings from Study 1 offer support for the hypothesized effects (H1) and provide a high degree of external validity.

Study 2 was conducted to replicate the results of Study 1, test the condition under which the predicted effect might be attenuated (H2) and examine the underlying causal mechanism in the process (H3). Specifically, Study 2 tested the predicted moderator (impulsivity) and mediator (positive affect) of the effects, thereby providing more robust findings and support for the hypotheses (H2 and H3).

The findings of this current research provide three important implications, theoretically and practically. First, this research contributes to the literature on weather and anchoring effects by testing a novel perspective that demonstrates how simple visual (temperature) cues, rather than ambient weather and temperature, can lead to anchoring effects. Prior research has established that weather can significantly influence consumer behaviors across different domains (Jacobsen and Marquering, 2008; Lazo et al., 2011; Murray et al., 2010). The current

[1] As an additional analysis, we conducted similar analysis and included age, average number of stays per year, gender, number of people in party, and annual income as statistical controls. The results yielded consistent findings. These findings thus, provide evidence for our predictions in a real-world setting.

study extends this stream of research by showing that subtle, indirect visual (temperature) cues cause anchoring effects that guide perception and individual notions of value.

Second, the findings of this research identify theoretically grounded moderator (impulsivity) and mediator (positive affect) variables within the research context. This is significant because there is little understanding on how psychological traits and individual differences can influence anchoring effects (Furnham and Boo, 2011). In fact, as pointed out by Furnham and Boo (2011), most research has focused on group (rather than individual) differences because they tend to find a universal rule that predict general behaviors.

Moreover, most studies which examine the underlying mechanism of anchoring effects have focused on cognitive factors, including anchoring-and-adjustment (Tversky and Kahneman, 1974), selective accessibility (Chapman and Johnson, 1999), and attitude change (Blankenship et al., 2008). Thus, the current study contributes to the literature on anchoring effects by identifying the impact of psychological traits (impulsivity) and examining the underlying process from an affective perspective (positive affect).

Third, the findings of this research are beneficial to marketers by highlighting the importance of simple, environmental cues to increase positive consumer evaluations. Previous academic research and industry reports have acknowledged the significant role of weather on consumer behavior (Jacobsen and Marquering, 2008; Lazo et al., 2011; Murray et al., 2010). However, by examining how visual temperature and weather cues can influence price valuations in a subtle and indirect way, this research provides a more nuanced understanding of the literature.

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