

Research Articles

Warm Ambient Scents Nudge Consumers to Favour Premium Brands and Right-Wing Parties

By Marcel Lichters, Susanne Adler, and Marko Sarstedt

Marketing has started exploring ambient scents' diverse effects and the psychological mechanisms through which they affect consumer behaviour. Recent research focuses on ambient scents' perceived temperature's impact on consumer behaviour. In this research, we first replicate prior research by showing that consumers exposed to a warm (vs. cool) ambient scent prefer premium over regular brands – also in an FMCG context. Broadening the perspective, we show that ambient scent's effect can be generalized to general elections. Specifically, we present initial evidence that the diffusion of a warm (vs. cool) ambient scent nudges potential voters to opt for right-wing instead of moderate political parties. We conjecture that the effect of perceived scent temperature on brand preferences and voting behaviour is a symbolic way of compensating for temperature perceptions.

sion-making in subtle, but powerful, ways – see, for example, Rimkute et al. (2016), Henshaw et al. (2016), and Luca and Botelho (2019) for comprehensive reviews. Given the numerous business cases providing ample evidence of scent marketing's potential (e.g., Abercrombie & Fitch, Singapore Airlines; see Lindstrøm 2005), the ambient scents industry has expanded very fast, showing an annual growth rate of 10 % (Elejalde-Ruiz 2014) and a total sales volume of more than USD 200 million (Girard 2017).

While ambient scents have become a visible element in marketing practice, marketing researchers have only recently started exploring their diverse effects and the psychological mechanisms through which they affect consumers' perceptions and behaviour (e.g., Biswas and Szocs 2019; Girard et al. 2019; Madzharov et al. 2018). An emerging research strand in the field focuses on odour-induced synaesthesia phenomena (Adams and Doucé 2017; Stevenson and Tomiczek 2007). According to this research, sensations in one modality (e.g., olfaction) can evoke a sensation in another modality, such as haptics (Speed and Majid 2018). Consumer researchers have paid special attention to the link between scents and temperature experiences (Luca and Botelho 2019). Research has more specifically shown that consumers semantically connect certain scents, such as vanilla and cedar wood, to

1. Introduction

Sensory marketing research has long established that ambient scents can influence consumer experience and deci-



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warm sensations, while relating others (e.g., mint, eucalyptus) to cold sensations (Adams and Douc   2017; Krishna et al. 2010; Lefebvre and Biswas 2019). Indeed, the mere presence of an ambient scent that is associated with warm (vs. cool) sensations can trigger the perception of a warm (vs. cool) ambient temperature (Madzharov et al. 2015), which, in turn, affects human perception and behaviour in numerous ways (Hadi and Block 2019; Ijzerman and Semin 2009; Sinha and Bagchi 2019; Tong et al. 2018). For example, Lefebvre and Biswas (2019) find that consumers exposed to a warm scent prefer high-calorie foods less than those exposed to a cool scent, because high-calorie food items are associated with an increase in body temperature. Furthermore, Madzharov et al. (2015) find that diffusing a warm (vs. cool) ambient scent in a retail environment induces consumers to spend more money on premium products or brands, which are symbolically linked to coldness (Park and Hadi 2020). While these studies offer valuable insights into scent temperatures' effect on consumer behaviour, research in this field is scarce and limited to a few product categories and consumption contexts. For example, it is as yet unclear whether the symbolic compensation of purchasing 'cold' premium products extends to those whose physical state prevents them from compensating for warmth (e.g., a hot cup of tea). In addition, prior research focused on durable products, which have a greater potential for signalling status than fast-moving consumer goods (FMCGs) such as foods, which entail a considerably lower risk for consumers (Lichters et al. 2016b). Finally, it is unclear whether the observed effects generalize to other aspects of consumer behaviour. Ongoing calls to broaden the scope of consumer research's perspective (Inman et al. 2018; Pham 2013) advocate a stronger inclusion of societal issues and expansion into public policy fields. These suggestions have recently gained traction via the growing field of transformative consumer research (Davis and Ozanne 2019) and include political activities (Korschun et al. 2020).

We address the calls for further research into the scent temperature domain (e.g., Lefebvre and Biswas 2019; Luca and Botelho 2019) and extend Madzharov et al.'s (2015) finding to two previously untested outcomes. First, we test scent temperature's effect on consumer preferences for coffee-to-go, which is typically served warm and, as such, does not physically provide coldness that would compensate for warm scent. In addition, as an FMCG, which is consumed within a short time frame before it cools off, coffee-to-go has limited means to signal status. That is, whereas the purchase of a premium durable product like a luxury watch or car is suited for signalling status over a long period of time and to many observers, coffee-to-go's potential in this regard is fast-fading. Second, we broaden the perspective by showing that the behavioural effects of a warm (vs. cool) ambient scent are not limited to purchase behaviour, but can be generalized to public policy fields. Specifically, we argue that voters who feel warmer may vote for parties with a

'colder' image, which distinguish themselves from the current political mainstream. In Western countries, these attributes and political aims are commonly associated with right-wing parties. We support this notion by presenting initial evidence that the diffusion of a warm (vs. cool) ambient scent nudges voters to opt for right-wing instead of moderate political parties. To exclude alternative explanations, such as spontaneous associations not related to scents' temperature dimension, we test the scent's effects in a controlled environment and consider multiple possible confounds, such as mood or scent perceptions unrelated to the perceived ambient scent temperature.

2. Theoretical background

In their seminal study, Madzharov et al. (2015) proposed and tested a comprehensive conceptual framework linking warm (vs. cool) ambient scents to consumers' preference for premium brands. These authors show that the scent-evoked feelings of warmth (vs. coldness) lead to a perception of a dense (vs. loose) social environment. [1] This finding supports research on ambient temperature showing that a higher (vs. lower) room temperature leads consumers to perceive higher levels of social proximity (Ijzerman and Semin 2010, 2009). The increased social density induces psychological dissonance, which triggers compensatory reactions in an effort to restore the intimacy equilibrium (Patterson 1976). Researchers have shown that increased social density decreases the perceived control that consumers experience over their social environment (Blut and Iyer 2020; Machleit et al. 2000). Consumers subsequently try to restore their power over the environment by engaging in power-compensatory purchase behaviour (e.g., Ma et al. 2019; Rucker et al. 2012). In line with this reasoning, Madzharov et al. (2015) find that consumers purchase more premium brands in environments with a warm (vs. cool) ambient scent.

Our work proposes a different, more parsimonious explanation of the psychological process leading to the selection of premium brands in warm (vs. cool) scented environments. Specifically, we assume that consumers strive to compensate for warm or cool temperatures. Consequently, their subsequent behaviours should be regarded as ways to feel cooler or warmer, which are not, as Madzharov et al. (2015) propose, necessarily driven by an extensive causal chain linked to social density and power restoration motivation.

For example, Hong and Sun (2012) show that physical coldness increases preferences for romantic movies. The authors attribute this behaviour to these movies' emotional warmth, showing that the effect is strongest in people who associate romantic movies with warmth as opposed to those who do not. Zhang and Risen (2014) show that feelings of coldness and warmth trigger consumers' need to return to a comfortable thermal state that, in turn, leads to a preference for activities that offset any imbal-

ance. Specifically, the authors show that participants favour socially warm activities when feeling cold. This link between temperature associations and attempts to preserve a comfortable thermal state is also evident in everyday language. For example, ‘giving someone the cold shoulder’ or the need for a ‘warm hug’ expresses an individual’s desire to symbolically maintain a comfortable level of inter-personal intimacy (Argyle and Dean 1965) through cold vs. warm temperature perceptions. Tying in with this research, Lefebvre and Biswas (2019) examined the differences between warm (cedar wood, cinnamon, and sandalwood) and cool (lavender, eucalyptus, and a composition called winter green) scents in a series of field and lab studies. Their results not only show that ambient scent manipulations lead consumers to feel warmer or cooler, but also that scents affect consumers’ food consumption behaviour in a way comparable to the effects induced by warm vs. cool ambient temperatures. For example, consumers in the warm (vs. cool) ambient scent condition consume more cool beverages and consume fewer high-calorie snacks (Lefebvre and Biswas 2019). The researchers attribute these changes to consumers’ attempts to regulate their body temperature.

This finding suggests that the effect of perceived scent temperature on premium purchases could be a symbolic way of compensating for temperature perceptions (see Fig. 1 for a comparison of our conceptual process as well as those of Madzharov et al. 2015 and Lefebvre and Biswas 2019). A recent study by Park and Hadi (2020) provides support for this notion. These authors show that premium products are semantically linked to coldness, thereby providing an indirect means of thermoregulation. As such, premium products are likely to compensate for warm temperature perceptions induced by warm ambient scents.

To summarize, warm (vs. cool) ambient scents modify consumers’ perception of the ambient temperature, which induces a need for temperature compensation. The latter entails stronger preferences for objects directly or

symbolically linked to coldness, such as premium brands (Park and Hadi 2020). Correspondingly, a cool ambient scent nudges consumers to prefer warm brands; that is, regular (non-premium) brands. We assume that this compensatory effect is symbolic and does not depend on the product’s actual physical temperature. For example, food products such as coffee, tea, mulled wine etc., which are typically served warm, provide no physiological cooling benefit.

We therefore propose:

H1: A warm (vs. cool) ambient scent leads to consumer preferences in favour of premium (vs. regular) brands.

Next, we seek to broaden the research scope by moving beyond the established purchase context. We propose that consumers’ need for thermoregulation generalizes to the public policy field. That is, we expect the effects of warm (vs. cool) ambient scents to extend to political elections as a societal topic. In line with our previous explanations, consumers exposed to warm (vs. cool) scents are expected to vote for parties semantically linked to coldness – a link that we establish in a separate pre-study. In Germany, these parties comprise right-wing parties whose policies often distinguish themselves intentionally from those of established parties by, for example, calling for highly restricted immigration and greater dissociation from the international community (Atzpödien 2020; Franzmann 2019; Kortmann and Stecker 2019), both of which are perceived as socially cold. For example, the right-wing party *Alternative für Deutschland* (AFD) generally incorporates less interpersonal warmth – in a sense of being likable, warm-hearted and good-natured – compared to other political parties (Blumenberg 2018).

Hence:

H2: A warm (vs. cool) ambient scent leads to voter preferences for right-wing rather than moderate political parties.

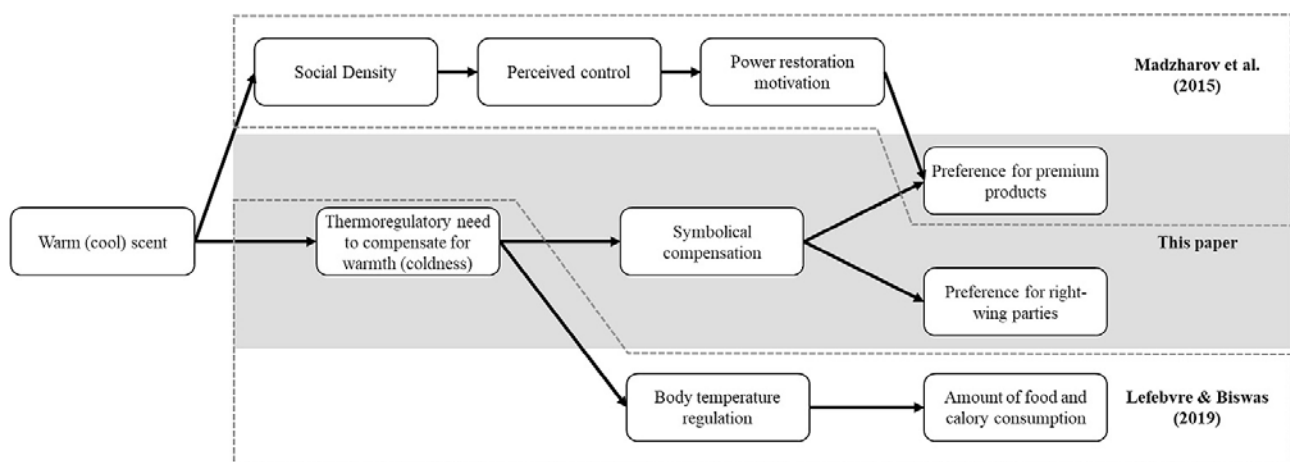


Fig. 1: Conceptual model of warm (vs. cool) scents’ effects on consumer behaviour and perception in comparison to Madzharov et al. (2015) and Lefebvre and Biswas (2019)

3. Methodology and pre-studies

3.1. Experimental design and technical setup

Our study's experimental design incorporates one between-subjects factor with two levels (cool vs. warm ambient scent). Following Adams and Doucé's (2017) findings on cross-modal scent perception, we chose vanilla as warm and peppermint as cool scents. *Scentcommunication*, a German professional fragrance manufacturer (<https://scentcommunication.com/en/>) provided us with corresponding scent gel cartridges (i.e., Vanilla/Caramel® and Peppermint®) appropriate for the company's Scense® electric ambient scent diffusers. The study was conducted in the experimental economics lab (MaXLab) of the Otto-von-Guericke University Magdeburg, Germany. The lab is fully air-conditioned and was scented with two diffusers during the experiment.

3.2. Sample

The sample ($n = 124$) consists of students and university staff who received a 6 € compensation for their participation, which was paid after the experiment. Participants had an average age of $mean_{age} = 24.08$ years, $SD = 3.53$ as well as a monthly net income of $mean_{income} = 798.97$ €, $SD = 396.63$. The distribution of gender was $n_{males} = 70$, $n_{females} = 53$, $n_{diverse} = 1$. In total, $n = 95$ were non-smokers. We provide further sample details in the supplementary material available in the Open Science Framework (OSF): <https://osf.io/5z2ta>.

3.3. Procedure and materials

After several general questions (e.g., sociodemographic), the computerized interview proceeded with an evaluation of *H1*. Specifically, we asked all the participants who consume coffee regularly ($n = 86$) to express their preference for a cup of coffee-to-go of a regular brand (*Tchibo*)


versus a premium brand (*Starbucks*) on a bipolar nine-point scale (Ma et al. 2019) – see Fig. 2.


To evaluate *H2*, the participants took part in a fictive election of the German parliament by voting for any of the political parties with at least one seat in any federal parliament at the time the study was conducted („Sonntagsfrage“). As in standard political opinion polls, the participants were asked to vote as if they were participating in the next German general election – see Fig. 3.

Subsequently, we asked the participants if they had noticed any special scent in the room (‘After entering the room, did you notice any special scent?’). Those participants who had consciously perceived the manipulation were then asked to state their spontaneous associations with the ambient scent (Krishna et al. 2010) in an open-ended question (‘Now, please focus on the ambient scent present in this room. State all words that come to your mind related to this scent spontaneously’). This was done to assess whether participants had spontaneous associations, which might confound the interpretation of results (e.g., if one scent is triggering concepts such as thirst, or a certain brand, but not the other scent). Furthermore, participants were asked to identify the most prominent ambient scent among a list of 15 items (text and images) that included vanilla and peppermint as well as several other scents such as lavender and cinnamon.

The same participants then evaluated the ambient scents' properties using a series of closed-ended questions. Specifically, we used established scales to measure the participants' perception of the scent's warmth (Adams and Doucé 2017; Madzharov et al. 2015), pleasantness and arousal (Bosmans 2006), familiarity (Morrin and Ratneshwar 2000), and intensity (Spangenberg et al. 1996). Finally, the participants rated their mood on the multidimensional mood questionnaire (Kosfeld et al. 2005;

Imagine that you want to buy a coffee to go. Which of the following brands below would you prefer?





Definitely Tchibo
Definitely Starbucks

123456789

☐☐☐☐☐☐☐☐☐

Fig. 2: Preference for a regular or a premium coffee-to-go brand (order was randomized)



Fig. 3: Choice between different parties (order was randomized)

Lichters et al. 2016a), the perceived indoor air quality (Zhang et al. 2011), the room's perceived warmth (Lefebvre and Biswas 2019), and the social density (Madzharov et al. 2015). The Appendix provides detailed information on all the scales (see Tab. A1). Likewise, we provide raw data and analysis scripts in the supplementary material available in the OSF (Lichters et al. 2021).

3.4. Pre-studies

In order to assess the consumers' perceptions of the coffee-to-go brands and political parties used in the main study (e.g., in terms of premium associations and coldness), we conducted two pre-studies – see Tab. 1 for an overview and main results.

In the first pre-study, myonlinepanel (<https://www.myonlinepanel.de/>), a professional market research agency, collected answers from $n = 141$ consumers (36.2 % females, $mean_{age} = 51.2$ years, see Tab. 1 for further details). To assess the coffee brands' perceptions, we confronted the participants with an image similar to Fig. 2, asking 'Which of the brands shown below would you describe as the more expensive premium brand for a Coffee-To-Go?' (nine-point scale, '1': Tchibo, '9': Starbucks). The results indicated that the participants perceived Starbucks as the more expensive premium brand in the context of coffee-to-go ($mean = 6.27$, $SD = 2.61$,

one-sample t-test against the scale's middle point: $t(140) = 5.79$, $p < .001$, $d = 0.49$).

A second online pre-study used a convenience sample of $n = 71$ (63.4 % females, $mean_{age} = 27.41$ years, see Tab. 1 for further details) consumers to gain further insights into consumers' perceptions about the involved brands (H1) and political parties (H2). This sample indicated that they perceive Starbucks as significantly colder than Tchibo (visual analogue slider scale with '1' = 'cold', '101' = 'warm'; $mean_{Starbucks} = 57.62$, $SD = 28.99$, $mean_{Tchibo} = 69.94$, $SD = 23.93$, paired t-test $t(70) = 2.86$, $p_{one-sided} = .003$, $d = 0.34$).

With regard to the perception of political parties, we conducted a focus group ($n = 8$) prior to the second pre-study to discuss the perceptions of the political parties involved. Based on the group consensus, we classified five of the 14 parties as unambiguously right-wing (AFD, Die Blaue Partei, Bürger in Wut, LKR, and NPD). The second pre-study supports this classification by showing that the participants on average perceived these five latter parties as more right-wing than the other parties (visual analogue slider scale with '1' = 'left', '101' = 'right', $mean_{right-wing} = 67.02$, $SD = 13.81$, $mean_{others} = 46.35$, $SD = 8.02$, paired t-test $t(70) = 12.70$, $p_{one-sided} < .001$, $d = 1.51$) and as colder than the other parties (visual analogue slider scale with '1' = 'cold', '101' = 'warm', $mean_{right-wing} = 29.98$, $SD =$

13.32; $mean_{others} = 49.62$, $SD = 12.07$, paired t -test $t(70) = 11.90$, $p_{one-sided} < .001$, $d = 1.41$).

4. Main study results

4.1. Preliminary analyses

After establishing the measures' reliability and validity by means of standard statistics (e.g., Cronbach's alpha, average variance extracted (AVE), and heterotrait-monotrait ratio of correlations (HTMT), see the supplementary material available in the OSF, Lichters et al. 2021), we compared the experimental groups with regard to differences in the participants' characteristics, mood, and perceptions (Lichters et al. 2016a).

Comparisons of the participants ($n = 124$, $n_{vanilla} = 65$, $n_{peppermint} = 59$) indicated no age differences between the groups (Welch's $t(121.89) = -0.35$, $p = .730$, $d = -0.06$), with the vanilla group's mean age being 24.19 years ($SD = 3.65$) and the peppermint group's mean age being 23.97 years ($SD = 3.41$). We find analogous results when only considering participants who consciously perceived the scent and whose sense of smell is not impaired ($n = 85$, $n_{vanilla} = 44$, $n_{peppermint} = 41$, overall: $mean_{age} = 23.98$ years, $SD = 3.52$, vanilla: $mean_{age} = 24.14$ years ($SD = 3.63$), peppermint: $mean = 23.80$ ($SD = 3.42$), Welch's $t(82.99) = -0.43$, $p = .666$, $d = -0.09$). There are also no group differences between the genders (vanilla: $n_{male} = 38$, $n_{female} = 26$, $n_{diverse} = 1$; peppermint: $n_{male} = 32$, $n_{female} = 27$, Fisher's exact test $p = .651$). The same holds

for the sample of participants who noticed the scent and whose sense of smell is not impaired (overall: $n_{male} = 51$, $n_{female} = 34$, vanilla: $n_{male} = 29$, $n_{female} = 15$; peppermint: $n_{male} = 22$, $n_{female} = 19$, Fisher's exact test $p = .275$). Furthermore, both groups were similar in terms of their monthly net income, federal state of origin, job status, smoking behaviour, scent notice, and self-reported scent sensitivity (smallest $p = .091$ for smoking behaviour, see supplementary material in the OSF for detailed statistics). However, the prevalence of an illness affecting the participants' sense of smell was higher in the peppermint than in the vanilla group ($n_{peppermint} = 5$, $n_{vanilla} = 0$, Fisher's exact test $p = .047$). [2]

According to the multidimensional mood questionnaire, the groups were also similar in terms of their mood, namely pleasantness (Cronbach's $\alpha = .91$, Welch's $t(118.14) = 0.32$, $p = .753$, $d = 0.06$), wakefulness (Cronbach's $\alpha = .90$, Welch's $t(121.81) = 1.50$, $p = .135$, $d = 0.27$), and calmness (Cronbach's $\alpha = .91$, Welch's $t(113.55) = 0.27$, $p = .786$, $d = 0.05$) as well as with regard to their perception of the overall air quality (Welch's $t(120.19) = -0.18$, $p = .854$, $d = -0.03$). We also found no group differences regarding social density. Specifically, the participants exhibited no differences regarding whether they think the room was occupied with many people (Welch's $t(94.87) = -1.01$, $p = .315$, $d = -0.21$) or whether they felt that they had little space around them (Welch's $t(94.96) = -0.32$, $p = .753$, $d = 0.06$).

We subsequently evaluated whether peppermint and vanilla scents differ in respect of properties other than their

Pre-study	Sample	Measurement	Results
Pre-study 1: Premium evaluation	$n = 141$, 36.2% females, $mean_{age} = 51.2$ years, $SD = 12.04$ Median net household income: €3,001 to €4,000 per month Profession: Employee: 68.8% Pensioner: 21.3% Self-employed: 6.4% Homemaker: 2.8% Currently searching for a job: 0.7%	Indicate which brand is the more expensive premium brand on a nine-point scale, '1': Tchibo, '9': Starbucks	$mean = 6.27$, $SD = 2.61$, one-sample t -test against the scale's middle point, i.e. '5': $t(140) = 5.79$, $p < .001$, $d = 0.49$
Pre-study 2: Temperature evaluation	$n = 71$, 63.4% females, $mean_{age} = 27.41$ years, $SD = 7.09$ Medium net income: €1,001 to €1,500 per month Profession: Student: 69.0% Employee: 23.9% Self-employed: 1.4% Homemakers: 1.4% Currently searching for a job: 4.2%	Indicate perceived level of coldness/warmth on visual analogue slider scale, '1' = 'cold', '101' = 'warm'	Starbucks vs. Tchibo: $mean_{Starbucks} = 57.62$, $SD = 28.99$, $mean_{Tchibo} = 69.94$, $SD = 23.93$, paired t -test $t(70) = 2.86$, $p_{one-sided} = .003$, $d = 0.34$ Right-wing vs. other parties: $mean_{right-wing} = 29.98$, $SD = 13.32$, $mean_{others} = 49.62$, $SD = 12.07$, paired t -test $t(70) = 11.90$, $p_{one-sided} < .001$, $d = 1.41$
		Indicate party's position on a visual analogue slider scale, '1' = 'left', '101' = 'right'	$mean_{right-wing} = 67.02$, $SD = 13.81$, $mean_{others} = 46.35$, $SD = 8.02$, paired t -test $t(70) = 12.70$, $p_{one-sided} < .001$, $d = 1.51$

Tab. 1: Sample description and main results (pre-studies)

perceived warmth or coldness, which might have confounded the interpretation of the participants' behaviour as reported later – a step neglected in other studies on ambient scents' temperature dimension. [3] We find that the two scents do not differ in terms of their pleasantness (Cronbach's $\alpha = .92$), familiarity, and perceived intensity (smallest $p = .193$, see the supplementary material in the OSF for further details). We tested the arousal scale's items separately due to the scale's low internal consistency (Cronbach's $\alpha = .29$) and find that participants perceived the vanilla scent's arousal in one out of four items (seven-point scale: -3: 'relaxed', +3: 'tense'; $mean = -1.36$, $SD = 1.57$) as lower than that of the peppermint scent ($mean = -.39$, $SD = 1.61$, Welch's $t(82.24) = 2.82$, $p = .006$, $d = 0.61$, all other differences regarding arousal's items: smallest $p = .091$). [4]

Aided identification of the peppermint scent ($n = 20$, 70.7 %) was higher than for vanilla ($n = 21$, 47.7 %, Fisher's exact test $p = .047$, $\Phi = -.23$). To gain more insights into the participants' spontaneous associations with the scents, we classified their qualitative responses to the open question into 26 categories (e.g., 'cold', 'mint', 'sweet', etc.). We subsequently applied Fisher's exact tests with a Bonferroni correction. Our results show that peppermint triggered the overarching category 'mint/eucalyptus' significantly stronger (75.6 %) than vanilla did (4.5 %, $p < .001$). The same holds for the category 'gum/toothpaste' (31.7 % vs. 4.5 %, $p = .034$). We observe the opposite pattern in terms of 'vanilla' (0 % vs. 38.7 %, $p < .001$) and 'sweet' (4.9 % vs. 36.4 %, $p = .010$). Overall, these results support the scent manipulation's validity and suggest that adverse scent associations in other dimensions than temperature, such as 'taste/hunger' ($p = 1$), or 'coffee' ($p = 1$) do not affect them. Importantly, none of the participants did associate the ambient scent with a certain brand.

A manipulation check assessed whether the participants did indeed perceive vanilla as warmer than peppermint. On a bipolar seven-point scale (Madzharov et al. 2015, 1: 'cool,' 7: 'warm'), the participants first rated vanilla as significantly warmer ($mean_{vanilla} = 4.09$, $SD = 1.78$ vs. $mean_{peppermint} = 2.24$, $SD = 1.20$, Welch's $t(75.86) = -5.65$, $p < .001$, $d = -1.21$). We obtained the same results from a visual analogue slider scale (Adams and Doucé 2017) with the two anchors 0: 'cold' and 100: 'hot' ($mean_{vanilla} = 44.52$, $SD = 19.01$ vs. $mean_{peppermint} = 24.80$, $SD = 20.07$, Welch's $t(81.71) = -4.64$, $p < .001$, $d = -1.01$).

In a next step, we evaluated whether the participants in the warm scent condition experienced the environment as warmer than in the cold scent condition. Their responses on a nine-point bipolar scale (1: 'cold,' 9: 'warm'; e.g., Lefebvre and Biswas 2019) show that they perceived the environment as significantly warmer in the warm scent condition, regardless of whether we only considered those participants who perceived the scent

consciously and whose sense of smell is not impaired ($mean_{vanilla} = 4.64$, $SD = 1.35$ vs. $mean_{peppermint} = 3.78$, $SD = 1.29$, Welch's $t(82.92) = -2.99$, $p = .004$, $d = -0.65$), or analysed all of the participants ($mean_{vanilla} = 4.59$, $SD = 1.32$ vs. $mean_{peppermint} = 3.83$, $SD = 1.33$, Welch's $t(94.94) = -2.82$, $p = .006$, $d = -0.57$). Importantly, the marginal differences in the actual room temperature (°C) across the experimental sessions in the fully air-conditioned labs do not explain these results ($mean_{vanilla} = 24.66$, $SD = 0.32$ vs. $mean_{peppermint} = 24.44$, $SD = .32$).

4.2. Hypotheses tests

Due to *H1* and *H2* being directed hypotheses, we test them for statistical significance applying directed test procedures (e.g., one-tailed t-tests). We first analysed whether warm (vs. cool) scent induces temperature-compensatory purchasing behaviour as evidenced by stronger preferences for premium vs. regular brands (*H1*). An analysis of the coffee-to-go scenario supports this notion. Specifically, consumers who regularly consume coffee and who consciously perceived the ambient scent show a significantly stronger preference for the premium brand *Starbucks* than for the regular brand *Tchibo* (expressed through a higher rating on the scale shown in Fig. 2) in the warm scent condition than in the cool scent condition ($mean_{vanilla} = 6.41$, $SD = 2.48$, vs. $mean_{peppermint} = 5.03$, $SD = 2.58$, Welch's $t(61.90) = -2.20$, $p_{one-sided} = .016$, $d = -0.55$). These results remain robust when also taking participants who did not perceive the ambient scent consciously into consideration ($mean_{vanilla} = 6.15$, $SD = 2.61$ vs. $mean_{peppermint} = 5.03$, $SD = 2.62$, Welch's $t(81.01) = -1.98$, $p_{one-sided} = .025$, $d = -0.43$). Thus, supporting *H1*, the diffusion of a warm (vs. cool) scent leads to a higher relative preference between both brands in favour of the premium brand *Starbucks*.

To evaluate *H2*, we combined all the votes for the right-wing parties (AFD, Die Blaue Partei, Bürger in Wut, LKR, and NPD) and compared them with those for all the other parties. Tab. 2 provides a breakdown of choices for parties classified either as left or right-wing or moderate.

A directed Fisher's exact test of those participants who perceived the scents consciously supports *H2*. Specifically, in the warm scent condition, 11.4 % of the participants voted for right-wing parties, whereas nobody did in the cool scent condition ($p_{directed\ test} = .033$, $\Phi = .24$). Again, these results also remain robust when adding the participants who did not perceive the ambient scent manipulation consciously (warm scent: 10.2 % vs. cool scent: 0 %, $p_{directed\ test} = .030$, $\Phi = .23$). A similar analysis of more pro-social, left-wing parties (SPD, Die Grünen,

	Left-wing	Moderate	Right-wing
Warm scent (vanilla)	28 (63.6%)	11 (25.0%)	5 (11.4%)
Cool scent (peppermint)	28 (68.3%)	13 (31.7%)	0 (0.0%)

Tab. 2: Political election results for the reduced sample

Die Linke, and *Die PARTEI*) did not indicate a relationship between scent and voting behaviour (warm scent: 63.6 % vs. cool scent: 68.3 %: $p = .819$, $\Phi = -.05$; full sample: warm scent: 65.3 % vs. cool scent: 70.8 %: $p = .664$, $\Phi = -.06$).

5. Discussion

5.1. Theoretical and managerial implications

In this study, we first replicate ambient scents' temperature synaesthesia effects by showing that exposure to a warm scent (vanilla) vs. a cool scent (peppermint) leads consumers to perceive the environment as warmer. Furthermore, as previous marketing research has shown (Madzharov et al. 2015), we too find that a warm (vs. cool) ambient scent induces a preference for premium over regular brands. Extending prior research, which explains these effects as the result of increased social density perceptions and resultant power restoration motives, we show that the tendency to opt for premium rather than regular brands also applies to relatively cheap and riskless products, such as coffee-to-go. Obviously, such FMCGs provide little opportunity to restore one's perceived power by signalling their status publicly over a long period of time (Rucker et al. 2012). We also provide evidence that warm (vs. cool) ambient scents impact consumers' preference for premium vs. regular brands, even in the absence of increased social density perceptions. We combine two research strands and propose an alternative explanation. On the one hand, research (Lefebvre and Biswas 2019) has shown that consumers exposed to a warm (vs. cool) ambient scent try to maintain their perceived body temperature (i.e., a thermoregulatory motivation) by engaging in compensatory behaviours. On the other hand, research has shown that premium (vs. regular) brands are conceptually linked to perceived coldness, irrespective of the products' actual temperatures (Park and Hadi 2020). Combining the two research strands implies that consumers' thermoregulatory motivations explain a stronger preference for cool premium vs. warm regular brands under a warm ambient scent well. Importantly, we show that thermoregulatory motivations function symbolically, even if the product fostering the regulation is actually hot. Consequently, under a warm ambient scent, consumers tend to opt for premium brands (i.e., *Starbucks* as opposed to *Tchibo*), because the former brand is semantically linked to perceived coldness (Park and Hadi 2020). As such, our work extends previous research on the thermoregulatory power of ambient scents, which has to date only focused on preference for products that actually impact body temperature (Lefebvre and Biswas 2019).

The same mechanism applies to general elections. Here, we first show – by means of an online pre-study – that, on average, German voters perceive right-wing parties as colder compared to other parties. Accordingly, we

proposed that a warm (vs. cool) ambient scent triggers voters to favour these party brands, because they symbolically provide coldness. In line with this hypothesis, we find that consumers in the warm (vs. cool) scented room show a greater preference for right-wing parties. These right-wing parties, such as the *Alternative für Deutschland* (AFD), diverge from the political mainstream by demanding a more nationalistic, globalization-critical course of action (Atzpodien 2020; Franzmann 2019; Kortmann and Stecker 2019). In doing so, they campaign for a greater dissociation from the international community, which is often perceived as socially cold. This notion is not only reinforced by social psychological research linking (social) distance to coldness (Ijzerman and Semin 2010, 2009), but also on an individual's level by the positive relationship between party identification and perceived warmth (Blumenberg 2018).

Our study also has several important managerial implications. Ambient scents provide an affordable means of creating favourable store atmospherics and impacting consumer behaviour (Spence et al. 2014). We replicate and extend prior research (Madzharov et al. 2015) by showing that consumers' preference for premium brands varies as a function of the perceived scent temperature – also in the context of FMCGs and even for brands of products that are physically warm. Moreover, we present initial evidence for the notion that this effect unfolds regardless of whether consumers notice the scent or not. Therefore, these effects also raise the question of the ethical standards of applying scent usage in servicescapes. This concern is especially relevant, since their consumers cannot evade the scent's effects (Bradford and Desrochers 2009; Lunardo and Mbengue 2013). In addition, we find that scent tends to affect potential voters' preferences for political parties. This finding has important public policy implications, as German legislation forbids any influence on voters in (and in close proximity of) polling stations in the form of pictures, logos, speeches, etc. (§ 32 *Bundeswahlgesetz*). Our results suggest that the *Bundeswahlgesetz* may need to be extended to also include potential olfactory or thermal manipulations.

5.2. Limitations and further research

Our study framework (see also *Fig. 1*) follows behavioural decision theory's central tenet that consumer preferences are partially constructed when decisions are made rather than retrieved from memory (Bettman et al. 1998). In fact, research on scents has shown that manipulations of ambient scent are able to impact the construction process with or without consumers being aware of this influence (e.g., Girard et al. 2019; Holland et al. 2005; Li et al. 2007). Nevertheless, the power of such manipulations is not without limitations. Specifically, researchers argue that strong a priori attitudes regarding specific choice options create a boundary condition for manipulation attempts (e.g., Eagly and Chaiken 1993; Petrocelli et al. 2007). That is, „strongly held attitudes are more likely to

remain unchanged over time, to persist across different contexts, and to resist persuasion attempts” (Yoon and Simonson 2008, p. 325). With regard to our analysis of preferences for coffee-to-go brands (*H1*) and political parties (*H2*), we would therefore expect that primarily those consumers without strongly held attitudes *a priori* are prone to the effect of warm vs. cool ambient scent. Similarly, we suggest that for brands which occupy strong and persistent attitudes in consumers’ mind, it is harder to nudge consumer preferences away from these brands as compared to weaker brands (Sinn et al. 2007). Our results offer support for this notion as we find pronounced preferences for *Starbucks* (i.e., the stronger of both brands) under warm, but not for *Tchibo* under cool ambient scent. Future research should explicitly examine the impact of *a priori* preferences in this regard. The same applies to consumers’ political voting behaviour. Research in the political sciences have long recognized that political choices do not reflect well-formed prior beliefs but are rather constructed on the fly (Bullock and Lenz 2019), particularly among young voters like those in our sample. Nevertheless, given the societal and legal implications of our results, future research should not only replicate our results (e.g., using a non-student sample), but also explicitly assess how *a priori* voting preferences impact consumers’ susceptibility to scent manipulations in their political voting behaviour. In doing so, researchers should establish and test a more elaborated theoretical underpinning of the underlying thermoregulatory effects (scent → perceived ambient temperature → need for temperature regulation → consumer behaviour).

While we successfully extended prior research on a warm (vs. cool) ambient scent’s effect on preference for premium brands to comparatively low-priced FMCGs, it would also be interesting to investigate this effect’s magnitude given premium brands’ signalling qualities. For example, Han et al. (2010) report that consumers’ preferences for conspicuously vs. inconspicuously branded luxury products depend on their need for status. Branding and consumers’ personal need for status may therefore serve as moderators. Likewise, future researchers should consider possible effects arising from prevalent colour themes used in product design and brand logos. In our coffee-to-go example (Fig. 2), the design of *Starbucks*’s logo features white as a cold colour. Colour-induced effects might interact with the perceived prestige of brands in the thermoregulatory process proposed here. On a related note, it would be interesting to shed further light on the symbolic compensa-

tion process underlying the observed preference difference. Most notably, future studies should evaluate whether the proposed symbolic thermoregulatory process is also relevant in situations where consumers can physically experience the products prior to their decision (e.g., grabbing a can of cold lemonade from a supermarket’s refrigerated shelf).

Furthermore, it would be interesting to see how a perceived ambient scent’s temperature influences consumer preferences in the service marketing domain. Early scent studies, for example, show that consumers perceive a massage to be of a better service quality if a warm scented massage oil is used (Baeyens et al. 1996). Based on our results, we speculate that warm vs. cool ambient scents may foster consumers’ preference for cool (vs. warm) service experiences. For example, it should be possible to nudge consumers to book access to a hotel’s sauna landscape via a cool-scented hotel lobby.

We assessed consumers’ perceptions of the brands and parties only in the course of two pre-studies. Including these evaluations in the main study would have allowed for a more robust assessment of the conceptual model. Hence, future research should opt for a design that allows for an evaluation of the whole causal chain at the individual level (e.g., via multiple experimental sessions with distractor tasks in-between).

Finally, analysing the impact of scent temperature on consumers’ information processing style (i.e., global, relational vs. a local, analytical) could be a promising approach to pinpoint the underlying effects. Research could profit from this account to gain an understanding of how consumers choose goal attainment strategies as well as provide an overarching theory bridging multifaceted compensatory effects (e.g. Hong and Sun 2012; Lefebvre and Biswas 2019; Madzharov et al. 2015; Rucker et al. 2012).

Notes

- [1] The concept of social density describes a metacognitive perceptual evaluation of how many individuals are present, the physical proximity between them, and the environment’s overall spaciousness (Eroglu and Machleit 1990).
- [2] Illness did not affect the dependent variables (smallest $p = .091$; see the Supplementary OSF Material for further details).
- [3] This analysis only involved those participants whose sense of smell was not impaired and who perceived the ambient scent manipulation consciously.
- [4] This item did not affect the dependent variables (smallest $p = .209$; see the supplementary material in the OSF for further details).

Appendix

Construct	Item	Mean (SD)		English wording	German wording
		Full sample	Reduced sample ^m		
Brand preference (coffee-to-go) ^a	1	5.64 (2.66)	5.75 (2.60)	Imagine that you want to buy a coffee-to-go. Which of the following brands below would you prefer?	Stell dir bitte vor, du würdest genau jetzt gerne einen Coffee-To-Go kaufen wollen. Für welche der unten abgebildeten Marken würdest du dich entscheiden?
Voting in political elections ^b	1	NA	NA	Imagine that today is the Germany parliamentary election and you can choose one of the parties listed below. Which party would you choose?	Stell dir vor, heute wäre Bundestagswahl, und du kannst dich für eine der unten aufgeführten Parteien entscheiden. Welche Partei würdest du wählen?
Perceived ambient scent temperature rating ^c	1	NA	3.20 (1.78)	In my opinion, the predominant smell in this room is... Cool vs. Warm	Meiner Meinung nach ist der vorherrschende Geruch in diesem Raum... Kühl vs. Warm
Perceived ambient scent temperature (visual analogous slider) ^d	1	NA	35.01 (21.80)	In my opinion, the predominant smell in this room is... Cool vs. Hot	Meiner Meinung nach ist der vorherrschende Geruch in diesem Raum... Kalt vs. Heiß
Perceived ambient scent pleasantness ^e	1	NA	1.08 (1.4)	In my opinion, the predominant smell in this room is... Bad vs. Good	Meiner Meinung nach ist der vorherrschende Geruch in diesem Raum... Schlecht vs. Gut
AVE = 0.69 ⁿ $\alpha = 0.92$	2	NA	0.89 (1.7)	Unpleasurable vs. Pleasurable	Unangenehm vs. Angenehm
	3	NA	0.69 (1.6)	Uncomfortable vs. Comfortable	Ungemäßlich vs. Gemütlich
	4	NA	1.08 (1.5)	Negative vs. Positive	Negativ vs. Positiv
	5	NA	0.58 (1.5)	Unattractive vs. Attractive	Unattraktiv vs. Attraktiv
Perceived ambient scent arousal ^f	1	NA	0.89 (1.3)	Unlively vs. Lively	Nicht lebhaft vs. Lebhaft
	2	NA	0.91 (1.5)	Dull vs. Bright	Trübe vs. Hell
	3	NA	-0.89 (1.7)	Relaxed vs. Tense	Entspannt vs. Angespannt
AVE = -0.90 $\alpha = 0.24$	4	NA	0.99 (1.2)	Boring vs. Stimulating	Langweilig vs. Stimulierend
Perceived ambient scent intensity ^g	1	NA	5.28 (1.11)	How intense is the smell in this room?	Wie intensiv ist der Geruch in diesem Raum?
Multidimensional mood questionnaire ^h (MDMQ) – pleasantness	1	3.6 (0.94)	3.6 (0.97)	Please take a look at the list, word by word, and mark for each word the answer that represents best the actual intensity of your mood status. Right now I feel...Satisfied	Bitte gib an, inwieweit die unten aufgeführten Wörter deine derzeitige Stimmung widerspiegeln. Im Moment fühle ich mich...Zufrieden
	2	4.5 (0.67)	4.4 (0.69)	Bad (reversed)	Schlecht
	3	3.9 (0.89)	3.8 (0.85)	Good	Gut
	4	4.4 (0.89)	4.3 (0.90)	Uncomfortable (reversed)	Unwohl
AVE = 0.56 $\alpha = 0.91$	5	3.7 (0.92)	3.7 (0.91)	Comfortable	Wohl
	6	4.3 (0.90)	4.3 (0.94)	Unhappy (reversed)	Unglücklich
	7	4.2 (1.03)	4.1 (1.12)	Unsatisfied (reversed)	Unzufrieden
	8	3.6 (0.90)	3.6 (0.86)	Happy	Glücklich
	1	3.1 (1.13)	2.9 (1.11)	Rested	Ausgeruht
	2	3.7 (1.04)	3.6 (1.07)	Weak (reversed)	Schlapp
	3	3.5 (1.07)	3.4 (1.06)	Tired (reversed)	Müde
	4	3.3 (0.98)	3.2 (0.93)	Lively	Munter
MDMQ – wakefulness	5	1.7 (1.08)	3.6 (1.08)	Sleepy (reversed)	Schläfrig
	6	3.5 (0.95)	3.4 (0.93)	Awake	Wach
	7	3.2 (1.05)	3.2 (1.08)	Fresh	Frisch
	8	3.8 (1.06)	3.8 (1.07)	Exhausted (reversed)	Ermattet
MDMQ – calmness	1	3.9 (1.20)	3.8 (1.17)	Restless (reversed)	Ruhelos
	2	3.7 (1.02)	3.7 (0.95)	Serene	Gelassen

Tab. A1: Item wordings, translation and construct assessment in the main study.

Perceived indoor air quality ^f	1	73.06 (22.60)	72.35 (23.96)	I think the current air quality in this room is... very bad vs. very good	Ich empfinde die Luftqualität in diesem Raum als... sehr schlecht vs. sehr gut
Perceived warmth ^f	1	4.22 (1.37)	4.22 (1.38)	How cold/warm are you right now?	Ist dir gerade kalt/warm?
Room full of people ^k	1	3.10 (1.42)	3.07 (1.41)	Now, please focus on your surroundings. Does it seem there are a lot of people around you right now?	Bitte konzentriere dich nun auf deine Umgebung. Wie voll mit Menschen ist dieser Raum deinem Empfinden nach?
Perception of little space ^k	1	2.95 (1.58)	2.99 (1.64)	Now, please focus on your surroundings. How spacious do you think this room is?	Bitte konzentriere dich nun auf deine Umgebung. Wie wenig Platz hast du um dich herum?
Scent familiarity ^f	1	NA	5.25 (1.57)	The smell is familiar to me.	Der Geruch ist mir vertraut.

Notes:

^a 9-point Likert scale Ma et al. (2019) ranging from 1 (*Definitely Tchibo*) to 9 (*Definitely Starbucks*).

^b Select one out of 14 German parties in a forced-choice design.

^c 7-point Likert scale by Madzharov et al. (2015) ranging from 1 (*cool scent*) to 7 (*warm scent*).

^d Slider scale by Adams and Doucé (2017) with verbal anchors of *cold* and *hot* at both ends.

^e 7-point semantic differential scale by Bosmans (2006) ranging from -3 to +3, German translations according to Girard et al. (2019).

^f 7-point semantic differential scale by (Bosmans 2006) ranging from -3 to +3, German translations according to Girard et al. (2019).

^g 7-point semantic differential scale by Spangenberg et al. (1996) ranging from -3 (*very weak*) to +3 (*very strong*), German translations according to Girard et al. (2019).

^h 5-point Likert scale by Steyer et al. (1994) and adapted by Lichters et al. (2016a) ranging from 1 (*not at all*) to 5 (*very*).

ⁱ Visual analogous slider scale by Zhang et al. (2011) with verbal anchors of *very bad* and *very good* at both ends.

^j 9-point Likert scale by Lefebvre and Biswas (2019) ranging from 1 (*cold*) to 9 (*warm*).

^k 7-point Likert scale by Madzharov et al. (2015) ranging from 1 (*not at all*) to 7 (*very*).

^l 7-point Likert scale by Morrin and Ratneshwar (2003) ranging from 1 (*fully disagree*) to 7 (*fully agree*).

ⁿ AVE = Average variance extracted.

^m Participants whose sense of smell was not impaired and who consciously perceived the ambient scent.

Tab. A1 (continued)

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