

## **A Meta-analytic investigation of consumer response to anthropomorphic appeals: The roles of product type and uncertainty avoidance**

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### **Abstract:**

We aim to resolve the mixed findings on the effectiveness of anthropomorphic appeals in generating positive product evaluations from consumers. In a meta-analysis of 47 papers that explores the persuasive impact of anthropomorphic versus non-anthropomorphic appeals, we show that when the salience of uncertainty is high (e.g., when consumers purchase experience products, when consumers come from countries with high uncertainty avoidance), anthropomorphic appeals are more influential than non-anthropomorphic appeals. We discuss the theoretical and practical implications of these findings, and how to improve persuasive messaging by considering the contextual effectiveness of anthropomorphism.

**Keywords:** anthropomorphism | meta-analysis | uncertainty avoidance | experience versus search products

### **Article:**

#### **1. Introduction**

*Anthropomorphism* is the attribution of human-like mental states to nonhuman agents, which allows consumers to perceive brands as having human characteristics (Epley, Waytz, & Cacioppo, 2007). Marketers worldwide have long applied anthropomorphism to promote products, mainly through the use of visual cues (e.g., features resembling human body parts) (Woodward, 1999), verbal cues (e.g., giving products human names) (Waytz, Heafner, & Epley, 2014), and brand personification (Delbaere et al., 2011, Wan and Aggarwal, 2015). Another approach is to imply that brands possess mental capabilities (Waytz, Heafner, & Epley, 2014). In fact, almost one in three brands sold to adults, and more than five in six brands sold to children, use some form of anthropomorphic representation in their branding (Triantos, Plakoyiannaki, Outra, & Petridis, 2016).

Given the prevalent use of anthropomorphism in product communications, marketers seem to hold an inherent belief that consumers are more receptive to anthropomorphic cues and that these cues enhance product evaluations. However, extant research offers no clear evidence to support this. While some scholars suggest that anthropomorphism enhances positive brand evaluations

(e.g., Aggarwal and McGill, 2012, Chen et al., 2017, Nowak et al., 2009, Touré-Tillery and McGill, 2015, Waytz et al., 2014), others show no effect of anthropomorphism on brand attitudes (Delgado-Ballester et al., 2013, Yuan and Dennis, 2017). There is even some evidence that anthropomorphism has negative effects on brand evaluations (Han et al., 2019, Puzakova and Aggarwal, 2015).

Such mixed findings suggest that this is a ubiquitous and complex problem that could benefit from a synthesis of the research on the topic. Given that these studies differ in many aspects (e.g., study context, cultural environment, product nature), we conduct a meta-analysis to meaningfully classify prior studies into different categories and then examine consumers' responses to anthropomorphism within each category. To this end, we propose that anthropomorphism may be more or less effective in influencing consumers' product evaluations, depending on the product type (i.e., experience products vs. search products), and the level of uncertainty avoidance that prevails in the country in which consumers reside.

One major thrust of our conceptualization is that anthropomorphism works by reducing the degree of uncertainty associated with consumers' evaluations of the advertised products. Because of our proposed "uncertainty reduction" account, it is natural that uncertainty avoidance at the country level may be an important contextual factor that facilitates or hinders the effectiveness of anthropomorphic appeals. In addition, given that experience (vs. search) products evoke more uncertainty (Mitra, Reiss, & Capella, 1999), we expect that the product type sets up another boundary condition for the effect of anthropomorphism on consumer evaluations.

This research makes significant contributions to the anthropomorphism and cross-cultural literatures. First, our research represents the first attempt to reconcile the inconsistent findings documented in the domain of anthropomorphism because previous studies are indecisive about the effect of anthropomorphic appeals on product evaluations. Our systematic review explains these mixed results by bringing a new perspective to the current anthropomorphism literature. Second, we uncover uncertainty reduction as a potential mechanism underlying the effect of anthropomorphic appeals on consumer product evaluation. This discovery is important, because it provides theoretical reasoning about why anthropomorphism is effective in some situations, but not in others. Building upon the "uncertainty reduction" account, we identify contextual factors that set boundary conditions for the effectiveness of anthropomorphic appeals. Last, apart from theoretical contributions, our findings also have significant implications for marketing practitioners. For example, marketers of experience products are advised to use an anthropomorphic presentation of their products because anthropomorphism helps reduce consumer uncertainty and boost product evaluations. Also, when firms expand to global markets, they are advised to use more anthropomorphic appeals in countries that exhibit more uncertainty avoidance. We provide more details on the theoretical and managerial implications in the General Discussion section.

In the sections that follow, we first provide the development of our hypotheses on the main effect of anthropomorphic appeals on product evaluations, as well as the key boundary conditions. Next, we describe the meta-analytic procedures we employ to test these hypotheses and the results. Finally, we conclude with a discussion of key findings and takeaways that inform theory and marketing practice.

## 2. Conceptual development

### 2.1. Consumers' responses to anthropomorphic appeals

The literature is indecisive on consumers' responses to anthropomorphic appeals. On one hand, a majority of studies in this domain have shown that anthropomorphic appeals positively affect consumer evaluations (Aggarwal and McGill, 2012, Chen et al., 2017, Nowak et al., 2009, Rauschnabel and Ahuvia, 2014, Waytz et al., 2014). Such positive effects of anthropomorphism can also be found in other contexts. In the context of gambling, for example, anthropomorphic appeals tend to reduce consumers' risk perception when playing a slot machine (Kim & McGill, 2011). Similarly, consumers are motivated to bid higher amounts for anthropomorphic products than for non-anthropomorphic products (Yuan & Dennis, 2017). Also, a tendency to anthropomorphize time (e.g., "time has a will of its own") changes consumers' preference for standard shipping over expedited shipping (May & Monga, 2014). In the context of gift giving, previous research shows that anthropomorphism increases monetary donations (Zhou, Kim, & Wang, 2019). Also, anthropomorphism tends to enhance environment-friendly behavior (Tam, Lee, & Chao, 2013). Furthermore, the act of anthropomorphizing products can influence consumer well-being: When consumers lack a sense of connectedness or competence, anthropomorphism helps make up these deficiencies and helps increase vitality (Chen, Sengupta, & Adaval, 2018).

On the other hand, this positive effect of anthropomorphism is not universally held. Some researchers reported that there is no difference between anthropomorphic and non-anthropomorphic appeals in influencing consumer product evaluations (Delgado-Ballester et al., 2013, Yuan and Dennis, 2017). Delgado-Ballester et al. (2013), for example, found no difference in consumers' product evaluations for a brand of cookies that includes either a human-like brand character or a non-human brand character. Also, Yuan and Dennis (2017) reported no difference in consumer ratings on a laptop that features or does not feature a human voice (to interact with consumers). Some other researchers even showed that anthropomorphism in some situations backfires and adversely affects consumers' product evaluations. Specifically, anthropomorphizing luxury brands tends to reduce consumers' perception of the brand's sophistication, which leads to less positive evaluations (Puzakova & Aggarwal, 2015).

Despite these contradictory findings, we anticipate that the overall impact of anthropomorphic appeals on consumers' evaluations of the advertised products should be positive. This is mainly driven by the uncertainty-reducing role of anthropomorphic appeals. In fact, product evaluations are by nature associated with uncertainty (Laroche et al., 2004, Laroche et al., 2005). The anthropomorphic representation of a product helps reduce the salience of such uncertainty, which in turn, enhances consumers' evaluations on the advertised products. Consistent with our argument, previous research shows that anthropomorphic appeals are likely to mitigate consumers' distrust in advertising messages (Touré-Tillery & McGill, 2015) and increases consumers' confidence when interacting with brand messages (Chen, Wan, & Levy, 2017). In situations where uncertainty is not salient, we expect the effect of anthropomorphic appeals to deviate from the general pattern of anthropomorphism, which leads to the mixed findings discussed earlier. Hence, we hypothesize:

**H1.** Consumers have more positive evaluations of anthropomorphized (vs. non-anthropomorphized) products.

## 2.2. Uncertainty-reducing role of anthropomorphic appeals

How do anthropomorphic appeals increase consumers' evaluations on the advertised products? We believe that it is due to the uncertainty-reducing role of anthropomorphism. Consumer decision-making in general and product evaluations in particular involve uncertainty, which is closely related to perceived risk (Laroche et al., 2004). Uncertainty is often associated with the unknown performance of a product (Havlena, & DeSarbo, 1991). To cope with the uncertainty coupled with product evaluations, consumers often benchmark the product under evaluation against a similar item that they are familiar with, as familiarity is a key factor to reduce uncertainty (Morgan-Thomas, & Veloutsou, 2013). With human-like features, anthropomorphic appeals help consumers mitigate the feelings of uncertainty by making them relate to brands in ways similar to how they relate to other individuals (Fournier and Alvarez, 2011, Puzakova et al., 2009). When consumers are interacting with a product that includes an anthropomorphic appeal it increases the chances to use a familiar frame (e.g., a social connection) in those situations. This familiar frame also allows consumers to think they are interacting with a social entity (MacInnis & Folkes, 2017).

In line with our reasoning, previous research shows that anthropomorphism helps consumers process product information more easily, and it motivates consumers to interact more effectively and more closely with the anthropomorphized product (Epley et al., 2007). When products are humanized, consumers raise beliefs and expectations that would typically apply only to humans, such as viewing a brand as a partner (Aggarwal & McGill, 2012). Humanized products tend to induce high levels of homophily (Nowak, Hamilton, & Hammond, 2009), and they lead consumers to view them as social, credible, and intelligent (Cronin, 2010, Nowak and Rauh, 2005). As a result, anthropomorphism increases attention (Basfirinci & Cilingir, 2015), brand trust (Waytz et al., 2014), and brand preference (Chen et al., 2017).

Because of our proposed “uncertainty reduction” account, we expect that situational factors that can make uncertainty salient set boundary conditions for the effect of anthropomorphic appeals on product evaluations. In our meta-analysis, we identify the following conceptual moderators: (a) product type (i.e., experience product vs. search product), and (b) cultural orientation (i.e., high vs. low uncertainty avoidance). The first conceptual moderators relate to the product and the stimuli received by the customer, whereas the second moderator relates to consumers' sensitivity to uncertainty.

## 2.3. The moderating role of experience vs. search products

We anticipate that the effect of anthropomorphism on consumer product evaluations is moderated by product type (experience vs. search products), such that the positive effect of anthropomorphic appeals is stronger for experience products. According to Nelson (1974), products can be classified into two groups: *search products* and *experience products*. Search products are dominated by attributes that can be fully assessed before the purchase; in contrast,

experience products are characterized by attributes that are difficult to assess before the product is purchased and used (Franke, Huhmann, & Mothersbaugh, 2004).

In general, experience (vs. search) products involve more uncertainty when consumers make product evaluations (Franke et al., 2004, Mitra et al., 1999, Weathers et al., 2007, Wang et al., 2020). Such uncertainty is driven primarily by a consumer's inability to know the actual outcome of a purchase when making a product evaluation (Weathers et al., 2007). Consumers' perceived risk is salient when they are not confident in their ability to judge the quality of the offerings (Hsieh, Chiu, & Chiang, 2005). When evaluating search products, consumers can obtain sufficient information to make an informed decision with little uncertainty regarding product quality. However, consumers are more skeptical about the quality of experience products due to the difficulty in gathering information for these products (Franke et al., 2004). Because of that, consumers take more time to examine experience products than search products (Huang et al., 2009, Wang et al., 2018) and use more recommendations from other consumers for experience products than for search products (Bei, Chen, & Widdows, 2004).

Extending these findings to our study context, it is expected that the same level of anthropomorphism may create more easiness in consumers when they are evaluating experience (vs. search) products. Anthropomorphism facilitates consumers' product evaluations through a human-like product representation, which creates a familiar frame of reference that reduces the ambiguity associated with the product. Given the easy access of intrinsic cues of search products (i.e., the attributes that directly related to product quality), the added value of anthropomorphism is marginal, because these intrinsic cues are sufficient for product evaluations (Wang, Yang, & Brocato, 2018). However, it is different for experience products: Due to the difficulty of accessing to intrinsic cues prior to purchase, extrinsic cues (i.e., the attributes that are not directly related to product quality such as the human-like presentation of the product) should play a more significant role in influencing consumers' evaluation of these products. Consistent with our argument, previous research shows that consumers rely primarily on intrinsic attributes to evaluate search products because search products are dominated by intrinsic attributes that are concrete, more objective, and easier to access (Wang, Yang, & Brocato, 2018). In contrast, consumers rely more on extrinsic attributes to evaluate the quality of experience products (Bei et al., 2004). Formally, we hypothesize:

**H<sub>2</sub>.** Among experience (vs. search) products, consumers have more positive evaluations of anthropomorphized (vs. non-anthropomorphized) products.

#### 2.4. The moderating role of uncertainty avoidance

Consumers in some societies are more prone to uncertainty than others (Hofstede, 2011). Such a difference is captured by a cultural dimension called uncertainty avoidance. According to Hofstede (1980), a nation's level of *uncertainty avoidance* represents the extent to which residents feel comfortable in novel, unknown, surprising, or unusual situations. In essence, uncertainty avoidance reflects an individual's fear of situations in which "anything can happen, and one has no idea what" (Hofstede, Jonker, & Verwaart, 2008, p. 144). The difference between high- and low-uncertainty avoidance countries has significant implications on consumers' sensitivity and responsiveness to perceived risk. Individuals in countries with high uncertainty

avoidance (e.g., France, Spain) value stability, predictability, and risk avoidance, whereas those in countries with low uncertainty avoidance (e.g., United Kingdom, USA) tend to be risk-taking, willing to change and adjust, and comfortable with the unknown (Huang, 2008, Kai et al., 2004). Because of such differences, uncertainty avoidance is negatively associated with per capita casino gambling (Ozorio, Lam, & Fong, 2010), business ownership rates (Wennekers, Thurik, van Stel, & Noorderhaven, 2007), supply chain collaborations (Qu & Yang, 2015), and bilateral trade (Wang, Yang, & Yasar, 2020).

We predict that the positive effect of anthropomorphism on consumers' product evaluations is more profound for countries with high uncertainty avoidance. In other words, consumers from countries with differing levels of uncertainty avoidance are likely to differ in their sensitivity to anthropomorphic appeals. Consumers in societies with high uncertainty avoidance tend to avoid uncertainty and ambiguity, since uncertainty usually makes them feel stressful and anxious (Li, Griffin, Yue, & Zhao, 2013). In contrast, consumers in countries with low uncertainty avoidance are more comfortable with uncertainty and ambiguity (Kailani & Kumar, 2011). In the context of evaluating products, it means that customers from countries with high (vs. low) uncertainty avoidance are more likely to search for confidence and trust. For example, tourists from countries with high uncertainty avoidance engage in more thorough evaluation of destinations to reduce the risks associated with vacation planning (Money & Crotts, 2003). Conceptualizing a product as human-like is anticipated to facilitate the evaluation process to a greater extent for consumers from societies with high (vs. low) uncertainty avoidance. In line with our reasoning, anthropomorphism in many ways reduces psychological distance between a consumer and humanized objects, making the consumer relate to these objects similar to how she relates to people (Fournier and Alvarez, 2011, Puzakova et al., 2009). When brands are humanized, consumers raise human type of beliefs and expectations like seeing a brand as a partner (Aggarwal & McGill, 2012), show love to the brand (Rauschnabel & Ahuvia, 2014), and perceive the brand's goodwill (Touré-Tillery & McGill, 2015). Taken together, the forgoing discussion suggests that anthropomorphism is more effective in easing consumers' evaluation process in societies with high (vs. low) uncertainty avoidance and thus enhances the positive effect.

**H3.** Among societies with high (vs. low) uncertainty avoidance, consumers have more positive evaluations of anthropomorphized (vs. non-anthropomorphized) products.

### **3. Database development**

To create our meta-analytic database, we started by searching published and unpublished studies that empirically explore the relationship between anthropomorphism and consumers' product or brand evaluations. Our search spans 17 years (2004–2020) and includes such keywords as *anthropomorphism*, *brand humanization*, *product humanization*, and *brand personification*. We searched for published articles through popular databases including EBSCOhost, Emerald, JSTOR, and Google Scholar. Additionally, we searched for unpublished articles via SSRN, Elsevier, and ProQuest Digital Dissertations databases. To enhance the exhaustiveness of our search, we contacted prolific authors in the domain of anthropomorphism, requesting working papers that have not been published. We located a total of 152 papers by using these methods.

After identifying the first set of papers, we evaluated the pertinence of each paper in terms of its relevance to our specific research focus. A study was deemed eligible if it: (a) focuses on the relationship between product/brand evaluations and the anthropomorphic representation of products or brands, and, (b) contains empirical data that allows us to calculate a common effect size (see Glass et al., 1981, Janiszewski et al., 2003). Since we seek to assess the effectiveness of anthropomorphic appeals in the context of product or brand evaluations, we exclude papers that do not compare the effectiveness of anthropomorphic appeals to non-anthropomorphic appeals. Ultimately, 47 papers<sup>1</sup>, (including 42 published articles and five unpublished manuscripts) met our criteria and were included in our meta-analytic database, yielding 168 effect sizes with a total sample size of 14,407 observations. Appendix A illustrates a forest plot of the studies in our database.

### 3.1. Coding procedure

Two of the authors coded the means, standard deviations, and sample sizes of both the anthropomorphic and non-anthropomorphic conditions for each observation to calculate Hedges'  $g$ —also known as the correction for Cohen's  $d$  (Lakens, 2013). The difference between these two metrics lies in the way the standard deviation is calculated (Fern & Monroe, 1996). As explained by Hedges and Olkin (1985), Cohen's  $d$  generates a biased estimate of the population effect size. For this reason, they suggest using Hedges'  $g$  as a more conservative and more robust estimation method.

Apart from capturing the effect size of each observation, we developed a coding scheme to examine several potential sources of variation for the effect of anthropomorphic appeals on consumers' product or brand evaluations. Some of these variables are methodological, pertaining to the sample (e.g., the number of anthropomorphic cues used in the study, whether the sample is composed of students, whether the study appears in a published paper, and whether the study uses a brand as a stimulus). The number of anthropomorphic cues ( $0 = \textit{single}$ ;  $1 = \textit{multiple}$ ) was determined by counting the number of cues used in each study. Given that methodological factors are less theoretically interesting and less practically important, we treat these factors as control variables in our meta-analysis when we run the meta-regression, following previous research (Freling et al., 2020).

Theoretical factors pertinent to our research hypotheses were also independently coded by two coauthors.<sup>2</sup> Appendix B provides our coding scheme. We focus our discussion on the substantive theoretical moderators featured in our hypotheses (i.e., experience vs. search product type, and uncertainty avoidance), whereas other cultural dimensions (i.e., power distance, individualism, and masculinity) are also treated as covariates in our meta-analysis.

Product type ( $0 = \textit{search product}$ ;  $1 = \textit{experience product}$ ) was coded in the same way as in previous studies (see Appendix C for details), except for five products, including gift cards, light bulbs, robots, slot machines, and staplers. To verify the product type of these five products, we conducted a survey of 90 Amazon Mechanical Turk workers (58.9% male;  $M_{\text{age}} = 35.92$ ,

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<sup>1</sup> These papers are denoted by an asterisk in our list of references.

<sup>2</sup> The inter-coder agreement was high 95.5%, and discrepancies were resolved through discussion, reference to the coding scheme, and confirmation from a third independent referee.

SD = 11.89). Following previous research (Hsieh et al., 2005, Huang et al., 2009), participants were first told that the quality of some products and services can be easily evaluated before purchase, but other products and services cannot be easily assessed until after use. Participants were then asked to imagine they were shopping at a retail store for products. They were asked to indicate their ability, before purchase, to evaluate product quality for each of the five products on a seven-point scale ranging from “not at all” (1) to “very well” (7). The order of products was randomized between subjects. A one-way repeated measured ANOVA showed that the perceived ability to evaluate the quality of experience products before purchase was significantly different among these products (Wilks’ Lambda = 0.51,  $F(4, 86) = 20.44, p < .001, \eta^2 = 0.49$ ). The means of the five products are:  $M_{\text{slot machine}} = 3.60, M_{\text{robot}} = 3.68, M_{\text{light bulb}} = 4.80, M_{\text{stapler}} = 5.11,$  and  $M_{\text{gift card}} = 5.49$ . As a result, slot machines and robots were classified as experience products, but light bulbs, staplers, and gift cards were classified as search products in the analysis.

Uncertainty avoidance was coded using Hofstede’s national culture dimensions data (Hofstede, 2018) associated with the nation where each study was conducted. The list of countries included in the meta-analysis is presented in Appendix D. The cultural score for each nation was entered as a continuous variable for the meta-regression to test the moderating effect of uncertainty avoidance. In the follow-up univariate analysis, the uncertainty avoidance scores were dichotomized using a median split, following previous research (Grinstein, 2008, Kirca et al., 2005).

### 3.2. Results

*Main effects.* In this section, we present the meta-analytic results regarding the overall effect of anthropomorphism on consumers’ product or brand evaluations. As shown in Table 1, the mean Hedges’  $g$  across the studies in our database is 0.199 ( $z = 11.66, SE = 0.017, p < .001$ ), which is a small (Rosnow & Rosenthal, 2008) but significant effect—as indicated by the 95% bootstrapped confidence interval around the mean ( $CI_{BS} = 0.165$  to  $0.232$ ). This result supports **H<sub>1</sub>**, indicating that consumers in general have more positive evaluations of anthropomorphized (vs. non-anthropomorphized) products.

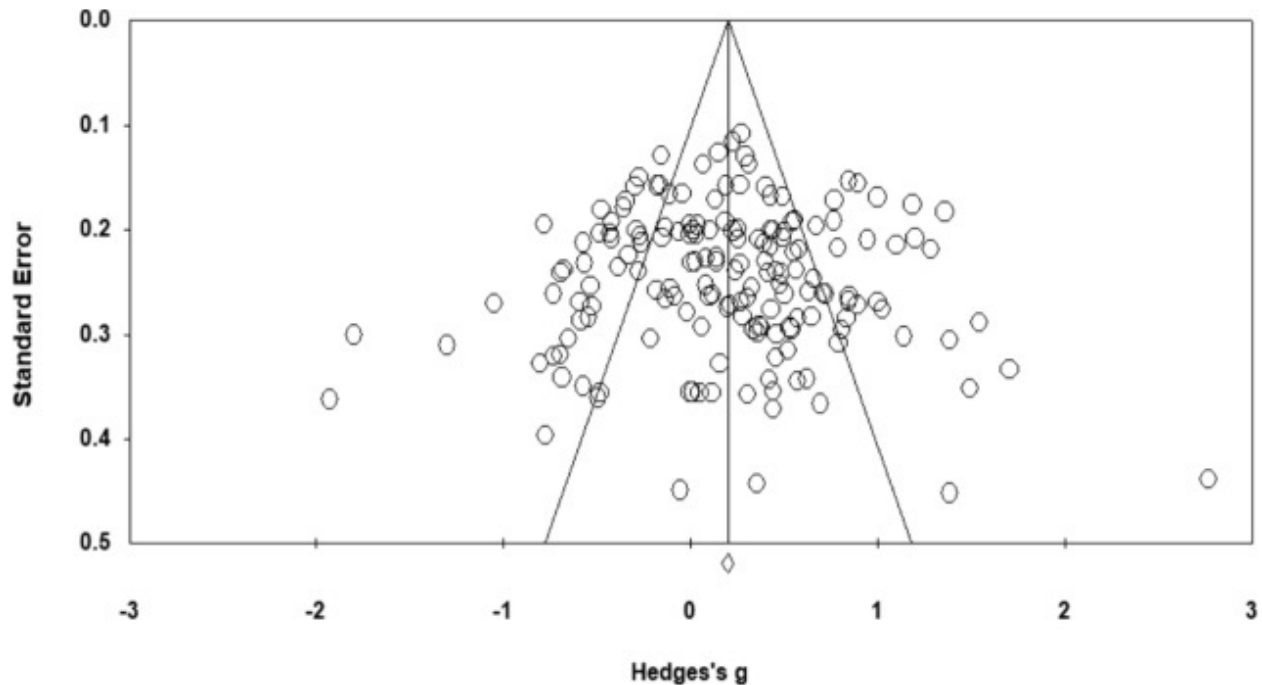
**Table 1.** Main Effect Results for Anthropomorphism Effects.

	Number of samples ( $k$ )	Number of observations (N)	Weighted Hedge’s $g$	Standard Error SE	95% Confidence interval ( $CI_{BS}$ )	Unaccounted variance ( $\chi^2$ )	Fail-safe sample size ( $N_{FS}$ )
Anthropomorphism effect	168	14,407	0.199***	0.017	[0.165, 0.232]	970.78	5291

Note: \*\*\*  $p < .001$ .

Rosenthal’s Fail-safe N ( $N_{FS} = 5,291$ ) indicates that these results are robust and publication bias is unlikely to be a problem in our analysis. A funnel plot of all effect sizes, plotted against their respective precision metrics, also confirms the lack of publication bias in the form of a “file drawer problem,” as shown in Fig. 1.





**Fig. 1.** Funnel Plot of Standard Error by Hedge's *g*.

*Moderating Effects.* Our main effect results demonstrate that consumers generally have more positive reactions to anthropomorphic appeals; however, there is substantial heterogeneity in the relationship between anthropomorphism and consumers' product evaluations ( $\chi^2 = 970.78$ ,  $p < .001$ ). This finding warrants an examination of the key moderators of the relationship between anthropomorphism and consumer product evaluations. The moderation analysis was conducted via a meta-regression analysis using CMA 3.0 software, with Hedges' *g* as the common effect size metric. All theoretical factors, methodological factors, and the three cultural dimensions were included as independent variables in the model, with the effectiveness of anthropomorphism as the dependent variable. Consistent with our expectations, the meta-regression analysis shows that the moderating effects of all theoretical factors were significant (product type:  $\beta = 0.118$ ,  $z = 2.94$ ,  $SE = 0.040$ ,  $p < .001$ ; uncertainty avoidance:  $\beta = 0.008$ ,  $z = 4.80$ ,  $SE = 0.002$ ,  $p < .001$ ; see Table 2).

**Table 2.** Moderator Estimates of the Meta-Regression.

Factors	Anthropomorphism Effect	
Product Type	Experience vs. Search	0.118***
Uncertainty Avoidance <sup>1</sup>	High vs. Low	0.008***
Methodological factors	Multiple Cues vs. Single cue	-0.107**
	Published Status vs. Unpublished	.016 <sup>n.s.</sup>
	Student vs. Non-student Sample	.010 <sup>n.s.</sup>
	With a Brand vs. Without a Brand	-0.068*
Control variables	Individualism <sup>1</sup>	-0.002 <sup>n.s.</sup>
	Power Distance <sup>1</sup>	0.008**
	Masculinity <sup>1</sup>	0.006***

Notes: \*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$ , †  $p < .10$ , <sup>n.s.</sup> not statistically significant.

<sup>1</sup> The scores of these cultural dimensions came from Hofstede's website (<https://geerthofstede.com/research-and-vsm/dimension-data-matrix/>). Continuous scores were used in this meta-regression analysis.

Post-hoc univariate analyses were conducted to test our remaining hypotheses, and these are presented in Table 3. Hypothesis 2 specifies that the positive effect of anthropomorphism on consumers' product evaluations is stronger for experience products than for search products. Consistent with this hypothesis, anthropomorphic appeals induce more positive responses from consumers for experience products ( $g = 0.249, p < .001$ ) than for search products ( $g = 0.102, p < .001; \chi^2(1) = 16.72, p < .001$ ). Further, in support of  $H_3$ —which specifies that the effect of anthropomorphism on consumers' product evaluations is stronger in societies with high uncertainty avoidance than for societies with low uncertainty avoidance—anthropomorphism has stronger effects in countries with high uncertainty ( $g = 0.409, p < .001$ ) compared to countries with low uncertainty avoidance ( $g = 0.162, p < .001; \chi^2(1) = 26.61, p < .001$ ). Taken together, these results indicate that the two theoretical factors we propose are important boundary conditions for the effect of anthropomorphism on consumer product evaluations.

**Table 3.** Weighted Univariate Results for Substantive Moderators.

	Number of samples	Number of observations	Mean effect	Q-value	Std. error
Product type					
Experience	111	9403	0.249	16.721***	0.044
Search	57	5004	0.102		0.057
Uncertainty avoidance					
High Uncertainty Avoidance	32	2117	0.409	26.610***	0.053
Low Uncertainty Avoidance	136	12290	0.162		0.040
Anthropomorphic cues					
Multiple	64	6032	0.112	19.268***	0.046
Single	104	8375	0.263		0.050
With a Brand vs Without a brand					
Brand present	91	7466	0.151	8.677***	0.044
Brand absent	77	6941	0.251		0.057

Note: \*\*\*  $p < .001$ .

Inconsistencies in the effectiveness of anthropomorphic appeals can also be explained by the number of anthropomorphic cues used in studies ( $\beta = -0.107, z = -2.72, SE = 0.039, p < .01$ ) and whether the study uses a brand as a stimulus ( $\beta = -0.068, z = -1.72, SE = 0.040, p < .10$ ). Planned contrasts reveal that multiple cues ( $g = 0.112, p < .001$ ) elicit significantly less positive response from consumers than a single cue ( $g = 0.263, p < .001; \chi^2(1) = 19.26, p < .001$ ). Also, employing a brand as part of the stimuli induces less positive response ( $g = 0.151, p < .001$ ) than the absence of a brand ( $g = 0.251, p < .001; \chi^2(1) = 8.67, p < .01$ ). Differences in publication status ( $\beta = 0.016, z = 0.26, SE = 0.063, p = .794$ ) and the type of sample (i.e., consisting of students vs. non-students;  $\beta = 0.010, z = 0.27, SE = 0.038, p = .399$ ) do not moderate the relationship between anthropomorphism and consumer product evaluations.

As for the other cultural variables, power distance ( $\beta = 0.009, z = 3.01, SE = 0.003, p < .01$ ) and masculinity ( $\beta = 0.006, z = 3.45, SE = 0.002, p < .001$ ) are significant moderators of the effect of anthropomorphism on consumer product evaluations. Planned contrasts show that the positive effect of anthropomorphic appeals is stronger in countries with high power distance ( $g = 0.285, p < .001$ ) than in those with low power distance ( $g = 0.178, p < .001; \chi^2(1) = 6.19, p < .001$ ). Also, anthropomorphism has a stronger effect in masculine countries

( $g = 0.476, p < .001$ ) than in feminine countries ( $g = 0.144, p < .001; \chi^2(1) = 52.45, p < .001$ ). However, individualism ( $\beta = 0.002, z = 1.14, SE = 0.002, p = .254$ ) does not exert a significant moderating effect in the presence of other cultural dimensions.

#### **4. General discussion**

This manuscript presents a meta-analysis that investigates the relative influence of anthropomorphic versus non-anthropomorphic appeals on consumers' product evaluations. Our results indicate that, in general, consumers react to anthropomorphic stimuli more positively compared to non-anthropomorphic stimuli. However, this pattern is not absolute: Situational factors associated with the salience of uncertainty in product evaluations set boundary conditions for the effectiveness of anthropomorphic appeals. Specifically, the effect of anthropomorphic appeals on product evaluations is more pronounced when the product is an experience (vs. search) product, and when the consumers are from societies with high (vs. low) uncertainty avoidance. Methodologically, our findings also show that anthropomorphic appeals are more effective when a single cue is used than when multiple cues are used to humanize the product or brand.

#### **5. Theoretical contributions**

Our research brings two significant contributions to the literature. First, our research represents a first effort to synthesize and reconcile the mixed findings in the literature on the effectiveness of anthropomorphic appeals. Some researchers show that anthropomorphic appeals are more influential than non-anthropomorphic appeals in the context of product or brand evaluations (e.g., Chen et al., 2017, Touré-Tillery and McGill, 2015); however, other scholars report the opposite pattern of results (Han et al., 2019, Puzakova and Aggarwal, 2015). Still others reveal no difference between anthropomorphic and non-anthropomorphic appeals in influencing consumer product evaluations (Delgado-Ballester et al., 2013, Yuan and Dennis, 2017). The present research suggests that the relative effectiveness of anthropomorphism depends on the salience of uncertainty involved in product evaluations—as with experience products or when consumers belong to a society with high uncertainty avoidance. These findings are important, because they show that the effectiveness of anthropomorphism is contingent upon not just product-level factors, but also consumer characteristics.

Also, these findings may help explain some interesting findings in a related, but distinct area: artificial intelligence (AI). Previous research on AI shows that some AI products have gained a quick penetration in some countries but not in others (Belanche, Casaló, & Flavián, 2019). Such a difference is usually attributed to the anthropomorphic product design and type of consumption task (Li, Rau, & Li, 2010). Our research provides another plausible explanation: AI products that do not have human-like features may have disadvantages in countries with high uncertainty avoidance. In these countries, humanizing the AI products can increase the adoption rates. However, this is not an issue for consumers in countries with low uncertainty avoidance.

Furthermore, our findings also contribute to the anthropomorphism literature by conceptualizing uncertainty reduction as a key underlying process that drives cross-cultural differences in the effectiveness of anthropomorphism. Prior literature on anthropomorphism has focused mainly on

proposing cross-national differences in anthropomorphism (Aguirre-Rodriguez, 2014, Epley et al., 2007, MacInnis and Folkes, 2017). However, to the best of our knowledge, no previous research has identified a particular cultural dimension to explain such a variance. Our research represents the first effort to uncover the process through which anthropomorphic appeals induce positive reactions from consumers. This is an important discovery, as it advances our understanding about why anthropomorphism is effective in some countries, but not in others. Armed with this information, it is reasonable to expect that anthropomorphic appeals should be more effective in the contexts of online shopping and first-time purchases, and when product information is scarce, because the uncertainty associated with product evaluations in these contexts is usually high (Laroche et al., 2005). It also suggests that in medical decision making, where consumers are often associated with uncertainty (Yang, Saini, & Freling, 2015), anthropomorphism may be fruitful in facilitating consumer decision making. Such a discovery is significant to the literature, and it helps integrate the seemingly irrelevant literatures together to unleash the power of anthropomorphism. Also, our findings provide the direction for future researchers to identify new domains that have not examined the effects of anthropomorphic appeals.

### 5.1. Managerial implications

Apart from the theoretical contributions, our findings also have significant implications for managers. Our findings suggest that, for product evaluations that do not involve much uncertainty due to the richness of intrinsic cues (e.g., shopping for search products), anthropomorphic appeals do not have a substantial advantage over non-anthropomorphic ones. These findings elucidate why anthropomorphism is more persuasive when ambiguity and uncertainty are salient. Armed with this information, marketers of search products may want to focus on displaying the attributes that directly relate to product quality in the advertisement, whereas advertisers of experience products should use anthropomorphic appeals in their product promotions.

These findings also suggest that managers might enhance the effectiveness of anthropomorphic appeals by capitalizing on the effects of situationally heightened uncertainty. Uncertainty can be primed—often subconsciously—by a variety of external stimuli such as communication appeals (Yang, Sun, Lalwani, & Janakiraman, 2019). For ads containing anthropomorphic appeals, marketers should strive to intensify consumers' feelings of uncertainty. For example, divergent customer ratings (i.e., when consumers have a broad range of conflicting opinions and there is no dominant view) are likely to give customers the impression of a wide spectrum of quality among the products in a particular category, which enhances a sense of uncertainty (Yang, Sun, Lalwani, & Janakiraman, 2019). In contrast, when an advertisement features non-anthropomorphic appeals, marketers may increase the effectiveness of such a message by providing convergent customer ratings (i.e., most respondents leave similar ratings for a product) to reduce consumers' feeling of uncertainty.

Our findings also provide useful guidelines that firms can use to adapt their strategies to various regions and to determine whether they should use anthropomorphic appeals. For products in regions where residents tend to have a salient uncertainty (e.g., countries with high uncertainty avoidance), anthropomorphic appeals should be used to reduce the distance between consumers

and the product. However, when marketers target consumers in societies that are low in uncertainty avoidance, they should realize that these consumers do not have a salient need to establish psychological intimacy with the product. Thus, anthropomorphic appeals may or may not have positive effects.

Finally, this meta-analysis provides novel insights on the number of anthropomorphic cues used in advertising. Specifically, our findings suggest that a single cue is more effective than multiple cues. This finding may also have implications for the methods used to anthropomorphize a product. In the real world, several methods are used to operationalize anthropomorphism: (a) using a face feature in the logo (e.g., logos for Amazon, LG, and Walmart), (b) featuring verbal cues (e.g., Alexa, IBM's Watson), (c) showing that the product possesses mental capabilities or human skills (e.g., brand characters for M&Ms, KFC, Mr. Clean], and (d) demonstrating that the product or package becomes alive or acts as a human (e.g., ads for Heineken). Our findings suggest that when choosing a particular anthropomorphic cue to represent a product or brand, the most important criterion is whether a cue is effective in reducing uncertainty for consumers. Uncertainty reduction is closely associated with the compatibility among the anthropomorphic cues, the product, and the customers; therefore, marketers should consider all the three aspects in their design of anthropomorphic appeals.

## 5.2. Limitations and future research

Our findings are subject to the inherent limitations of the meta-analytic technique. First, as with any meta-analysis, despite our best efforts, we could not include all studies and all constructs featured in the literature due to a lack of necessary information for the calculation of effect sizes. We were constrained by the availability of the data, and we sometimes could not access the information needed to transform empirical results into a usable metric to be included in our analysis. Second, while several other factors would be of interest as potential moderators, we limited our focus to the variables that could be coded systematically in the original studies. Third, the studies in our meta-analytic dataset are correlational by nature, so causal directions are inferred by theory, not by empirical evidence. Future research can conduct laboratory studies in a controlled environment to test causal interpretations. Finally, although this meta-analysis demonstrates two theoretical moderators of the link between anthropomorphism and consumer response, we cannot determine why these effects occurred. Future research could build on our findings and provide a deeper understanding of the effectiveness of anthropomorphic appeals and boundary conditions by explicitly manipulating these and other variables to examine their impact on the relationship between anthropomorphism and product evaluations.

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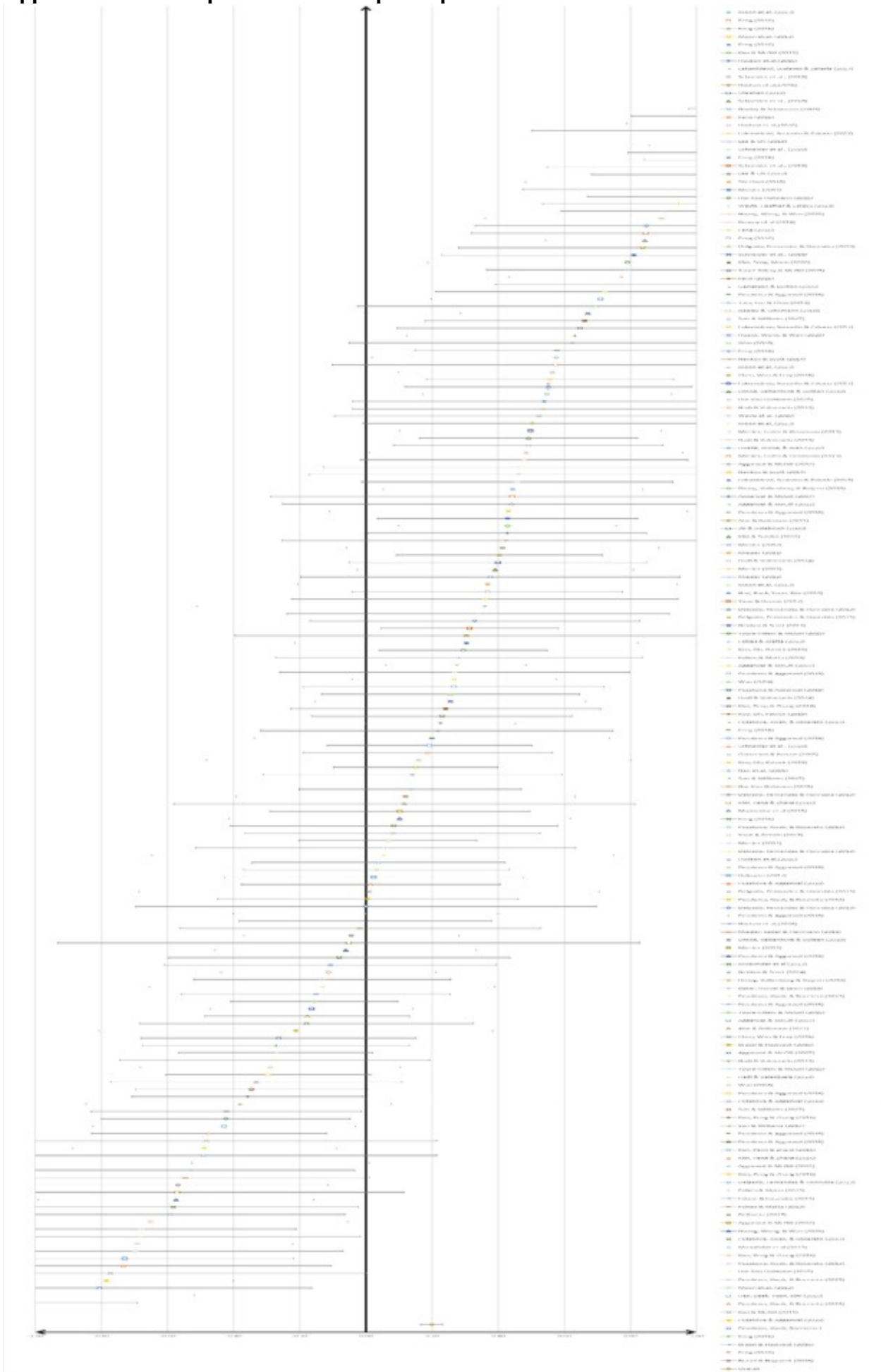
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# Appendix A. Forrest plot of the anthropomorphism studies included in the database



## Appendix B. Coding scheme for moderators included in the meta-analysis

Variable Name	Coding Scheme
<b>Type of product</b>	Type of product used in the study was coded on the basis of prior studies.
Experience product	Experience product = 1
Search product	Search product = 0
<b>Culture</b>	The national origin of the samples taken from each study included in the meta-analysis
Uncertainty Avoidance Individualism/Collectivism Power Distance Masculinity/Femininity	For each country, we coded the cultural values of customers using Hofstede's cultural score.
<b>Multiple cues vs. single cue in advertisements</b>	We counted the number of cues used to manipulate anthropomorphism in each study.
Combination of cues used to prime anthropomorphism.	Multiple = 1
A single used to prime anthropomorphism.	Single = 0
<b>Publication status</b>	
Published	Published = 1
Unpublished	Unpublished = 0
<b>Type of participant</b>	Respondents that participated in the study.
Students	Student sample = 1
Non-students	Non-student sample = 0
<b>With a Brand vs. Without a brand</b>	Observed if the study includes a brand name as a cue in the stimuli.
Brand present	With a brand = 1
Brand absent	Without a brand = 0

## Appendix C. Coding for experience and search products

Reference	Product Category	Product Type Classification
Micu & Pentina (2015) Luan, Yao, Zhao, & Liu (2016)	Athletic Shoes	Experience
Wright & Lynch Jr. (1995) Kwon et al., 2008, Micu and Pentina, 2015	Candy and Chocolate	Experience
Girard & Dion (2010)	Car	Experience
Kwon et al., 2008, Chen and Jin, 2012	Cereal	Experience
Jiang, 2004, Kwon et al., 2008	Cheese	Experience
Luan et al. (2016)	Clothing	Experience
Lightner & Eastman (2002)	Cookies	Experience
Franke et al. (2004)	Decorative Pictures (Paints)	Experience
Franke et al. (2004)	Groceries (Beer, Beverage, Cheese Crackers, Fruit snacks, Snacks, Donut, Healthy Snacks, Vegetables)	Experience
Hsieh et al., 2005, Jiménez and Mendoza, 2013	Hotel Services	Experience
Franke et al. (2004)	Insurance	Experience
Franke et al., 2004, Xie et al., 2015, Moorthy and Hawkins, 2005	Medicines (Flu medicine, over the counter medicines, nasal spray, prescription drugs)	Experience
Luan et al. (2016)	Sneakers	Experience
Lee et al., 2015, Wang et al., 2018	Software (Mobile Apps, Facebook)	Experience
Antipov & Pokryshevskaya (2018)	Smoothie Maker	Experience
Girard and Dion, 2010, Yang et al., 2016	Speaker (Audio devices)	Experience



Reference	Product Category	Product Type Classification
Antipov & Pokryshevskaya (2018)	Steam Iron	Experience
Weathers et al., 2007, Moon et al., 2008	Sunglasses	Experience
Hine, 2014, Chang et al., 2018	Sunscreen	Experience
Wu, Wang, & Hsu (2014)	Tea Bags	Experience
Mudambi and Schuff, 2010, Xu et al., 2015	Video Games	Experience
Girard & Dion (2010)	Backpack	Search
Huang et al., 2009, Mudambi and Schuff, 2010, Xu et al., 2015	Camera	Search
Mudambi and Schuff, 2010, Jiménez and Mendoza, 2013 Luan et al. (2016)	Cellphones	Search
De Groot et al. (2009)	Clock	Search
<b>Reference</b>	<b>Product Category</b>	<b>Product Type Classification</b>
De Groot et al. (2009)	Coffee Cups / Cup	Search
Kwon et al. (2008)	Dental Floss	Search
Mixon (1999)	Electric Bike (Bicycles)	Search
Korgaonkar et al., 2006, Weathers et al., 2007	Health Supplement	Search
Franke et al. (2004)	Houseware (Faucet, scoop)	Search
Ashraf, Jaafar, & Sulaiman (2017)	Kitchen Utensils	Search
Luan et al. (2016)	Laptops	Search
Kwon et al. (2008)	Orange Juice	Search
Ashraf et al. (2017)	Paper Towel	Search
Yang et al. (2016)	Tablet	Search
Franke et al. (2004)	Toys	Search
Girard & Dion (2010)	Watch	Search

#### Appendix D. Country list

Austria	Germany	Singapore	United Kingdom
Canada	Hong Kong	South Korea	USA
China	Indonesia	Spain	
France	Netherlands	Switzerland	

Note: Hofstede's cultural dimension of the 14 countries came from <https://www.hofstede-insights.com>.

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