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Sounds Expensive?

The effect of voice pitch on price perception

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SOUNDS EXPENSIVE?
THE EFFECT OF VOICE PITCH ON PRICE
PERCEPTION

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ABSTRACT

Voice pitch has been researched widely in the field of psychology, still the impact of voice pitch in audio commercial context has rarely been studied in the field of marketing with the aim to understand how voice pitch can affect product perception. Former research in various fields have established that the level of voice pitch can affect the perception of size, dominance and power. We wish to establish if voice pitch can also affect product attribute perception in a commercial setting, with the focus on price perception.

Our findings show that voice pitch affects subjects to perceive the price of a product as higher when exposed to an audio advertisement spoken with a lower voice pitch. Contrary to our hypothesis, the effect of voice pitch does not seem to be dependent on the order in which the questions regarding the product attributes are asked. In other words, no order effects between voice pitch and product attributes were found. Furthermore, the effect of voice pitch does not seem to be moderated by order effects, other product attributes or salience of the focal variable. The findings support the previous research stating that a lower voice pitch is associated with power, dominance, success, larger size and social status.

KEYWORDS: sensory marketing, vocal cues, pitch, price, quality, dominance, power, social status, size, salience, priming, audio advertisement.

INTRODUCTION

Attention towards the field of sensory marketing is increasing as new technologies allow the use in practice and measurement of sensory components in marketing and organizations. Vision is the most studied element in sensory marketing and social psychology (Elder et al., 2010), and in comparison, little research has been carried out with regard to auditory stimuli (Krishna, 2011). Considering the amount of communication channels that rely fully or partially on auditory message delivery, such as radio, podcasts, TV or telephone, we wish to contribute to the understanding of the effect of voice pitch on product perception.

Within marketing, auditory message delivery occurs through radio advertisements, loudspeakers in supermarkets, customer support or ads in podcasts, cinema or TV. We process large amounts of audio-based marketing information, and for the brands to understand how consumers perceive and respond to the auditory cues can be of great importance if they wish to succeed with their advertising strategies. When reaching out to consumers, advertisement is one of the most common tools to use. Audio advertisement is often communicated through a spokesperson, yet previous research implies that managers and leaders tend to select spokespeople for commercials based on intuition with little or no knowledge about how the different elements of sound impact customers' perception (Areni, 2003; Bruner, 1990). Sometimes the spokesperson in a commercial is visible and can project traits like beauty, dominance, fitness, trust or credibility, but in auditory commercials these traits will not be visually conveyed to the listener. We wish to investigate whether other attributes can communicate these traits or impact consumers' product perception. We aim at presenting some decision guidance when choosing spokespersons for an audio advertisement, by establishing the link between voice pitch and perceived price of a product.

Research Question

Voice pitch conveys meaning through basic differences in transmitting cues such as dominance, size and social status through non-verbal communication. Previous research has established the relationship between voice pitch and size (Lowe & Haws, 2017), where respondents evaluated a product to be larger in size, when exposed to a product advertisement with a low voice pitch. We wish to examine whether voice pitch affect only size perception, or if the effect is present for other

magnitude dimensions, with the focus on price perception and if the effect can be found for attributes without magnitude dimensions such as quality. The research question we have established is:

How does voice pitch of a spokesperson in audio commercial affect consumers' price perception of the advertised product and other product attributes?

We consider the different potential outcomes of the voice pitch effect, based on different explanatory frameworks such as the meaning of sound, social status, vertical conceptual metaphors, power and dominance. To the authors' current knowledge, the effect of voice pitch has yet to be shown in the context of consumer's price perception. Implications from our study will be relevant for marketing managers, planning of marketing messages, and how one can utilize voice pitch to convey price level in the communication, as well as for academic purposes and further research in the field of sensory marketing. Our research aims at providing some decision criteria on one of the most salient vocal cues; pitch. We aim to find out whether pitch affects perception of different attributes of the product and subsequently, whether consumers will perceive the price of the product differently because of the voice pitch.

When researching how voice pitch can influence perception, we consider two possible main paths to the effect on product attribute perception. One is based on a conceptual spatial metaphor where a high (low) voice pitch can lead to a high (low) perceived product price. Another path is through the influence of traits such as larger size, dominance, high social status, and power attributed to low voice pitch initially leading to a low (high) voice pitch being associated with a high (low) perceived product price. Hence, it seems inevitable to present competing hypotheses in this study. In the following section, we will look into both paths, give the theoretical framework for both directions and develop research hypotheses.

LITERATURE REVIEW

Speech Sound Conveys Meaning

The way we communicate today is based on words, but the interpretation is deeply rooted in sophisticated systems of old associations with sound. These systems have been formed by our brains as we have anticipated to understand our surroundings and interpret the sounds we hear. When communicating with others, these patterns are helping us understand the information we receive. Our neural networks are active in making sounds as well as perceiving and interpreting them (Kraus & Slater, 2016), meaning that when communicating we are not only transferring sound signals but we have an interaction between individuals. Therefore, we can understand that sound provide meaning beyond words, adding several dimensions to communication (Kraus & Slater, 2016).

Voice Pitch and Vertical Placement

The first path which could lead the voice pitch to influence price perception goes through the conceptual metaphor of vertical placement. Vertical placement refers to something placed physically higher than others in space, and the ways of placement is infinite. Previous research (Lakoff & Johnson 1999; Meier, Hauser, Robinson, Friesen, & Schjeldahl, 2007) has found that vertical placement seems to relate to several metaphorical associations such as power, morality and valence. This was confirmed in a study by Giessner and Schubert (2007), where participants were asked to evaluate a leader's power from an organizational chart. On the chart, the leader was parted from the employees with a vertical line, and the more the length of the line increased, the more power the participants perceived the leader to have. The vertical line can in this case be a metaphor for the power distance between the leader and the employees. Conceptual metaphors are forms of mental associations arising when people attempt to communicate effects they cannot see, touch, hear, taste or smell (Lakoff & Johnson, 1980, 1999). Such abstract ideas can be more clearly expressed by formulating it as a mental association. Lakoff and Johnson (1980, 1999) emphasized the asymmetrical nature of conceptual associations, meaning that our thoughts rely on sensory experience. However, a conceptual thought is not needed to provide a sensory experience. Metaphors can change and manipulate how we experience events and relationships depending on which metaphor it is linked with (Lee &

Schwarz, 2014). A metaphorical influenced object can be perceived differently due to unconscious sensory phenomena and through indirect physical links connected to the object. Many articles from the literature of psychology and consumer behavior confirm this effect. Meier and Robinson (2004) gave an example of how a child tasting candy recognizes the taste as sweet and perceives the sweet taste as pleasant. The link established by the child between sweet and pleasant might later lead to the child perceiving sweet people to be pleasant.

We wish to investigate if the power and dominance connected to a high vertical placement can metaphorically transmit from a high voice pitch to a high product price. Therefore, based on the studies presented above, we wish to investigate if there could be an effect of the conceptual metaphor of high (low) voice pitch on a high (low) perceived price. Hence, our first hypothesis is:

H1: When exposed to a low (high) voice pitch respondents will perceive the price to be lower (higher).



Figure 1: Conceptual model of H1

Social Status, Quality and Voice Pitch

The second path through which the voice pitch can affect price perception is through the traits and attributes connected with a lower voice pitch. In this section, we will present former research looking at the relationships between a lower voice pitch and social status, dominance, power, quality, health and size.

According to Titze (1998), differences in conveyed meaning can be dependent on the frequencies in the voice pitch, and the source filter model claims that the frequencies of the voice are connected to the vocal fold vibration and the formant frequencies are connected to the vocal tract. Former research (Butler et al., 1989; Titze, 1998; Harries, Hawkins, Hacking & Hughes, 1998) state that the quantity of testosterone appearing in the subsequent stages of puberty regulates the fundamental frequency of the voice. For both genders, the voice gets lower as the vocal tract increases throughout childhood until puberty and sexual maturity (Fitch & Giedd, 1999). Several studies have been conducted on the vocal channel

of the fundamental frequency of phonation, also referred to as F0. The F0 is the frequency of the human voice below 0.5 kHz, and the outcome of the research has proven that the F0 conveys nonverbal information regarding social status (Gregory, Webster, & Huang, 1993; Gregory, 1994; Gregory & Webster, 1996; Gregory, 1999).

Based on the studies mentioned above, the Communication Accommodation Theory (CAT) has been developed. The theory explains how individuals adapt and match their communication and behavior adjusting to social status asymmetry. When status differences exist, an individual with lower status will adapt to the individual with higher status (Gregory, Green, Carrothers, Dagan, & Webster, 2001). Humans also adjust their voice pitch when leading a conversation with a partner having a higher social status (Gregory & Webster, 1996). Hughes, Farley, and Rhodes (2010) found evidence supporting that both genders lower their voice pitch when leaving a voicemail to a person they find physically attractive.

According to Gregory, Dagan and Webster (1997), several studies indicate that the F0 frequency has an essential impact on transmission of information about dominance and social status, and the absence of F0 cause people to perceive conversations to be of lower quality. Consumers often interpret the product price as an expression of quality (Peterson & Wilson 1985). Quality can be defined as the degree of excellence or superiority attributed to something or someone. When we describe perceived quality, we refer to the consumer's opinion about the degree of excellence or superiority of a product or service. The perceived quality is not necessarily similar to the objective quality of the item in evaluation, and the level of abstraction connected to the evaluation is often higher and not attribute specific. In addition, the perceived quality is often a reflection of the consumer's attitude towards the product made in the consumer's evoked set (Zeithaml, 1988). Some studies found that no such thing as objective quality exist and that all evaluations of quality are in some way subjective (Maynes, 1976). When evaluating quality, consumers can use different attributes. Previous studies indicated that quality is evaluated on a higher cognitive level when level of available search attributes are high (common for durable goods). Opposite results were found for services and nondurable goods where consumers rely more on experience attributes. Quality was evaluated on a higher affective level when more experience attributes were available (Lutz, 1986).

In addition to study if voice pitch can influence people's price perception, we also wish to establish to what extent this could be influenced by their quality perception. We expect the quality evaluation to be of a more affective character due to the lack of experience attributes presented in the stimuli (see study 1, 2 and 3) and hence, more susceptible to influence of other cues such as voice pitch. The assumption only holds if voice pitch can affect the perception of attributes without magnitude dimensions. If a high voice pitch can lead to perceived decrease of quality in a conversation, we wish to research if a low voice pitch can have an opposite effect and eventually transmit perceived increased quality of the product. Thus, our second hypothesis is:

H2: When exposed to a low (high) voice pitch participants will perceive the product quality to be higher (lower).

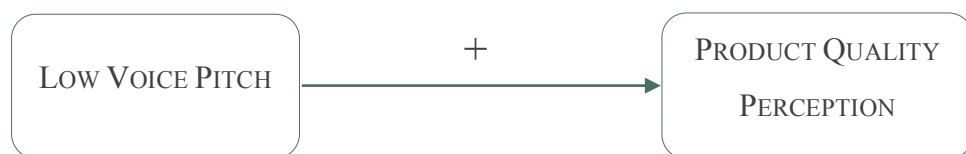


Figure 2: Conceptual model of H2

Since voice pitch seems to affect the way people interact in social settings due to perceived differences in social status, we wish to look further into what are the underlying mechanisms causing this behavior and perceived differences through the next section in the paper.

Power and Dominance

According to Feinberg et al. (2006), low frequencies in male voices are connected to reproductive health and masculinity. Former research has proven that men with deeper voices tend to have higher testosterone levels (Dabbs & Maling, 1999). They also found that lower frequencies in male voices are wrongly associated with a larger body size of the speaker and a hairier chest. These findings were also confirmed by previous studies (Fitch, 1994; Fitch & Hauser, 1995; Fitch & Giedd, 1999). Therefore, studies have been conducted to prove female preference for large vocal tract lengths and low voice pitch. Collins (2000) provided evidence that male voices with lower frequencies and smaller harmonic spacing were found

to be more attractive. Confirming this finding is the study by Pawłowski (2000) who found that women prefer the voices of men with a low and larger sounding voice pitch, and they claimed the reason for this finding to be male body size positively correlating with the reproductive fitness. Fitch and Giedd (1999) found that women's preference for male body size was moderated by their own height and weight, bringing us back to the social context's influence found by Gregory et al. (2001). Men tend to lower their voices when speaking to a competitor they experience as less dominant than themselves. Opposite, when males feel less dominant than a competitor, they raise their voice pitch (Puts, Gaulin, & Verdolini, 2006). Borkowska and Pawłowski (2011) conducted a study proving that women with lower pitched voices are seen as more socially dominant. Men are perceived as physically stronger when their voice contains a lower pitch (Collins, 2000; Feinberg, Jones, Little, Burt, & Perrett, 2005). Previous studies have proven that people tend to elect leaders with lower voice pitch (Klofstad, Anderson, & Peters, 2012; Tigue, Borak, O'Connor, Schandl, & Feinberg, 2012). They also discovered that a lower pitched voice was perceived to be more trustworthy, competent and stronger. In other words, people attribute capabilities connected to being a better leader to people with lower voice pitch, and the findings were consistent regardless of genders of spokesperson and perceiver. However, the assignment of traits and attributes because of a lower voice pitch does not stop here.

Size and Voice Pitch

Since a low voice pitch is associated with physical dominance, reproductive health and larger size amongst other favorable traits, science has also investigated how a larger body size can influence how a person is being perceived. In regards to dominance and body size, previous studies have found that taller people receive premium wages, opposite to their shorter colleagues (Persico, Postlewaite, & Silverman, 2004) and the effect of height having a positive influence on income is also significant when controlling for age, gender and weight (Judge & Cable, 2004). The same study found that height also has a positive impact on success at work for both women and men. This indicates that there could be a link between perceived size of a person and perceived success of a person based on the perceived dominance in the voice pitch.

Previous research by Lowe and Haws (2017) exploring the relationship between dominance, size and power, discovered that the voice pitch affects how big respondents estimated the size of a product in a commercial to be. They found a consistent pattern where a lower voice pitch made participants evaluate the product to be larger in size. We can see from the research stated above that low voice pitch is associated with dominating and favorable traits such as success, being rich, credible and physically attractive, and having a larger physical body size, and we wish to establish if the results from Lowe and Haws (2017) can be replicated and applicable for other magnitude dimensions related to other product attributes than size. Sound can express cross-modal meaning, and for example impact the product perception leading to perceiving a low voice pitch connected to a large product size. Cross-modal correspondence refers to our encoding pattern being influenced by our senses interacting with each other. This phenomenon is defined as the perceptual fit recognized by one sense with the sensory experience in a different sensory process (Spence, 2011). Because of the cross-modal effects between visualization and sound, Lowe and Haws (2017) showed through several studies how acoustic pitch influences people's behavior, beliefs and evaluations of physical size. They found that participants evaluated a burger to be larger in size, when exposed to a burger advertisement with a low voice pitch, and smaller when exposed to a high voice pitch advertisement. However, Lowe and Haws (2017) could not establish any significant effect of voice pitch on perception of other product attributes such as price. One possible explanation could be the order in which they asked the questions after the exposure to the stimuli. Price was one of the last questions in the survey, opposite of the question regarding product size. In the next section, we investigate what could cause the order of the questions to impact the effect of voice pitch on product perception.

Multiple Memory Systems and Priming

Prior research in the fields of cognitive, neuropsychological, and neurobiological sciences has established the understanding of the human memory consisting of multiple systems, among others, the explicit and implicit forms of memory (Graf & Schacter, 1985; Schacter, 1987). When intentionally recalling previous experiences, the explicit memory is used, and traditionally explicit memory can be measured in a laboratory by testing a person's recall and recognition ability.

Implicit memory refers to the prior experiences that lead to changes in behavior without the subject being able to consciously or intentionally recall the memories. Other researchers have been referring to these systems as memory with and without awareness (Jacoby & Witherspoon, 1982). Several studies have investigated amnesic patients and their failure to recall memories of acquisition of certain skills, yet they were able to perform relatively complicated tasks requiring these skills (Glisky, Schacter, & Tulving, 1986; Glisky & Schacter, 1989). The aforementioned research regarding implicit and explicit memory explains how amnesic patients can perform tasks when recently primed with an object without any explicit recollection of the prime or their abilities. Most research on priming has been conducted in controlled experimental environments, but researchers suggest that similar conditions also exist in everyday life and hence it seems reasonable to assume that priming also occurs here (Tulving & Schacter, 1990). Keeping this in mind, it would be reasonable to think that the enormous number of commercials people are exposed to daily, will to some extent have an impact on their behavior, even though most people are not able to recall even being exposed to the commercial. Based on this, we can assume that the voice pitch can influence the listener without the listener being consciously aware of the frequency of the voice pitch or reflecting about the spokespersons voice pitch. Further we will explain how memory can impact order effects.

Order Effects and Memory

As mentioned, we can assume that the implicit memory can be affected by the pitch. Implicit memory has proven to have unconscious influence on recent experiences (Roediger, 1990), even when the experience cannot be recalled. Therefore, voice pitch stored in implicit memory could influence the participant's evaluation of the product attributes in the ad. Implicit memory has also been proven to be unaffected by time delay and decrease in attention (Shapiro & Krishnan, 2001).

If the voice pitch will be stored in the implicit part of memory of participants, we can expect no order effects meaning the time between exposure to stimulus and evaluating the ad will not be affected by time, according to the aforementioned research by Shapiro and Krishnan (2001). If the perception of the voice pitch in the ad is more related with the explicit memory, we can expect that the order in

which questions are asked regarding the independent variable will have a significant impact on the result.

We expect to find the effect of voice pitch on size found by Lowe and Haws (2017). In addition, we believe the effect of voice pitch not to be attribute-specific with regard to size, but moderated by the order in which you ask respondents to evaluate the attributes. Hence our third hypothesis is:

H3: The order of which evaluation of the independent variables are asked, will significantly affect how respondent's perception is influenced by the voice pitch.

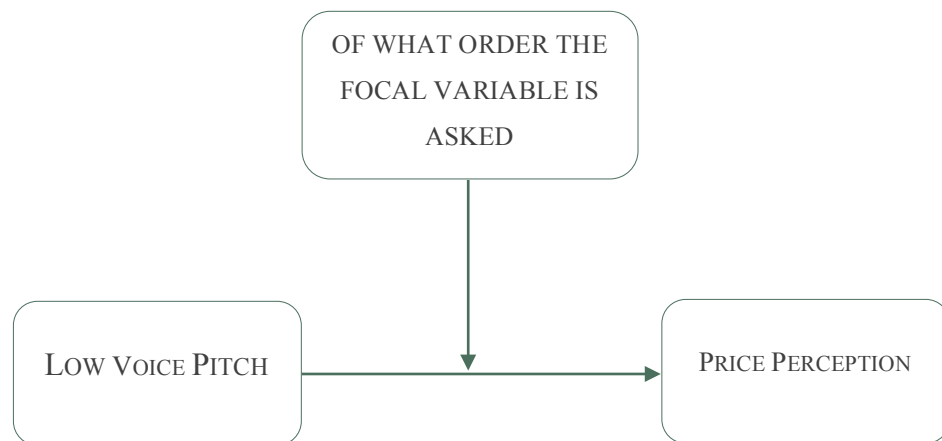


Figure 3: Conceptual model of H3

Further, we wish to establish if the effect of voice pitch holds for other product evaluation criteria as well. We wish to examine if any of the associations (dominance, social status, quality, power) people attribute to a low voice pitch can transmit to other product attributes with magnitude dimensions, and more specifically price. Based on the studies presented in the previous chapters, we would expect a low voice pitch to be associated with a higher price of a product based on the established links between low voice pitch and larger size, higher quality, success, health, social status and dominance. Based on the voice pitch ability to influence people's perception and judgement, we form the fourth hypothesis:

H4: Participants will perceive the price of the products to be higher (lower) when exposed to stimuli with low (high) voice pitch.

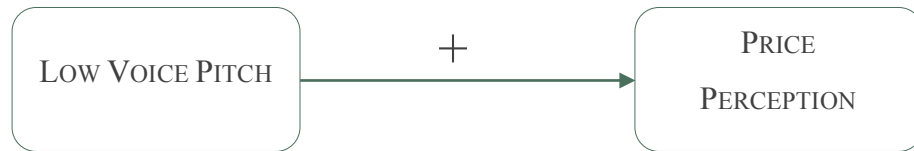


Figure 4: Conceptual model of H4

Priming and Salience

Direct priming has become one of the most studied forms of implicit memory. Direct priming refers to how identification of a perceptual object can be facilitated by a prior exposure to an object (Tulving & Schacter, 1990), making the object salient. The process is connected to implicit memory in the way that direct priming can happen independently of explicit and conscious recollection of a previously experienced stimuli (Schacter, 1992). In the field of social psychology previous studies have established that salience is a factor which can influence judgement and evaluation (Taylor & Fiske, 1975). Former research has also established that when something is salient it tends to receive a disproportionate load of attention in respect to the context. In addition, people seem to attribute more to entities and people being salient. The effect of salience leading to more causal attribution, has also been proven to be true for people and items being salient (Pryor & Kriss, 1977). They found that the salience of an item affect the items availability in the participant's memory, which leads to a mediating effect of how much attributions are made in regards to the item. Based on this information, we can expect that if we make the variable price more salient by priming participants with several questions about price before exposing participants to the auditory stimuli, they will attribute more of the effect of voice pitch to the product price. Hence, our fifth hypothesis is:

H5: *When price is salient, the effect of voice pitch will have a larger impact on respondent's price perception of the advertised product.*

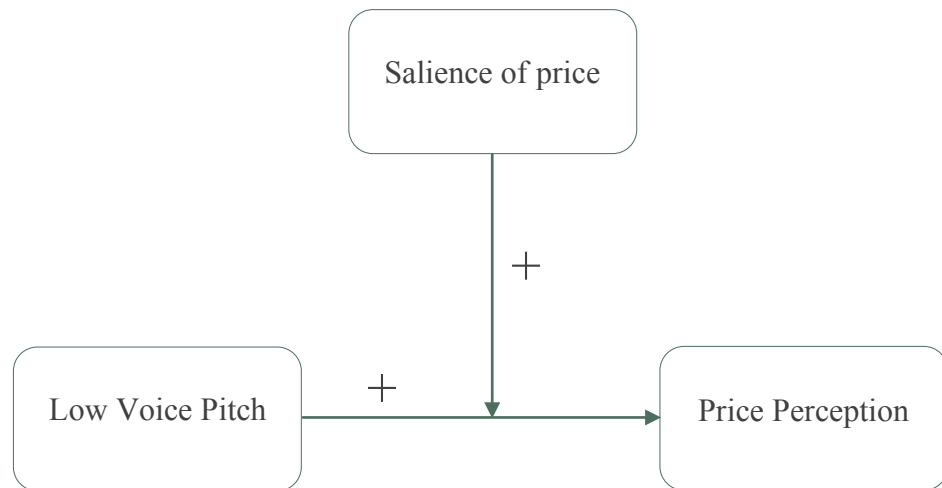


Figure 5: Conceptual model of H5

In the next chapter, the experimental analyses will be presented. Three studies were conducted to test the hypotheses stated above, and they are outlined and discussed subsequently.

OVERVIEW OF EXPERIMENTS

In this section the methods and testing of the hypotheses are described through three studies. All the studies tested the proposed hypotheses about the relationship between voice pitch and price perception. Study 1 focused on replicating findings from Lowe and Haws (2017), regarding the relationship between voice pitch and size perception of a product. In addition, study 1 aimed to establish which of the two paths (mentioned in the introduction) would lead to voice pitch effect on product perception. We also aimed at testing whether the order of which the questions were asked could influence the responses and be a moderator of voice pitch. Hence, study 1 tested the hypotheses H1, H3 and H4.

In study 2, we further investigated the relationship between voice pitch and price. The audio advertisement for study 2 was different from study 1, and the same hypotheses as for study 1 were tested under new conditions. In addition, we wished to investigate if the effect of voice pitch only holds for attributes with magnitude dimensions or if the effect also holds for other product attributes, such as quality. Hence in study 2, hypotheses H1, H2, H3 and H4 were tested.

To further strengthen our findings from study 2, and to understand the impact of the salient price information, we conducted the third study. In addition to strengthen results testing hypotheses H2, H3 and H4, a fifth hypothesis was also tested by including salience as a third independent variable (IV).

We note that sample sizes for samples collected online were roughly determined by seeking 80-100 participants per cell. Following our studies, we end with a discussion of theoretical and practical implications of these results and directions for future research.

STUDY 1 – PILOT STUDY

Design and Subjects

The purpose of study 1 was to replicate the findings from Lowe and Haws (2017) regarding the effect of voice pitch on size perception, where a lower voice pitch lead participants to evaluate the burger larger in size. We also aimed to test hypotheses one, three and four, where one and four are competing hypotheses.

H1: When exposed to a low(high) voice pitch, respondents will perceive the price to be lower (higher),

H3: The order of which evaluation of independent variables are asked, will significantly affect how respondent's perception is influenced by the voice pitch

H4: Participants will perceive the price of the products to be higher (lower) when exposed to stimuli with low (high) voice pitch.

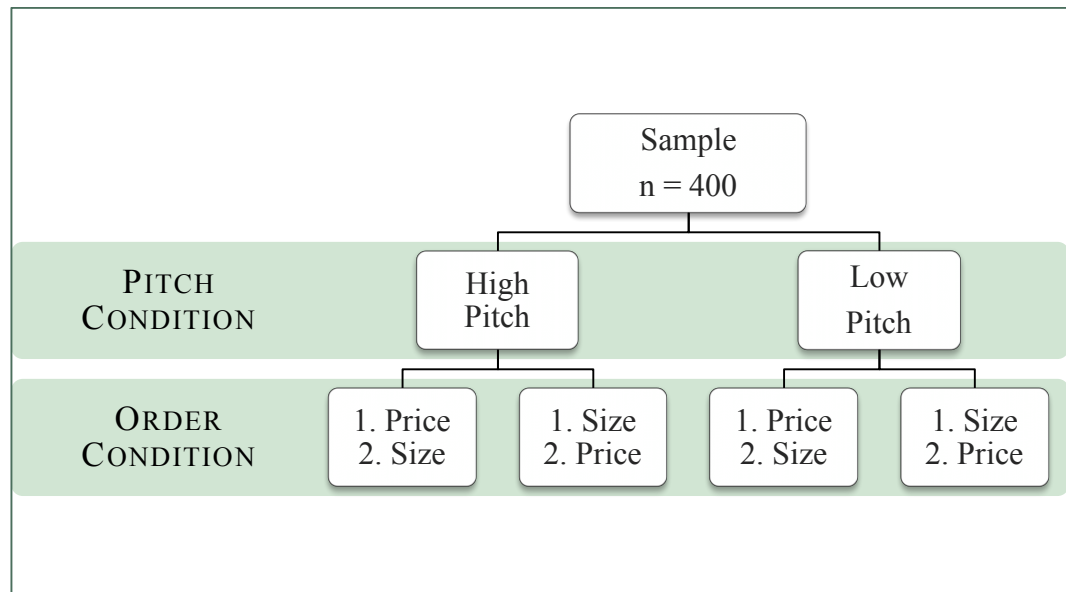


Figure 6: Schematic overview of study 1

For the experiment, 406 participants (201 male) were recruited from the online panel, Amazon Mechanical Turk (MTurk) where participation was rewarded with a moderate financial compensation. The choice of an online panel instead of a controlled lab experiment, was based on previous research showing that it does not significantly affect the result of the study (Feinberg, DeBruine, Jones, & Little 2008). By using an online panel participants cover a larger base of demographics, thus contributing to a high external validity of the study.

Audio Description

The participants listened to the same ad for burgers as used by Lowe and Haws (2017), and the voice pitch manipulation was also identical. The ad was pre-tested by Lowe and Haws, who asked the respondents to rate their agreement with three statements after listening to the ads: “The ad sounded strange”, “The ad was realistic” and “The ad was high quality”. The ratings were measured on a 7-point

scale between “Strongly disagree” and “Strongly agree”. A t-test confirmed that there was no significant difference in the ratings of the two versions of the ad.

Main Study

In the main study, a two (voice pitch: high vs. low) x two (order of questions about price and size) between-subject design was used, with price, size and pitch as the factors of interest. All conditions were randomly assigned to the participants. When subjects respond to surveys, several types of response errors might occur. One common error is related to the effect of the order in which the questions are asked. Previous research has revealed that the order of the questions matters, but there are ambiguous answers to what direction the effects go. Several studies found support for the primacy effect, where respondents are biased to answer the first option available (McFarland, 1981). In contrast, many studies have also shown proof of the recency effect, where subjects tend to respond to the last choice presented to them. Also, some studies have found no order effects at all (Krosnick, 1999). Order effects are found to be consistent across gender and education levels. A common way of controlling for this, is through randomization of the order in which the questions are exposed to the participant (McFarland, 1981). To make sure the measurements only included effects of voice pitch and associations with the variables of interest and not the effect of priming from the other questions, the questions about price and size were randomized to either be asked first or last.

The participants were told to use headphones to ensure the quality of the recording. In the introduction of the study the participants were told through a message on the screen that they were going to answer some questions regarding an audio advertisement. No additional visual stimuli were provided. After hearing one of the two versions of the of the advertisements (high or low pitch), the respondents were asked to complete a few questions about the advertised product. To reduce suspicion of the focal variable (price and size perception), questions that were not central to the study about quality and taste were included. The questions were answered through a seven-point semantic differential scale, designed from the scale presented by Kirmani, Sood, and Bridges (1999). The question regarding price perception was presented in seven-point semantic scale, anchored on “Lower than average” and “Higher than average”. In order to remove those participants that have not paid attention to or heard the content of the

commercial, the participants also had to respond to an “attention check” about the commercial.

Independent (IV), Dependent (DV), and Moderating Variables

The dependent measures in study 1 were size perception level (one item along a seven-point scale), price perception level (one item along a seven-point scale), taste perception level (one item along a seven-point scale) and quality perception level (one items along a seven-point scale). All the dependent variables were measured with a scale ranging from “Much worse/lower than average” to “Much better/higher than average”.

The independent variables were speaker pitch condition and order condition of the questions regarding level of size and price. In the analysis, PriceSize indicate that price was asked first, and size was asked last. SizePrice indicate that size was asked first, and price was asked last. Objective independent variables such as age and gender were included. To evaluate whether or not we should exclude the respondent from the study, a question about ad recall (“What kind of product was advertised in the ad?”), sound problems and hearing impairment was included. The full questionnaire for study 1 is included in appendix 1.

Preliminary Analysis

After executing quality checks, 33 participants were excluded from the analysis due to wrong answer to the control question or hearing impairment. In the next part, statistical analysis will be presented together with the significant findings. A repeated-measures analysis of variance (ANOVA) was conducted and the results are presented in Table 1.

Results and Discussion

Size

A two-way ANOVA including pitch condition (IV) and order condition (IV) to predict size (DV) was conducted to see if the results from the Lowe and Haws (2017) could be replicated. Residual analysis was performed to test for the assumptions of the two-way ANOVA. Outliers were assessed by inspection of a box plot and normality was assessed using Shapiro-Wilk's normality test for each cell of the design, and homogeneity of variances was assessed by Levene's test. One outlier was discovered (respondent 87). The outlier was not a result of data

entry error or measurement error. The results did not sufficiently differ from the results with the outliers, therefore, the outlier was kept for future analysis. Residuals were not normally distributed ($p > 0.05$), hence, we ran test comparisons on the transformed data, and found no meaningful differences (e.g. changes in statistical conclusions, etc.). There was homogeneity of variances ($p = 0.912$).

Dependent variable: Size

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3.770 ^a	3	1.257	1.514	.210
Intercept	10503.461	1	10503.461	12659.513	.000
ConditionPitch	3.149	1	3.149	3.796	.052
ConditionOrder	.621	1	.621	.748	.388
ConditionPitch* ConditionOrder	.073	1	.073	.088	.767
Error	306.155	369	.830		
Total	10831.000	373			
Corrected Total	309.925	372			

a. R Squared = .012 (Adjusted R Squared = .004)

Table 1: Test of between-subjects effects (Study 1, DV: Size; IV: condition Pitch and condition Order)

The resulting interaction was not significant, $F(1, 373) = .088$, $p = .767$. However, the ANOVA did show a close to significant difference between pitch conditions. In line with the results found by Lowe and Haws (2017) we found marginal support for lower voice pitch leading participants to perceive the burger to be larger in size ($M_{\text{HighPitch}} = 5.218$ vs. $M_{\text{LowPitch}} = 5.402$; $F(1, 373) = 3.796$, $p = .052$). There was not a significant contrast between the individuals in the different order conditions of size ($M_{\text{PriceSize}} = 5.269$ vs. $M_{\text{SizePrice}} = 5.351$; $F(1, 373) = .767$, $p = .388$).

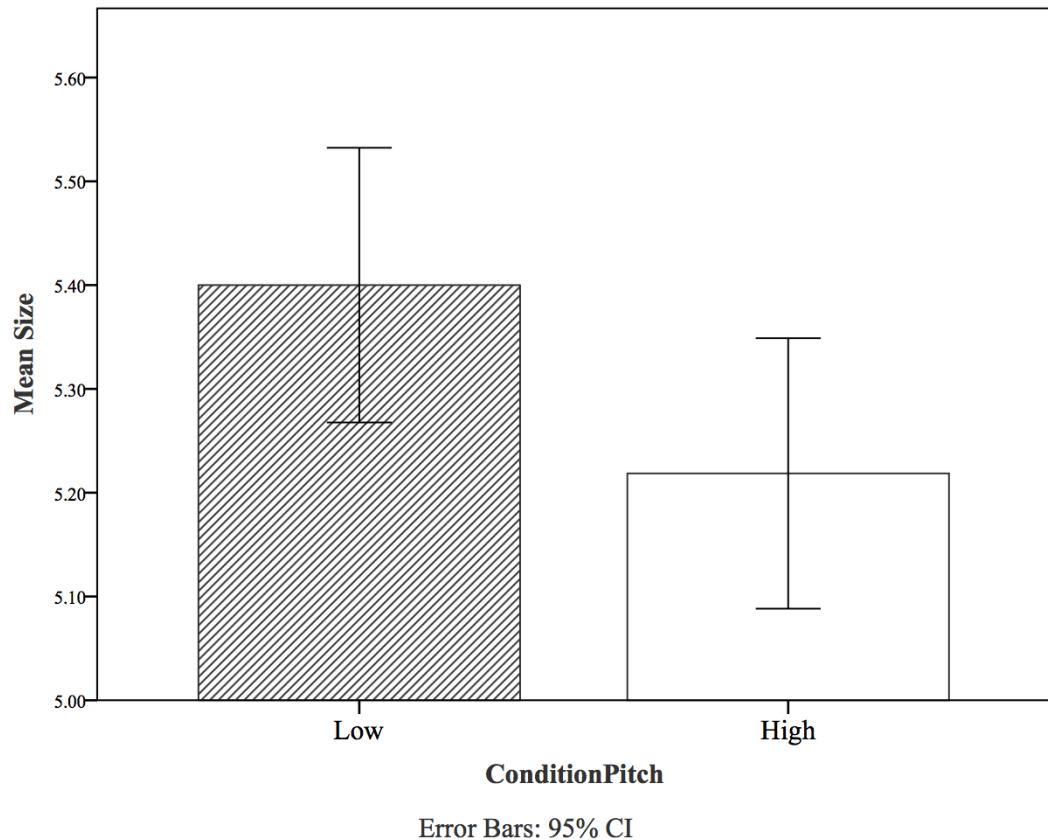


Figure 7: Mean rating of size under different pitch conditions

Price

Next, an ANOVA including pitch condition (IV) and order condition (IV) to predict price (DV) was conducted. Residual analysis was performed to test for the assumptions of the two-way ANOVA. Outliers were assessed by inspection of a box plot and normality was assessed using Shapiro-Wilk's normality test for each cell of the design and homogeneity of variances was assessed by Levene's test.

The resulting interaction between pitch condition and order condition on price was not significant ($F(1, 373) = 0.052, p = 0.820$). However, there was a significant main effect for order condition, $F(1, 373) = 4.182, p = 0.042$. All pairwise comparisons were run where reported 95% confidence intervals and p -values were Bonferroni-adjusted. The unweighted marginal means of "Price" levels for the conditions PriceSize and SizePrice were 4.359 (SE = 0.054), and 4.516 (SE = 0.054), respectively, such that when size was asked first, it led the participants to infer a higher price compared to when asked about size last (see figure 8).

Dependent Variable: Price

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2.355 ^a	3	.785	1.424	.235
Intercept	7336.008	1	7336.008	13307.771	.000
ConditionPitch	.004	1	.004	.007	.934
ConditionOrder	2.305	1	2.305	4.182	.042
ConditionPitch* ConditionOrder	.028	1	.028	.052	.820
Error	203.414	369	.551		
Total	7549.000	373			
Corrected Total	205.769	372			

a. R Squared = .011 (Adjusted R Squared = .003)

Table 2: Test of between-subjects (Study 1, DV: Price; IV: condition Pitch and condition Order)

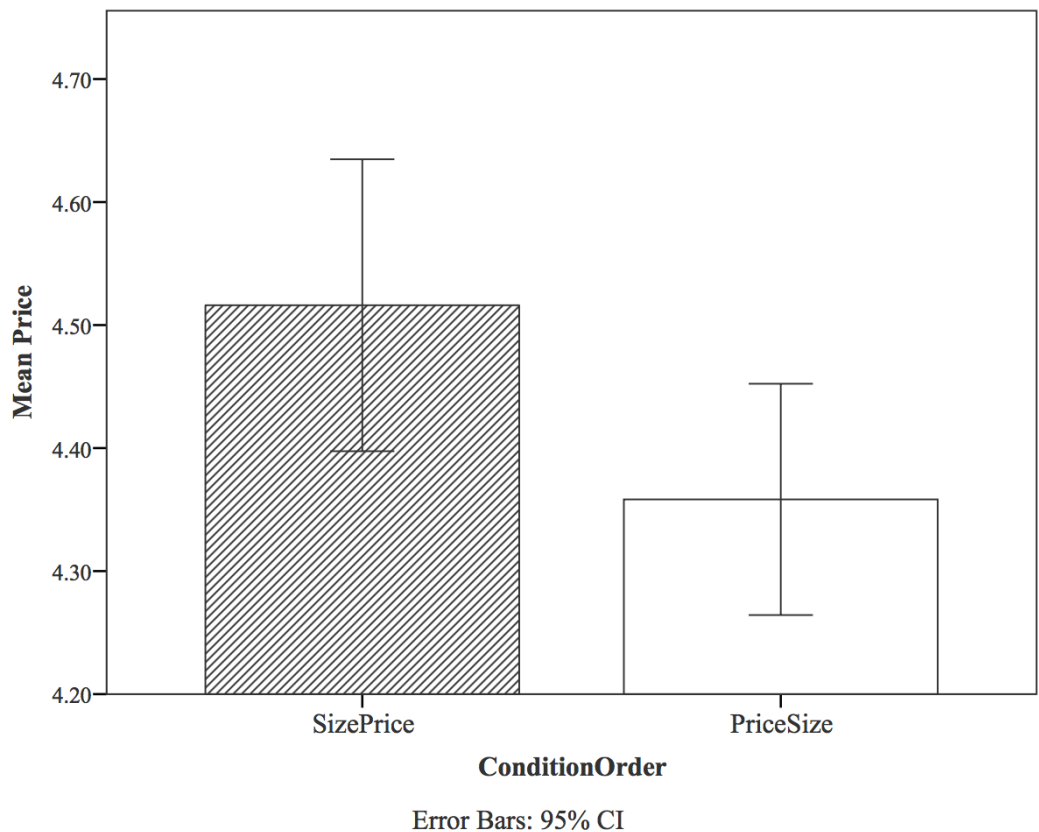


Figure 8: Mean price rating under different order conditions of questions.

Discussion

The ANOVA test did not show significant difference between pitch conditions ($M_{\text{HighPitch}} = 4.4426$ vs. $M_{\text{LowPitch}} = 4.4316$; $F(1,373) = 0.007$, $p = 0.934$). In other words, no significant effect of voice pitch on price perception was found. Because of that, no support was found for H1 or H4, and the direction and the effect of voice pitch on price perception continued to be unclear. We also checked for moderating effects of age and gender. No significant moderating effects were found. The dependent variables, taste and quality, were also tested. None of the independent variables (pitch condition, order condition, age and gender) had any significant effects on these DVs.

The purpose of the study 1 was to replicate the findings from Lowe and Haws (2017), and to statistically test H1, H3 and H4. Study 1 supports the findings from the Lowe and Haws (2017), claiming that voice pitch influences perceived product size. Also in line with Lowe and Haws (2017), our findings did not support our hypotheses claiming that voice pitch affect price perception.

The significant order effect found, can be related to studies showing that in addition to time delay the content of the message can also impact the persuasiveness of the message. When the content is perceived by the receiver as unfamiliar, non-salient, uninteresting and non-controversial, the recency effect tends to appear (Furnham, 1987; Rosnow & Robinson, 1967). As mentioned previously, the recency effect means participants pick the choice presented last to them. The effect appears before the subject decides what to answer, and the effect seems to be connected to convenience and memory retrieval of the choices presented. Since fast food burger ads may not be processed with the high involvement by the participants, the convenience of memory retrieval is likely to be used. This could explain the order effect found in the studies mentioned above where participants evaluated price to be lower when the question about price was asked closest in time to the voice message, but not when asked last, and hence, harder to recall the ad.

We acknowledge that most likely the lack of evidence supporting H4 is due to the product category that was used in the experiment. However, the study gave results indicating the direction in which a lower voice pitch is associated with a higher product price. However, the results from the study were not significant. As

mentioned previously, a lower voice pitch is associated with the quality of conversations and traits of quality, such as credibility, social status and health. If the effect of voice pitch can influence perceived product quality, the price is likely to be also perceived higher in positive correlation with the quality. Previous studies have established that people use many cues, including price, when evaluating product quality (Olson, 1977). Former research has also proven that there are variations for the product attributes used for evaluation of product quality in different product categories (Gardner, 1970; Lambert, 1972; Peterson & Wilson, 1985). Peterson and Wilson (1985) found that the greater the price variation within a product category (often durable goods), the more likely consumers are to use price as an indicator for quality. Therefore, small variations in quality perception has been found in nondurable goods with exceptions of the categories, perfume and wine, where the price range is larger (Gardner, 1970; Lambert, 1972; Peterson & Wilson, 1985). In the study 1, the burger advertisement used had the typical character often associated with fast food. In the fast food category, the price variations for burgers are small and often connected with size, and hence we assume this to be the reason for the insignificant effects found in regards to voice pitch effect on price perception. When proceeding with the study 2, we chose an audio advertisement for whiskey, which is a product category of great price variation. In addition, whiskey is a product that comes in standardized sizes, often 0.75 or 1 litre in contrast to the burger category. This could also be helpful in the process of determining whether evaluation of size leads participants to rate the price level, or if the voice pitch has a direct effect on price perception, not moderated by the size perception. Therefore, we also changed the size attribute in the order condition, since it would no longer make sense to ask respondents to evaluate the size of the product. The size attribute was therefore changed with the product attribute quality.

STUDY 2

Design and Subjects

Study 2 was conducted with a new audio stimuli since we suspected that the previous advertisement used in study 1 could have impacted the lack of significant findings in study 1. Therefore, the following hypotheses were tested:

H1: *When exposed to a low (high) voice pitch respondents will perceive the price to be lower (higher).*

H2: *When exposed to a low (high) voice pitch participants will perceive the product quality to be higher (lower)*

H3: *The order of which evaluation of independent variables are asked, will significantly affect how respondent's perception is influenced by the voice pitch*

H4: *Participants will perceive the price of the products to be higher (lower) when exposed to stimuli with low (high) voice pitch*

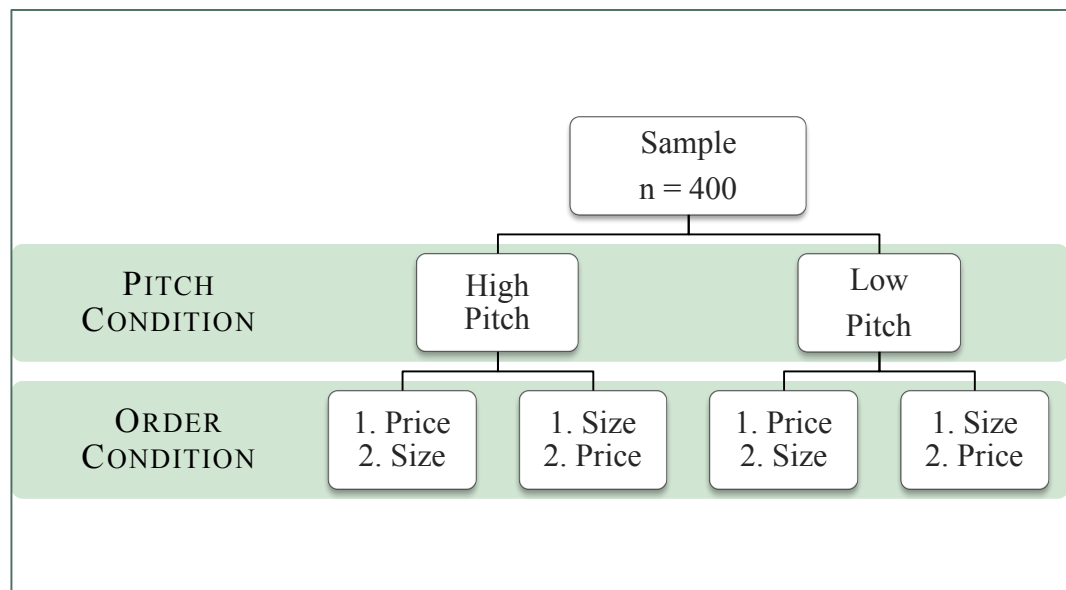


Figure 9: Schematic overview of study 2

404 people were exposed to an audio ad for whiskey, followed by a questionnaire about the advertised product. As in the study 2, the participants were recruited through the online panel (MTurk). 404 participants completed the online experiment. As explained in the study 1, using an online panel, participants cover a large base of demographics, and therefore contribute to a high external validity.

Voice Pitch Manipulation

When manipulating voice pitch, we used the technical methods from Titze (1998). The research established that male speakers have a fundamental frequency (F0) between 85 Hz and 180 Hz with the average male voice pitch of 124 Hz (Traunmüller & Eriksson, 1994). In this study an English native speaker (Scottish accent) with a baseline F0 133.636 Hz was used in the audio ad. The speaker's voice pitch was digitally manipulated. Humans can perceive differences in voice

pitch at 25 audio cents (Hyde & Peretz, 2004), yet it is of great importance that the changes in voice pitch seems realistic and not distorted. The “high voice pitch” was raised by 80 audio cents (139.946Hz), and the “low voice pitch” was lowered by 140 audio cents (118.239Hz). To make sure that the auditory stimuli seemed realistic and not distorted the ad was pretested. After listening to one of the ads, the respondents were asked to confirm their degree of agreement with three statements: “The ad sounded strange”, “The ad was realistic” and “The ad was high quality”. The test was based on a similar pretest used by Lowe and Haws (2017). The answers were measured on a seven-point scale between “Strongly disagree” and “Strongly agree”.

Main Study

In the main study, two (voice pitch: high vs. low) x two (order of questions about price and quality) between-subject design was used, with price, quality, order, and pitch as the factors of interest. The participants were randomly assigned to either the low or high voice pitch condition. To ensure the evaluation included only the effects of price and quality perception and not the effect of priming from the other questions, the questions about price and quality were randomized so that they either were asked first or last. As mentioned, the unedited voice pitch of the male speaker was 133,636 Hz, and the high pitch condition was increased by 80 audio cents and the low pitch condition was lowered by 140 audio cents, corresponding with a natural sound (according to the pretest) and previous studies (Traunmüller & Erikssons, 1995). The participants received an introduction message informing them to turn off sound sources in the environment and to wear headphones, followed by a short sound check. In the introduction of the study, the participants were told through a message on the screen that they are going to listen to a radio advertisement and then respond to various questions about the advertisement and the product being advertised. To help the respondents be aware of the price range in the product category, they were asked to write what they believed to be the price range for a 750 mL whiskey bottle. No additional stimuli were provided. After listening to one of the two advertisement versions (high or low pitch), respondents were asked to complete a short survey regarding the ad and the product. To avoid hypothesis guessing and suspiciousness regarding the focal variable (price perception), questions not central to the study were included, such

as size and taste. At the very end of the survey, the respondents were also asked to evaluate their whiskey expertise.

The answers were structured through a seven-point semantic differential scale that was designed based on the scales presented by Kirmani et al. (1999). The question regarding price of the product in the advertisement, was presented in seven-point semantic scale, anchored on “Lower than average” and “Higher than average”. In order to remove the participants that did not pay attention to the content of the commercial, participants had to answer what product was advertised in addition to the brand name. Finally, the respondents had to answer to questions regarding the sound quality and potential hearing impairments, so that respondents not hearing the ad properly could be excluded from the data set.

Independent, Dependent, and Moderating Variables

The dependent measures in study 2 were: price perception level (one item along a seven-point scale), quality perception level (one item along a seven-point scale), taste perception level (one item along a seven-point scale) and size perception level (one items along a seven-point scale). All the dependent variables were measured with a scale ranging from “Much worse/lower than average” to “Much better/higher than average”.

The independent variables were: speaker pitch condition, and order condition of the questions, regarding level of price and quality. In the analysis, PriceQual indicate that price was asked first, and quality was asked last, and QualPrice indicate that quality was asked first, and price was asked last. Objective independent variables, such as age, gender, and subjective factors, such as expertise were included. To evaluate whether to exclude the respondent from the study or not, a series of questions were included in the questionnaire. Ad recall (“What kind of product was advertised in the ad?”), attention check (“What was the name of the brand used in the commercial?”), sound problems, hearing impairment, whether or not the respondent left the room while answering the questionnaire, and brand knowledge was included for this purpose. The full questionnaire for study 2 is included in appendix 1.

Preliminary Analysis

28 respondents were removed after executing quality checks, leaving 376 respondents for further analysis. The percentage of excluded participants was within the limits for acceptable levels of exclusion 10-15 percent without affecting

the validity of the study). The 28 participants were dismissed due to problems with ad recall, fail to answer attention check, reported problems with the Scottish accent, reported hearing impairment, whether the participant were underage (under 21), or a mix of several of the factors. In the following section, the analysis of the statistically significant results will be presented. Repeated-measures analysis of variance (ANOVA) was conducted and the results are presented in Table 2. In addition, analyses were conducted to establish the moderator effects of order of the questions, age, expertise (participant's self-evaluation of their whiskey knowledge), gender and participants perceived average price of a bottle of whiskey. These moderator effects were checked together with the pitch condition and its effect on price perception.

Results

Price (H1, H3 and H4)

A two-way ANOVA was conducted to examine the effects of voice pitch condition and order condition on price perception level. Residual analysis was performed to test for the assumptions of the two-way ANOVA. Outliers were assessed by inspection of a boxplot, normality was assessed using Shapiro-Wilk's normality test for each cell of the design and homogeneity of variances was assessed by Levene's test, $p > 0.05$.

Dependent Variable: Price

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3.792 ^a	3	1.264	1.591	.191
Intercept	8530.416	1	8530.416	10734.729	.000
<u>ConditionPitch</u>	3.221	1	3.221	4.054	.045
<u>ConditionOrder</u>	.447	1	.447	.563	.454
<u>ConditionPitch * ConditionOrder</u>	.188	1	.188	.237	.627
Error	295.612	372	.795		
Total	8840.000	376			
Corrected Total	299.404	375			

a. R Squared = .013 (Adjusted R Squared = .005)

Table 3: Test of between-subjects effects (Study 2, DV: Price; IV: condition pitch, condition order and pitch*order)

The resulting interaction between voice pitch condition and order condition on price perception level was not significant, $F(1, 376) = 0.237$, $p = 0.627$. Hence, we found no support for H3: *The order of which evaluation of independent variable are asked, will significantly affect how respondent's perception is influenced by the voice pitch.* An analysis of the main effects of voice pitch condition and order condition on price perception level was performed. Main effect of order condition on price was not significant, $F(1, 376) = 0.563$, $p = 0.454$. All pairwise comparisons were reported at 95% confidence interval and p -values were Bonferroni-adjusted. The unweighted marginal means of price perception levels for PriceQual and QualPrice were 4.730 ($SE = 0.065$) and 4.799 ($SE = 0.065$), respectively. Even though these results are not statistically significant, the order (QualPrice) which lead to perception of higher price level is an interesting finding.

However, the analysis indicated that the main effect of voice pitch on price perception level was statistically significant, $F(1, 376) = 4.054$, $p = 0.045$. All pairwise comparisons were reported at 95% confidence interval (CI) and p -values were Bonferroni-adjusted. The unweighted marginal means of price perception levels for low pitch and high pitch were 4.857 ($SE = 0.065$) and 4.672 ($SE = 0.065$), respectively (see figure 10). A low pitch condition with a mean "price perception" score 0.185 (95% CI, 0.004 to 0.366) higher than a low voice pitch condition, a statistically significant difference, $p < 0.05$. Hence, we found support for H4 regarding a low (high) voice pitch leads to a high (low) perception of price level, which was competing with H1, stating the opposite effect. Therefore, no support was found for H1 regarding the spatial conceptual metaphor affecting how voice pitch impact price perception.

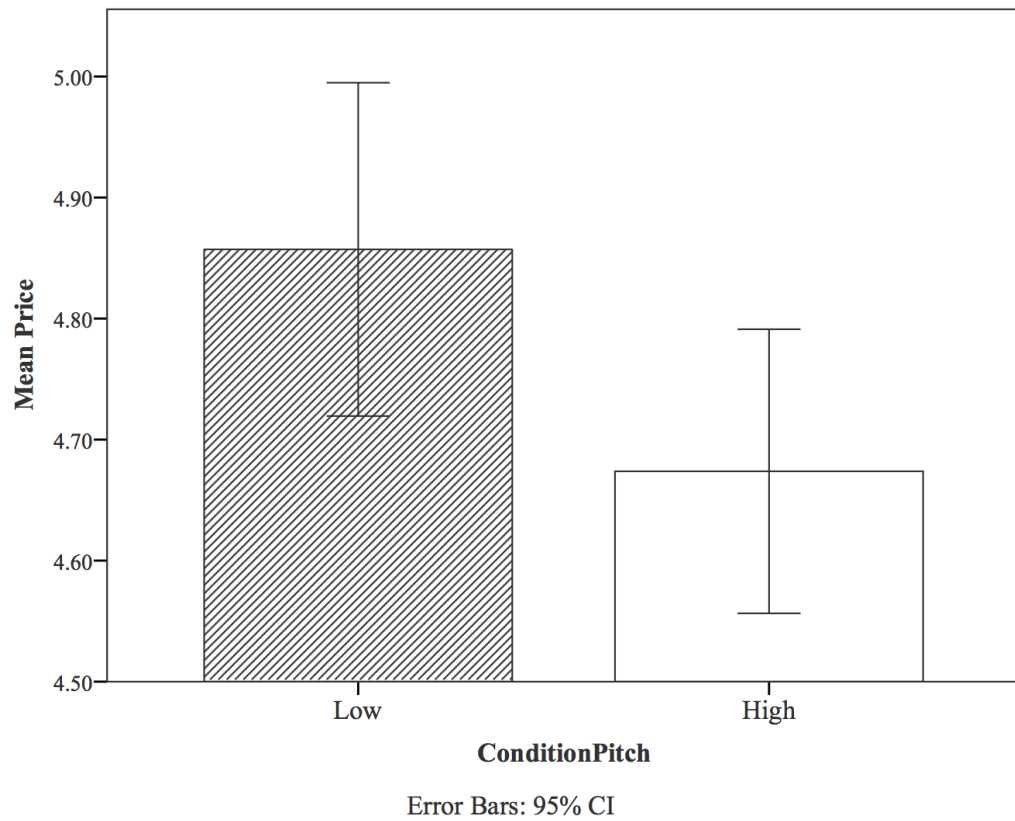


Figure 10: Mean price rating under different pitch and order conditions.

Additionally, we analyzed voice pitch condition together with age (pitch*age), expertise (pitch*expertise) and gender (pitch*gender). No significant interaction effects were found.

Quality (H2)

A two-way ANOVA was conducted to examine the effects of voice pitch condition and order condition on quality perception level. Residual analysis was performed to test for the assumptions of the two-way ANOVA. Outliers were assessed by inspection of a box plot, and no outliers were found. Normality was assessed using Shapiro-Wilk's normality test for each cell of the design and homogeneity of variances was assessed by Levene's test, $p > 0.05$.

The interaction effect between voice pitch condition and order condition on quality perception level was not significant, $F(1, 376) = 0.554$, $p = 0.457$. An analysis of the main effect for voice pitch condition was performed, which indicated that the main effect was not significant, $F(1, 376) = 1.314$, $p = 0.252$. Neither was the main effect for order condition, $F(1, 376) = 0.663$, $p = 0.416$. Hence, we cannot support H2 regarding perceived product quality.

Discussion

The purpose of the study 2 was to investigate if changing the audio stimulus to an advertisement with a category with more price variation could help establishing H1, H2, H3 and H4.

First, support was found for H4, that is low (high) voice pitch leading participants to evaluate a product to be more (less) expensive. This confirms the hypothesized effect regarding a low voice pitch being associated with a higher price of a product, based on the aforementioned links between low voice pitch and larger size, higher quality, success, health, social status and dominance. Further, we can exclude H1 stating the expected effect of the spatial conceptual metaphor potentially leading to the opposite effect of H4. Next, we will discuss some of the non-significant findings, from the study 2 and explain what we believe are the reasons for the results, and ways in which we can move forward to the next study.

In the survey, a question about expertise was included to explore its potential as a moderator. We believe that the way in which we phrased the question might have impacted the non-significant result. Previous research has shown that the less people know about a topic, the more they tend to inflate their estimations of their own expertise, meaning that their lack of knowledge, skills or expertise also robs them of the metacognitive ability to realize their own limitations (Kruger & Dunning, 1999). Therefore, we decided to include several questions measuring expertise in the study 3, based on experience and frequency of experience, instead of explicitly ask for expertise.

In study 2, no support was found for the second hypothesis regarding voice pitch effect on quality. In this section, we wish to look into possible explanations for this unexpected non-significant finding. Quality measures can be divided into different cues, and one often separates extrinsic and intrinsic cues (Zeithaml, 1988). The intrinsic cues are product specific and relates to the physical product. Extrinsic cues are not part of the physical product, but they are product related. Attributes such as price, brand and amount of advertising are examples of extrinsic cues that consumers often use to evaluate the product quality. Many researchers have devoted their resources to study the extrinsic cue price, and it seems that when consumers lack information about intrinsic (product specific) attributes, they tend to use price as a surrogate for quality when evaluating the product (Zeithaml, 1988; Olson, 1977). The extrinsic cues often present the

generalized perceived quality of the product and these findings are stable across brands, products and categories (Olshavsky, 1985; Holbrook & Corfman, 1985). In the whiskey commercial used in the study 2, there are not a lot of intrinsic quality attributes present and this could explain why we get a significant effect of voice pitch on price perception. Assuming participants experience lack of information to evaluate the quality of the product, the low voice pitch gives the impression of a higher quality, which the participants expresses through the variable price functioning as a surrogate for quality (Zeithaml, 1988; Olson, 1977), hence, we do not see a significant support for our second hypothesis regarding quality perception.

Further, in the study 1 and 2 participants evaluated the price range and average generic price of the product in the commercial before being asked to assess the price of the product advertised. We suspect that the questions regarding price in general would prime (see literature review about priming and salience, page 11 and 12) respondents and be the reason why we got significant results of voice pitch effect on price perception. Therefore, we added one more condition in the study 3 to be able to test our fifth hypothesis regarding price salience. To be able to fully establish the causality of our finding, salient price information was added as a condition in the study 3.

STUDY 3

Design and Subjects

The study used the same auditory stimuli as study 2, in order to establish the strength of the results from study 2 and to test H5: *When price is salient, the effect of voice pitch will have a larger impact on respondent’s price perception of the advertised product.*

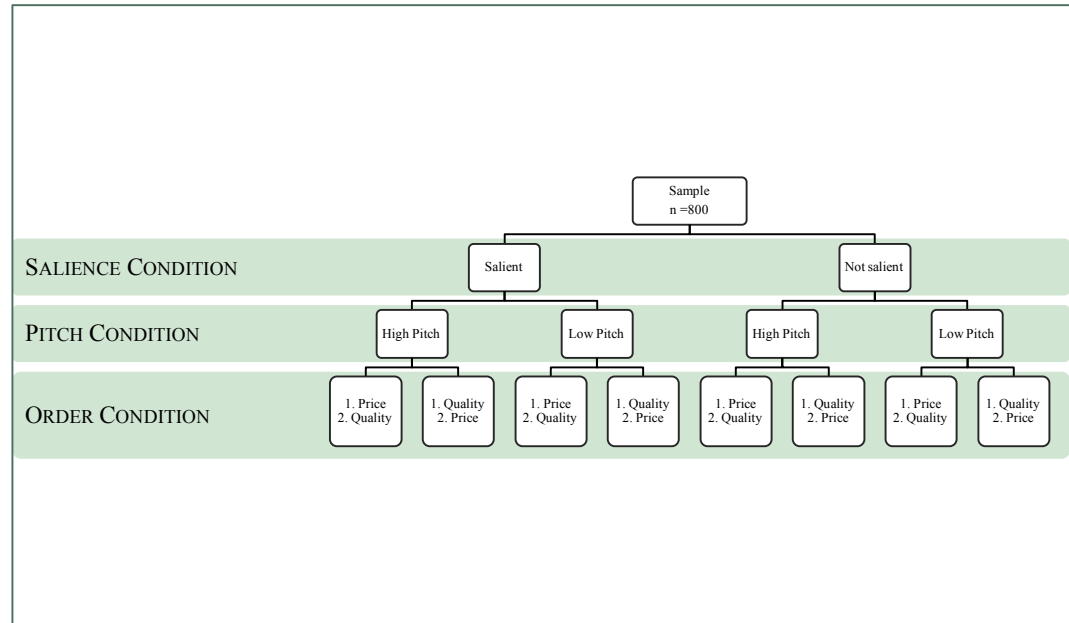


Figure 11 Schematic overview of study 3 (See larger version in appendix 3)

813 participants were exposed to the audio ad for whiskey also used in the study 2. The advertisement was followed by a similar to the previous questionnaire, modified as discussed in the previous section. Identically as in the study 1 and 2, the participants were recruited through the online panel (MTurk). 813 participants completed the online experiment. As explained previously, when using an online panel participants cover a large base of demographics, thus contributing to high external validity of the experiment.

Voice Pitch Manipulation

When manipulating voice pitch, the technical methods from Titze (1998) were used. In the study 3, the same ad was used as in study 2, with the English native speaker (Scottish accent) with a baseline F0 133.636 Hz. The speaker's voice pitch was digitally manipulated in the same way as in the study 2, that is; the “high voice pitch” was raised by 80 audio cents (139.946Hz), and the “low voice pitch”

was lowered by 140 audio cents (118.239Hz). The voice manipulation was pretested for the study² and because the voice pitch was not further manipulated, no new pre-test was conducted.

Main Study

In the main study, two (voice pitch: high vs. low) x two (order of questions about price and quality) x two (salience price vs non-salience price) between-subject design was used with price, quality, salience, order and pitch as the factors of interest. Respondents were randomly assigned to either the low or high voice pitch condition. Questions about price and quality were randomized so that respondents were asked about price and quality first or last, to make sure their evaluation was not affected by priming effect from other questions. Randomizing the variables also allowed for establishing the effect the order of questions have on respondent's assessment.

Similar to the study 2, the unedited voice pitch of the male speaker was 133,636 Hz. The high pitch condition was increased by 80 audio cents and the low pitch condition was lowered by 140 audio cents, to ensure a natural sound according to previous studies (Traunmüller & Erikssons 1995) and pre-tests. The participants were asked to turn off other sound sources in the environment and wear headphones. The survey started with a short sound check. Then subjects were told that they were going to listen to a radio advertisement, followed by a questionnaire about the ad and the advertised product. For the respondents entering the salient price condition, they were made aware of the price of the category by estimating what they believed to be the price range for a 750 mL bottle of whiskey, in addition to what they believed was the average price of a 750 mL bottle of whiskey. No visual stimuli were given. For the respondents not entering the salient price condition, no questions regarding price of whiskey were asked before hearing the advertisement.

After hearing one of the two advertisement versions (high or low pitch) and being primed with price or not, respondents were asked to complete a short survey about the ad and the product. To bypass suspiciousness about the focal variable (price perception), questions about taste and size were included. Further, subjects were asked to evaluate their experience with whiskey and prestige, status and exclusivity of the product. The responses were structured through a seven-point semantic differential scale. The design was based on the scales presented by

Kirmani et al. (1999). The question about price of the product in the advertisement was structured in seven-point semantic scale, anchored on “Lower than average” and “Higher than average”. To remove the respondents not paying attention to the audio stimuli, participants had to provide information about which product was advertised, and what was the brand name. To be able to exclude participants not hearing the stimuli properly respondents were asked two questions about the sound quality and potential hearing impairments. For this study, we also wished to examine if respondent’s income would have an impact on the price and quality assessment, and therefore participants were asked to provide the information.

Independent, Dependent, and Moderating Variables

The dependent measures in the study 3 were: price perception level (one item along a seven-point scale), quality perception level (one item along a seven-point scale), taste perception level (one item along a seven-point scale), prestige perception level (three items along a seven-point scale). All the dependent measures, except prestige perception level, were measured with a scale ranging from “Much worse/lower than average” to “Much better/higher than average”. Prestige perception level was measured on a seven-point scale ranging from “Strongly disagree” to “Strongly agree”, and summed up based on three items: “I think the product is prestigious”, “I think the product is exclusive”, and “I think the product signals high status”.

The independent variables were: speaker pitch condition, order condition of the questions price and quality, salience of price (whether respondent received whiskey pricing questions before stimuli or not). Finally, we also included objective independent variables such as age, gender, income, whiskey experience, and whiskey consumption to check if they had moderating effects.

To evaluate whether we should exclude the respondent from the study, several quality checks were added. Ad recall (“What kind of product was advertised in the ad?”), attention check (“What was the name of the brand used in the commercial?”), sound problems, hearing impairment, quality of the audio, whether or not the respondent left the room while answering the questionnaire, and brand knowledge was included for this purpose. The questionnaire of the study 3 is included in appendix 1.

Preliminary Analysis

85 respondents were removed after executing quality checks, leaving 728 respondents. The 85 participants were dismissed due to problems with ad recall, fail to answer attention check, reported problems with the Scottish accent, reported hearing impairment and whether the participant was under 21 and did not have any experience with whiskey. Prior brand knowledge was also considered, because of possibility of prior knowledge influencing brand perception and overruling the effect of voice pitch. In the following section, the analysis of the statistically significant results will be presented. A repeated-measures analysis of variance (three-way ANOVA) was conducted and the results are presented in Table 4. The analysis was run to establish whether there is a moderator effect of order of the questions regarding price salience (received questions about price before stimuli or not), age, experience with whiskey, and gender. These moderator effects were checked together with the pitch condition and its effect on price perception (DV).

Results

Price

A three-way ANOVA was conducted to determine the effects of voice pitch, order and salience on price perception level. There were six outliers assessed as a value greater than three box-lengths from the edge of the box, but the outliers were not the result of a data entry error or measurement error. The results did not sufficiently differ from the result with the outliers. Therefore, we kept the outliers for future analysis. Price perception was not normally distributed ($p > 0.05$). Therefore, we ran test comparisons on the transformed data and found no meaningful differences (e.g. changes in statistical conclusions, etc.). There was homogeneity of variances as assessed by Levene's test for equality of variances, $p = 0.379$.

Dependent Variable: Price

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	21.292 ^a	7	3.042	3.237	.002
Intercept	16206.927	1	16206.927	17248.000	.000
ConditionPitch	5.394	1	5.394	5.741	.017
ConditionOrder	10.573	1	10.573	11.252	.001
ConditionSalience	2.912	1	2.912	3.099	.079
ConditionPitch* ConditionOrder	1.200	1	1.200	1.277	.259
ConditionPitch* ConditionSalience	1.392	1	1.392	1.481	.224
ConditionOrder* ConditionSalience	.060	1	.060	.063	.801
ConditionPitch* ConditionOrder* ConditionSalience	.188	1	.188	.200	.655
Error	676.541	720	.940		
Total	17019.000	728			
Corrected Total	697.834	727			

a. R Squared = .031 (Adjusted R Squared = .021)

*Table 4: Test of between-subjects effects (Study 3, DV: Price; IV: pitch, order*salienc, pitch*order, pitch*salienc, order*salienc, pitch*order*salienc)*

There was not a statistically significant three-way interaction between voice pitch, order and salienc, $F(1, 720) = 0.200$, $p = 0.655$. Neither did we find any significant ($p < 0.05$) two-way interactions (i.e., pitch*order; $p = 0.259$, pitch*salienc; $p = 0.224$, and salienc*order; $p = 0.801$). Hence, we did not find support for H5 stating that when price is salient the effect of voice pitch will have a larger effect on respondent’s price perception of the advertised product.

However, the analysis showed significant main effects for both pitch condition, $F(1, 720) = 5.741$, $p < 0.05$, and order condition, $F(1, 720) = 11.252$, $p < 0.05$. All pairwise comparisons run, were reported at 95% confidence intervals and p-values were Bonferroni-adjusted. The unweighted marginal means of "price perception" levels for respondents in low and high pitch condition were 4.816 (SE = 0.050), and 4.643 (SE = 0.051), respectively, confirming the findings in the study 2 (See figure 12).

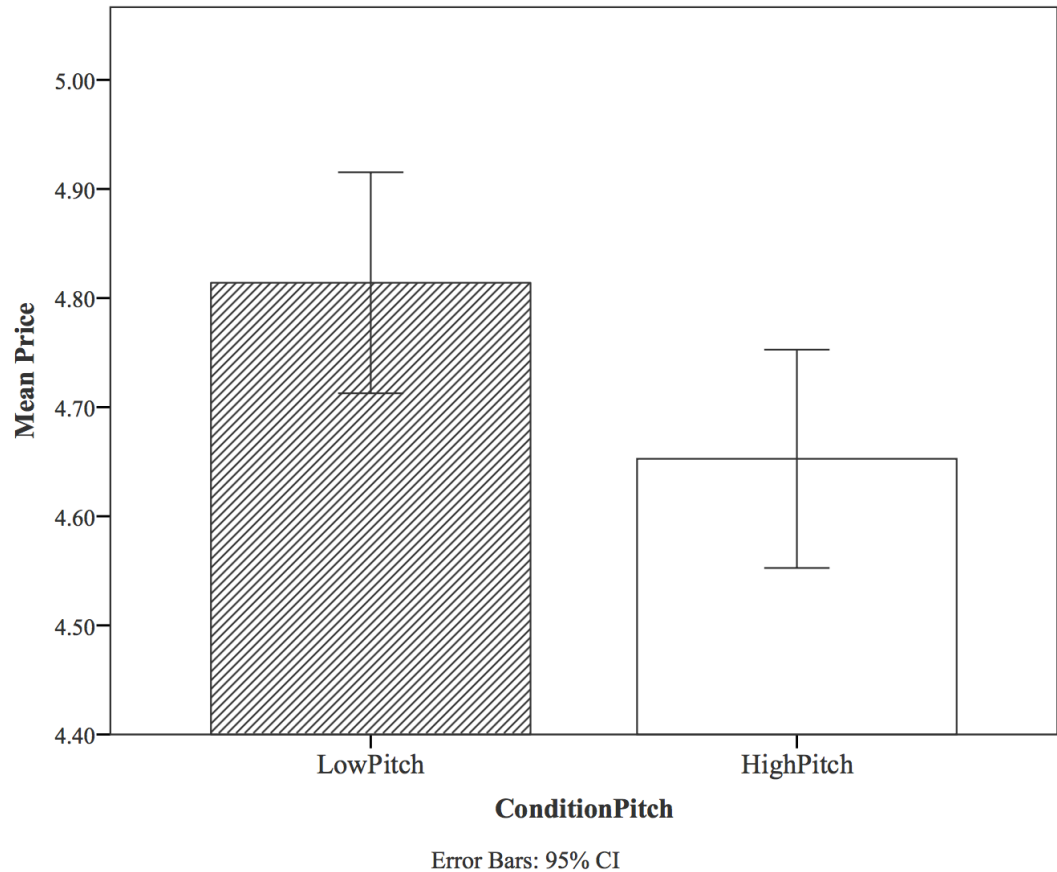


Figure 12: Mean price rating under different pitch conditions

The unweighted marginal means of "price perception" scores for respondents in PriceQual condition and QualPrice condition were 4.609 (SE = 0.051), and 4.850 (SE = 0.051), respectively (See figure 13).

Low pitch condition was associated with a mean "price perception" score 0.173, 95% CI [-0.031, -0.314] points higher than high pitch condition, a statistically significant difference, $p < 0.05$. QualPrice condition was associated with a mean "price perception" score 0.242, 95% CI [0.1, 0.383] points higher than a PriceQual condition, $p < 0.05$.

Additionally, separate three-way ANOVA with the independent variables age ($Pitch*Order*Age$), gender ($Pitch*Order*Gender$), income ($Pitch*Order*Income$) and experience ($Pitch*Order*Experience$), checking for both interaction effects and main effects, were conducted, and no significant effects were found ($p > 0.05$).

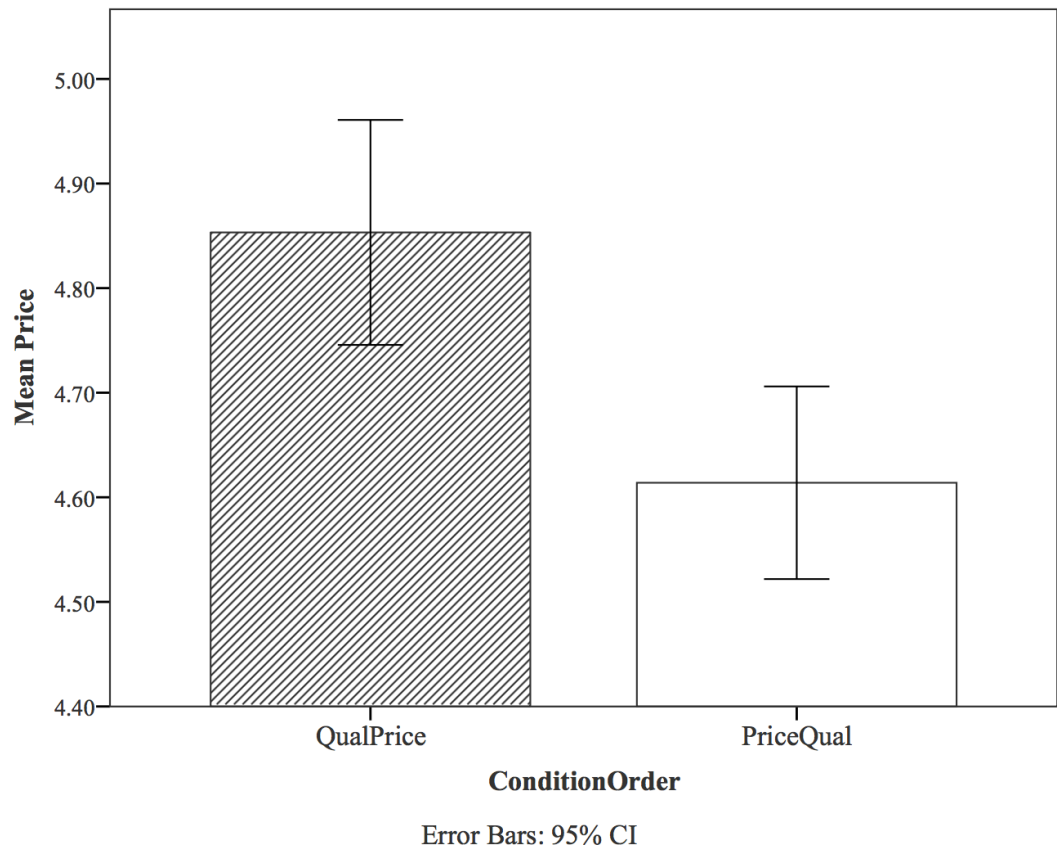


Figure 13: Mean rating price under different pitch and order conditions

Quality

A three-way ANOVA was conducted to determine the effects of voice pitch, order and salience on quality perception level. There were eight outliers assessed to have a value greater than three box-lengths from the edge of the box, however the outliers were neither the result of a data entry error or measurement error. The results did not sufficiently differ from the result with the outliers. Thus, we kept the outliers for future analysis. Price perception was not normally distributed ($p > 0.05$). Therefore, we ran test comparisons on the transformed data and found no meaningful differences (e.g. changes in statistical conclusions, etc.). There was homogeneity of variances as assessed by Levene's test for equality of variances, $p > 0.05$. There was not a statistically significant three-way interaction between voice pitch, order and salience, $F(1, 720) = 0.093$, $p = 0.879$. Also, no significant two-way interactions (i.e., $pitch*order$; $p = 0.146$, $pitch*saliency$; $p = 0.461$, and $saliency*order$; $p = 0.093$) were found. No statistically significant main effects were found for the conditions pitch ($F(1, 720) = 0.141$, $p = 0.708$), order ($F(1, 720) = 0.000$, $p = 0.992$) or salience ($F(1, 720) = 0.003$, $p = 0.959$).

Discussion

The aim of the study 3 was to strengthen the results from the study 2 and see if the salience of price was the reason for the effect of voice pitch on price perception. We found a significant effect supporting our previous result, confirming that voice pitch affects how participants perceived price level. Another finding we did not foresee, was respondents rating the price to be significantly higher when asked about the quality first over price first. As mentioned, the same tendency was found in study 2, but the effect was not significant. According to our theory about priming and salience, the price ratings were expected to be higher when price was asked first rather than when quality was asked first. One possible explanation can be linked to the word quality, which in its original meaning is a neutral word. Quality can be high and low or good and bad, but previous research has shown that people do not seem to perceive this word as neutral. In general, people tend to load the word quality with a positive meaning the word originally does not possess. Harvey and Green (1993) claimed that «the traditional notion of quality sticks to any usage of the term and has the potential to obscure its meaning. » Therefore, our results can be explained by the positive associations people have with the word quality, and when asked about the product quality they automatically assume the product to have a high quality and hence they evaluate the price to be higher. An interesting direction of research would be to also investigate if the word price is perceived as neutral or if the same effect could also be found here.

GENERAL DISCUSSION

As outlined in the introduction, the aim of this research was to establish: *How does voice pitch of a spokesperson in audio commercial affect consumers' price perception of the advertised product and other product attributes?*

In our thesis, we have explored this topic conducting three studies within two different product categories in the pursuit of finding if and how voice pitch can affect consumer's perception of magnitude dimensions with price as the focal variable. To investigate this, we conducted three online experiments, giving us support for some of our research hypotheses confirming that voice pitch indeed affects how consumers perceive product attributes. The following section will clarify the overall findings, contributions, limitations and recommendation for further research.

Overall Findings

As stated in the research question above, this paper theoretically connected and empirically investigated the effect of voice pitch on people's perception of product attributes with the focus on price. The theoretical background suggested two paths to a possible impact of voice pitch on price perception. One path through the spatial conceptual metaphor, and the other through a low voice pitch being associated with favorable attributes such as high social status, power, dominance, larger body size and quality. The two different paths led to competing hypotheses. In the study 1, we aimed at replicating the results of Lowe and Haws (2017), finding that a low voice pitch lead participants to evaluate the product in the audio ad to be larger in size. At the same time, we wanted to investigate if this finding was special for the size attribute, or also holding for other magnitude dimensions such as price. In addition, the study aimed at understanding if the order of questions in which participants were asked to rate the product attributes impacted the outcome of their responses. An online experiment was conducted. Marginal support significant at 90 % confidence interval was found for voice pitch leading participants to evaluate the product larger in size. No support was found for either of the competing hypotheses H1 and H4 and no evidence of the direction of the effect could be established. However, the results showed a significant difference of the price evaluation depending on when the question about price was asked. This could indicate support for H3, but no significant interaction effect was found. Participants who rated the price first seemed to evaluate the product as higher in price than participants who rated the price last. The same effect was visible for size, but marginally significant at a 90% confidence interval.

Based on the results of the study 1, some changes were made when proceeding with the study 2. The audio advertisement was replaced with another ad for a different product category with a larger price range and at the same time excluding the potential effect of size evaluation on price assessment. The online experiment supported H4, and hence no support was found for the competing hypothesis H1. Thus, the results showed evidence that a lower (higher) voice pitch lead participants to evaluate the product price as higher (lower). In the same study, no support was found for H2 regarding quality, or H3 regarding the order of the questions. When proceeding with the next study, the effect of salient price information was a variable of interest.

In the study 3, the purpose was to strengthen the results from the previous study, and investigate the potential effect of salient price information on participant's perception of product attributes. No support was found for H5 regarding the salient price information. In line with the study 2, the results also supported H4 stating that a low voice pitch affect participants to evaluate a product to be higher in price. No interaction effect between order and pitch and order and price were found. However, an unexpected finding of order was found. When asking respondents about quality first, they evaluated the price to be higher than when asked about price first. In the discussion after the study 3 we have elaborated on what could be the explanations for this, but no further research was conducted to fully understand the relationship.

Theoretical Implications

The present study has identified evidence of voice pitch effect in the context of price perception of an advertised product. The finding gave a foundation based on which we further investigated the relationship between voice pitch and product attributes. By postulating the idea that the positive characteristics such as power, dominance, social status and quality, attributed to a lower voice pitch, could transmit to magnitude dimensions of product attributes, we conducted several experiments contributing to and confirming this theory. Lowe and Haws (2017) found the effect of voice pitch on size perception only through a process of visual mental imagery which they provided through visualisation cues in the advertisement used in their experiments. They argued the cross-modal effect between pitch and size to be a key explanatory factor for their findings. Our studies however, show that the lack of effect for other attributes than size, might be connected to other factors such as product category, memory, price and quality variations. Our result indicate that the effect of voice pitch might not be so dependent of visual mental imagery after all, considering the lack of visualisation cues in the advertisements used in the second and third study. Since price salience (visualisation of price) did not appear to strengthen the voice pitch effect on price perception, this further supports questioning of the role of visual mental imagery. Further, Lowe and Haws found the sound symbolism of voice pitch only to hold for the product attribute size. Our results have suggested that voice pitch can impact other magnitude dimensions as well, proven by the effect on price perception. Further research should look into if our results are applicable for all

product attributes with magnitude dimensions, or only for some, and what drives the effect. Whether voice pitch can only affect product attributes with magnitude dimensions, or if the effect can be true for attributes with non-numerical measures (as proven possible for human qualities such as power, credibility and social status), is also yet to be investigated by further research. We found an effect of voice pitch on price perception when participants were asked to evaluate quality before price, and if that is a proof of voice pitch effect on such attributes, or if that can be related to salience, category, order effect or other factors is also to be researched further.

Managerial Implications

Through three studies we have demonstrated that the speaker's pitch affects perception of product price level and size of the product. Meaning, magnitude dimensions such as size and price level can be communicated through the nonverbal cue, voice pitch. When creating an advertisement, the speaker's pitch should be considered. If the product is of a character where larger price or size are seen as beneficial, the voice pitch of the speaker should have a lower pitch to reflect and convey the price level of the product and in this way, benefit the brand. The impact of low voice pitch on perceived price seems to be especially effective when product quality is exposed. Since the ads used in the study were made to sound realistic, the results indicate that even small differences in pitch can make a difference in perception of the product. In addition, the studies have implications in regard to extending the understanding of sensory marketing and the reach of sound, and the importance of congruence in advertising. A high percentage of media is consumed when people are being distracted or have limited attention (Ophir, Nass, & Wagner, 2009; Rideout, Foehr, & Roberts, 2010). However, Clark (1987) found that sound can be held in an unprocessed form until made sense of, and this is called echoic memory. So even when not paying full attention, echoic memory persists. Therefore, managers should consider the importance of what can appear to be peripheral sensory aspects of the ad, such as speaker's voice pitch. Managers can utilize this information to better convey product attributes matching the sensory experience. The information can also be used to better position products and develop advertisements cohesive with sensory marketing, or at least encourage the managers to consider how voice pitch affects the consumer's perception of the product.

Limitations and Further Research

In this section, possible limitations of the research will be presented together with suggestions for further research. First, all our experiments were conducted by distributing an online survey. By not controlling for potentially disturbing factors in the participant's environment, we cannot exclude the possibility of a non-laboratory setting as a confounding factor.

Amazon.com's Mechanical Turk (MTurk) was used to recruit participants. There is little research conducted on the general validity of this panel, but Paolacci et al. (2011) claimed to find support that experimenters should consider MTurk as a viable alternative for data collection. However, samples from MTurk are less representative than subjects recruited through internet-based panels (Berinsky, Huber, & Lenz, 2012). This could possibly be a limitation of the study but with the benefits of cheap costs and several experiments allowing us to strengthen the results, we consider the validity of our results to be satisfying.

In the second audio advertisement used in the study 2 and 3 for Scottish whiskey, the spokesperson has a Scottish accent. Despite all respondents being native English speakers, some of the respondents reported they had problems understanding the content because of the accent. The subjects reporting problems were removed, but we cannot exclude the possibility that more people suffered from the same dialect struggle. If so, this would affect the internal validity of the study. One participant commented that the questionnaire did not specify whether the whiskey bottle, of which respondents were asked to estimate the price of, was full or empty. In the unlikely scenario that several participants have interpreted the bottle to be empty this could threaten the internal validity of the findings.

The whiskey product category has a large range of price and quality. The finding from the study 3 regarding participants evaluating quality as higher when exposed to salient price information, is yet to be fully understood and explained. As mentioned in the discussion (page 27 and 28), we propose some framework about perceived quality and price and their relationship as an explanation, but we believe further research could help establish the effects and their causality. Also, to investigate if the word *price* is perceived as neutral could help understand the relationship fully. Further research should also establish if the impact of voice pitch also holds for other products and product categories. Since the advertisement used in the study 2 and 3 contained little information about product quality, further research can also investigate how the relationship between pitch and price

interacts with, and relates to quality and expressed differences in quality. Further research should also consider how voice pitch affect other product attributes and magnitude dimensions to fully establish the effect of voice pitch on general product perception.

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APPENDICES

Appendix 1 – Surveys

Study 1 (Screen shots)

Dear Participant,

In this study, you will answer some questions regarding an audio advertisement.

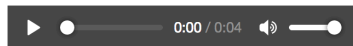
Please note that you need headphones or speakers to participate in this study.

AudioTest

You need headphones or speakers to participate in this study.

Please turn off any music or other sound sources in your environment now.

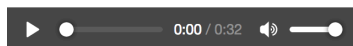
Listen to the sound below and adjust the volume to a pleasant level. Please make sure you can hear the sound loud and clear and follow the auditory instructions.



ConditionPitch

Now, you will listen to a 30-seconds audio advertisement.

Please listen to the following advertisement:



ConditionOrder

We are now going to ask you some questions about the advertised product

What do you think about the price of the product?

Much lower than average Average Much higher than average

What do you think about the size of the product?

Much smaller than average Average Much larger than average

TasteQuality

What do you think about the taste of the product?

Much worse than average Average Much better than average

What do you think about the quality of the product?

Much lower than average Average Much higher than average

ConditionOrder

What do you think about the size of the product?

Much smaller than average Average Much larger than average

What you think about the price of the product?

Much lower than average Average Much higher than average

AdRecall

What kind of product was advertised in the commercial?

Did you have any problems hearing the ad?

No
 Yes:

Demographics

Finally, please fill in...

Age

Gender

Male
 Female
 Other

Do you have any hearing impairment?

- No
- Yes (please specify):

Study 2 (Screen Shots)

Dear Participant,

In this study, you will answer some questions regarding an audio advertisement.

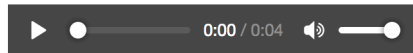
Please note that you need headphones or speakers to participate in this study.

AudioTest

You need headphones or speakers to participate in this study.

Please turn off any music or other sound sources in your environment now.

Listen to the sound below and adjust the volume to a pleasant level. Please make sure you can hear the sound loud and clear and follow the auditory instructions.



Price Range

Please enter what you believe is the price range for a 750 ml whiskey bottle below:

From (\$):

To (\$):

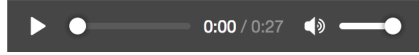
Average price

Please enter what you believe is the average price (in \$) for a 750 ml whiskey bottle below:

PitchCondition

Next, you will listen to a 30-seconds audio advertisement about whiskey.

Please listen to the following advertisement:



ConditionOrder

Next, we will ask you some questions about the advertised product.

What do you think about the price of the product?

Much lower than average Average Much higher than average

What do you think about the quality of the product?

Much lower than average Average Much higher than average

TasteQuality

What do you think about the taste of the product?

Much worse than average Average Much better than average

What do you think about the size of the product?

Much smaller than average Average Much larger than average

ConditionOrder

What do you think about the quality of the product?

Much lower than average Average Much higher than average

What you think about the price of the product?

Much lower than average Average Much higher than average

AdRecall

What kind of product was advertised in the commercial?

What was the name of the brand used in the commercial?

Technical

Did you have any problems hearing the ad?

No

Yes:

Demographics

Finally, please fill in...

Age

Gender

Male

Female

Other

How would you evaluate your knowledge of whiskey?

- Not knowledgeable at all Slightly knowledgeable Moderately knowledgeable Very knowledgeable Extremely knowledgeable
-

Do you have any hearing impairment?

- No
 Yes (please specify):
-

Did you at any time leave your device during this survey or take a break?

- Yes
 No

Study 3 (Screen Shots)

Dear Participant,

In this study, you will answer some questions regarding an audio advertisement. Please note that you will need headphones or speakers to participate. The study will take about 5-6 minutes.

It is important that you do the survey in a quiet area where you do not get disturbed. Please do not leave your computer while doing the survey.

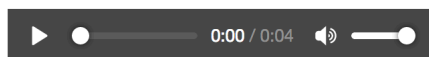
Thanks in advance for your help!

AudioTest

You need headphones or speakers to participate in this study.

Please turn off any music or other sound sources in your environment now.

Listen to the sound below and adjust the volume to a pleasant level. Please make sure you can hear the sound loud and clear and follow the auditory instructions.



Saliency

Please enter what you believe is the price range (in \$) for a 750 ml bottle of whiskey below:

From (\$):

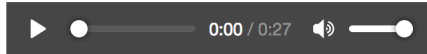
To (\$):

Please enter what you believe is the average price (in \$) for a 750 ml bottle of whiskey below:

ConditionPitch

Next, you will listen to a 30-seconds audio advertisement about whiskey.

Please listen to the following advertisement:



ConditionOrder

Next, we will ask you some questions about the advertised product.

What do you think about the price of the product?

Much lower than average Average Much higher than average

○ ○ ○ ○ ○ ○

What do you think about the quality of the product?

Much lower than average Average Much higher than average

○ ○ ○ ○ ○ ○

Additional questions

What do you think about the taste of the product?

Much worse than average Average Much better than average

Please indicate how much you disagree or agree with the following statements:

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I think the product is prestigious	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think the product is exclusive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think the product signals high status	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

ConditionOrder

What do you think about the quality of the product?

Much lower than average Average Much higher than average

What you think about the price of the product?

Much lower than average Average Much higher than average

AdRecall

What kind of product was advertised in the commercial?

What was the name of the brand used in the commercial?

Technical

Did you have any problems hearing the ad?

- No
 - Yes:
-

Experience and frequency

How much experience do you have with whiskey?

- None at all
 - Little
 - Slightly below average
 - Average amount
 - Slightly above average
 - Much
 - A great deal
-

On average, how often do you drink whiskey?

- Never
 - Less than once a month
 - 1-3 times a month
 - Once a week
 - 2-3 times a week
 - 4-6 times a week
 - More frequently
-

Demographics

Finally, please fill in...

Age

Gender

- Male
 - Female
 - Other
-

What is your total annual household income (before taxes)?

- Less than \$10,000
- \$10,000 - \$19,999
- \$20,000 - \$29,999
- \$30,000 - \$39,999
- \$40,000 - \$49,999
- \$50,000 - \$59,999
- \$60,000 - \$69,999
- \$70,000 - \$79,999
- \$80,000 - \$89,999
- \$90,000 - \$99,999
- \$100,000 - \$149,999
- More than \$150,000

Do you have any hearing impairment?

- No
- Yes (please specify):

Please say how much you agree or disagree with the following statements:

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
The ad sounded realistic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The ad sounded strange	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The ad was high quality	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The accent of the speaker made it difficult to understand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Did you at any time leave your device during this survey or take a break?

- Yes
- No

Have you ever heard about the brand Whyte and Mackay?

- Definitely yes
- Probably yes
- Probably not
- Definitely not

Appendix 2 – Content of Audio Stimuli

Study 1

Picture this: You're sittin' down to lunch at Clark's, unwrapping two hot, sizzling, angus beef patties, covered with hot, melty slices of jack cheese and all the jalapeños you can handle, with just enough cool ranch to keep that fire under control, all piled on a toasted sesame seed bun. You've got the new Jalapeño Jack Burger at Clark's. You lift it. You bite it. You love it. Clark's – Dig in.

Study 2 and 3

We are eating all the leftovers, and are having enough cold meat to feed an army. We are finally getting the armchair back from the mother-in-law, and we are staying in the good books. We are happy it is all over, and we would do it all again tomorrow. We are a blend of the finest malts and aged grain whiskeys, and we are proud to be blenders by trade. We are triple matured for a smooth rich taste. We are Whyte & Mackay

Audio files can be found here:

<https://soundcloud.com/c-m-k-f/sets/master-thesis>

Appendix 3 – Schematic Overview of Study 3

