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The Power of Consequential Product Sounds

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Abstract

Building on theory in sensory marketing, mental simulation, and cue diagnosticity, this research investigates when consequential product sounds, or ancillary sounds generated by the normal operation of a product, can impact customers' perceptions and behavioral intentions. Across four studies, we demonstrate how consequential product sounds coupled with imagery and phrasing of products *in use* can encourage customers into a mental space in which they can clearly envision using the product, also known as a process mindset. This mindset allows customers to use the amplitude of the consequential product sound to make inferences about its power, and subsequently enhances their willingness to pay for louder products (versus quiet products or those with no sound). Effects are attenuated when customers are encouraged into an outcome mindset, or a mental space in which they only consider the end benefits of using a product. We provide clear theoretical and managerial implications and, based on our findings, propose that retailers should consider incorporating consequential product sounds into customers' shopping experiences, as these auditory cues can help to encourage a process mindset and thereby, positively impact customers' willingness to pay.

Keywords: Mental Simulation; Sensory Marketing; Audition; Willingness to Pay; Virtual Reality; Online Shopping

The study of sensory marketing has gained influence as retailers realize the importance of providing customers with product information via their five senses. Sensory information influences customer experiences (Biswas 2019), and operates as a diagnostic cue customers can use to draw conclusions about products they intend to purchase (Bone and Ellen 1999). For example, visual cues such as color can impact perceptions of taste (Hoegg and Alba 2007) and attitudes (Aydinoglu and Krishna 2019). In addition, the scent of a hotel room can impact perceptions of cleanliness (GTP 2005; Holland et al., 2005). Further, touching a sweater can impact perceptions of texture, hardness, and weight (Klatzky and Lederman 1992, 1993), and touching food before consumption can increase hedonic evaluations (Madzharov 2019). While taste, scent, and touch have proven to be powerful sources of information for customers in their purchase decisions, these senses cannot be readily used as diagnostic cues in online retail channels. As customers spend increasing amounts of time shopping and researching products online (Bleier et al., 2019), it is imperative that retailers offer useful sensory product cues that can be experienced in the digital marketplace. One such cue which can be easily experienced online and through virtual shopping experiences, is auditory, or sound cues.

Prior audition research has focused on the use of sound in advertising, background music, sonic branding, language, and food consumption (Krishna 2013; Meyers-Levy 1989; Milliman 1982; Zampini and Spence 2004, 2005), yet, we are unaware of any work that has focused on the role of ancillary product sounds. Consequential product sounds, or the sounds of products *in use* are a potential source of pre-purchase product information. Our research investigates the effects of sounds generated by the normal operation of a product, resulting from moving parts and generally experienced as "noise" (Langeveld et al. 2013). Specifically, we explore how consequential product sounds coupled with imagery and phrasing of products in use can encourage customers into a mental space in which they can clearly envision using the product, also known as a process mindset (Escalas and Luce 2003). This mindset allows customers to use the amplitude of the consequential product sound to make inferences about its power, and subsequently enhances their willingness to pay. Given that nearly all products produce a consequential sound

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when in use, a richer understanding of how consequential product sounds impact customer perceptions and ultimately their behavioral intentions, is both relevant and necessary for retail managers and researchers alike. Moreover, as managers attempt to quantify how sensory marketing strategies can affect the bottom line (Businesswire 2019), research is needed to understand the connections between sensory cues and important financial outcomes, such as customers' willingness to pay.

To address these gaps in our knowledge, we build on theory in mental simulation and sensory marketing to demonstrate *when* customers are influenced by auditory cues prior to purchase. Our research contributes empirical evidence to the sensory marketing literature in the understudied area of audition, and advances the idea that when in a process mindset, hearing consequential product sounds can influence customer perceptions of product power, and this results in an enhanced willingness to pay for louder products (versus quiet products or those with no sound). In addition, we find that effects are attenuated when customers are encouraged into an outcome mindset, which is a mental space where customers only consider the end benefits of using a product (Escalas and Luce 2003). Further, by illustrating that mental simulation effects hold across online and virtual reality product showrooms, we contribute actionable insights to retail managers on the benefits of incorporating consequential product sounds into their customers' digital shopping experiences.

THEORETICAL FRAMEWORK

Audition and Mental Simulation

Audition, or sound, has three distinct properties, each of which can be manipulated to change customer perceptions. The first property is frequency, or how many cycles per second the sound wave goes through, and is often perceived as its pitch (Krishna 2013; Lowe et al., 2018). The second property of sound is harmonics, or timbre (Bruner 1990). Timbre can be understood as the tone quality of a sound that allows a listener to differentiate one sound from another. The third property of sound is amplitude. Amplitude is measured in decibels and is perceived as the loudness or softness of the noise (Bruner 1990; Krishna 2013).

Prior amplitude research focused on background music in restaurants, and findings revealed that quieter (vs. louder) music can lead to higher expenditures on food and beverages (Sullivan 2002). Surprisingly, little work has investigated the effects of amplitude on consumer behavior beyond the study of background music. Our research aims to remedy this knowledge gap by clarifying when the amplitude of consequential product sounds can function as diagnostic cues which ultimately influence customers' behavioral intentions, including their willingness to pay. Specifically, we believe that when customers are in a process mindset, consequential products sounds will produce the greatest impact on customers' behavioral intentions.

The theory of mental simulation links actions and outcomes in a causal fashion via a narrative that unfolds within the customer's mind (Pennington and Hastie 1986). There are two types of mental simulation: process mindsets and outcome mindsets (Escalas and Luce 2004). A process mindset makes the step-by-step process of engaging in an activity salient, while an outcome mindset makes the outcome of performing that activity salient (Escalas and Luce 2003). Prior research demonstrates that a process mindset is more effective, as this type of mental simulation encourages individuals to spontaneously create a plan before they begin an activity (Escalas and Luce 2003). Moreover, a process mindset forges "action-outcome links" which allow consumers to rehearse a narrative for success (e.g., "If I engage in actions x and y, then I will achieve outcome z"), while an outcome mindset merely allows consumers to reach the end of the story without any details regarding how they arrived there (Escalas and Luce 2004). For instance, after viewing an advertisement, customers with a process mindset made plans to purchase the advertised items, and reported higher purchase intentions as compared to customers who viewed the advertisement with an outcome mindset (Escalas and Luce 2003).

A process mindset promotes a dual focus on both the actions to be taken as well as the outcome of those actions. That is, when encouraged to think in a process mindset, customers mentally simulate both the means and the end benefits of an activity (Thompson et al., 2009). Conversely, when encouraged to think in an outcome mindset, customers only consider the end benefits of the activity (Escalas and Luce 2003, 2004).

Given this evidence, we propose that when customers hear a consequential product sound, they are encouraged to focus on the product in use as consequential product sounds result from the operation of a product, encouraging them to mentally simulate how they would use the product (the means) as well as the outcome of using the product (the end benefits). When combined with images and phrasing that cue the product in use, increased process-oriented thoughts should lead to action-outcome plans, resulting in stronger behavioral intentions such as willingness to pay for the product.

Cue Diagnosticity and Power

The cue diagnosticity framework suggests that customers base their decisions on information that is both accessible and diagnostic (Hoegg and Alba 2007; Lynch et al., 1988). Past research in this area focuses on cues which help customers assess product quality when it is not readily observable, such as the information conveyed via a brand name, price, advertising, or retailer reputation (Aaker 1996; Grewal et al. 1998; Kirmani 1990; Olson 1977). However, the use of cues varies with their diagnosticity (Purohit and Srivastava 2001). The diagnosticity of a particular cue is based on the reliability of the cue in discriminating between alternative interpretations; such that as diagnosticity increases, there is a higher likelihood that it will be used in assessments of the product (Dick et al., 1990). In other words, if the customer knows that Apple is a brand that represents a high-quality product, then brand name would be diagnostic as the cue is easy to interpret. But, if the customer is faced with using the less well-known brand Belk, this may be less diagnostic as the quality varies based on the product purchased from this retailer.

Cues can also be used to assess specific underlying attributes, which are attributes that cannot be assessed without first using the product (Milliken and Martins 1996). We suspect that for many customers, product power may be an underlying attribute because it must be experienced in order to be meaningful. That is, products must be heard and visualized in use, in order for customers to draw inferences about their power. The engineering literature defines power as the rate at which electrical energy is transformed by a product in order to perform a task (Russell et al. 2011). Products that transform energy at a higher rate are considered more powerful and tend to be louder when performing their operations. For instance, a jet engine is more powerful than an electric toothbrush and would produce a greater volume of sound when operating. Moreover, when purchasing products with motors, customers naturally expect sounds to emanate from vibrating materials inside products, with more vibration causing sound waves with greater volume which are associated with greater energy and power (Gaver 1993).

In the engineering literature, the logarithmic relationship between volume and power is well established (Zwicker and Fastl 2013). While the average customer might not be aware of the mathematical relationship that exists between amplitude and power, they are likely aware of it from a more anecdotal standpoint. For example, customers understand that when they press on the accelerator of their car, the car not only drives faster, but the engine sound grows louder until they remove their foot from the accelerator. Based on this evidence, it is clear that customers can and do rely on sensory cues such as the audition emitted when the product is running (a consequential product sound) to make inferences about underlying product attributes, but the sensory marketing literature has not fully investigated this phenomenon.

To address this gap in our knowledge, we focus our investigation on instances when hearing consequential product sounds can influence customers' perceptions and behavioral intentions. We predict that consequential product sounds that cue the product in use should help to increase process-oriented thoughts, which will lead to the formation of "action-outcome links" (Escalas and Luce 2003). This mindset will encourage customers to consider product attributes that are most likely to support their narrative for success in using the product. That is, the underlying product attributes that are most likely to help customers achieve their goals in using the product will become salient (e.g., needing power to reach their desired end state). Thus, the diagnositicity of power via hearing consequential product sounds becomes salient. Moreover, we predict that customers in a process mindset will be willing to pay more for these value-added product attributes (Spendrup et al., 2016; Wei et al. 2018). Hence, when in a process mindset, we predict that loud (vs. quiet) consequential product sounds will lead to an increase in perceptions of product power, which in turn, will increase willingness to pay for the product.

In contrast, when customers are encouraged to think outcome-oriented thoughts, hearing an auditory cue of a product in use will exert less pronounced effects. Customers will consider only the end benefits of using the product without considering how those benefits are achieved. That is, when customers are in an outcome mindset, they are not likely thinking about underlying product attributes, such as needing more power to reach their desired end state, but rather are just thinking about the end state. Thus, the diagnositicity of power via hearing consequential product sounds is less salient. Therefore, when in an outcome mindset, we predict that the amplitude of consequential product sounds should not have any effect on power perceptions, nor on behavioral intentions such as willingness to pay, as customers will not be likely to consider their need for power.

Therefore, we hypothesize a moderated mediation process, specifically:

H_{1A}: When a process mindset is encouraged, loud (vs. quiet) consequential product sounds will increase perceptions of power which in turn will increase willingness to pay.

H_{1B}: When an outcome mindset is encouraged, there will be no effect on perceptions of power or willingness to pay, regardless of the amplitude of consequential product sounds.

OVERVIEW OF STUDIES

Recall that the purpose of this research is to establish when the amplitude of consequential product sounds influence customer perceptions and willingness to pay. As consequential product sounds are part of the process of using the product, studies 1A-B ask participants to listen to the product in use, which encourages them to think in a process mindset and tests H_{1A}. In studies 2-3, mindset is manipulated to fully explore how the amplitude of consequential product sounds impact willingness to pay depending on the customer mindset ($H_{1A\text{-}B}$). Additionally, although we do not hypothesize differences between the amplitude of consequential product sounds and no product sounds, some of our studies utilize a no product sound comparison condition, as it is managerially relevant and represents current retailing practices. We test our predictions across a series of four studies which span three different product categories and two types of product showrooms, including online and VR. In studies 1A-B, we establish that hearing loud (vs. quiet) consequential product sounds results in perceptions of greater power and increased willingness to pay when in a process mindset. In studies 2 and 3, we test the moderating role of mindset by including outcome mindset and control conditions. These studies provide evidence in support of our moderated mediation hypothesis ($H_{1A\text{-}B}$).

STUDY 1A

Method

Four hundred twenty-seven undergraduate students (54.1% female, $M_{age} = 20.38$) were randomly assigned to a one-way (consequential product sound: loud vs. quiet vs. no sound)[1] between-subjects design. The study was conducted in the univer-

[1] Participants were randomly assigned to conditions by the lab session they registered for. Lab assistants rotated the consequential product sound condition by hour for eight days.

sity's behavioral lab and was presented as a consumer preference study for a new blender. Individuals were taken to a separate room so that other participants could not see or hear the manipulation. All participants viewed the same blender and were told that they would be asked to evaluate the blender when they returned to the computer lab. Participants in the no sound condition did not receive any additional instructions. In the loud and quiet sound conditions, an iPad was set up in front of the blender and participants were asked to: "press play to hear what the blender sounds like when it is in use." This manipulation was designed to encourage a process mindset, as it makes the step-by-step process of engaging in a particular activity salient (Escalas and Luce 2003). To ensure control of the audio stimuli, an audio engineer compressed the files and then manipulated them so that only the loudness of the product sound was changed (90 dB for loud; 60 dB for quiet; see appendix A), similar to differences used in prior work on audition and consumer behavior (Kellaris and Altsech 1992). Additionally, lab assistants ensured that the volume on the iPad remained at a consistent level throughout the study.

After returning to the computer lab, participants answered questions related to the loudness of the product (1 = quiet; 7 = loud) and perceived product power (1 = less powerful; 7 = more powerful). Next, they responded to an open-ended question that featured our dependent variable of interest, "how much would you be willing to pay for the blender you just saw?" (Miller et al. 2011). Lastly, participants indicated their age and gender.

Results and Discussion

Manipulation Check

In the loud condition, the blender was rated as being significantly louder (M = 5.28) than in the quiet condition (M = 3.42; $F(1, 283) = 120.28$, $p < .001$; $d = 1.30$).

Power

A one-way ANOVA of consequential product sound was conducted and results indicate a significant main effect ($F(2, 424) = 5.61$, $p = .004$) with post hoc tests indicating that when the consequential product sound was loud, participants perceived the blender to be more powerful (M = 5.73) than when the consequential product sound was quiet (M = 5.37; $F(1, 424) = 6.64$, $p = .01$, $d = .32$) or when there was no product sound (M = 5.28; $F(1, 424) = 9.96$, $p = .002$, $d = .39$). The difference between the no sound and the quiet sound conditions was not significant ($F < 1$). This finding is consistent with the product engineering literature which indicates that a loud consequential product sound should be perceived as being more powerful (Zwicker and Fastl 2013).

Willingness to Pay

We find a significant main effect of consequential product sound on willingness to pay ($F(2, 424) = 3.35$, $p = .04$). Post hoc tests indicate that when the consequential product sound was loud (M = $102.76), participants were willing to pay more for the blender than when the consequential product sound was quiet (M = $86.70; $F(1, 424) = 5.46$, $p = .02$, $d = .27$) or when there was no product sound (M = $87.86; $F(1, 424) = 4.62$, $p = .03$, $d = .26$). The difference between the no sound and the quiet sound conditions was not significant ($F < 1$). In a test of H_{1A}, we examined whether perceived power mediates the positive relationship between the amplitude of the consequential product sound and willingness to pay using PROCESS (model 4; Hayes 2018). The contrast between no sound versus loud, as well as the contrast between quiet versus loud, both indicated significant indirect paths (95% CI[2.4278, 10.9922]; 95% CI[1.3893, 8.9923]; respectively), with the 95% confidence interval wholly above zero (see Table 1), indicating mediation occurred and in support of H_{1A}.

While this study produced a successful test of H_{1A}, it is important to clarify whether hearing a consequential product sound coupled with the instruction to listen to the product in use was successful in encouraging a process mindset. Therefore, we conducted a posttest in which we measured this factor.

Posttest

A posttest was conducted to ensure that asking participants to listen to a consequential product sound and pairing that with an in use instruction, resulted in a process mindset. Sixty-eight undergraduate students (58.82% female, $M_{age} = 20.15$) were randomly assigned to a one-way (in use instruction vs. no instruction) between-subjects design. Participants were told they would listen to and evaluate a new blender. Those in the in use instruction condition were asked to think about the blender in use when listening to the product while those in the no instruction condition did not receive any additional information. All participants then heard the same consequential product sound clip as in the main study, but unaltered (everyone heard the sound at the same volume level), and then responded to the three-item process mindset scale ($\alpha = .89$; Escalas and Luce 2004; see appendix B for the items). In line with our assumption that receiving an in use instruction combined with a consequential product sound (vs. no instruction) would result in a more process-oriented mindset, we found a significant main effect ($F(1, 66) = 6.15$, $p = .02$, $d = .60$). Those in the in use instruction condition experienced a more process-oriented mindset (M = 2.592) than those in the no instruction condition (M = 1.77). Thus, we are able to conclude that hearing a consequential product sound coupled with phrasing which cues thoughts about the product being used can encourage a process mindset.

Discussion

Thus, study 1A provides initial support for our prediction that when asked to think about a product in use, the amplitude of consequential product sounds are important cues customers use to evaluate products and form behavioral intentions. Results indicate an increased willingness to pay for products with consequential sounds that are loud versus quiet or have no sound due to perceptions of greater product power.

STUDY 1B

As retailers seek to offer customers innovative and immersive ways to shop and obtain product information, tools such

Table 1
Tests of Indirect Effects for Studies 1 – 3.

Study #	PROCESS Model #	IV	DV	Mediator	Index of Moderated Mediation	Moderator	Contrast	Conditional Indirect Effects - 95% CI	Conditional Direct Effects - 95% CI
1A	4	Consequential Product Sound	Willingness to Pay	Perceived Power	—	—	No Sound vs. Loud	2.4278 to 10.9922	−4.6172 to 21.8282
					—	—	Quiet vs. Loud	1.3893 to 8.9923	- 2.0988 to 24.0237
					—	—	No Sound vs. Quiet	−2.8648 to 5.7430	−15.2282 to 10.5143
1B	4	Consequential Product Sound	Willingness to Pay	Perceived Power	—	—	No Sound vs. Loud	1677.0933 to 5320.4819	- 2869.2125 to 5560.5181
					—	—	Quiet vs. Loud	607.9660 to 3036.1365	−928.2012 to 7254.8552
					—	—	No Sound vs. Quiet	458.2526 to 3149.7430	−5899.8946 to 2264.5463
2	8	Consequential Product Sound	Willingness to Pay	Perceived Power	−27.6057 to -.5464	Process Mindset	—	3.4776 to 26.6109	10.2003 to 91.7862
					27.9813 to 173.0652	Outcome Mindset	—	−7.8507 to 11.4056	−59.1165 to 17.0917
						Quiet	Process vs. Outcome	−41.5714 to 49.4910	−226.6918 to 139.7741
3	8	Mindset	Willingness to Pay	Perceived Power	51.5192 to 203.2090	Loud		45.0569 to 161.3326	90.0019 to 474.4400
						Quiet	Process vs. Control	−34.4622 to 57.6549	−141.0423 to 244.3479
					−40.7325 to 93.6402	Loud		70.3330 to 195.9392	55.0353 to 439.7249
						Quiet	Outcome vs. Control	−38.8284 to 53.4167	−91.7705 to 281.9937
						Loud		−15.0468 to 82.8363	−229.3648 to 159.6830

as virtual reality (VR) are increasingly being offered as a way for shoppers to view products, learn about their features, and try them in fresh and engaging ways. With VR, the user is completely immersed in the virtual environment – users can move in the environment and hear sounds (Tokareva 2018). For instance, Mercedes-Benz currently uses this technology, offering visitors the opportunity to experience their vehicle configurations in real time (Daimler 2018). Given the vast implications this technology has for the future of retail shopping, study 1B replicates our results using VR and extends our inquiry to a different product category, thus adding to the generalizability of our findings.

Method

Four hundred seventy-six undergraduate students (44.75% female, $M_{age} = 20.8$) were randomly assigned to a one-way (consequential product sound: loud vs. quiet vs. no sound)3 between-subjects design. The study was conducted in the university's behavioral lab. Participants were individually taken to a separate room that was set up to accommodate VR equipment. Participants were told that they would be using VR to evaluate a sports utility vehicle (SUV) currently on the market. Participants could look around the vehicle and, in the loud and quiet consequential product sound conditions, were told they would hear the engine start. Participants in the no sound condition did not receive any additional instructions. Participants were first shown a picture of the vehicle and then a lab assistant fitted the participant with a headset (Vive Pro MV) that covered both their eyes and ears. Once immersed, participants found themselves in the driver's seat and were given 42 seconds to look around the vehicle. After 2 seconds, participants in the loud and quiet consequential product sound conditions heard the engine turn on (see appendix A). Consistent with study 1A, this manipulation was designed to encourage a process mindset (Escalas and Luce 2003), as hearing the sound of a product in use should make the process of using the product more salient. A sound engineer compressed and manipulated the audio files to the same volume levels as in study 1A and a lab assistant ensured that volume was held constant throughout the experiment.

After completing the VR manipulation, participants returned to the computer lab to answer questions related to the loudness of the SUV (1 = quiet; 7 = loud), how powerful the SUV was (1 = less powerful; 7 = more powerful), and answered an open-ended question that asked how much they would be willing to pay for the SUV. Lastly, participants indicated their age and gender.

Results and Discussion

Manipulation Check

In the loud condition the product sound was significantly louder (M = 4.88) than in the quiet condition (M = 3.85; $F(1, 315) = 44.71$, $p < .001$; $d = .75$).

Power

A one-way ANOVA indicated a significant main effect of consequential product sound on perceived power ($F(2, 473) = 19.96$, $p < .001$). Post hoc tests indicate that when the consequential product sound was loud (M = 5.23), participants perceived the SUV to be more powerful than when the consequential product sound was quiet (M = 4.82; $F(1, 473) = 10.33$, $p = .001$, $d = .38$) or when there was no sound (M = 4.43; $F(1, 473) = 39.91$, $p < .001$, $d = .72$). However, unlike the previous study, where the difference between the no sound and quiet condition were not significant, here we find a significant difference ($F(1, 473) = 9.66$, $p = .002$, $d = .34$). While we cannot be sure why we find differences in perceptions of power in this study when we did not in study 1A, we speculate it could be due to the immersive quality of the VR experience. When the senses are engaged in such an immersive way, it is possible that the addition of one more sense (product sound) to the visual experience, was enough to shift perceptions of power, even when the consequential product sound was quiet.

Willingness to Pay

We find a significant main effect of consequential product sound on willingness to pay ($F(2, 473) = 3.39$, $p = .04$). Post hoc tests indicate that when the consequential product sound was loud (M = \$41,126.58), participants were willing to pay more for the SUV than when the consequential product sound was quiet (M = \$36,305.03; $F(1, 473) = 5.17$, $p = .02$, $d = .25$) or when there was no sound (M = \$36,522; $F(1, 473) = 4.71$, $p = .03$, $d = .25$). As in our previous study, the difference between the no sound and the quiet sound condition was not significant ($F < 1$).

Additionally, in an attempt to replicate the results of study 1A, we tested whether perceived power mediates the relationship between the amplitude of consequential product sound and willingness to pay (PROCESS model 4; Hayes 2018). In support of H_{1A}, the contrast between no sound versus loud, as well as the contrast between quiet versus loud, both indicated significant indirect paths (95% CI[1677.0933, 5320.4819]; 95% CI[607.9660, 3036.1365]; respectively), with the 95% confidence interval wholly above zero (see Table 1), indicating mediation occurred. However, just as we observed that perceptions of power were significantly greater when the consequential product sound was quiet as compared to the no sound condition, we also find significant mediation in this comparison for willingness to pay (95% CI[458.2526, 3149.7430]). Again, we suggest this finding is likely due to the immersive experience offered by our VR shopping scenario.

Posttest

As in study 1A, a posttest was conducted to ensure that by asking participants to listen to a consequential product sound for the SUV in use, this resulted in a process mindset. Forty-five undergraduate students (67% female, $M_{age} = 20.38$) were randomly assigned to a one-way (in use instruction vs. no instruction) between-subjects design. Participants were told they were going to listen to and evaluate a new car being introduced to the market. Those in the in use condition were told to think about the car in use when listening to the engine start while those in the no instruction condition did not receive any additional information. All participants then heard the same consequential product sound clip (the same SUV sound as in the main study, but unal-

tered – the product sound was played at a consistent volume level in both conditions), and then responded to the three-item process mindset scale (α = .81). In line with our assumption that receiving an in use instruction (vs. no instruction) would result in a more process-oriented mindset, we found a significant main effect ($F(1, 43) = 7.63$, $p = .008$, $d = .82$). Those in the in use instruction condition resulted in a more process-oriented mindset (M = 3.204) than those in the no instruction condition (M = 2.32).

Discussion

This finding, in combination with the earlier results, indicates that participants were encouraged into a process mindset by asking them to focus on the product in use while listening to a consequential product sound. While results thus far support our predictions, we have not yet fully explored the impact of mindset and consequential product sounds on customer perceptions and behavioral intentions. In study 2 we place participants in either a process or outcome mindset to fully test $H_{1A\text{-}B}$.

STUDY 2

The goal of study 2 is to provide a full test of the proposed role of mindset to clarify when the amplitude of consequential product sounds can influence customer perceptions and behavioral intentions. We propose that a loud consequential product sound signals powerfulness to customers, and this positively impacts willingness to pay, but only when a process mindset is encouraged. When an outcome mindset is encouraged, we do not expect loud consequential product sounds to impact power perceptions or willingness to pay. Thus far we have only tested our effects for a process mindset, therefore in this study, we examine whether effects hold when an outcome mindset is encouraged. In a test of $H_{1A\text{-}B}$, we predict that a loud consequential product sound will positively impact perceptions of power for a product in use and this will lead to an increase in willingness to pay, but *only* when a process mindset, and not an outcome mindset, is encouraged.

Method

Two hundred and one MTurk members (43.72% female, $M_{age} = 36.96$) were randomly assigned to conditions in a 2 (consequential product sound: loud, quiet) x 2 (mindset: process, outcome) between-subjects design. Participants were told that this study was designed to understand their attitudes towards a product featured in a video advertisement. All participants were asked to set the volume on their computer to a level of 50 or the middle volume for their computer and were given a test sound to ensure the sound was working correctly. Participants then received the mindset manipulation (Escalas and Luce 2004). Those assigned to the process mindset were asked to list all of the steps they would take to use a blender to make a drink. Upon completion, these participants were instructed to think about the process of using the blender while they watched the advertisement. Those assigned to the outcome mindset were asked to list at least five drinks they could make using a blender. Upon completion, these participants were instructed to imagine the end benefits they would receive from the blender while they watched the advertisement.

After the mindset manipulations, all participants viewed the same QVC home shopping channel video advertisement (65 seconds in length), that guided viewers through the grinding of ice using the same blender that was featured in study 1A. The only difference in videos occurred when the blender was running. As in the other studies, a sound engineer compressed the audio files and then manipulated them so that only the loudness of the consequential product sound was changed. Participants in the loud consequential product sound condition heard a blender at 79.66 dB and those in the quiet consequential product sound condition heard a blender at 50.23 dB. All other baseline sounds (vocal sounds of the person using the blender and other background noises) remained the same (67.68 dB; see appendix C), and thus acted as an auditory anchor. Then, because our previous studies collected measures of the mediator prior to the dependent variables, we reverse the order of questions here to ensure the effects hold and are not a result of the order in which the questions were asked. Participants first indicated willingness to pay via the same open-ended measure as used in study 1A, and then answered questions designed to ensure our manipulations were effective. Specifically, participants answered the same three process mindset questions as in the posttest for studies 1A-B. These items were combined to form a mindset index (α = .86). Participants then answered questions related to the loudness of the product (1 = quiet; 7 = loud) and their perceptions of product power (1 = less powerful; 7 = more powerful).

Additionally, we attempted to rule out an alternative explanation associated with mindset research. Specifically, we asked participants to indicate how vivid the video advertisement was (Peck et al., 2013; see appendix B). These items were combined to form a vividness index (α = .89). Participants then indicated their age and gender. Two participants did not correctly answer the sound test question and were removed, leaving us with 199 participants.

Results and Discussion

Manipulation Check

In the process mindset condition (M = 5.21), participants thought about the process of using the blender significantly more than in the outcome mindset condition (M = 4.69; $F(1, 197) = 7.56$, $p = .007$, $d = .39$). Additionally, in the loud sound condition, the product was perceived as significantly louder (M = 5.23) than in the quiet sound condition (M = 4.58; $F(1, 197) = 8.91$, $p = .003$, $d = .43$).

Power

We began by examining the impact of consequential product sounds and mindset on customer perceptions of power. Here we would expect our results from previous studies to hold *only* for the process mindset. We would expect no difference in perceptions across the outcome mindset as a focus on the outcome of using the product diminishes the saliency of the consequential product sound. A two-way ANOVA resulted in a main effect of consequential product sound ($F(1, 195) = 6.54$, $p = .01$, $d = .35$).

When loud (M = 6.07) participants indicated the blender was more powerful than in the quiet condition (M = 5.66). The main effect of mindset was not significant ($F(1, 195) = 1.60$ $p = .21$).

However, this result should be interpreted in light of a significant interaction which emerged ($F(1, 195) = 4.57$, $p = .02$; see Fig. 1). Post hoc tests indicate that for participants in a process mindset, the blender in the loud consequential product sound condition (M = 6.34) was evaluated as more powerful than the blender in the quiet consequential product sound condition (M = 5.58; $F(1, 195) = 10.58$, $p = .001$, $d = .71$). Additionally, and consistent with our predictions, there were no differences for power perceptions in the outcome mindset between the loud and quiet consequential product sound conditions ($M_{loud\ sound} = 5.79$, $M_{quiet\ sound} = 5.72$; $F < 1$). Thus, only when a process mindset is encouraged does the amplitude of a consequential product sound act as a cue for power, with a louder consequential product sound being deemed more powerful.

Willingness to Pay

A two-way ANOVA on willingness to pay resulted in non-significant main effects of consequential product sound and mindset ($F(1, 195) = 2.49$, $p = .12$; $F(1, 195) = 2.16$, $p = .14$; respectively). However, there was a significant interaction between consequential product sound and mindset on willingness to pay ($F(1, 195) = 8.82$, $p = .003$; see Fig. 1). Post hoc tests indicate that when a process mindset was encouraged, participants were willing to pay more for the blender in the loud (M = $154.20) versus the quiet (M = $89.56; $F(1, 195) = 9.92$, $p = .002$, $d = .54$) consequential product sound condition. However, when the outcome mindset was encouraged, we find no difference in willingness to pay (M_{loud} = $91.06, M_{quiet} = $110.86; $F(1, 195) = 1.01$, $p = .32$).

Moderated Mediation

Given our findings thus far, we would anticipate that perceived power would mediate the relationship between the amplitude of consequential product sound and willingness to pay, but *only* for those in a process mindset. Therefore, in a test of $H_{1A\text{-}B}$, we ran a moderated mediation analysis (PROCESS model 8; Hayes 2018) on willingness to pay with mindset as the moderating variable. In support of $H_{1A\text{-}B}$, we find a significant index of moderated mediation (-27.6057, -.5464) for willingness to pay with further analysis of the indirect effects showing significance in the loud consequential product sound condition for those in a process mindset (see Table 1).

Vividness

It is possible that vividness is driving our effects since louder consequential product sounds have the potential to enhance a customer's imagined experience with the product, and positively impact product evaluations (Peck et al., 2013). A consequential product sound by mindset ANOVA produced no significant main effects ($F's < 1$) or interaction ($F(1, 195) = 2.49$, $p = .12$). It would appear that differences in vividness are not driving our effects.

Discussion

Study 2 provides further evidence that pairing consequential product sounds with advertising phrasing and imagery that draws focus to the product in use serves to encourage a process mindset in customers. Further, results demonstrate that when customers are in a process mindset, the amplitude of consequential product sounds can positively influence their perceptions of product power and this enhances their willingness to pay (H_{1A}). As predicted by H_{1B}, effects did not hold when an outcome mindset was encouraged. This is likely due to the customer's focus on the outcome, or what the blender can do for them, and thus, the amplitude of the consequential product sound as a diagnostic cue for power was less salient. Study 3 replicates these results in an additional product category and in a laboratory environment that provides more control over the audio manipulations.

STUDY 3

The goal of study 3 is to provide an additional test of the proposed role of mindset in explaining when the amplitude of consequential product sounds can influence customer perceptions and behavioral intentions in a different context, and with the inclusion of a control treatment for further comparison. The addition of a control condition, or no mindset manipulation, provides an opportunity to elucidate the results of prior studies. By demonstrating that a control treatment produces consistent results as compared with an outcome mindset manipulation, we demonstrate the earlier reported results are due to encouraging participants into a process mindset by asking them to focus on the sound of a product in use.

Method

Two hundred seventy-nine undergraduate students (42.32% female, $M_{age} = 20.6$) were randomly assigned to a 2 (consequential product sound: loud vs. quiet) x 3 (mindset: process, outcome, control) between-subjects design. Upon entering the lab in groups of up to twelve, participants were seated at individual cubicles in front of a computer where they were presented a consumer preference study for a new lawnmower. Via the online survey tool, participants were randomly assigned to mindset manipulation conditions as in study 2 (Escalas and Luce 2004). Those encouraged into a process mindset were asked to list all of the steps they would take to use a lawnmower to care for their lawn. Upon completion, these participants were instructed to think about the process of using the mower while they listened to the product. Those assigned to the outcome mindset were asked to list at least five things they could do on a freshly mowed lawn. Upon completion, these participants were instructed to imagine the end benefits they could receive from the lawnmower while they listened to the product. Participants assigned to the control condition were asked to list five things they would do later that day, and upon completion, received no extra instructions while they listened to the lawnmower.

Participants then listened to the consequential product sound manipulation, depending on their randomly assigned condition (see appendix A). As in our earlier studies, a sound engineer

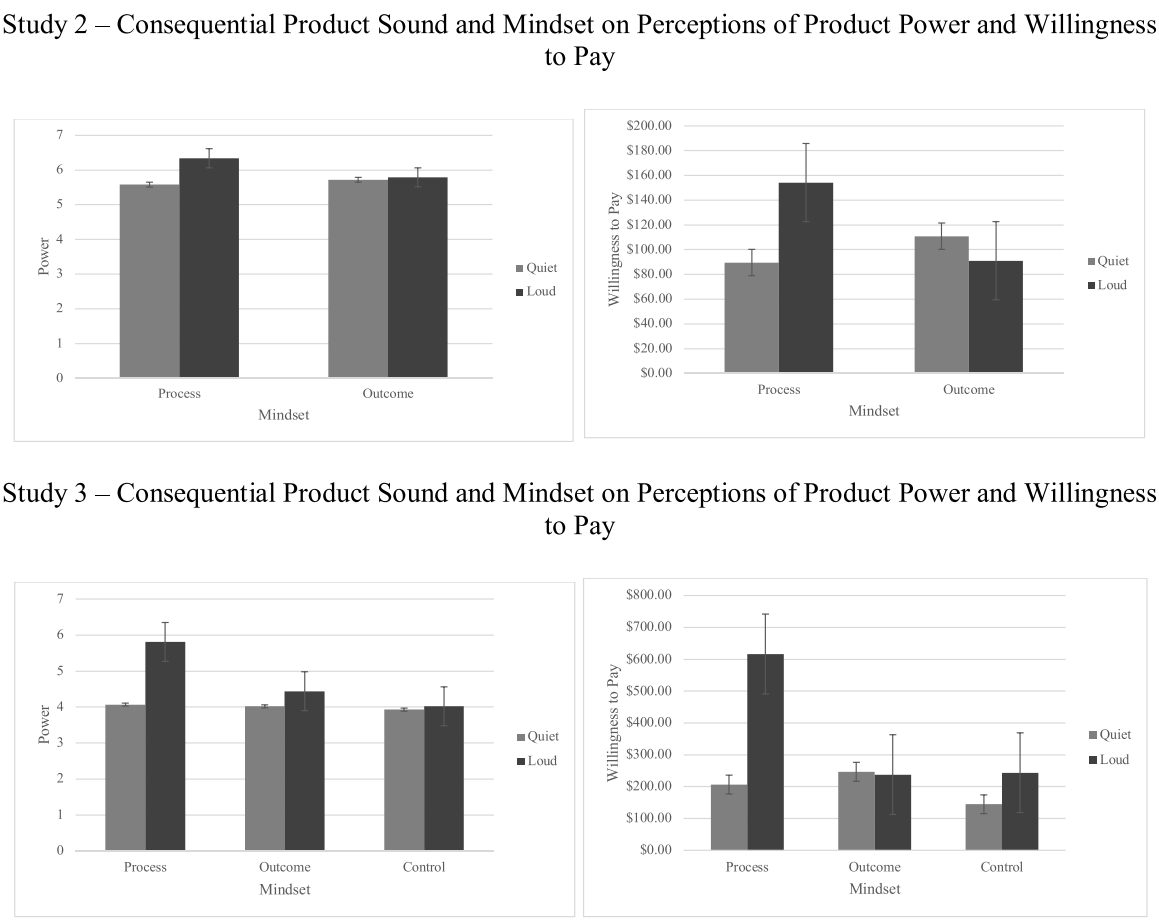

Fig. 1. Study 2 – Consequential Product Sound and Mindset on Perceptions of Product Power and Willingness to Pay. Study 3 – Consequential Product Sound and Mindset on Perceptions of Product Power and Willingness to Pay.

compressed the audio files and manipulated them so that only the loudness of the consequential product sound was changed.

Participants then answered an open-ended question regarding how much they would be willing to pay for the lawnmower they just heard and answered questions designed to ensure our manipulations were effective. Participants answered the same mindset manipulation questions as in previous studies ($\alpha = .84$). They then indicated perceived product power (1 = less powerful; 7 = more powerful) and their perception of the loudness of the product (1 = quiet; 7 = loud), as well as their age and gender. Then, to ensure that participant changes to volume settings were not driving our effects, lab assistants checked the volume on each lab computer at the end of each session, and noted whether or not the volume setting had been changed. Twelve participants lowered the volume (three in the quiet product sound condition and nine in the loud product sound condition) and were removed, leaving us with two hundred sixty-seven participants.

Results and Discussion

Manipulation Check

In the process mindset condition (M = 3.07) participants thought about the process of using the lawnmower significantly more than in the outcome mindset (M = 2.46, $d = .44$) or control condition (M = 2.27; $F(2, 264) = 8.94$, $p < .001$, $d = .60$). Additionally, in the loud condition, the consequential product sound was significantly louder (M = 5.56) than in the quiet condition (M = 3.55; $F(1, 265) = 142.34$, $p < .001$, $d = 1.47$).

Power

A two-way ANOVA was conducted and there was a main effect of consequential product sound on product power ($F(1, 261) = 18.25$, $p < .001$, $d = .49$). Participants in the loud consequential product sound condition (M = 4.76) indicated the lawnmower was more powerful than in the quiet consequential product sound condition (M = 4.01). Additionally, we observed a significant main effect of mindset ($F(2, 261) = 11.10$, $p < .001$). Post hoc tests indicate that those in the process mindset (M = 4.94) deemed the lawnmower to be more powerful than those in the outcome mindset (M = 4.23; $F(1, 261) = 11.27$, $p < .001$, $d = .45$) or control condition (M = 3.97; $F(1, 261) = 20.23$, $p < .001$, $d = .67$). The difference between the outcome mindset and control condition was not significant ($F(1, 261) = 1.34$, $p = .25$). This should be interpreted in light of a significant interaction between consequential product sound and mindset ($F(2, 261) = 8.43$, $p < .001$; see Fig. 1). Post hoc tests indicate that for participants who were encouraged into a process mindset, the lawnmower in the loud consequential product sound condition (M = 5.81) was evaluated as more powerful than in the quiet consequential product sound condition (M = 4.07; $F(1, 261) = 35.24$,

$p < .001$, $d = 1.31$). Additionally, and consistent with our predictions, there were no differences in perceptions of power for participants in the outcome mindset ($M_{loud} = 4.44$, $M_{quiet} = 4.02$; $F(1, 261) = 1.83$, $p = .18$) or the control mindset ($M_{loud} = 4.02$, $M_{quiet} = 3.93$; $F < 1$) between the loud and quiet consequential product sound conditions. Thus, *only* when a process mindset is encouraged does the amplitude of a consequential product sound act as a diagnostic cue for power, with a louder consequential product sound being deemed more powerful.

Willingness to Pay

A two-way ANOVA was conducted and there was a main effect of consequential product sound on willingness to pay ($F(1, 261) = 8.82$, $p = .003$, $d = .35$). When the consequential product sound was loud (M = $365.90), participants indicated a greater willingness to pay for the lawnmower than when the consequential product sound was quiet (M = $199.26). Additionally, we observed a significant main effect of mindset ($F(2, 261) = 5.69$, $p = .004$). Post hoc tests indicate that those in the process mindset (M = $411.47) were willing to pay more for the lawnmower than those in the outcome mindset (M = $242.11; $F(1, 261) = 6.27$, $p = .01$, $d = .31$) or control condition (M = $194.15; $F(1, 261) = 10.07$, $p = .002$, $d = .43$). The difference between the outcome mindset and control condition was not significant ($F < 1$). However, this should be interpreted in light of a significant interaction between consequential product sound and mindset on willingness to pay ($F(2, 261) = 5.21$, $p = .006$; see Fig. 1). Post hoc tests indicate that when a process mindset was encouraged, participants were willing to pay more for the lawnmower in the loud (M = $616.41) versus the quiet consequential product sound condition (M = $206.53; $F(1, 261) = 19.21$, $p < .001$, $d = .66$). However, when the outcome mindset ($M_{loud} = $237.69, $M_{quiet} = $246.53) or control condition ($M_{loud} = $243.58, $M_{quiet} = $144.73) were encouraged, we find no difference in willingness to pay (F's < 1).

Moderated Mediation. To test $H_{1A\text{-}B}$ and replicate the results found in study 2, we ran a moderated mediation analysis (PROCESS model 8; Hayes 2018) on willingness to pay. In support of $H_{1A\text{-}B}$, we find significant indexes of moderated mediation (process vs. outcome [27.9813, 173.0652] and process vs. control [51.5192, 203.2090]) for willingness to pay with further analysis of the indirect effects showing significance only in the loud consequential product sound condition when in a process mindset (see Table 1).

Discussion

Ultimately, across studies 2 and 3, we find that it is important for retailers to pair consequential product sounds with phrasing and imagery that draws focus to the product in use to encourage a process mindset in customers. Specifically, we find evidence that louder consequential product sound results in significantly higher willingness to pay for such products when compared with quiet consequential product sound *only* when a process mindset is encouraged. As predicted by $H_{1A\text{-}B}$, effects did not hold when an outcome mindset was encouraged. Moreover, study 3 included a control condition, or no mindset manipulation, which clarified the results of prior studies in that the control condition produced results consistent with the outcome mindset manipulation.

GENERAL DISCUSSION

Previous research has focused on the use of cue diagnosticity to assess underlying attributes, and we build on this work by investigating the diagnostic role of sensory cues when customers are encouraged into a process mindset. More specifically, we aimed to understand when sensory cues, namely consequential product sounds, can be added to the information provided to customers by retailers to influence customer perceptions and behavioral intentions. The combined results from multiple laboratory and online experiments demonstrate that *only* when a process mindset is encouraged, the amplitude of consequential product sounds can allow customers to make inferences about a product's power and this process enhances their willingness to pay. Because product sounds are easily implemented across retail channels, and at a small cost to managers, understanding when the amplitude of consequential product sounds can positively impact customer perceptions and behavioral intentions is both needed and important. Therefore, our findings provide value to marketing scholars and retail managers alike.

While some researchers might be reluctant to report small effect sizes, or point to the small and moderate effect sizes found in the current research to question the true impact of our work for managers, we remind readers that "large" effects are not always more important than "small" or "medium" effects. Rather, it is important to consider the practical value and not just the magnitude of the effect (Durlak 2009). In other words, results should be examined relative to prior research in a similar area. Recent research by Roschk and Hosseinpour (2020) provides an opportunity to compare our effect sizes to those of others in sensory marketing. Results from their meta-analysis show effect sizes as standardized mean differences (Cohen's d) for other sensory research ranged from -.42 to .75, with the majority falling in the .20 to .30 range, consistent with the effect sizes shown here.

Theoretical Implications

Our research contributes to the mental simulation literature and the growing body of sensory marketing literature by demonstrating the importance of encouraging a process mindset when using sensory cues to influence customers' product perceptions and their behavioral intentions, such as their willingness to pay. While prior research has used sensory information as cues to diagnose an underlying attribute (i.e., touch, taste), these cues must be used in-store and do not translate to other products and settings. Our studies offer evidence as to the role of consequential product sounds, an easily implementable cue for online and VR shopping. As such, our research broadens the literature on sensory marketing by examining product sounds beyond the context of food, as well as illustrating how sensory cues can be utilized *prior* to purchase to assess underlying attributes other than quality. As far as we know, this is the first study to examine the links between mental simulation, consequential product

sounds, cue diagnosticity, and willingness to pay, which adds to the theory in each of these areas.

Our research also links theory in product engineering with mental simulation and sensory marketing, thus adding to the emergent literature stream on consequential product sounds which has focused on product sound design (Langeveld et al. 2013), while remaining an area that is largely underexplored in the marketing literature. Additionally, we add to the literature on mental simulation, establishing the links between a process mindset, sensory marketing, and positive impacts on customer perceptions and behavioral intentions. Specifically, we empirically demonstrate that hearing loud consequential product sounds can lead to greater perceptions of product power, and this explains an enhanced willingness to pay when customers are encouraged into a process mindset (but not when customers are encouraged into an outcome mindset). This is a notable finding, as prior mental simulation research has not yet made the important connection between a process mindset and a greater willingness to pay. Finally, our work answers the call for enhanced realism in the study of consumer behavior (Morales et al., 2017) as we used the actual consequential product sounds of a blender, an SUV, and a lawnmower as stimuli across our studies, and we also tested our effects using VR, a technology that retailers are just beginning to implement.

Managerial Implications

Given that retailing is undergoing a significant transformation that includes the creation of multi-sensory experiences to attract and retain customers (Helmefalk and Hultén 2017; Möller and Herm 2013), it has become increasingly important for retail managers to understand the impact of each sensory aspect on their bottom line. The majority of sensory research is based on in-person evaluations (Peck and Shu 2009; Spangenberg et al., 1996) and this is not surprising given our inability to touch, taste, or smell products and services purchased online. However, as online and VR shopping continues to increase (Bleier et al. 2019), marketers and retailers need to understand when implementing consequential product sounds into these digital shopping environments can enhance customer perceptions and behavioral intentions, including willingness to pay. This research offers important implications for marketing managers who aim to use sensory cues to impact customer willingness to pay for their products. Our findings suggest that the strategic use of loud consequential product sounds can have a positive impact on willingness to pay when customers are encouraged into a process mindset. This effect is attenuated when an outcome mindset is encouraged. Therefore, retailers should consider adding an option for customers to hear the sounds of products in use when shopping, particularly when power is a desirable or necessary attribute. The consequential product sounds played should be combined with images and phrasing that draw focus to the product in use (process mindset) and not just what the product can produce (outcome mindset).

Additionally, we suggest that managers embrace new technologies that can provide sensory cues in a context that maximizes the positive effects of audition while minimizing any negative effects. With the introduction of affordable at-home VR experiences that allow customers the ability to shop and listen to products in a more immersive manner, managers can leverage this new way of retailing to engage with customers and produce positive results.

Limitations and Future Research

Although our research provides substantial evidence for when the amplitude of consequential product sounds can impact perceptions of product power and willingness to pay, we recognize some limitations that must be considered. Within both offline and online retail environments, products are not usually assessed individually, but are compared to competing products. Our work focused on assessing products individually and did not consider a product comparison. Future work in this area should examine effects of product sounds and mindset when products are presented simultaneously online or showcased side-by-side in a physical store.

Next, while our work focused on consequential product sounds, it would be interesting to discover how customers use sensory information obtained by listening to intentional product sounds. Intentional sounds are those that are added to a product to convey brand values or elicit emotional responses in the customer (Langeveld et al. 2013), such as the musical interlude emitted by a washing machine to signal the completion of the wash cycle. Additionally, while we attempted to create realistic retail experiences across our experiments, we were not able to observe actual purchasing. Future researchers should conduct a field study that utilizes product sounds in-store and via the store's website. While we investigated the impact of product sounds for products where power is important, another avenue of research might examine the role of consequential product sounds for products where power is less important to purchase decisions, such as a dishwasher. Additional research could explore whether there are other product or service attributes that would benefit from consequential product sounds beyond those that indicate power; such as the "thunk" of a lock being engaged, the "snip" of a hair stylist's scissors, or the cascade of water at the car wash. Next, in support of the potentially broader application of product sounds to services, Formula 1 Racing has begun updating the motor sport technology of the engines to produce more power as well as enhancing the sound of the engines. The update to the sport comes after fans and racing teams called for louder engines after rules instituted in 2014 produced quieter cars (Loewenberg 2017; Noble 2017). Thus, we encourage future work which studies intentional product sounds that are added to consequential product sounds to impact customers' perceptions and service experiences.

We also call for research that continues our investigation of the use of sensory cues in online retail situations. Future researchers might explore ways to simulate product touching online or, uncover ways in which customers can virtually taste products. Currently the use of all five senses are restricted in the online retail environment and as this shopping channel continues to grow, it is important for researchers to find new and creative ways to implement useful sensory cues. Finally, we

call for additional research that explores how advances in technology such as VR can enhance or potentially detract from a customer's shopping experience. How might VR or other technology sharpen a customer's senses, or alter their sensitivity to sensory information, and how would this process impact their subsequent purchase decisions?

Although additional research is needed to further understand the nature of product sounds and their relationship with mindset, our findings suggest that implementing consequential product sounds in customers' shopping experiences can yield positive results. Despite its limitations, we argue that this article has been helpful in laying a foundation for future research, and our hope is that scholars will continue exploring the diagnostic role of sensory cues in online, in-store, and VR contexts.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.jretai.2020.09.002.

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