

The Anchoring Effects of Temperature Cues on Price Valuations

ABSTRACT

This research involves two studies examining the effect of visual cues on consumer valuations of a service product. Findings show visual cues have an anchoring effect on perceived value, with the effect being attenuated by a moderator (impulsivity). The presence of a causal mechanism (positive affect) was also determined.

EXTENDED ABSTRACT

Purpose of this paper

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 & 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 & Zhu, 2005; Jacobsen & Marquering, 2008), retail sales (Starr-McCluer, 2000; Steele, 1951), food consumption (Bruno, Melnyk, & Völckner, 2017; Lucht & Kasper, 1999), helping behaviors (Cunningham, 1979; Rind, 1996) and willingness to pay (Murray, Di Muro, Finn, & Leszczyc, 2010). Importantly, most of the existing research has typically examined the effects of actual weather (Bruno et al., 2017; Goetzmann & Zhu, 2005) and ambient temperature (Bruno et al., 2017; Murray et al., 2010). Given that anchoring serves as a heuristic in a cognitive process (Tversky & 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 use such heuristics in making decisions (Cheung, Kroese, Fennis, & De Ridder, 2017; Salmon, Fennis, de Ridder, Adriaanse, & De Vet, 2014).

The current research aims to extend the findings in this area 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, it is proposed that high (vs. low) temperature cues will increase higher levels of price valuations for a given product or service. However, this anchoring effect will be moderated by impulsivity. Further, positive affect will mediate the relationship.

Design/methodology/approach

The research consisted of two studies. Study 1 was a one-factor, six-level (temperature: 31, 32, 39, 81, 83, 89) between-subject design. Guests at a hotel in the United States participated in exchange for a chance to win an additional free night of accommodation. Study 2 was a one-factor, two-level (temperature: 35, 85) between-subject design, 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.

Findings

Findings demonstrate participants viewing high temperature cues ($M = 110.96$, $SD = 8.96$) reported higher levels of price valuations than did those viewing low temperature cues. In addition, a significant interaction between temperature and impulsivity was observed. Specifically, there were positive effects of temperature on price valuations at moderate and high levels of impulsivity. Similarly, moderated mediation analysis examined the indirect effect of temperature (high vs. low) on choice price, 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).

Originality and contribution of this paper

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. 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 & Boo, 2011). Moreover, most studies which examine the underlying mechanism of anchoring effects have focused on cognitive factors, including anchoring-and-adjustment (Tversky & Kahneman, 1974), selective accessibility (Chapman & 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.

MAIN PAPER

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 & 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 & Zhu, 2005; Jacobsen & Marquering, 2008), retail sales (Starr-McCluer, 2000; Steele, 1951), food consumption (Bruno, Melnyk, & Völckner, 2017; Lucht & Kasper, 1999), helping behaviors (Cunningham, 1979; Rind, 1996) and willingness to pay (Murray, Di Muro, Finn, & Leszczyc, 2010). Importantly, most of the existing research has typically examined the effects of actual weather (Bruno et al., 2017; Goetzmann & Zhu, 2005) and ambient temperature (Bruno et al., 2017; Murray et al., 2010).

The current research aims to extend the findings in this area 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, it is proposed that high (vs. low) temperature cues will increase higher levels of price valuations for a given product or service. However, this anchoring effect will be moderated by impulsivity. Further, 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.

Theoretical Background

Anchoring Effects of Temperature Cues

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, Wegener, Petty, Detweiler-Bedell, & Macy, 2008; McElroy & Dowd, 2007), legal judgments (Englich & Soder, 2009; Marti & Wissler, 2000), and purchase decisions (Ariely, Loewenstein, & Prelec, 2003; Wansink, Kent, & Hoch, 1998). The current research aims to extend the findings in this area by examining the anchoring effects of temperature cues on price valuations. Specifically, it is suggested when consumers view a temperature cue, that cue will influence their evaluations of unrelated products or services. As such, the following hypothesis is proposed:

H1: Participants who view high (vs. low) temperature cues will show higher levels of price valuations.

The Moderating Role of Impulsivity

Given that anchoring serves as a heuristic in a cognitive process (Tversky & 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 use such heuristics in making decisions (Cheung, Kroese, Fennis, & De Ridder, 2017; Salmon, Fennis, de Ridder, Adriaanse, & De Vet, 2014). In contrast, it is expected consumers with low levels of impulsivity are less likely to be influenced by heuristics. Building on these findings, it is

proposed that 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 show higher levels of choice price only in high levels of impulsivity condition.

The Mediating Role of Affect

Prior research has demonstrated the positive association between benign weather—higher temperature and sunlight—and positive affect (Cao & Wei, 2005; Cunningham, 1979; Murray et al., 2010). 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.

Study 1

The purpose of the 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.

Methods

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

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 (outside temperature 81°, 83°, 89° f) and three days in the winter (outside temperature 31°, 32°, and 39°f). Age, average number of stays per year, gender, number of people in party and annual income were measured as controls.

Results and Discussion

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 $< .001$)¹, providing support for H1.

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.

Methods

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.

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) ($\alpha = .97$) 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 ($\alpha = .98$) 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.

Results and Discussion

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 ($\beta = 41.42$, $SE = 4.83$, $t(97) = 8.57$, $p < .001$).

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 to 49.3589) and one SD above the mean level of impulsivity ($B = 112.85$, $SE = 13.61$, 95% CI: 85.8370 to 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 ($M = 6.88$, $SD = .26$) reported higher levels of positive affect than did those in the low temperature condition ($M = 3.93$, $SD = .25$, $p < .001$). Results are shown in Table 1.

< insert 'Table 1: Summary of results' here >

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 choice price, 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 to 59.7631) and one SD above the mean level of impulsivity ($B = 77.30$, $SE = 11.78$, 95% CI: 56.2462 to 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 to 22.8873). These findings provide strong support for Hypothesis 3.

General Discussion and Conclusion

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 & 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 & Marquering, 2008; Lazo et al., 2011; Murray et al., 2010). The current 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 & 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 & Kahneman, 1974), selective accessibility (Chapman & 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 is 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 & 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.

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)				

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