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Author(s): Ashwani Monga and Rajesh Bagchi
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Years, Months, and Days versus 1, 12, and 365: The Influence of Units versus Numbers

ASHWANI MONGA
RAJESH BAGCHI

Quantitative changes may be conveyed to consumers using small units (e.g., change in delivery time from 7 to 21 days) or large units (1–3 weeks). Numerosity research suggests that changes are magnified by small (vs. large) units because a change from 7 to 21 (vs. 1–3) seems larger. We introduce a reverse effect that we term unitosity: changes are magnified by large (vs. small) units because a change of weeks (vs. days) seems larger. We show that numerosity reverses to unitosity when relative salience shifts from numbers to units (study 1). Then, arguing that numbers (units) represent a low-level (high-level) construal of quantities, we show this reversal when mind-set shifts from concrete to abstract (studies 2–4). These results emerge for several quantities—height of buildings, time of maturity of financial instruments, weight of nutrients, and length of tables—and have significant implications for theory and practice.

In the marketplace, consumers frequently encounter comparisons that are quantitative in nature. Examples include a breakfast cereal company changing fiber content from 1 to 5 grams or an online bookstore changing delivery time from 1 to 3 weeks. Consumers might also make comparisons across products, such as of fiber content across cereal brands or delivery time across online bookstores. For such comparisons, we examine how a difference framed in large units (e.g., 1–5 grams, 1–3 weeks) is viewed differently from an equivalent difference framed in small units (1,000–5,000 milligrams, 7–21 days).

A rational perspective would suggest no influence of units. However, drawing from the psychology of numerosity (Pelham, Sumarta, and Myaskovsky 1994), a stream of research reveals that units influence judgments because of the size of the associated numbers. For instance, a delay expressed in small units (7–21 days) seems larger than one expressed in large units (1–3 weeks) because a change from 7 to 21 seems larger than a change from 1 to 3. This effect of the size of numbers has been observed for a variety of comparisons that consumers make, such as for warranties (Pandelaere, Briers, and Lembregts 2011), movie rental plans (Burson, Larrick, and Lynch 2009), and money (Wertenbroch, Soman, and Chattopadhyay 2007). The central thesis of our article is that, in some conditions, individuals rely on the size of the units instead of the size of the numbers, leading to a reversal of judgments.

We introduce the term "unitosity" to refer to a reliance on units as cues for making judgments. We argue that there are conversational norms for units, such that small quantitative changes are usually conveyed via small units, but large changes are conveyed via large units (e.g., small delays are conveyed in days, but large delays are conveyed in weeks). Because people encounter such associations (between the size of a change and the size of a unit) very frequently, they may interpret a change conveyed in small units as small and a change conveyed in large units as large. Such a unit-based inference (change of weeks > change of days) yields unitosity such that a delay seems greater when it is expressed in large rather than small units (change from 1 to 3 weeks > change from 7 to 21 days). Importantly, this is the reverse of the number-based inference (change from 7 to 21 > change from 1 to 3) that yields numerosity (change from 7

Ashwani Monga (ashwani@moore.sc.edu) is associate professor of marketing, Darla Moore School of Business, University of South Carolina, 1705 College Street, Columbia, SC 29208. Rajesh Bagchi (rbagchi@vt.edu) is assistant professor of marketing, Pamplin College of Business, Virginia Tech, 2052 Pamplin Hall, Blacksburg, VA 24061. Correspondence: Ashwani Monga. The authors acknowledge the helpful input of the editor, associate editor, and reviewers. In addition, the authors thank their respective spouses—Sonia Basu Monga and Amy Pruden-Bagchi—as well as seminar participants at Virginia Tech for valuable feedback on a previous version and Robin Soster and Katherine Olson for excellent research assistance. The authors are also grateful for a grant from the Darla Moore School Research Grants Program. Order of authorship was determined by a coin toss; both authors contributed equally to this research.

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to 21 days > change from 1 to 3 weeks). We demonstrate this reversal by using graphs to change perceptual salience—when relative salience shifts from numbers to units, numerosity reverses to unitosity. Three other studies show similar reversals due to cognitive salience. Specifically, we theorize that individuals construe numbers as relatively low-level features that are more salient when mind-set is concrete, but they construe units as high-level features that are more salient when mind-set is abstract. Consequently, concrete mind-sets yield numerosity, but abstract mind-sets yield unitosity.

Our results support the aforementioned numerosity literature such that, in our studies, numerosity is indeed driven by the salience of numbers rather than units. In fact, such salience of numbers might be the default in situations of the kind employed in prior research, in which the salience of units was not increased. However, as we show in four studies, numerosity reverses to unitosity when relative salience shifts from numbers to units due to either perception (i.e., presentation format) or cognition (i.e., mind-sets). When participants respond in "here and now" concrete settings, numerosity does arise in our studies, just as it did in prior studies that did not consider psychologically distant events. However, life is frequently about the "there and then," such as when people make decisions about a vacation that might be at a far-off place or at a far-off time. Such situations, and even individual traits (Vallacher and Wegner 1989), can make individuals think abstractly rather than concretely, leading to unitosity rather than numerosity.

Our results have a parallel in the literature on time discounting. Malkoc, Zauberman, and Bettman (2010) argue that the well-established effect of present bias is due to a default concrete mind-set but can be attenuated by evoking an abstract mind-set. We argue that the well-established effect of numerosity is due to a concrete mind-set but can be reversed by evoking an abstract mind-set. Our results also connect to time discounting in another manner. Specifically, discounting is known to be driven by time perception (Kim and Zauberman 2009; Zauberman et al. 2009). Given our results about units of time, it seems likely that units might have an influence on time discounting and related self-control problems such as impulsive spending and obesity (Frederick, Loewenstein, and O'Donoghue 2002; Lynch and Zauberman 2006).

The new effect of unitosity augments prior effects for units of time (e.g., per day vs. per month) in the context of donations (Gourville 1998), health hazard statistics (Chandran and Menon 2004), and budgets (Ülkümen, Thomas, and Morwitz 2008). Moreover, our results apply not just to time but to measured quantities in general—we also show reliance on units of height, weight, and length. In addition, we demonstrate that the reliance on units is facilitated by abstract mind-sets because units are construed at a higher level than numbers.

Implications also arise for practice. When managers convey quantitative changes, units or numbers might be more prominent because of how they are displayed or because of consumers' mind-sets (e.g., near-future decisions make numbers salient; distant-future decisions make units salient). If units are salient, managers ought to use large units to magnify positive changes (e.g., increase in fiber content) or small units to understate negative changes (e.g., increase in delivery time). If numbers are salient, they ought to do the opposite. For positioning against competitors, they could change salience of units to accentuate advantages or diminish disadvantages (e.g., in comparative advertisements). If such strategies prevent a fair assessment of changes within and across products, regulators may consider standardizing units in the interest of consumer welfare.

Our results are relevant not just for the assessment of products but for the consideration of information in general. For instance, *Time* magazine (2010, 20–21) provides a numerical snapshot of the world from 2000 to 2010 (e.g., world's tallest building: 1,483 vs. 2,717 feet; arctic ice cap: 2.7 vs. 1.9 million square miles; U.S. defense budget: $316 vs. $693 billion). Our results suggest that different units (e.g., floors, square miles, and millions, respectively) would change readers' interpretations about skyscrapers, global warming, and national defense.

We next discuss the numerosity and unitosity effects, delineate the conditions in which they might occur, and test our predictions in four laboratory experiments—the first one examines perceptual salience, and the other three examine cognitive salience due to mind-sets.

NUMEROSITY

Numerosity is a "property of a stimulus that is defined by the *number* of discriminable elements it contains" (Brannon and Terrace 1998, 746; italics added). It refers to the use of numbers as a cue for making judgments, such as those about amounts and likelihoods. As Pelham et al. (1994) discuss, because more pieces of something usually suggest a larger magnitude, people develop a numerosity heuristic. For example, because larger houses usually have more rooms, people use the number of rooms as a heuristic to judge the size of a house. Similarly, Nayak and Prabhala (2001) show that people use an increase in the number of shares as a cue for higher firm value, even when the increase is simply because of a stock split.

In consumption situations, quantities are usually characterized by not just numbers but also units. Therefore, a stream of research has studied how consumers perceive differences between two values when those values are communicated using different units. Wertenbroch et al. (2007) examine monetary differences that are communicated using a weak currency (e.g., Singapore dollar) or a strong currency (e.g., U.S. dollar). Given the exchange rate at that time, they show that a monetary difference is magnified when units are small (S$1.70 vs. S$17.00) rather than large (US$1 vs. US$10) because smaller units inflate differences ($17 - 1.7 > 10 - 1$). Burson et al. (2009) show that this currency numerosity effect is more general and applies to several scales that are expanded (e.g., movies per year) versus contracted (e.g., movies per week). They find that differences seem larger when the discriminability between numbers is higher—movie rental plans seem more different when the choice of unit leads to numbers that are large (364 vs. 468 movies per year) rather than small (7 vs. 9 movies per week). This effect is not limited to ratios (e.g., movies per week vs. per year) but has also been shown for units in general (week vs. year). For instance, Pandelaere et al. (2011) show that a difference between two dishwasher warranties is perceived to be higher when the units used are relatively small (84 vs. 108 months) rather than large (7 vs. 9 years). The authors also demonstrate that these effects arise because people base their judgments on the size of the numbers, without considering how those numbers would have changed if alternative units had been used. This idea is consistent with research on framing (Tversky and Kahneman 1981)—people process information passively and do not consider that the same information may have been framed differently. We argue that, just as people rely on the numbers, they might also rely on the units that they are presented with.

UNITOSITY

While numerosity research examines changes (e.g., changes in warranty periods), other research examines values of substantive variables (e.g., donations). Specifically, a donation seems smaller when it is framed using a per-day rather than a per-year format (Gourville 1998), risks from health hazards seem higher when statistics are presented in a per-day rather than a per-year format (Chandran and Menon 2004), and individuals underestimate when they budget for a month rather than for a year (Ülkümen et al. 2008). Thus, substantive variables (donations, health hazard statistics, and budgets) are viewed differently when different units of time are used. In particular, Chandran and Menon (2004) argue that a hazard seems more proximal when it is expressed in terms of a per-day rather than a per-year basis; the per-day formulation makes the hazard seem closer in time because a day is shorter than a year. That is, the size of the unit is used to make an inference about the proximity of an event. We argue that the size of the unit may also be used to make an inference about the size of a change because of the conversational norms (Grice 1975) that people employ to communicate changes.

People usually communicate small changes via small units and large changes via large units. A small change in meeting time from Monday to Wednesday is likely to be communicated as a 2-day delay (rather than a 2/7 week delay or a 2/30 month delay), but a larger change may be conveyed in weeks or months. Similarly, small changes in the weight of a newborn (or differences between weights of newborns) are conveyed using ounces, but pounds are used for the larger changes in adults. And changes in the height of growing children are communicated using centimeters or inches, but larger changes in the height of rising buildings are conveyed using feet or floors. Thus, the size of a change is matched with the size of a unit. It is well known that when two concepts are repeatedly associated, people make inferences about one on the basis of the other. For instance, because there is a frequent association between the likelihood of an event and the ease with which it comes to mind, people show an availability effect—the ease with which an event comes to mind is used as a cue to judge its likelihood (Tversky and Kahneman 1973). Similarly, because there is a frequent association between the size of a change and the size of the unit used to communicate it, we argue that people will show a unitosity effect—the size of a unit will be used as a cue to judge the size of a change. That is, a change conveyed in small units will be interpreted as small, and one conveyed in large units, as large.

Thus, we propose an effect that is analogous to the effect of numerosity. In the case of numerosity, a change seems larger in the case of small rather than large units (change from 7 to 21 days > change from 1 to 3 weeks) because of the salience of numbers—people infer the extent of a change from the size of the numbers (change from 7 to 21 > change from 1 to 3). In the case of unitosity, a change seems larger in the case of large rather than small units (change from 1 to 3 weeks > change from 7 to 21 days) because of the salience of units—people infer the extent of a change from the size of the units (change of weeks > change of days).

We conducted a pilot study with 48 participants to verify the above premise about deriving meaning from units. Participants read that time estimates for two events were being revised—without mentioning specific numbers, they were told that the estimates were changing by either months or days (between subjects). For each event, they were asked how much longer the new time estimate was, compared to the earlier one (1 = not longer at all; 7 = much longer). The change in the estimate was perceived to be higher when the unit was months rather than days ($M_{\text{event 1}} = 4.30$ vs. 3.52; $F(1, 46) = 4.51$, $p < .05$; $M_{\text{event 2}} = 4.70$ vs. 3.92; $F(1, 46) = 4.97$, $p < .05$). Thus, the size of the unit determined perceptions about the size of the change. We now formalize our predictions regarding the conditions in which numerosity versus unitosity emerge.

PREDICTIONS: NUMEROSITY VERSUS UNITOSITY

Numbers and units are inseparable because the two coexist to determine the value of a quantity. More important, given a fixed value, they share an inverse relationship—small units have large numbers, and large units have small numbers. Considering different units (small = u; large = U) and numbers (small = n; large = N), a difference could be expressed as either $N_2u - N_1u$ (e.g., 21 − 7 days) or $n_2U - n_1U$ (e.g., 3 − 1 week). Because numerosity is predicated on salient numbers, the effect may be represented as follows (bold signifies salience): $(\mathbf{N_2} - \mathbf{N_1})$ u versus $(\mathbf{n_2} - \mathbf{n_1})$ U. That is, the change seems larger when units are small rather than large: $\mathbf{N_2} - \mathbf{N_1} > \mathbf{n_2} - \mathbf{n_1}$ (e.g., 21 − 7 > 3 − 1). Research on numerosity has not considered a shift in salience from numbers to units and the representation that it may lead to: $(N_2 - N_1)$ **u** versus $(n_2 - n_1)$ **U**. As argued earlier, salient units will make the change seem larger when units are large rather than small: change of **U** > change of **u** (e.g., change of weeks > change of days).

Thus, a shift in relative salience from numbers to units can reverse results. Specifically, when numbers are salient, numerosity will hold: the impact of a change will be stronger when it is expressed in small (vs. large) units. In contrast, when units are salient, unitosity will hold: the impact of a change will be stronger when it is expressed in large (vs. small) units. Such a shift in relative salience from numbers to units may be due to either perception or cognition.

Perceptual Salience

Although numbers and units coexist, the two aspects might not receive equal consideration because perceptual resources are limited. It is well known that individuals do not pay attention to all aspects of an environment but to those that are prominent because of features such as physical size (Peter and Olson 2008, 112). For example, to a person walking down a street, a huge billboard is more salient than a tiny one. Moreover, what is salient is weighted more heavily in judgments. For instance, salient dimensions influence judgments of area and volume (Krider, Raghubir, and Krishna 2001; Raghubir and Krishna 1999).

One manner in which perceptual salience could vary is the graphical format in which information is presented (Stone, Yates, and Parker 1997; Stone et al. 2003). Risk information can be presented either as a ratio (number of people harmed / total number of people at risk of harm) or using graphical formats that highlight the foreground aspect (i.e., numerator) or the background aspect (i.e., denominator). Stone et al. (2003) show that graphically highlighting the foreground aspect increases risk perception, but this effect is eliminated or reversed when the background aspect is highlighted. Thus, even when both foreground and background aspects are available, perceptual salience of one aspect changes risk perceptions. Similarly, we argue that even when both numbers and units are available, salience of one aspect will change perceptions—salient numbers will yield a numerosity effect, but salient units will yield a unitosity effect.

Cognitive Salience

Even when perceptual salience of numbers and units is the same, one of the two aspects might be more cognitively salient. As we argue next, differences in cognitive salience might arise due to differences in how numbers versus units are construed.

Construal of Numbers versus Units. For every category, the high-level (vs. low-level) features present a more big-picture perspective—they convey the essential rather than peripheral meaning. Also, low-level features are associated with minor changes, and high-level features, with major changes. For instance, the category of an animal has two main features: physical and genetic. Physical features denote a low-level or small-picture view—they do not convey the core essence but only make it specific, and it is the relatively minor changes that are represented by changes in physical features. In contrast, genetic features denote a high-level or big-picture view—they signify the essence of what an animal is, and it is the relatively major changes that are represented by changes in genetic features (Medin 1989; Rosch 1978).

Analogously, the category of a quantity has two features: numbers and units. Numbers denote the low-level or small-picture view—they do provide specificity (delay of 7 days) but do not convey meaning on their own (delay of 7), and it is the relatively minor changes that are represented by changes in numbers (delay of 3 days vs. delay of 7 days). In contrast, units denote the high-level or big-picture view —they signify the essence of a quantity even if numbers are unknown (delay of days), and it is the relatively major changes that are represented by changes in units (delay of days vs. delay of years).

We conducted a pilot study with 68 participants to verify the construal-level distinctions noted above (Medin 1989; Rosch 1978). We first gave participants an overview about how every measured quantity is characterized by a number and a unit and presented some examples for illustration (e.g., in 10 miles, "10" is the number, and "miles" is the unit). Then, on 7-point scales (1 = number; 7 = unit), they answered four questions (ellipses denote the common ending phrase: meaning of a measured quantity): (*a*) Which component is more essential (rather than peripheral) to the . . . ? (*b*) A change in which component will produce a minor (rather than major) change in the . . . ? (*c*) Which component presents more of a high-level (rather than low-level) . . . ? and (*d*) Which component presents a more big-picture (rather than small-picture) . . . ? The second item was reverse coded, and then the items were averaged ($\alpha = .70$). The mean of this measure was significantly higher than the midpoint of 4 ($M = 5.32$; difference = 1.32; $t(67) = 8.81$, $p < .001$), suggesting that participants deemed units (rather than numbers) as the higher-level feature. Given this, mind-sets might influence the salience of numbers versus units.

Salience of Numbers versus Units. According to construal level theory (Trope and Liberman 2003; Vallacher and Wegner 1987, 1989), concrete mind-sets make low-level perspectives salient, but abstract mind-sets make high-level perspectives salient. Consider the action of locking a door. When people think concretely ("how"), they focus on the low-level perspective (turning a key), but when they think abstractly ("why"), they focus on the high-level perspective (securing one's home; Freitas, Gollwitzer, and Trope 2004). Such mind-sets may be evoked by psychological distance. A concrete mind-set evoked by near events makes people focus on low-level features of events, but an abstract mind-set evoked by far events makes them focus on high-level features (Forster, Friedman, and Liberman 2004; Trope and Liberman 2000).

Given the above discussion, when individuals are in a concrete mind-set, the salience of numbers will yield numerosity: the impact of a change will be stronger when it is expressed in small (vs. large) units. In contrast, when individuals are in an abstract mind-set, the salience of units will yield unitosity: the impact of a change will be stronger when it is expressed in large (vs. small) units. We now present four laboratory experiments in which we test our predictions—the first one examines perceptual salience, and the other three examine cognitive salience due to mind-sets. Across these studies we employ different manipulations of salience (graphical format, why-how procedure, geographical distance, and temporal distance) and manipulate units for a variety of quantities (height of buildings, time of maturity of financial instruments, weight of nutrients, and length of tables). The effects we observe are robust: a perceptual or cognitive shift in relative salience from numbers to units leads to a reversal from numerosity to unitosity.

STUDY 1: GRAPHS

In this study, we manipulate perceptual salience of numbers versus units. The context we use is that of building height, which is communicated in either small units (feet) or large units (floors). We rely on a commonly used relationship between these two units (1 floor = 13 feet). This relationship is not precise (e.g., the Empire State Building's observatory on the 86th floor is at a height of 1,050 feet, which is close to a ratio of 1 : 12), but precision is not necessary. Because the unit of floors is larger than feet, the predicted effects should hold. To manipulate salience, we use graphical formats. In their research on graphical (vs. numerical) formats of risk ratios, Stone et al. (2003) used graphs to change salience of numerators versus denominators. Although we examine a different question, we also use graphs to change the salience of numbers versus units.

Design and Procedure

We used a 2 (unit: small vs. large) × 2 (salience: numbers vs. units) between-subjects design. The small unit was feet, and the large unit was floors. We asked participants to compare two buildings—A and B—that are currently under construction. On completion, both buildings would have a height of 130 feet (10 floors). However, building A at 104 feet (8 floors) was closer to completion relative to building B at 78 feet (6 floors).

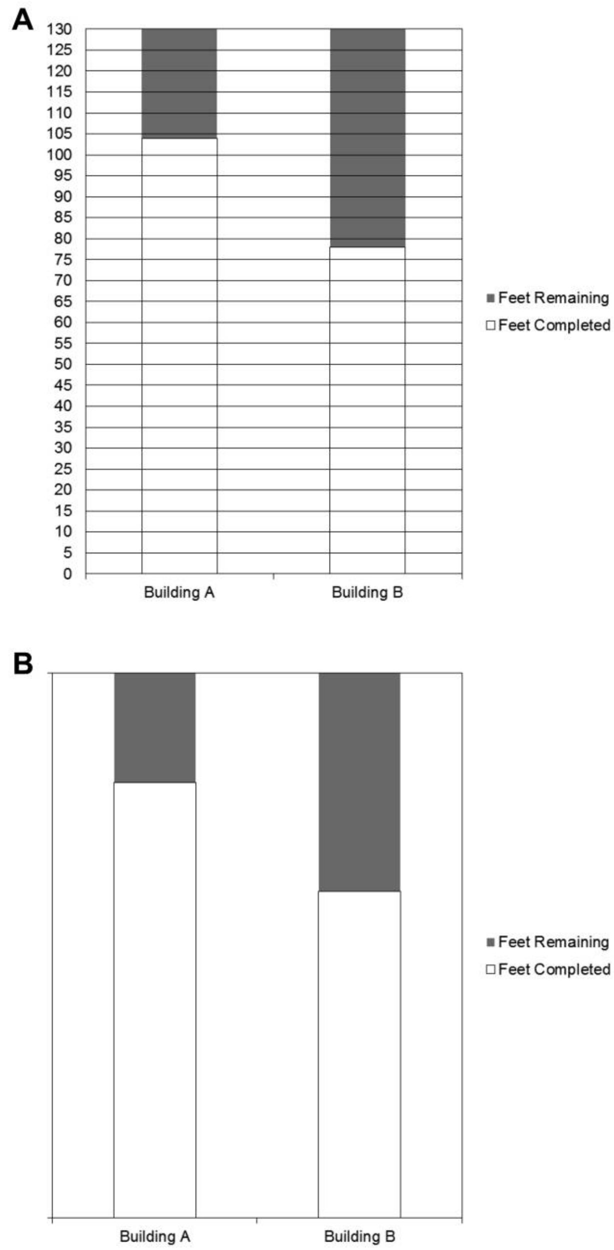
Salience was manipulated graphically. While all participants were given height information in a paragraph, their attention was drawn to either numbers or units using stacked bar graphs. Consistent with our earlier discussion about how units carry their own meaning (even in the absence of numbers), we made units perceptually salient by mentioning units alone in the legend, without mentioning any numbers. In contrast, we made numbers perceptually salient by including numbers on the *y*-axis, along with the corresponding grid lines (see fig. 1).

The dependent variable was participants' opinions about how much more work and time was needed to complete building B relative to building A. These two measures would reflect how differences in building height are perceived by participants.

One hundred and one undergraduate students (M_{age} = 21 years, 58% female) participated in return for partial course credit. They were randomly assigned to one of the four

FIGURE 1

STUDY 1: BUILDING HEIGHT—EXAMPLE OF STIMULI USED IN THE FEET CONDITION



NOTE.—*A*, Numbers salient; *B*, units salient.

experimental conditions and asked to indicate how much more work remained for building B relative to A (1 = not much more work; 7 = a lot more work) and how much more time it would take to complete the remaining portion of building B relative to A (1 = not much more time; 7 = a lot more time). Then, participants were reminded about how the height of the two buildings was communicated using numbers and units, and, on two separate items, they were asked to indicate the extent to which they had paid attention to the numbers and the units (1 = not at all; 7 = a lot).

Results and Discussion

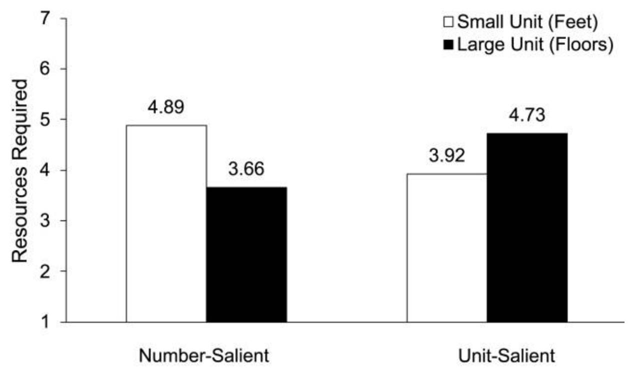
Relative Salience of Numbers versus Units. The salience manipulation is aimed at changing relative salience, such that relative attention to numbers (i.e., number − unit) should be higher when number is salient than when unit is salient. To test this, we relied on a repeated-measures approach with one within-subjects variable (attention to numbers and units) and two between-subjects variables (unit and salience). As expected, a significant interaction between attention and salience emerged ($F(1, 97) = 5.91$, $p < .02$), indicating that the relative salience of numbers versus units was higher in the number-salient than in the unit-salient condition. This result was identical to that obtained from an analysis using difference scores (i.e., number attention − unit attention: $M_{number} = 1.89$ vs. $M_{unit} = .63$). Relative salience was driven by the attention given to numbers ($M_{number} = 5.86$ vs. $M_{unit} = 4.75$; $F(1, 97) = 8.01$, $p < .01$) and not by the attention given to units ($M_{number} = 3.97$ vs. $M_{unit} = 4.12$; $F(1, 97) = .16$, $p > .60$). This is consistent with our theorizing and manipulation. Because numbers alone would not have carried any meaning, we had displayed units in all conditions and changed relative salience via the display of numbers. What is critical is that the shift in relative salience was in the intended direction and statistically significant. This relative shift from numbers to units is predicted to diminish numerosity, giving way to unitosity.

Resources Required. As noted earlier, participants indicated how much more work and time were needed to complete building B relative to A. These two measures were strongly correlated ($r = .67$; $\alpha = .80$) and were therefore averaged to form a measure of resources required. An ANOVA with required resources as the dependent measure and unit and salience as the independent variables did not yield any main effects ($p > .25$), but the significant two-way interaction ($F(1, 97) = 28.41$, $p < .0001$) confirmed that the pattern of results in the number-salient condition was different from that in the unit-salient condition (see fig. 2).

Planned contrasts supported our specific predictions. Numerosity emerged in the number-salient condition: required resources were higher when units were small rather than large ($M_{small} = 4.89$ vs. $M_{large} = 3.66$; $F(1, 97) = 21.28$, $p < .0001$). Conversely, unitosity emerged in the unit-salient condition: required resources were higher when units were large rather than small ($M_{small} = 3.92$ vs. $M_{large} = 4.73$; $F(1, 97) = 8.70$, $p < .005$). Thus, a relative shift from number to unit salience reversed numerosity to unitosity. Additional contrasts supported the role of salience; salience of one aspect (numbers or units) magnified differences when that aspect was large. That is, in the case of small units (that have large numbers), required resources were higher when numbers (vs. units) were salient ($M_{number} = 4.89$ vs. $M_{unit} = 3.92$; $F(1, 97) = 13.23$, $p < .0005$). But, in the case of large units (that have small numbers), required resources were higher when units (vs. numbers) were salient ($M_{number} = 3.66$ vs. $M_{unit} = 4.73$; $F(1, 97) = 15.19$, $p < .0005$).

FIGURE 2

STUDY 1: BUILDING HEIGHT—EFFECT OF UNITS AND SALIENCE ON RESOURCES REQUIRED (FOR BUILDING B RELATIVE TO BUILDING A)



STUDY 2: WHY-HOW

Study 1 showcases the key reversal by manipulating perceptual salience. However, even if perceptual salience of numbers and units is identical, this reversal could arise because of cognitive salience, which is the focus of this study and of the two studies that follow. As discussed earlier, concrete mind-sets should make people focus on numbers, but abstract mind-sets should make them focus on units. In this study, we use the classic procedure of Freitas et al. (2004) to evoke concrete ("how") and abstract ("why") mind-sets and communicate units of time in either days or months. The context we employed was that of certificates of deposit (CDs), which has been used in prior studies (e.g., LeBoeuf 2006) and offers a clean template to test our predictions. Unlike most products that have complex meanings, CDs are simple: an initial principal amount is locked for a maturity period, and a higher amount is available at the end of the period. Thus, the longer the maturity period, the higher is the amount that people desire. We expect this amount to vary with units and mind-sets.

Design and Procedure

We used a 2 (unit: small vs. large) × 2 (mind-set: concrete vs. abstract) between-subjects design. The dependent variable was the minimum amount that participants would want in return for extending the CD's maturity period.

Ninety-eight undergraduate students (M_{age} = 21 years, 58% female) participated in return for partial course credit. Following an established procedure (Freitas et al. 2004), we told participants in the concrete mind-set condition that certain behaviors can help them achieve their broader life goals and that by responding to a sequence of "how" questions, they will be able to identify these behaviors. They saw a series of vertically aligned boxes that began at the top of the page and were labeled by downward "How?" arrows. In the abstract mind-set condition, participants saw a series of boxes that began at the bottom of the page and were labeled by upward "Why?" arrows. After seeing an example, participants wrote within the boxes for a specific activity: improving and maintaining one's physical health.

Participants then read general information about CDs, such as how an amount stays invested until the end of a maturity period. Next, they imagined owning a CD that was going to yield $1,000 at the end of the maturity period. In return for a larger amount, they could extend the maturity period from 182 to 547 days (small-unit condition) or 6–18 months (large-unit condition). Finally, they indicated the minimum total amount that they would want to receive in return for extending the maturity period.

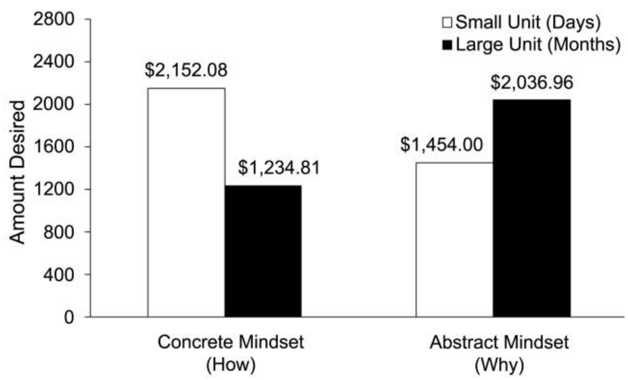
Results and Discussion

An ANOVA with amount as the dependent measure and unit and mind-set as the independent variables did not yield any main effects ($p > .40$), but the significant two-way interaction ($F(1, 94) = 12.44$, $p < .001$) confirmed that the pattern of results in the concrete mind-set condition was different from that in the abstract mind-set condition (see fig. 3).

Planned contrasts supported our specific predictions. Numerosity emerged in the concrete mind-set condition: the amount required was higher when units were small rather than large (M_{small} = $2,152.08 vs. M_{large} = $1,234.81; $F(1, 94) = 9.49$, $p < .005$). Conversely, unitosity emerged in the abstract mind-set condition: the amount required was higher (at a marginally significant level) when units were large rather than small (M_{small} = $1,454.00 vs. M_{large} = $2,036.96; $F(1, 94) = 3.68$, $p = .058$). Thus, a shift from concrete to abstract mind-sets reversed numerosity to unitosity. Additional contrasts supported the role of mind-sets; a certain type of mind-set (concrete or abstract) magnified differences when the corresponding aspect (numbers or units) was large. That is, in the case of small units (that have large numbers), the amount desired was higher for concrete (vs. abstract) mind-sets ($M_{concrete}$ = $2,152.08 vs. $M_{abstract}$ = $1,454.00; $F(1, 94) = 5.40$, $p < .03$). Conversely, in the case of large units (that have small numbers), the amount desired was higher for abstract (vs. concrete) mind-sets ($M_{concrete}$ = $1,234.81 vs. $M_{abstract}$ = $2,036.96; $F(1, 94) = 7.10$, $p < .01$).

FIGURE 3

STUDY 2: CD MATURITY PERIOD—EFFECT OF UNITS AND MIND-SET ON AMOUNT DESIRED (FOR EXTENDING MATURITY PERIOD)



STUDY 3: GEOGRAPHICAL DISTANCE

Having observed the effect of cognitive salience, we now test the robustness of this effect in two ways. First, we examine whether a mind-set manipulation leads to similarly robust results for two very different quantities—height of a building (feet vs. floors) and weight of a nutrient (milligrams vs. grams of fiber). Second, we earlier used the why-how procedure for manipulating mind-sets. While this procedure is a classic one, mind-sets in real life are more likely to be evoked by psychological distance, such as that due to geographical distance (considered in this study) and temporal distance (considered in the next study). Consumers frequently consider events that are geographically near or far (e.g., a trip to a location that is near vs. far), and such consideration leads to different mind-sets—physically near events evoke concrete mind-sets, whereas distant events evoke abstract mind-sets (Trope, Liberman, and Wakslak 2007). For instance, Fujita et al.'s (2006) participants described events in a video using more abstract rather than concrete language when they thought that the video protagonists were in a geographically far location (in a foreign city) rather than a near location (in the city of the participants). We also used a foreign city manipulation in the current study, which we first pretested.

In a two-cell, between-subjects design, we presented 91 participants (M_{age} = 20 years, 51% female) with a scenario describing the construction of a new building that on completion was going to be taller than the average building in the area. The building was either being constructed within the same U.S. state in which the participants lived or in South Korea. In an open-ended response, we asked participants to describe the thoughts that came to mind when thinking about this building. We then asked them to self-report whether their overall thoughts were of a specific (i.e., concrete) or general (i.e., abstract) nature (1 = very specific; 7 = very general). This self-reported measure revealed that, consistent with prior research (e.g., Fujita et al. 2006), participants' thoughts were significantly more general when participants were in the far rather than the near condition (M_{near} = 4.53 vs. M_{far} = 5.19; $F(1, 89) = 4.13$, $p < .05$). A significant effect also emerged ($\chi^2(1) = 10.01$, $p < .005$) when the open-ended responses were coded by two judges as concrete or abstract. Respondents in the near condition were more likely to have concrete versus abstract thoughts (65% concrete, 35% abstract) relative to those in the far condition (31% concrete, 69% abstract). Given this effect of distance, we proceeded to the main study.

Design and Procedure

We used a 2 (unit: small vs. large) × 2 (mind-set: concrete vs. abstract) × 2 (replicate: building vs. nutrient) mixed design. Unit and mind-set were between-subjects variables, and replicate was a within-subjects variable. Mind-sets were evoked by geographical distance, such that the scenario promoted a concrete mind-set (scenario was set in the U.S. state of the participant) or an abstract mind-set (scenario was set in a foreign country—Japan for the building scenario and South Korea for the nutrition scenario). The building scenario mentioned the average height of office buildings as either 260 feet (small unit) or 20 floors (large unit) and the height of a yet-to-be-constructed building as either 455 feet or 35 floors. The nutrient scenario mentioned the average daily amount of fiber consumed as either 15,000 milligrams (small unit) or 15 grams (large unit) and the recommended amount as either 25,000 milligrams or 25 grams. For each replicate, the dependent variable was the perceived deviation from the average value.

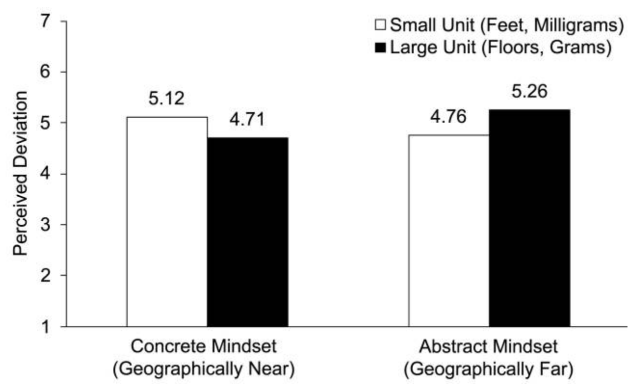
One hundred and seventy-one undergraduate students (M_{age} = 20 years, 62% female) participated in return for partial course credit. They were randomly assigned to one of the four between-subjects conditions and shown counterbalanced building and nutrient scenarios. On two scales (1 = not much at all; 7 = a lot), they indicated perceived deviation: how much more time it would take to construct the new building relative to an office building of average height and how much more fiber is recommended relative to that consumed on average by individuals.

Results and Discussion

We first conducted a MANOVA using the two dependent variables (perceived deviation for building and nutrient) and the two independent variables (unit and mind-set). The two-way interaction of unit and mind-set was significant ($F(2, 166) = 6.13$, $p < .005$). The repeated-measures approach also revealed significance for this two-way interaction of unit and mind-set ($F(1, 167) = 12.23$, $p < .001$), which was driven by significant interactions for both replicates: the two-way interaction was significant for the building scenario ($F(1, 167) = 7.71$, $p < .01$) and for the nutrient scenario ($F(1, 167) = 5.73$, $p < .02$). Also, the interaction of the within-subject replicates and the between-subjects variables of unit and salience was not significant ($F(1, 167) = .05$, $p > .80$), suggesting that the pattern did not change across the two replicates. Therefore, we further explored the overall two-way interaction, which established that the pattern for perceived deviation was different when mind-set was concrete rather than abstract (see fig. 4).

FIGURE 4

STUDY 3: BUILDING HEIGHT AND NUTRIENT WEIGHT—EFFECT OF UNITS AND MIND-SET ON PERCEIVED DEVIATION (RELATIVE TO AVERAGE)



Planned contrasts supported our specific predictions. Numerosity emerged in the concrete mind-set condition: perceived deviation was higher when units were small rather than large (M_{small} = 5.12 vs. M_{large} = 4.71; $F(1, 167) = 5.03$, $p < .03$). Conversely, unitosity emerged in the abstract mind-set condition: perceived deviation was higher when units were large rather than small (M_{small} = 4.76 vs. M_{large} = 5.26; $F(1, 167) = 7.31$, $p < .01$). Thus, a shift from concrete to abstract mind-sets reversed numerosity to unitosity. Additional contrasts supported the role of mind-sets; a certain type of mind-set (concrete or abstract) magnified differences when the corresponding aspect (numbers or units) was large. That is, in the case of small units (that have large numbers), perceived deviation was higher for concrete (vs. abstract) mind-sets ($M_{concrete}$ = 5.12 vs. $M_{abstract}$ = 4.76; $F(1, 167) = 3.75$, $p = .05$). Conversely, in the case of large units (that have small numbers), perceived deviation was higher for abstract (vs. concrete) mind-sets ($M_{concrete}$ = 4.71 vs. $M_{abstract}$ = 5.26; $F(1, 167) = 9.11$, $p < .005$).

STUDY 4: TEMPORAL DISTANCE

We observed the predicted effects of physical prominence in study 1 and of cognitive mind-sets in studies 2 and 3. In this final study, we provide further evidence for the robustness of our results. In previous studies, we tested our effects for several quantities, some of which refer to changes in the attributes of consumer products (e.g., time of maturity of a CD). In this study, we consider an attribute of another consumer product (length of a dining table) but in a situation that involves a comparison of two products. This situation is very realistic because consumers often compare products along certain attributes in order to figure out which one offers the best deal. Moreover, it helps us examine the causal relationship between the independent variables (unit, mind-set), the mediator (size perception), and the final dependent variable (deal perception).

The mind-set manipulation that we use, temporal distance, is also realistic. Consumers are known to consider not only the near future but also the distant future (e.g., a recent graduate planning a future home purchase or making investment decisions related to retirement). Temporal distance is an appropriate manipulation not only because of such real-world relevance but also because its effects have been very well documented—near events evoke concrete mind-sets, and far events evoke abstract mind-sets (Forster et al. 2004; Trope and Liberman 2000).

Finally, we use this study to illustrate that "small" and "large" do not refer to an absolute size of units but to their meaning in a certain context. Specifically, relatively large units are used in contexts that are generally large (e.g., building height in feet/floors), and small units are used in contexts that are generally small (e.g., table length in inches/feet). Thus, the same unit of feet would be small in the case of buildings but large in the case of tables. Still, we expect the unit × mind-set interaction to emerge for table length, just as it did earlier for building height.

Design and Procedure

We used a 2 (unit: small vs. large) × 2 (mind-set: concrete vs. abstract) between-subjects design. While prices of the two tables were identical in all conditions ($300 for table A; $415 for table B), the units of length were manipulated to be either small (42 inches for A; 60 inches for B) or large (3.5 feet for A; 5 feet for B). Mind-set was manipulated using temporal distance. The scenario indicated that consumers would get the new table when they move to a new apartment in either 6 days (near future; concrete condition) or 6 months (far future; abstract condition).

One hundred and forty-two undergraduate students (M_{age} = 21 years, 58% female) participated in return for partial course credit. They were randomly assigned to one of the four between-subjects conditions. They read the scenario about moving and were shown pictures of two rectangular tables, each with a dotted line denoting the diagonal length and the value of that length (in either inches or feet). They then indicated which of the two tables was a better deal (1 = table A; 7 = table B) and, on the next screen, indicated how much larger table B was relative to A (1 = not at all; 7 = a lot). For both variables, we expect concrete mind-sets to yield a numerosity effect but abstract mind-sets to yield a unitosity effect. Also, we expect size perception to be the mediator. That is, manipulating units of length should influence size perception and, given that prices are constant across conditions, this effect should also translate to deal perception.

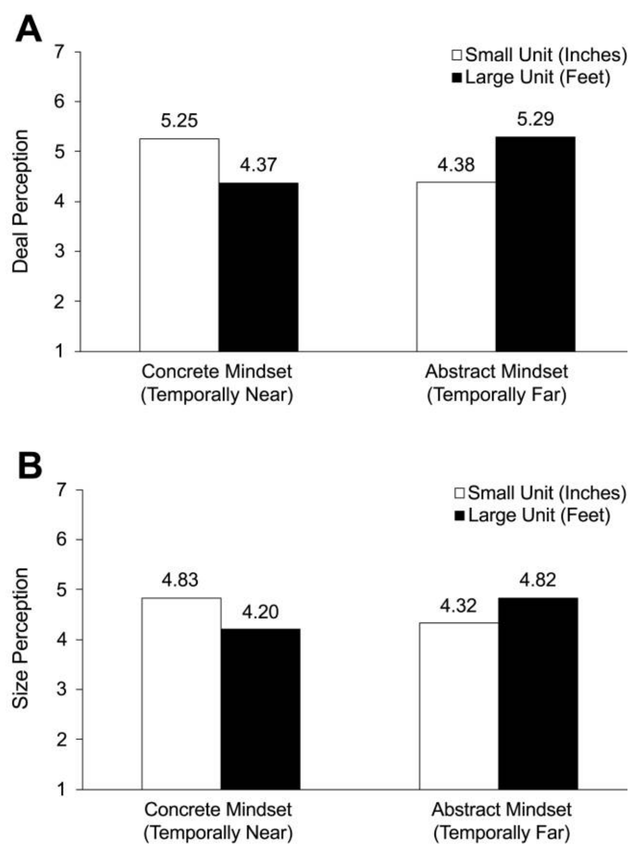
Results and Discussion

Deal Perception. An ANOVA with deal perception of table B (relative to table A) as the dependent measure and unit and mind-set as the independent variables did not yield any main effects ($p > .90$), but the significant two-way interaction ($F(1, 138) = 8.26$, $p < .005$) confirmed that the pattern of results in the concrete mind-set condition was different from that in the abstract mind-set condition (see fig. 5*A*).

Planned contrasts supported our specific predictions. Numerosity emerged in the concrete mind-set condition: deal perception (of table B relative to A) was higher when units were small rather than large ($M_{small} = 5.25$ vs. $M_{large} = 4.37$; $F(1, 138) = 3.97$, $p < .05$). Conversely, unitosity emerged in the abstract mind-set condition: deal perception

FIGURE 5

STUDY 4: TABLE LENGTH—EFFECT OF UNITS AND MIND-SET ON DEAL AND SIZE PERCEPTIONS (OF TABLE B RELATIVE TO TABLE A)



was higher when units were large rather than small (M_{small} = 4.38 vs. M_{large} = 5.29; $F(1, 138) = 4.30$, $p < .04$). Thus, a shift from concrete to abstract mind-sets reversed numerosity to unitosity. Additional contrasts supported the role of mind-sets; a certain type of mind-set (concrete or abstract) magnified differences when the corresponding aspect (numbers or units) was large. That is, in the case of small units (that have large numbers), deal perception was higher for concrete (vs. abstract) mind-sets ($M_{concrete}$ = 5.25 vs. $M_{abstract}$ = 4.38; $F(1, 138) = 4.01$, $p < .05$). Conversely, in the case of large units (that have small numbers), deal perception was higher for abstract (vs. concrete) mind-sets ($M_{concrete}$ = 4.37 vs. $M_{abstract}$ = 5.29; $F(1, 138) = 4.25$, $p < .05$).

Size Perception. An ANOVA with size perception of table B (relative to table A) as the dependent measure and unit and mind-set as the independent variables did not yield any main effects ($p > .70$), but the significant two-way interaction ($F(1, 138) = 9.04$, $p < .005$) confirmed that the pattern of results in the concrete mind-set condition was different from that in the abstract mind-set condition, just as it was for the measure of deal perception (see fig. 5*B*).

Planned contrasts supported our specific predictions. Numerosity emerged in the concrete mind-set condition: size perception (of table B relative to A) was higher when units were small rather than large (M_{small} = 4.83 vs. M_{large} = 4.20; $F(1, 138) = 5.66$, $p < .02$). Conversely, unitosity emerged in the abstract mind-set condition: size perception was higher (at a marginally significant level) when units were large rather than small (M_{small} = 4.32 vs. M_{large} = 4.82; $F(1, 138) = 3.51$, $p = .06$). Thus, a shift from concrete to abstract mind-sets reversed numerosity to unitosity. Additional contrasts were also supportive. In the case of small units (that have large numbers), size perception was higher for concrete (vs. abstract) mind-sets ($M_{concrete}$ = 4.83 vs. $M_{abstract}$ = 4.32; $F(1, 138) = 3.76$, $p = .05$). Conversely, in the case of large units (that have small numbers), size perception was higher for abstract (vs. concrete) mind-sets ($M_{concrete}$ = 4.20 vs. $M_{abstract}$ = 4.82; $F(1,138) = 5.33$, $p < .03$).

Mediation. We examined the role of size perception as a mediator (Muller, Judd, and Yzerbyt 2005). As discussed above, the unit × mind-set interaction was significant for deal perception ($F(1, 138) = 8.26$, $p < .005$) and size perception ($F(1, 138) = 9.04$, $p < .005$). To test for mediation of deal perception by size perception, we considered the initial independent variables (unit, mind-set, unit × mind-set) and added the mediator-related terms (size perception, mind-set × size perception). When these terms were included, the effect of size perception was highly significant ($F(1, 136) = 18.57$, $p < .0001$), but the significance of the unit × mind-set interaction dropped in the meditational analysis ($F(1, 136) = 3.47$, $p > .06$) from the high significance that we had observed in the initial two-way analysis ($p < .005$). This mediation effect was confirmed using a Sobel's test ($z = 2.43$, $p < .02$). Thus, units and mind-set interacted to yield numerosity and unitosity for table size perceptions and, consequently, for deal perceptions.

GENERAL DISCUSSION

Consumers frequently compare values of quantitative attributes within, as well as across, products and services. For such comparisons, we examine how consumers react to different units—how a difference framed in small units (e.g., delivery time of 21 days instead of 7 days) is viewed differently from an equivalent difference framed in large units (e.g., 3 weeks instead of 1 week). Research on numerosity suggests that, due to the size of the numbers (change from 7 to 21 > change from 1 to 3), a change is magnified by small (vs. large) units. We propose a reverse effect of unitosity: due to the size of the units (change of weeks > change of days), a change is magnified by large (vs. small) units.

To test this theory of numerosity versus unitosity, we manipulate the relative salience of numbers versus units in four laboratory experiments. We first observe a reversal due to perceptual salience—prominent numbers yield numerosity, but prominent units yield unitosity. Then, on the basis of our argument that numbers represent a low-level construal and units a high-level construal, we observe an effect of cognitive salience—concrete mind-sets yield numerosity, but abstract mind-sets yield unitosity. Across these studies, we manipulate salience in many ways (graphical format, why-how procedure, geographical distance, and temporal distance) and manipulate units for a variety of quantities (height of buildings, time of maturity of financial instruments, weight of nutrients, and length of tables). In all cases, the predicted interaction emerges—numerosity reverses to unitosity when perceptual salience shifts from numbers to units or mind-set shifts from concrete to abstract.

Implications for Theory

The key proposition arising from the numerosity perspective (Pelham et al. 1994) is that differences are magnified when the choice of units leads to larger numbers (Burson et al. 2009; Pandelaere et al. 2011; Pelham et al. 1994; Wertenbroch et al. 2007). We provide strong support for this proposition. Our results suggest that numerosity is indeed driven by the salience of numbers and not units. As we discuss later (in the "Limitations" section), such salience of numbers seems to be the default in several situations. What we demonstrate, however, is that numerosity is not the only possibility—individuals exhibit unitosity when they rely on units rather than numbers. We delineate the conditions that change the focus from numbers to units and yield a reversal from numerosity to unitosity. Those conditions relate to both perception (e.g., presentation format) and cognition (e.g., abstract mind-sets for distant-future events).

Our effects bear semblance to the effect of mind-sets on time discounting. Just as Malkoc et al. (2010) argue that the well-established effect of present bias is due to a default concrete mind-set, we believe that the well-established effect of numerosity is due to concrete mind-sets. And, just as present bias changes when mind-set shifts to being more abstract, the numerosity effect changes when mind-set shifts. Our results also connect to time-related biases in another manner. Research on duration neglect shows how subjective perceptions of time are different from objective changes (Elster and Loewenstein 1992; Fredrickson and Kahneman 1993; Varey and Kahneman 1992). Our results suggest that duration neglect might be a function of units and mind-sets. For instance, when we varied units of time in study 2, concrete mind-set participants were more sensitive to changes in duration when the unit was small (vs. large), but abstract mind-set participants were more sensitive to changes when the unit was large (vs. small). This result about units influencing time perception implies an effect on time discounting, which is known to be driven by time perception (Kim and Zauberman 2009; Zauberman et al. 2009).

By demonstrating that the size of a unit influences perceptions of a change, we augment prior findings on units of time (e.g., per day vs. per month) in the context of donations (Gourville 1998), health hazard statistics (Chandran and Menon 2004), and budgets (Ülkümen et al. 2008). Moreover, our unitosity effects are not restricted to time but apply to measured quantities in general. Finally, we show that people rely more on units when the mind-set is abstract (vs. concrete) because units are construed at a higher level than numbers.

Implications for Practice

Managers need to be aware that units might play a role when consumers compare quantitative attributes. Such comparisons could occur, for example, when there is a change in the delivery time of a product. Study 2 was analogous to this setting in that participants considered an increase in the maturity period of a CD. In other cases, consumers compare across products, such as when they compare video cameras in terms of battery life or memory space and breakfast cereal in terms of size of package or nutrition content. Study 4 was analogous to this setting in that participants compared two tables in terms of length.

Our results regarding the influence of units suggest that marketers could employ units strategically. For example, consumers are likely to be in an abstract mind-set when making plans in the spring for a trip in the summer. Because this mind-set makes units salient, a beach-house manager offering a longer stay ought to use large units that will magnify the change (for the same price, stay for 2 weeks instead of 1 week) rather than small units (stay for 14 days instead of 7 days). But, consumers will be in a concrete mind-set when making last-minute travel plans during the summer. Because this mind-set makes numbers salient, the manager ought to use small units. In contrast, using large units might be better in other concrete mind-set situations, such as when a consumer is expecting a shipment in the near future. If there is a delay in shipping time, managers would be better off diminishing a consumer's perception of delay by using large units (3 weeks instead of 2 weeks) rather than small units (21 days instead of 14 days).

Even when not making changes, managers could use units to position a product's features against competitors. For instance, in a comparative advertisement, a marketer could manipulate the prominence of units versus numbers in order to highlight a higher quantity vis-à-vis a competitor's offering (same price, more laundry detergent) or even a lower quantity (same load of clothes, less detergent required).

Because the potential abuse of these techniques is a threat to consumer welfare, regulators could consider standardizing units as well as their presentation (as is done to some extent for nutrition labeling) so that consumers can make uniform assessments of quantitative changes within and across products. At the same time, it is known that exposing individuals to alternative units, rather than the same unit, makes them less susceptible to the framing effects of numerosity (Pandelaere et al. 2011). Therefore, letting different firms use different units might itself act as a debiasing mechanism for effects such as those of numerosity and unitosity.

Units could also be employed to better alert society to the urgency of issues such as the melting of Arctic ice and global warming. To perhaps draw readers' attention to such issues, the aforementioned magazine article (*Time* 2010) used numbers with font sizes that were sometimes five times as large as the sizes of the associated units. Given this salience of numbers, the use of large units for the shrinking of the Arctic ice cap over a decade (from 2.7 to 1.9 million square miles) was perhaps counterproductive in making readers grasp the gravity of global warming. The use of small units (2,700 to 1,900 thousand square miles) would have made the change in ice cap seem much more ominous. Alternatively, to accomplish the same goal, the large unit (million square miles) could have been made more prominent. Public opinions on such important issues might, therefore, be influenced by how people view numbers and units.

Limitations and Future Research

Despite our best efforts, some issues regarding process and generalizability remain. These limitations also provide a starting point for new avenues of research.

Process. Distinguishing the role of numbers versus units is challenging because, given a fixed value of a quantity, the two are inseparable. Especially in consumption settings, quantitative attributes are usually characterized by both numbers and units. That is why the norm in prior research has been to compare equivalent values (i.e., numbers and units are changed simultaneously) and to then assess the role of numbers in the context of numerosity (Burson et al. 2009; Pandelaere et al. 2011; Wertenbroch et al. 2007). Given the steady progress in understanding the process of numerosity, we are hopeful that the process of unitosity will also be better understood over time. Our evidence at this point is limited, but there are three reasons that make us confident about unitosity being driven by the salience of units and not numbers.

First, as we show in study 1, unitosity arises when the perceptual salience of numbers (relative to units) is low.

This makes it likely that units, not numbers, lead to unitosity because judgments are influenced by attributes that are high, not low, in salience (Krider et al. 2001).

Second, in our studies, both sets of contrasts point to the same process. Consider the link between abstract mind-sets and salience of units. The first set of contrasts shows that, for abstract mind-sets, perceptions are magnified more by large units (that have small numbers) than by small units (that have large numbers). Because there is no theoretical reason for perceptions to be magnified by small (vs. large) numbers, this result is likely due to unit salience. The second set of contrasts is also consistent with the relationship between abstract mind-sets and units—in the case of large units (that have large numbers), perceptions are magnified by abstract (vs. concrete) mind-sets.

Finally, we provide evidence via dissociation. Different coexisting systems (e.g., memory systems) are shown as yielding different effects (e.g., on explicit or implicit memory) if one effect can be turned on at one time (Gabrieli et al. 1995). We also examine a coexisting system (numbers and units). Because making numbers (units) relatively salient turns on numerosity (unitosity), we do provide evidence for the proposed number-numerosity and unit-unitosity links. However, more direct evidence is desired. For instance, eye tracking, which assesses attention (Parkhurst, Law, and Niebur 2002), can better test the causal role of number versus unit salience.

Generalizability. Our results are generalizable in terms of conceptual replicability (Lynch 1982) because the predicted effects emerge across several contexts employing different independent and dependent variables. However, given that numerosity has been the default outcome in a stream of prior research, the robustness of unitosity needs further examination. We believe that unitosity has not been observed earlier because a typical numerosity study involves presenting participants with a situation without creating any psychological distance for the event. Thus, participants are likely to have responded in the "here and now" rather than the "there and then." Indeed, the concrete-condition results of numerosity (in studies 3 and 4) replicated when we conducted separate control studies, suggesting that, in the absence of a distance manipulation, participants do naturally respond in the "here and now." Thus, numerosity seems to be the default in several situations. This raises the question of whether unitosity will arise naturally in the real world. We believe that it will because presentation format, such as in advertisements, may make units relatively more salient (as in study 1). Moreover, units may be salient because real life is not always about the "here and now"—judgments and decisions frequently require stretching one's mind to a far-off location (as in study 3) or a far-off time (as in study 4).

As a related issue of robustness, we focused only on laboratory settings in order to control extraneous influences and isolate a new effect. However, we are confident that our effects will replicate in more natural settings (e.g., field study) because our lab interventions have a long history of yielding robust effects. Each of our manipulations (physical prominence, why-how mind-sets, geographical distance, temporal distance) can boast about its own research streams and is known to have clear parallels in the real world. For instance, mind-sets do vary naturally across individuals (Vallacher and Wegner 1989), and real-world situations do nudge people toward certain types of mind-sets (e.g., distant-future events evoke abstract mind-sets).

Generalizability to other contexts also needs to be examined. We studied eight quantity-unit combinations (building height in feet/floors, time of CD maturity in days/months, nutrient weight in milligrams/grams, and table length in inches/feet). Future research could examine other combinations and seek to form classes of units or quantities that show unitosity. One classification could be in terms of the construal of units (Chandran and Menon 2004)—unitosity might strengthen for very large units that make people think abstractly (e.g., trillions in federal deficit). Ambiguity of units suggests another classification. For instance, just as choices are influenced by the number of loyalty program points (van Osselaer, Alba, and Manchanda 2004), they are also influenced by step sizes (points earned per dollar). Bagchi and Li (2011) show that step sizes are considered when they are unambiguous (receive 10 points) but ignored when they are ambiguous (receive 5–15 points). Given this, we speculate that unitosity effects will weaken for ambiguous units (e.g., Kelvin for temperature) because individuals will ignore such units.

Quantities might also differ in terms of whether they encourage broader thinking and a consideration of available cues. For instance, the quantity of time (vs. money) encourages a broader perspective (Mogilner and Aaker 2009) and a higher reliance on heuristics (Monga and Saini 2009; Saini and Monga 2008). Thus, reliance on units as a judgmental cue is likely to occur for time, as we show in study 2. However, this is less likely to occur for money, in which case it might be harder to reverse the established numerosity results (Wertenbroch et al. 2007). Apart from examining such time-money differences, it would also be interesting to study time-money combinations (and other dual-quantity situations). Bagchi and Davis (2012, in this issue) show an order effect in such situations (e.g., for streaming TV: $28.59 for 58 hours vs. 58 hours for $28.59). It remains to be seen how our single-quantity results apply to such dual-quantity contexts.

A final issue of generalizability is that we examined unitosity for relative differences (i.e., quantity differences in one unit vs. another) but did not test whether it extends to absolute differences (i.e., a quantity in one unit vs. another). Our focus on relative differences was deliberate for two reasons. First, we did not want to stray from our focus on the numerosity effect of relative changes (Burson et al. 2009; Pandelaere et al. 2011; Wertenbroch et al. 2007). Second, understanding relative change is important in itself because it is fundamental to perception. This has been documented in classic texts, which discuss how the perception of brightness, loudness, temperature, and other attributes is based on relative changes from an adaptation level (Helson 1964) and how the value of an outcome is perceived in relation to the relative change from a reference point (Kahneman and Tversky 1979). That said, expanding our scope to absolute quantities would certainly broaden our understanding of numbers and units.

Conclusion

Despite the above limitations, the current research reveals an interesting effect—equivalent changes in quantities yield divergent effects depending on which component is salient. A focus on numbers (e.g., due to concrete mind-set) yields numerosity: a change is magnified when units are small rather than large. However, a focus on units (e.g., due to abstract mind-set) yields unitosity: a change is magnified when units are large rather than small. Thus, while numbers and units coexist to represent quantities, they promote distinct and opposing interpretations of quantitative changes, leading to consequences for both theory and practice.

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