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WORKING PAPER

Are All Units Created Equal?: The Effect of Default Units on Product Evaluations

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Previous research on attribute framing has shown that people often infer higher quantity from larger numbers, usually with the assumption that the units used to specify this information elicit the same meanings. Drawing on literature on categorization and numerical cognition, the authors challenge this assumption and show that consumers often have preset units for attribute levels that strike an optimal balance between a preference for small numbers and the need for accuracy (study 1a). As such, these default units appear commonly (study 1b). Specifying positive attributes in default units renders products' evaluation more favorable, even if such specification lowers the nominal value of the attributes (studies 2–4). This effect disappears if participants attribute metacognitive feelings generated by default units to an irrelevant source (study 3). Study 5 shows that a default unit effect is more likely in single evaluation mode, but a numerosity effect may reemerge in joint evaluations.

Consumers often confront quantitative product information during their purchase decisions and may even consider it more informative than their own direct experience with the product (Hsee et al. 2009). Despite the clear importance of quantitative information in consumer decisions, relatively little research investigates the potential influence of the unit in which such information is specified. For example, do consumers' evaluations of a cell phone vary if its warranty is expressed in years or days? Normatively, specifying an attribute in an alternative unit should not influence product evaluations, but an emerging research stream suggests that consumers show different preferences when quantitative information is expressed in alternative units (Burson, Larrick, and Lynch 2009; Monga and Bagchi 2012; Pandelaere, Briers, and Lembregts 2011; Zhang and Schwarz 2012).

Specifically, when an attribute description uses a contracted scale (e.g., quality rating on a 10-point scale) rather than an expanded one (e.g., quality rating on a 1000-point scale), consumers perceive the difference between two options as greater in the latter situation (Pandelaere et al. 2011). Research on medium maximization and loyalty programs further shows that consumers prefer rewards expressed in larger numbers, even if the outcomes are identical (Bagchi and Li 2011; Hsee et al. 2003), mainly because people rely too much on the sheer number and ignore the unit that specifies the attribute.

Although this converging evidence indicates that consumers infer bigger quantities from bigger numbers, prior research seems to assume that the units for conveying information do not differ in evoked meaning, such that the choice of specific unit to express attribute levels may seem arbitrary. In contrast, we argue that for many attribute levels, default units exist that represent the units most people would use to express information on a particular attribute. For example, consumers probably are more accustomed to see warranty information expressed in years rather than in days; years constitutes their default unit for a warranty. This possibility raises the question of whether consumers' product evaluations are similar if the warranty is specified in days (i.e., larger numbers) rather than years (i.e., smaller numbers). We argue and show that they do not. In general, positive attributes (i.e., higher values are preferred) expressed in default units generate more favorable product evaluations, due to enhanced ease of processing (i.e. processing fluency; Schwarz 2004), despite its lower numerosity. For our theorizing, we draw on research into categorization, numerical cognition, and metacognitive feelings.

This research thus contributes to emerging literature on numerosity effects in product evaluations (Burson et al. 2009; Monga and Bagchi 2012; Pandelaere et al. 2011) in three ways. First, this research adds to current literature by showing that choice of specific unit to express attribute levels is not arbitrary. Second, we offer a more nuanced understanding of when numerosity effects occur and specify the conditions in which they are reversed. Third, by drawing on literature on categorization, numerical cognition, and fluency, we offer a new perspective to recent research that suggests quantitative information can generate inferences beyond the numbers involved (Monga and Bagchi 2012; Zhang and Schwarz 2012).

In addition, this research extends literature on fluency by identifying a hitherto ignored source. Research on fluency typically employs manipulations that make information either easy or difficult to perceive, by changing the font or varying the contrast between statements and background (Novemsky et al. 2007; Reber, Winkielman, and Schwarz 1998). But considering the importance of clearly communicating product information, it is rather unlikely that one would find real-world advertisements written in unclear fonts or shady backgrounds. Still, sellers may make choices about the units used to communicate product information in an arbitrary fashion. For example, Amazon.com advertises the battery life of cell phones in hours, whereas Wirefly.com employs days. Our research shows that this choice is not without consequences.

NUMERICAL FRAMING AND THE UNIT EFFECT

Emerging literature indicates that consumers evaluate options differently when attribute information is expressed in alternative units (Burson et al. 2009; Monga and Bagchi 2012; Pandelaere et al. 2011; Zhang and Schwarz, 2012). For example, Zhang and Schwarz (2012) find that consumers infer higher accuracy for attributes specified in smaller units. Pandelaere and colleagues (2011) asked participants to evaluate the difference between two television sets, for which participants received quality information with the unit manipulated: on a 10-point scale or a 1000-point scale. The results indicate that an attribute difference looms larger when it is expressed in large numbers (i.e., small units) rather than small numbers (i.e., large units). A possible explanation for this so-called unit effect is that consumers associate bigger numbers with bigger quantities (i.e., numerosity heuristic; Josephs, Giesler, and Silvera 1994; Pelham, Sumarta, and Myaskovsky 1994). Despite the potential usefulness of this heuristic, it can lead to misestimated outcomes, because people fail to take the *type of unit* into account when evaluating numerical information. Instead, they rely only on the *number of units*.

Although this research suggests that people infer larger quantities from larger numbers, it also implicitly assumes that units do not differ in elicited meaning and can be used interchangeably to express a given score on an attribute. In some situations, this assumption is true; Burson and colleagues (2009) manipulate the number of movies (per week vs. per year) of a movie rental plan, and Pandelaere and colleagues (2011) employ quality ratings and probability judgments (10- or 1000-point scales). In these studies, the units probably do not differ in evoked meaning, and respondents should not have considered switching between units. Other researchers have used attribute scores that are equally easy to process such as one month or 31 days, and people probably have no preference for either expression. However, in other cases, some units may be markedly preferred over others to express attribution information. We propose that expressing information in these default units may affect product judgments.

THE ORIGINS OF DEFAULT UNITS

Small Number Preference

Linguistics studies show that people prefer to use certain expressions over others, without any specific reason (Greenberg 1966). In asymmetric relationships between linguistic elements, so-called marked elements are dominant and more frequently used, so when asking about a person's age, people tend to use the adjective "old" ("How old are you?") instead of "young" ("How young are you?"). Extending this line of reasoning, we propose that people might have dominant expressions for quantitative information and prefer to use convenient numbers to express attributes.

What makes a number convenient? Research on numerical cognition suggests that numbers are mapped onto an approximate mental number line (Cantlon, Platt, and Brannon 2009; Cohen Kadosh, Tzelgov, and Henik 2008; Dehaene 2011; Izard and Dehaene 2008), which exhibits a magnitude effect (Dehaene, Dehaene-Lambertz, and Cohen 1998; Dehaene 2003; Parkman 1971; Shepard, Kilpatrick, and Cunningham 1975). That is, people have a harder time discriminating between two large numbers than two small ones, because the mental number line follows Weber's law, which posits that the threshold of discrimination between two stimuli increases linearly with stimulus intensity. The mental representation of numbers thus becomes less precise when they convey larger magnitudes. For example, people decide more quickly that 7 is larger than 5 than they can decide that 107 is larger than 105 (Parkman 1971) and rate 8 and 9 as more similar than 2 and 3 (Shepard et al. 1975). This decreasing accuracy prompts people to prefer to use smaller numbers (Banks and Coleman 1981; Banks and Hill 1974; Viarouge et al. 2010).

Also from a computational point of view, smaller numbers appear preferred. Research has repeatedly shown that for mental computations, a problem-size effect occurs (Ashcraft 1992), such that computations with large numbers induce typically longer response times than computations with small numbers (Ashcraft 1992; Groen and Parkman 1972). In addition, linguistic analyses of number frequencies reveal that small numbers appear more frequently in written texts in many languages (Dehaene and Mehler 1992; Dorogovtsev, Mendes, and Oliveira 2006; Jansen and Pollmann 2001). Words take numerical prefixes, such as bi- or tri-, only for small numerosities; no prefixes exist for 57 or 26 (Dehaene 2011). From a rational perspective, it would make more sense to categorize a journal issue as number 564, but most people seem to prefer to classify it by volume and then issue within the volume, which reduces numerosity.

Our system of units also clearly reflects this preference. When humans quantify objects, at a certain threshold, large numerosities tend to be grouped into smaller numbers. Thus, people represent an increasing quantity in the same unit until the point at which the numerals representing this quantity become too large (e.g., 1024 megabytes). After this point, they regroup the large quantity in one larger unit (e.g., 1 gigabyte). Through this mechanism, people adapt the environment to the constraints imposed by their brain structure (Dehaene 2009). Normatively, there is no reason to change the unit in which a quantity is specified, but contrary to this rational perspective, the human brain’s preference for small natural numbers leads people to employ relatively large units (and thus small numbers).

Basic Unit Categorization

Numerical units are basically categories of measurement (Stevens 1946; Wiese 2003). Research on categorization has demonstrated that some categorization levels are more dominant than others (Mervis and Rosch 1981; Rosch 1975). Objects are mostly categorized at basic levels (e.g., tree) rather than at superordinate (e.g., plant) or subordinate (e.g., Red Maple) levels, though this categorization is not simply a matter of expressing information as cognitively efficiently as possible. For example, categorizing a tree as a plant is very cognitively efficient but also insufficient to distinguish the object from other plants, resulting in low accuracy. Likewise, expressing quantitative information exclusively in small numbers is very cognitively efficient but not very accurate for discriminating among objects. A measurement system that would use a limited range of small numbers would be too imprecise to be practically useful in most cases; a measurement system that consisted exclusively of 1, 2, and 3 would make differentiating 20 attribute levels impossible. We argue that people trade off some level of cognitive efficiency to achieve higher accuracy and prefer the units that best achieve both aims (need for accuracy and need for cognitive efficiency). Decision making theory (e.g. Bettmann, Luce and Payne 1998) supports such an argument. In general, decisions are often characterized by some compromise between the desire to make an accurate decision and the desire to minimize cognitive effort.

The tension between the need for cognitive efficiency and the need for accuracy is best illustrated by the way technological innovations can change the preferred unit. As a demonstration, we conducted a pilot study, in which we examined the numbers and units used to specify computers' hard disk capacity in multiple issues of the Belgian equivalent of *Consumer Reports* ("*Testaankoop*"). Figure 1 shows the changing numbers that refer to the lowest disk capacity from 1987 to 2011. In 1987, the unit was megabytes; considering the limited memory capacity available, this unit provided consumers with a relatively small, convenient number. The numbers also were sufficiently precise to discriminate among attribute levels of that time. As hard disk capacity increased though, the numbers grew quickly, and in the trade-off, accuracy began to dominate cognitive efficiency. Around 1997, an increase of 1 megabyte seemed too precise, considering the low level of cognitive efficiency it then implied. To regain cognitive efficiency, a less precise unit came into use (i.e., gigabyte). With further technological improvements, the terabyte seems likely to replace the gigabyte as the preferred unit for hard disk capacity (Kryder and Kim 2009).

Figure 1 about here

In general, the choice of specific unit to express attribute levels might not be arbitrary. We propose that for many attribute levels, “basic units” arise from people’s need to represent a range of attribute scores cognitively efficiently while still allowing for a sufficient level of accuracy. Basic units optimally achieve both aims.

DEFAULT UNITS, PROCESSING FLUENCY, AND PRODUCT EVALUATION

Because basic units strike the most optimal trade-off for a particular attribute range, consumers might employ them more regularly than other units. As a consequence, a basic unit might become the default unit for a specific range of attribute scores. Default units are thus the units that consumers are most accustomed to for describing certain attributes. Given that people are more familiar with default units, consumers should be able to process attribute information more easily when it appears in default units rather than in nondefault units. Thus, specifying attribute information in an alternative unit might change the metacognitive experience of fluency that consumers experience during processing.

Vast research has documented that experienced ease or difficulty of processing provides a basis for a wide array of judgments, such as liking (Reber, Winkielman, and Schwarz 1998; Winkielman and Cacioppo 2001), aesthetic appreciation (Pandelaere, Millet, and Van den Bergh 2010; Reber, Schwarz, and Winkielman 2004), product evaluations (Cho and Schwarz 2010; Pocheptsova, Labroo, and Dhar 2010), goal pursuit (Labroo and Kim 2009; Labroo and Lee 2006), importance ratings (Labroo, Lambotte, and Zhang 2009; Shah and Oppenheimer 2007), risk assessments (Song and Schwarz 2009), and choice (Novemsky et al. 2007; Garbarino and Edell 1997). Fluency can be generated through various instantiations, including font manipulations (Novemsky et al. 2007; Reber et al. 1998), rhyming words (McGlone and Tofighbakhsh 2000), and even facial expressions (Stepper and Strack 1993; Strack and Neumann 2000).

Adding to this stream of research, we suggest that specifying attribute information in an alternative unit might change the fluency that consumers experience during processing. Because consumers have default units in which they prefer attribute information to be expressed, specifying information in nondefault units might lead to some metacognitive difficulty. Metacognitive difficulty likely generates negative product evaluations (Labroo, Dhar, and Schwarz 2008; Reber et al. 1998), so we propose that, relative to default units, attribute information specified in nondefault units leads to less favorable product evaluations (see figure 2).

Figure 2 about here

DEFAULT UNIT VS. NUMEROSITY EFFECT

In potential contrast with a numerosity account, we theorize that expressing positive attributes in *smaller* units (i.e., *larger* numbers) will not always lead to more positive product evaluations. However, the default unit account is not an alternative explanation of extant numerosity findings; rather, we argue that numerosity guides the judgment of products described in alternative units under a different set of circumstances. Consistent with previous research (Monga and Bagchi 2012; Zhang and Schwarz 2012), we argue that quantitative information can generate inferences beyond the numbers involved. For example, changing the consumers' focus to units could reduce the accessibility of numerosity as a decision criterion (Monga and Bagchi 2012). Similarly, when metacognitive difficulty is the most accessible decision input, it may reverse the effect of numerosity, thereby resulting in a default unit effect. However, when numerosity is the most accessible decision input, a numerosity effect may dominate the default unit effect.

One factor that might affect the accessibility of different judgment cues is evaluation mode (Hsee 1996). Research on the effects of specifying attributes in an alternative unit (Burson et al. 2009; Pandelaere et al. 2011) typically involved joint evaluation modes, in which attribute values were explicitly juxtaposed. Consequently, attribute differences and numerosity may become very salient, resulting in a numerosity effect. Moreover, in comparative situations, the alternative options are all expressed in the same unit, as a result of which the type of unit (default vs. nondefault) could become nondiagnostic. During single evaluations though, the attribute difference cue disappears, and metacognitive feelings may emerge as the most accessible decision criterion.

We do not claim that numerosity effects cannot occur in separate evaluation contexts. Srivastava and Raghubir (2002) demonstrated a face value effect: Relative to a less numerous foreign currency, consumers tend to underspend when prices are specified in a more numerous foreign currency. Gourville (1998) demonstrated that, relative to a year frame (US$300 per year), representing a donation request in a day frame (US¢85 per day) leads to higher donations. These results seem inconsistent with the hypothesized default unit effect in separate evaluation mode. However, in these studies, metacognitive experiences may be similar across conditions. In the face value effect studies, an American participant would consider both Malaysian ringgit and the Bahraini dinar nondefault units, and equally difficult to process. Similarly, in the Gourville studies, US$300 per *year* versus US¢85 per *day* are presumably equally easy or difficult to process.

Some experiments compared a (default) home currency to a higher numerosity foreign currency and obtained a numerosity effect (exp. 2 and 4 in Srivastava and Raghubir 2002). However, there are two major differences with our work. First and most importantly, in Srivasta and Raghubir (2002), participants were not presented with any product attribute values at all. Rather, participants were asked to *generate* a maximum price for a particular product (e.g. a scarf) in either a foreign or familiar currency. In our theorizing, we expect the default unit effect to occur when attributes are simultaneously *presented* with the product. Second, given that metacognitive experiences between the familiar (default) and unfamiliar (nondefault) currency presumably differ, one could argue that the default unit account should predict that consumers should be willing to spend more in a familiar currency, irrespective of face value. However, consumers seem to be *less* inclined to spend more fluent forms of money (Mishra, Mishra, and Nayakankuppam 2006). The default unit account would therefore make similar predictions as the numerosity account.

STUDY OVERVIEW

We test our predictions in six experiments. In study 1a, we offer evidence for our contention that the choice of units is not arbitrary. Particularly, units that most optimally satisfy the need for cognitive efficiency and the need for accuracy are preferred. In study 1b, we provide evidence that for a wide range of product attributes, a default unit exists that is considered the most suitable and most regularly used. In study 2, we demonstrate the default unit effect on product evaluations. Specifying attribute information in default units, relative to nondefault units, leads consumers to pay more, irrespective of the face value of the attribute.

In study 3, we provide evidence for our premise that fluency drives the default unit effect by employing a misattribution paradigm (Schwarz et al. 1991), in which the fluency generated by the default unit effect can be misattributed to an irrelevant source (i.e., background music). In study 4, we provide process evidence for the default unit effect. Specifically, the enhanced processing fluency associated with the default unit leads to enhanced product evaluations. In addition, we exclude the possibility that this effect is generated by the fluency associated with the numbers used in information specified in default units. In study 5, we show that evaluation mode (Hsee 1996) determines whether a default unit or a numerosity effect arises. In a separate evaluation, we replicate the default unit effect; in the joint evaluation though, numerosity may overrule the fluency generated by default units as a decision input.

STUDY 1a

We strive to find support for our premise that that the choice of units is not arbitrary; instead, units differ in the extent to which they satisfy the need for cognitive efficiency and the need for accuracy. This implies that people should prefer a measurement system that makes use of a parsimonious number of categories, but nevertheless achieves a sufficient level of accuracy. In addition, we aim to show that consumers prefer a unit that represents the most balanced trade-off between accuracy and parsimony. We anticipate that a unit consisting of a limited range of small numbers (e.g., 1–10) will appear very parsimonious but not very precise. Conversely, a unit containing a very wide range of numbers (e.g., 1–1000) will be considered very precise but not parsimonious. Alternatively, a unit containing a moderate range of relatively small numbers should be regarded as precise *and* parsimonious (e.g., 1–100). This unit maximizes accuracy at the smallest cost possible, so we predict it will be preferred.

Method

In total, 33 participants (M_{age} = 22 years, 26 women) were recruited from an online panel. In the first part of the study, participants were told that a couple of companies had decided to introduce a new product. In addition, this product had a new feature for which no measurement unit existed. Three attribute scales were considered: numbers from 1 to 10, from 1 to 100, and from 1 to 1000 range. For each scale, participants rated the extent to which it was accurate in specifying attribute information (1 = "not accurate at all"; 7 = "very accurate") and parsimonious in conveying attribute information (1 = "not parsimonious at all"; 7 = "very parsimonious"). After completing these measures, participants indicated for each scale its suitability for specifying the new attribute (1 = "totally not suitable"; 7 = "very suitable").

Results

We first subjected the accuracy ratings to a repeated measures analysis of variance (ANOVA) with scale type (1–10; 1–100; 1–1000) as within-subjects factors. This analysis yielded the expected main effect of scale type ($F(2,64) = 37.73$, $p < .05$). Planned contrasts revealed that the wide range unit was rated as more accurate than the narrow (M_{wide} = 5.85 vs. M_{narrow} = 3.64; $t(32)$= 6.58, $p < .05$) or moderate range units (M_{wide} = 5.85 vs. $M_{moderate}$ = 5.27;

t(32)= 2.17, $p < .05$). As expected, an analysis of the parsimony ratings also revealed a significant main effect ($F(2,64) = 34.12$, $p < .05$). The narrow range unit was considered more parsimonious than the moderate ($M_{narrow} = 5.73$ vs. $M_{moderate} = 5.18$; $t(32)= 2.18$, $p < .05$) and wide versions ($M_{narrow} = 5.73$ vs. $M_{wide} = 3.33$; $t(32)= 7.29$, $p < .05$).

An analysis of the suitability ratings demonstrated significant differences across the three units ($F(2,64) = 10.35$, $p < .05$), in further support of our conjecture that the units are not arbitrary. Confirming our hypothesis, participants rated the moderate range unit as more suitable than the narrow ($M_{moderate}= 5.64$ vs. $M_{narrow} = 4.67$; $t(32) = 2.67$, $p < .05$) or wide range units ($M_{moderate}= 5.64$ vs. $M_{wide} = 3.88$; $t(32) = 4.86$, $p < .05$). The difference in suitability between the narrow and wide range units was marginally significant ($t(32) = 1.82$, $p = .078$), which suggests that people may consider parsimony more important than accuracy.

We next regressed evaluations of suitability on accuracy and parsimony ratings. A multilevel model accounted for the repeated-measures nature of the data. To test whether people trade off accuracy and parsimony, we included the interaction between accuracy and parsimony ratings. The analysis reveals main effects of both parsimony ($F(1,38.51) = 22.21$, $p < .001$) and accuracy ratings ($F(1,26.69) = 5.19$, $p < .05$). As expected, a significant interaction ($F(1,38.89) = 19.29$, $p < .001$) indicates that people trade off accuracy for parsimony.

A closer inspection of this interaction reveals that accuracy is not related to suitability when parsimony is low (-1SD) (simple slope = .013, $z = .93$, $p = .35$). As parsimony increases, accuracy becomes related to suitability. For instance, for moderate (i.e. mean) parsimony, accuracy influences suitability (simple slope = .41, $z = 4.71$, $p < .001$). Likewise, parsimony is not related to suitability when accuracy ratings is low (-1SD) (simple slope = -.12, $z = .89$, $p = .37$). As accuracy increases, parsimony becomes related to suitability. For instance, for moderate (i.e. mean) accuracy, parsimony influences suitability (simple slope = .24, $z = 2.27$, *p*

< .05). This pattern of results suggests that people indeed prefer units that maximally satisfy both the need for cognitive efficiency and the need for accuracy.

Discussion

This study demonstrates that choice of units is not arbitrary; people try to achieve both accuracy and cognitive efficiency. Our results suggest that units that most optimally satisfy both the need for cognitive efficiency and the need for accuracy seem more suitable than units that overemphasize either one. Admittedly, due to the within subjects design, the current study suffers from a demand effects explanation. Future research may therefore investigate the tension between accuracy and parsimony in a between-subjects design. Still, our study offers preliminary evidence for the existence of optimal units. Our theorizing suggests that such optimal units are likely to be used more often and consequently become default units.

STUDY 1b

In study 1a, we demonstrated that units that most optimally balance between the need for cognitive efficiency and accuracy are preferred. In this study, we aim to show that for a wide range of attributes, such a preferred unit exists and is used commonly. That is, we argue that these initially preferred units become default for particular attributes. We test the regular use of a unit indirectly by assessing its familiarity. If a unit is used more frequently, it should be more familiar than other units. We expect that unit suitability (i.e., extent to which it represents an optimal balance between small number preferences and need for precision) should be highly correlated with unit familiarity.

Method

In total, 47 undergraduates (M_{age} = 21 years, 18 women) from Ghent University participated in exchange for course credit. To avoid false inflation of the relations between unit suitability and unit familiarity, we opted for a between-subjects design. Half the participants rated the suitability of a unit for a particular attribute (1 = "totally not suitable"; 7 = "very suitable"), and the other half indicated the extent to which a unit was familiar (1 = "totally not familiar"; 7 = "very familiar"). We included six attributes: weight (laptop, USB flash drive, table, truck), spatial dimensions (cell phone, table, television, distance between cities, newspaper, house), digital capacity (computer hard disk, CD), warranty (cell phone), camera resolution (digital camera), and content (glass, dustbag of a vacuum cleaner). For each attribute, participants rated three alternative units on their familiarity or suitability. For example, for hard disk capacity, they rated kilobyte, megabyte, and terabyte; for the dimensions of a television, they considered meter, millimeter and centimeter. The order of presentation was random. For each combination of attribute and unit, we calculated a mean score across participants for both familiarity and suitability (see figure 3).

Figure 3 about here

Results and Discussion

We observed a strong positive correlation between mean unit suitability and mean unit familiarity (r = .92, p < .001); more suitable units were more familiar. Visual inspection of figure 3 clearly shows that for most attributes, people have a default unit: The warranty of a cell phone in years appears more familiar and suitable than one expressed in days, and for camera resolution, megapixels is the default unit, whereas gigapixels and pixels are nondefault units. Megapixels probably most optimally meet the need for both accuracy and cognitive efficiency, whereas the two latter units insufficiently satisfy the need for accuracy and the need for cognitive efficiency, respectively.

Consistent with our theory, a default unit for product A might be a nondefault unit for product B. For example, a centimeter is the default unit for describing the spatial dimensions of a television, but not for measuring the spatial dimensions of a house. For the latter purpose, centimeters clearly insufficiently meet the need for cognitive efficiency. Extending this reasoning, the same attribute (e.g., weight) can have multiple default units (e.g., grams or kilograms), depending on the attribute level. The default unit for the weight of light objects (e.g., USB stick) is grams; that for heavy objects (e.g., truck) is kilograms or tons. The kilogram is lacking accuracy for light objects, but a gram insufficiently satisfies the need for cognitive efficiency for heavy objects. Consistent with our pilot study, a gigabyte is currently the default unit for hard disk capacity, but technological improvements are already making the terabyte a fairly suitable alternative.

Thus, we provide support for the premise that default units exist for a wide range of attributes. In addition, we show that these default units are preferred over other units and used more regularly than nondefault units. In the following studies, we investigate how attribute information in default units affects product evaluations.

STUDY 2

In study 2, we want to examine the proposed default unit effect; we predict that a product with attributes expressed in default units generates a higher willingness to pay, despite its lower numerosity.

Method

In total, 153 students (M_{age} = 21 years, 67 women) were recruited in exchange for a course credit for a series of unrelated studies, including the current one. The entire session took about 50 minutes to complete. The participants were randomly assigned to one of two conditions and presented with an advertisement for a cell phone and a vacuum cleaner. Both products were described on the basis of one attribute: battery life for the cell phone and capacity of the dust bag for the vacuum cleaner. In the *high numbers, nondefault* condition, battery life was expressed in hours and dust bag capacity in centiliters (i.e., large numbers). In the *low numbers, default* condition, attributes were described in default units of information, or days and liters, respectively. An open-ended question assessed willingness to pay (WTP) for both products.

To ensure that the framing of the attributes corresponded with our conceptualization of default and nondefault units, we conducted a pretest with 31 adults from the same population as the main study. All participants reviewed the attribute information of a cell phone, specified in the varying units, and indicated the extent to which these units were familiar to them in describing the attribute (1 = "totally not familiar"; 7 = "very familiar"). For battery life, participants rated 6 days as more familiar than 144 hours (M_{days} = 5.65 vs. M_{hours} = 4.45; $t(30)$ = 2.52, $p < .05$). Likewise, 2.6 liters was rated as more familiar than 260 centiliters (M_{liters} = 5.35 vs. $M_{centiliters}$ = 1.68; $t(30)$ = 10.96, $p < .001$).

Results and Discussion

A one-way between-subjects MANOVA conducted on WTP ratings yielded a significant difference ($F(2,150) = 4.87$, $p < .05$). Consistent with our hypothesis, two separate t-tests showed that participants were willing to pay more when information was in *low numbers, default* units than in *high numbers, nondefault* units. Similar difference arose for both the cell phone (M_{default} = €126 vs. $M_{\text{nondefault}}$ = €102; $t(151) = 2.52$, $p < .05$) and the vacuum cleaner (M_{default} = €98 vs. $M_{\text{nondefault}}$ = €80; $t(151) = 2.16$, $p < .05$).

This study supports the hypothesis that a product described in default units generates a higher WTP, despite the lower numerosity of the attribute score. In the next study, we search for evidence of the proposed mechanism.

STUDY 3

Study 3 aims to support the proposed fluency mechanism for the default unit effect. In particular, we examine the role of metacognitive feelings in the default unit effect. To do so, we use a misattribution paradigm, such that we provided respondents with an alternative, salient source to which they could attribute the metacognitive feelings they experience (Schwarz and Clore 1983). With this alternative source, their experienced metacognitive feelings are no longer attributed to the product they are evaluating, and no affective transfer to the product occurs. For example, Schwarz and colleagues (1991) told participants that their affective reactions to forthcoming stimuli might be influenced by background music; this manipulation undermined the informational value of their affective reactions, because participants attributed them instead to the background music, and fluency effects on judgments no longer arose.

Similarly, the metacognitive difficulty that participants experience when processing information expressed in nondefault units should not lead to negative product evaluations when they believe that these feelings have been caused by background music. The mere presence of background music does not suffice to establish misattribution, because participants normally do not regard it as a valid source of their experienced feelings. Instead, participants must be informed that music can influence their feelings, which makes that background music salient as a source of metacognitive feelings. We expect that the default unit effect will be attenuated by the presence of background music, if it is perceived as a source of experienced metacognitive difficulty. If background music is not regarded as a source, the default unit should persist.

Method

Participants were 89 undergraduates (M_{age} = 20 years, 35 women) who participated in exchange for course credit. The experiment employed a 2 (unit: low numbers, default vs. high numbers, nondefault) × 2 (background music: nondiagnostic vs. diagnostic) design. When participants entered the laboratory, they were seated in a cubicle in front of a computer. Background music started playing at that moment. In the *nondiagnostic music* conditions, participants were informed only that they were to evaluate a cell phone and answer some questions afterward, without any specific information about the background music. In the *diagnostic music conditions*, we told participants that the experiment dealt with the influence of music on product evaluations and that previous research had shown that music has an influence on experienced feelings. Participants also were informed that every feeling they experienced probably could be attributed to the background music.

Next, all participants reviewed a cell phone and its warranty information. In the *low numbers, default unit* condition, the warranty was expressed in years, whereas in the *high numbers, nondefault* condition, it was specified in days. The face value of the latter condition thus was substantially higher. A pretest showed that “2 years” appeared more familiar than “731 days” for warranty length (M_{years} = 6.37 vs. M_{days} = 1.68; $t(70) = 20.78$, $p < .05$). Participants then rated the attractiveness of the product offer on a 10-point scale (1 = “totally not attractive”; 10 = “very attractive”).

Results

The 2 (unit: low numbers, default vs. high numbers, nondefault) × 2 (background music: nondiagnostic vs. diagnostic) ANOVA conducted on participants’ product attractiveness ratings yielded the expected interaction ($F(1,85) = 6.51$, $p < .05$). In the nondiagnostic music conditions, a significant difference in attractiveness ratings emerged: The cell phone was rated as more attractive when the warranty was specified in years than in days ($M_{\text{default}} = 6.28$ vs. $M_{\text{nondefault}} = 4.47$; $t(42) = 3.00$, $p < .05$). This pattern replicates the key finding of study 2. Consistent with our hypothesis, in the diagnostic music conditions, the difference in attractiveness was not significant ($M_{\text{default}} = 5.30$ vs. $M_{\text{nondefault}} = 5.72$; $t(43) = .67$, $p = .50$). That is, participants discounted the metacognitive cues generated by the attribute information.

Insert figure 4 about here

Discussion

This experiment provided evidence of the role of processing fluency in specifying attributes in default versus nondefault units. Giving participants the possibility to misattribute metacognitive feelings generated from processing the attribute information to background music playing during their product evaluation eliminated the default unit effect. In these conditions, participants’ product attractiveness ratings did not differ across alternative attribute frames. When background music was not identified as a source to which feelings could be attributed, a product described in default units was rated as more attractive than one described in nondefault units, despite the lower face value of the former.

STUDY 4

Study 4 had two main goals. First, we wanted to provide process evidence for how default units influence product evaluations. Specifically, we predicted that the processing fluency associated with the unit mediates the effects of default units on product evaluations. Second, we aimed to eliminate an alternative explanation for our effects based on a numerical fluency account (King and Janiszewski 2011). King and Janizewski (2011) demonstrate that numerical stimuli can enhance fluent experiences. Because default units often use fluent numbers, the default effect could be explained by the fluency generated by the numbers used (e.g., 2 is probably more numerically fluent than 731). From our theorizing, we expect default unit effects to emerge because this type of unit is deemed more appropriate to describe a range of attribute scores, irrespective of number fluency. To distinguish these explanations, we set up an experiment in which the numbers in both the default and the nondefault unit condition were equally fluent to process.

Method

In total, 74 participants (M_{age} = 22 years, 48 women) were randomly assigned to one of two conditions, and all were presented an advertisement for a smartphone. The smartphone was described on one attribute: warranty. In the *high numbers, nondefault* condition, warranty was specified in weeks (80 weeks), such that the attribute was specified in small units and large numbers. In the *low numbers, default* condition, information was presented in years (1.5 years), that is, rather large units and small numbers. We asked a separate group of participants from the same population (N = 40) to rate the extent to which they found the numbers 1.5 and 80 difficult to process (1 = “totally not difficult to process”; 7 = “very difficult to process”). The numbers did not differ significantly in processing difficulty ($M_{1.5}$ = 2.48 vs. M_{80} = 2.15; $t(39)$ = 1.29, p = .20), though if anything, participants considered 1.5 somewhat more difficult to process than 80. In addition, we conducted a pretest (N = 31) showing that a warranty of 1.5 years was more familiar than 80 weeks (M_{years} = 6.42 vs. M_{weeks} = 2.42; $t(30)$ = 12.72, $p < .001$). An open-ended question assessed WTP for the phone.

To test for mediation, we included three measures of the fluency associated with the unit: How “right” does it feel to express warranty for smartphones in years (weeks)? (1 = “totally not right”; 7 = “very right”); How suitable do you think it is to express warranty for smartphones in years (weeks)? (1 = “totally not suitable”; 7 = “very suitable”); and How appropriate is it to express warranty for smartphones in years (weeks)? (1 = “totally not appropriate”; 7 = “very appropriate”). These measures were summed into a composite measure (α = .95) of the fluency associated with the unit.

Results

Fluency associated with the unit. An independent samples t-test revealed that participants rated default units as eliciting more fluent attribute information processing than nondefault units ($M_{default}$ = 6.07 vs. $M_{nondefault}$ = 2.14; $t(72)$ = 19.26, $p < .001$).

Willingness to pay. In line with our hypothesis, an independent samples t-test revealed that a smartphone described in low numbers and default units generated a higher WTP than when it was specified in high numbers and nondefault units ($M_{default}$ = €161 vs. $M_{nondefault}$ = € 129; $t(72)$ = 2.04, $p < .05$).

Mediation analysis. Following Zhao, Lynch, and Chen (2010), we tested whether unit fluency mediated the relation between condition (default unit = 1) and WTP (β = 32.06, $t(72)$ = 2.04, p < .05) using a bootstrap resampling method based on 5,000 resamples (Preacher and Hayes 2004, 2008). The results revealed an indirect effect (a × b = 70.72, *SE* = 39.32), with a 95% confidence interval excluding 0 (.09 to 148.38). Compared with the nondefault unit, being in the default unit condition enhanced processing fluency (β = 3.94, $t(72)$ = 19.26, p < .001); holding constant condition (default vs. nondefault), unit fluency increased WTP (β = 19.09, $t(71)$ = 2.17, p < .05). The direct effect of condition on WTP turned insignificant ($t(72)$ = -1.14, p = .26), so this mediation was classified as complementary (Zhao, Lynch, and Chen 2010). Because our mediation analysis suffered from multicollinearity, we drew on the logic of ridge regression (Hoerl and Kennard 1970; Mahajan, Jain and Bergier 1977) to reduce it. This analysis yielded similar results, showing that the mediation result is robust.

Discussion

This experiment provides clear evidence of the proposed mechanism driving the default unit effect. The default unit effect emerges because default units are more fluently processed than nondefault units. Furthermore, in contrast with a numerical fluency account, attribute information specified in default units generates a larger willingness to pay, even if the numbers involved do not differ in their number fluency.

STUDY 5

Study 5 aims to position the default unit effect relative to the numerosity effect. People often employ the most accessible decision criterion (Chaiken 1987; see also Wyer 2011), so we predict that the relative strength of numerosity and default unit effects depends on the respective accessibility of numerosity and metacognitive feelings as decision inputs. Particularly, evaluation mode (Hsee 1996) might affect accessibility. In joint evaluation mode, the numerosity associated with attribute differences may become very salient, such that it could override the fluency associated with processing default versus nondefault units. When consumers evaluate differences between larger numbers, the differences may still seem greater than equivalent differences between smaller numbers, even if the product information is described in nondefault units. During single evaluations though, the salient attribute difference numerosity cue disappears, so metacognitive feelings may emerge as the most accessible decision criterion for consumers' judgments.

In addition, prior research has mainly employed relative judgments (e.g., choice) that ask participants to compare two products. Specifically, participants must indicate the offer they consider best. Because the type of unit is identical (i.e., both default or both nondefault), no difference can surface in metacognitive experiences between options, thereby excluding the possibility of the default unit effect. To detect a possible default unit effect, we employed absolute judgments (e.g., attractiveness of product offer) in a comparative context (e.g., multiple products).

Method

In total, 175 students (M_{age} = 21 years, 132 women) participated in an online study. The experiment employed a 2 (unit: low numbers, default vs. high numbers, nondefault) × 2 (evaluation mode: separate vs. joint) design.

All participants reviewed at least one digital camera and its warranty information. In the *low numbers, default unit* conditions, the warranty was expressed in years, whereas in the *high* *numbers, nondefault unit* conditions, it was specified in days. In the separate evaluation conditions, participants evaluated only one digital camera. Warranty was either presented in years (2 years) or in days (730 days). In the joint evaluation conditions, participants rated two digital cameras. One of them (superior one) was identical to the one presented in the separate evaluation conditions. The other camera had a warranty of 1.5 years (550 days). A pretest (N = 31) confirmed that a warranty of 1.5 years was rated as more familiar than 550 days (M_{years} = 6.42 vs. M_{days} = 2.03; $t(30) = 15.21$, $p < .05$). Thus, in all conditions, participants rated the attractiveness of the offer involving the camera with a warranty of 2 years (or 730 days) on a 10-point scale (1 = "totally not attractive"; 10 = "very attractive").

Results

A 2 (unit: low numbers, default vs. high numbers, nondefault) × 2 (evaluation mode: separate vs. joint) ANOVA conducted on participants' product offer attractiveness ratings yielded the expected interaction ($F(1,171) = 10.91$, $p < .05$). In the separate evaluation mode, planned contrasts showed a significant difference in attractiveness ratings between default and nondefault unit conditions: The digital camera offer was rated as more attractive when the warranty was specified in years (low numbers, default unit) than when it was specified in days (high numbers, nondefault unit) ($M_{default}$ = 6.73 vs. $M_{nondefault}$ = 5.67; $t(96) = 2.81$, $p < .01$). This result replicates the default unit effect.

Consistent with prior research on numerosity effects, in joint evaluation mode, this difference in attractiveness was marginally significantly reversed ($t(75) = 1.93$, $p = .058$): Contrary to the single evaluation mode, the digital camera was rated as marginally significantly *less* attractive when the warranty was specified in years (low numbers, default unit) than when it was specified in days (high numbers, nondefault unit) ($M_{default}$ = 6.46 vs. $M_{nondefault}$ = 7.21).

Of note is that the attractiveness of the offer in the nondefault conditions differs across evaluation modes: In joint evaluation mode, attractiveness is higher than in single evaluation mode ($M_{joint} = 7.21$ vs. $M_{single} = 5.67$; $t(90) = 3.99$, $p < .001$). For default units, no difference emerged between single and joint evaluation modes ($t(81) = .49$, $p = .49$).

Discussion

Whereas the previous experiments used situations in which the metacognitive ease associated with processing default versus nondefault units probably was a more salient decision input than attribute numerosity, this study examined a situation in which it was not the case. When a digital camera was evaluated by itself, the default unit effect emerged. When the same digital camera was juxtaposed to another a marginally significant numerosity effect emerged. The latter result is consistent with previous studies (Burson et al., 2009; Monga and Bagchi 2012; Pandelaere et al. 2011).

In addition, this result does not necessarily imply that no default unit effect can occur in a comparison of several products. Research on evaluability (Hsee et al. 1999) instead emphasizes that the distinction between joint and separate evaluation should be regarded as a continuum. In this study, products in joint evaluation mode were explicitly juxtaposed, and the numerosity associated with the attribute difference was thus very salient. However, when consumers evaluate multiple options more sequentially, the numerosity of the difference may become less salient. Instead, the ease versus difficulty of processing may serve as a more accessible cue in this situation, giving rise to a default unit effect.

Finally, in this context it is interesting to note that research on knowledge accessibility suggests that once a target has been evaluated, the evaluation is likely to affect future judgments (Kardes 1986; Pocheptsova and Novemsky 2010; Yeung and Wyer 2004). For example, Pocheptsova and Novemsky (2010) examine how incidental mood during real-time judgments affects subsequent judgments. In one study, they show that participants who evaluated a painting based on incidental affect continued to employ this biased evaluation criterion five days later. If consumers evaluated a product described in default units in single evaluation mode (e.g., an advertisement), the favorable representation might persist and affect subsequent judgments, even if they involve comparison with other products. This prior evaluation then may attenuate or even reverse numerosity effects in a subsequent joint evaluation. Similarly, numerosity effects that occur during a joint evaluation may attenuate or reverse the default effect in subsequent single evaluations.

GENERAL DISCUSSION

Research on attribute framing increasingly considers the possible role of specifying attributes in alternative units (Burson et al. 2009; Monga and Bagchi 2012; Pandelaere et al. 2011; Zhang and Schwarz 2012). This research has shown that describing product attributes in smaller units and larger numbers, relative to those specified in larger units and smaller numbers, inflates the perceived attribute difference between products. The proposed mechanism is that consumers infer higher quantities from larger numbers. However, the extent to which judgments exhibit numerosity effects, and whether the numerosity heuristic is the only mechanism influencing such judgments, has remained unclear. In a series of studies, we identify a different, complementary mechanism and examine the circumstances in which it operates.

In this work, we find that positive product attributes specified in small units do not unequivocally lead to more favorable product evaluations. In contrast with the assumption that attribute levels are specified in arbitrary units, we find that in many cases, consumers maintain a default unit for the expression of product attribute levels and experience greater difficulty judging a product when the attributes are expressed in nondefault units. This metacognitive cue leads them to evaluate products described in nondefault units less favorably.

With study 1a, we offer evidence for the premise that preferred units represent the most optimal trade-off between accuracy and parsimony (or cognitive efficiency). Study 1b shows that for a wide range of attributes, a default unit exists. Study 2 provides preliminary evidence of the proposed default unit effect, because products with positive attributes specified in default units generate a higher WTP than products described in nondefault units, despite a lower face value of the former. With study 3 we demonstrate that these effects are generated by the enhanced fluency of processing product information expressed in default units. If participants misattribute the experienced affect to background music, the default unit effect disappears. Study 4 provides process evidence about how default units affect product evaluation and excludes an alternative account based on numerical fluency. Finally, study 5 reveals the role of evaluation mode in guiding cue selection for judgment (numerosity or ease versus difficulty of attribute processing). In the separate evaluation mode, we replicate the default unit effect, but in the joint evaluation mode, a marginally significant numerosity effect emerges. This study extends previous research by showing when numerosity effects may be reversed.

It also offers a more nuanced understanding of how specifying attributes in an alternative unit influences consumers' evaluations. Particularly, this article offers a new perspective on recent research that suggests that quantitative information can generate inferences beyond the numbers involved (Monga and Bagchi 2012; Zhang and Schwarz 2012). In addition, we offer a more nuanced understanding of when numerosity effects occur and specify the conditions in which they are reversed. Finally, this research adds to current literature by recognizing that default units exist for many attributes.

Given that the current article only employs positive attributes (i.e. higher values are preferred to lower values), one may wonder whether the effects found also apply to negative attributes (i.e. lower values are preferred to higher values). Extant theorizing on fluency (Novemsky et al. 2007; Reber, Winkielman, and Schwarz 1998) suggests there seems little reason to expect that the default effect would not hold for negative attributes. So, we would expect that default units always increase product evaluations. At the same time, however, we believe that it may be very challenging to disentangle numerosity and default unit effects for negative attributes. This would require specifying attribute information in default units in *larger* numbers. Our theorizing on the origin of default units implies that low attribute values would usually correspond to default unit specification. Any nondefault unit specification that uses even lower numbers implies the use of decimal fractions below 1 (e.g. numbers like 0.71). The use of decimal fractions may elicit additional processes that may attenuate the default unit effect (e.g., left digit effect; Manning and Sprott 2009; Thomas and Morwitz 2005).

We have demonstrated that evaluation mode may determine whether a numerosity or a default unit effect arises. Specifically, in joint evaluations, the options compared differ in their attribute levels but not their type of unit, so processing fluency is similar for both options, and the numbers for specifying the attribute levels primarily affect evaluations, resulting in a numerosity effect. In single evaluation, though, attribute-level differences are less salient, and processing fluency appears more likely to affect evaluations, resulting in a default unit effect. Alternatively, a joint evaluation context might also communicate new defaults. Specifically, the default effect might be attenuated if two products are described using nondefault units because consumers begin to perceive the new unit as a standard. Given that the current experiment cannot distinguish between these two explanations, future research may address this.

Our research expands research findings by Maglio and Trope (2011) that show that people tend to adopt an abstract focus when presented with larger units. In their study, participants estimated the length of a line representing a road trip in small or large units and revealed when they expected the road trip to occur. The larger units induced an abstract (i.e., more distant) mindset; participants in this condition expected the trip to happen later (i.e., more temporally distant) than those in the smaller unit condition. Some core assumptions of their study fit nicely with our framework: They argue that more distant objects are associated with larger units and more proximate ones with smaller units, so for distant objects, a larger unit is default, whereas for more proximate objects, a smaller unit is the primary unit. For example, the default unit for the distance from a front door to a mailbox is probably in feet or yards; the default unit for the distance from a front door to the nearest beach may be miles or hundreds of miles. Recent research on construal-level theory confirms that more distant objects get segmented in larger segments (Henderson et al. 2006). Moreover, people with an abstract construal level are less affected by metacognitive feelings (Tsai and Thomas 2011). Further research should investigate whether they are also less likely to exhibit a default unit effect.

The processing fluency associated with default units is likely to stem from two different sources of processing fluency, one stemming from frequency of usage and one stemming from the tradeoff between cognitive efficiency and accuracy. Usually, these two sources go hand in hand: That is, the unit that most optimally satisfies both needs (cognitive efficiency and accuracy) also is most frequently used. However, default units likely change through technological advance. During a short period of ‘turbulent change’, both the old and the new default unit may be considered default. For example, around 1997, the then frequently used and familiar unit “megabyte” no longer struck an optimal balance between accuracy and cognitive efficiency while the less familiar unit “gigabyte” did (see Figure 1). Investigating default unit effects in such transition periods may yield additional insights in the default unit effect.

Factors beyond technological innovation might also change default units. Research on categorization has shown that basic categories shift in specific conditions, including individual differences in domain-specific knowledge that affect the extent to which the basic level is central to categorization (Dougherty 1978; Johnson and Mervis 1997). For example, when bird experts were asked to perform a free naming task on birds, they used more subordinate-level names (e.g., jay) for identifying objects (e.g., bird). In a similar vein, Johnson and Mervis (1997) find that fish experts are more inclined to generate new features of a fish at a subordinate level. In the consumer domain, increased familiarity with a product category results in an increased ability to categorize objects at a finer level (Alba and Hutchinson 1987).

In light of these findings, consumers with prior knowledge or expertise might prefer attribute information specified in precise units. Even if the majority of consumers consider more precise units nondefault, knowledgeable consumers might cite the more precise unit as the default unit. From the perspective of our discussion about how default units emerge, this possibility makes perfect sense: Default units offer satisfactory levels of both accuracy and parsimony. Increased familiarity with a product and its attributes might lead to an enhanced capacity to process information, thereby allowing for additional precision without trading off some level of parsimony (Alba and Hutchinson 1987). Consequently, increased product familiarity may nudge consumers to prefer a higher level of accuracy and consider more precise units the default.

Our research also contributes to work regarding fluency effects in consumer evaluations. We identify a hitherto ignored source of fluency effects: the default unit. Although we have focused specifically on product evaluations, default units might influence judgments through indirect pathways (Oppenheimer 2008). People often weight information according to the ease with which they can process it (Shah and Oppenheimer 2007). When comparing products on a range of attributes, the weight of a specific attribute might be influenced by its frame, such that an attribute specified in default units might seem more important. Specifying an attribute on which a target product performs badly in nondefault units might reduce the damaging effect of this attribute on judgments. In addition, nondefault units are associated with decreased processing fluency, so specifying an attribute in nondefault units probably increases choice deferral and strengthens the compromise effect (Novemsky et al. 2007).

Although we find that a product described in nondefault units generates less favorable product evaluations, recent evidence shows that the effect of metacognitive cues depends on the inferences drawn from these experiences (Briñol, Petty, and Tormala 2006; Unkelbach 2006). For example, in one experiment, some participants read a short text arguing that unintelligent people often experience a feeling of difficulty when thinking, and intelligent people mainly experience a feeling of ease, while the other half read a paragraph containing the opposite information and reversing the traditional easy-is-good association. The interpretation of metacognitive experience emerged as malleable in this study; sometimes metacognitive difficulty can enhance evaluations (Labroo and Kim 2009; Pocheptsova et al. 2010).

For special occasion products, the inference that a product feels unusual, out of the ordinary, or more difficult to process likely has positive connotations (Pocheptsova et al. 2010), so these products might even benefit from the difficulty associated with processing nondefault units. For example, a limited edition MP3 player could best be described in nondefault units. Pursuing a goal requires an assessment of the extent to which an object is instrumental to its fulfillment. During evaluations, people often predict that a good indicator of the instrumentality of an object is its experienced difficulty. According to this naïve theory, metacognitive difficulty actually might improve efficacy evaluations of the means to attain the goal (Labroo and Kim 2009), and our findings would suggest that a product described in nondefault units may be perceived as more instrumental. Consider a fitness goal: Specifying a bicycle warranty in nondefault units, such as days, increases processing difficulty, which may cause that bicycle to appear more instrumental for the fitness goal and generate more favorable product evaluations.

Further research should address how other factors might attenuate default unit effects. For example, motivational context can moderate the positive effects of fluency (Freitas et al. 2005). Because fluency often signals safety, prevention-focused people experience positive affect when presented with fluent stimuli. In contrast, promotion-focused people are less focused on security, so for them, fluency effects may be eliminated. Similarly, information in default units may be more appealing when induced in a prevention focus rather than a promotion focus. With the assumption that happiness signals a safe environment, De Vries and colleagues (2010) demonstrate that happiness moderates fluency effects, because familiarity is less valued in benign environments. Thus default unit effects may be less pronounced for people in a happy mood.

CONCLUSION

Specifying attribute information in alternative units can alter metacognitive experiences and affect product evaluations. This research is among the first to integrate research streams on fluency, attribute framing, and numerical cognition. Furthermore, we add to growing literature that describes the circumstances for numerosity effects (Bagchi and Davis, 2012; Monga and Bagchi, 2012) by showing that units have differential effects on product evaluations. In five studies, we have demonstrated that products described in default units (i.e., basic-level categories of measurement) generate more positive product evaluations, despite their lower numerosity.

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FIGURE 1

EVOLUTION OF UNITS DESCRIBING HARD DISK CAPACITY (1987-2011): PILOT STUDY

FIGURE 2

OVERVIEW DEFAULT UNIT EFFECT

FIGURE 3

FAMILIARITY RATINGS AS A FUNCTION OF SUITBILITY RATINGS AND PRODUCT ATTRIBUTES: STUDY 1B

FIGURE 4

PRODUCT ATTRACTIVENESS RATINGS AS A FUNCTION OF MUSIC DIAGNOSTICITY AND (NON)DEFAULT UNITS: STUDY 3

Figure 1: Evolution of Units Describing Hard Disk Capacity (1987–2011): Pilot Study.

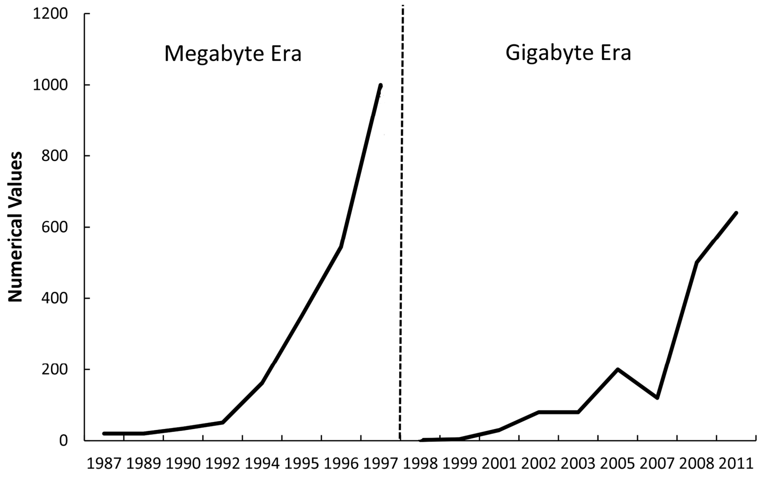


Figure 2: Overview Default Unit Effect.

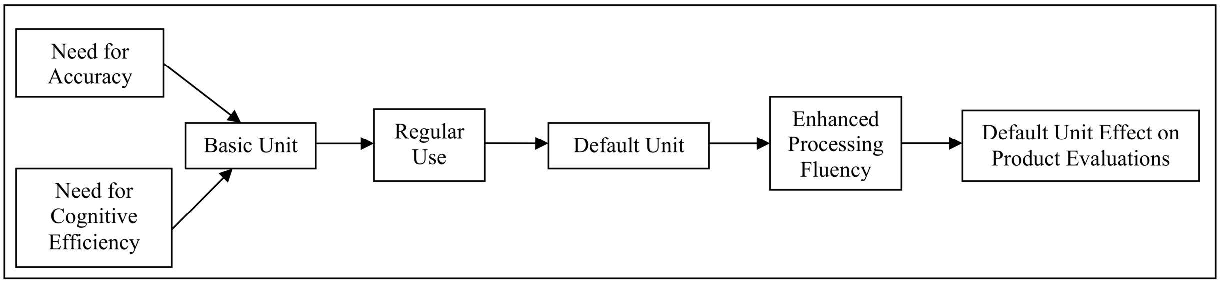


Figure 3: Familiarity Ratings as a Function of Suitability Ratings and Product Attributes: Study 1b.

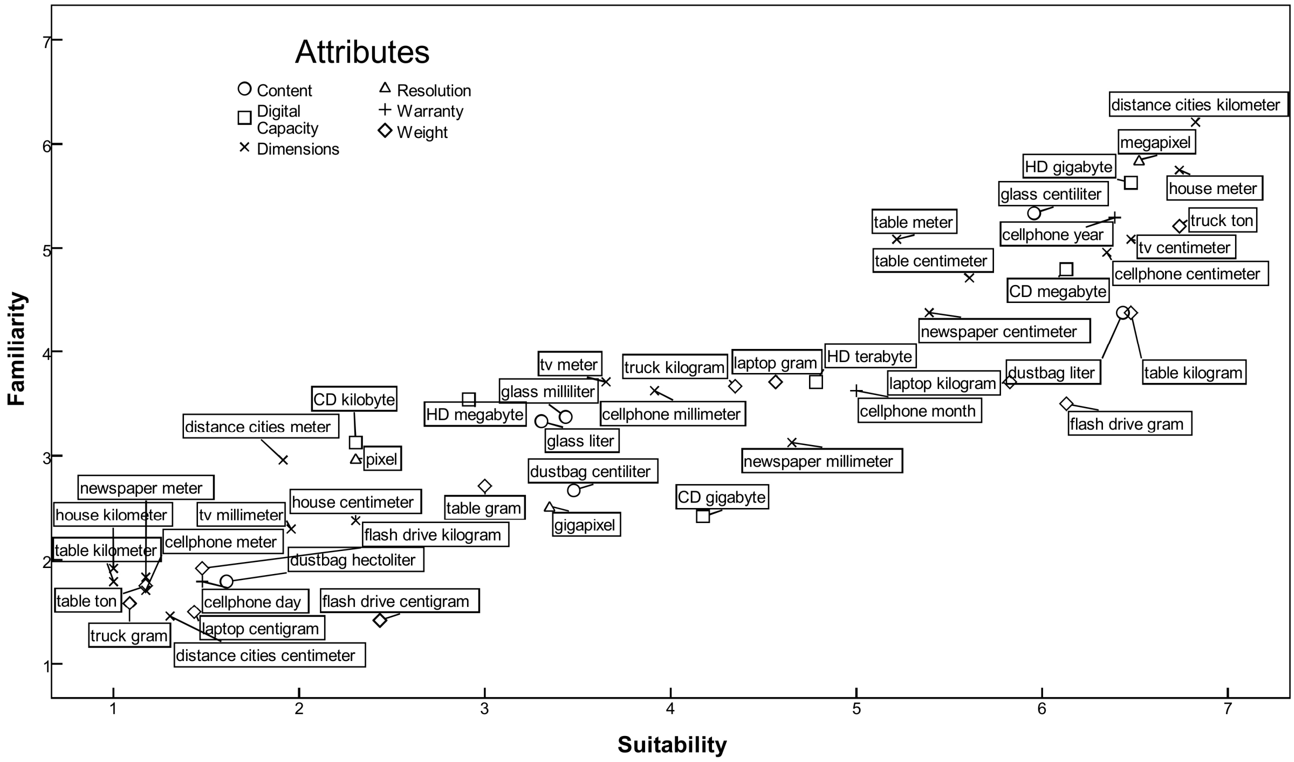
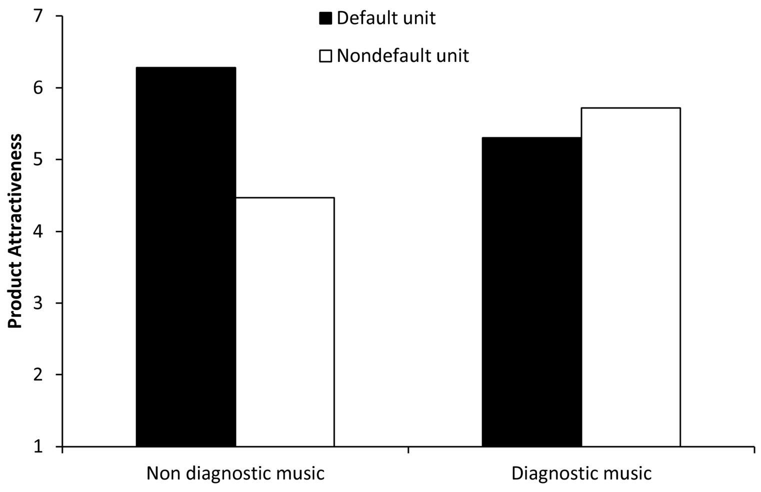


Figure 4: Product Attractiveness Ratings as a Function of Music Diagnosticity and (Non)Default Units: Study 3.



1) NUMERICAL FRAMING AND THE UNIT EFFECT

1) THE ORIGINS OF DEFAULT UNITS

2) Small Number Preference

2) Basic Unit Categorization

1) DEFAULT UNITS, PROCESSING FLUENCY, AND PRODUCT EVALUATION

1) DEFAULT UNIT VS. NUMEROSITY EFFECT

1) STUDY OVERVIEW

1) STUDY 1A

2) Method

2) Results

2) Discussion

1) STUDY 1B

2) Method

2) Results and Discussion

1) STUDY 2

2) Method

2) Results and Discussion

1) STUDY 3

2) Method

2) Results

2) Discussion

1) STUDY 4

2) Method

2) Results

3) Fluency Associated with the Unit

3) Willingness to Pay

3) Mediation Analysis

2) Discussion

1) STUDY5

2) Method

2) Results

2) Discussion

1) GENERAL DISCUSSION

1) CONCLUSION