Re-Inquiries

Bottoms Up! The Influence of Elongation on Pouring and Consumption Volume

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Although the effects of shapes on area perceptions have been widely investigated, we replicate, extend, and generalize one of the few studies to relate the effects of shapes to consumption volumes (Raghubir and Krishna 1999). While Raghubir and Krishna demonstrate the effect of the elongation of prepoured drinks on consumption volume, we have people pour their own drinks in a series of controlled field experiments. Two experiments in cafeterias show that both children and adults pour and consume more juice when given a short, wide glass compared to those given a tall, slender glass, but they perceive the opposite to be true. We conclude that the elongation of glasses negatively influences consumption volume in a single-serving context. A third potentially policy-relevant field experiment conducted with Philadelphia bartenders and liquor shows that the effect of elongation is moderated—but not eliminated—with pouring experience.

The effects of shapes on area perceptions have been widely investigated. For instance, it has been shown that triangles are perceived to be larger than squares (Anastasi 1936; Fisher and Foster 1968), squares larger than circles (Pfeiffer 1932), and elongated objects larger than less elongated objects (Anderson and Cuneo 1978; Holmberg 1975; Holmberg and Holmberg 1969; Verge and Bogartz 1978). Yet research linking these effects of shape to consumption volumes is limited. We replicate, extend, and generalize one of the few studies to relate the effects of shapes to consumption volumes (Raghubir and Krishna 1999) by examining how elongation influences people in natural field settings when they pour their own beverages.

Raghubir and Krishna demonstrate that the elongation of an empty glass positively influences the perceived capacity of that glass (study 2). Likewise, in study 3, they show that the elongation of the prepoured drink inside glasses (vs. the elongation of glasses itself) positively influences the perceived volume of that prepoured drink. In a multiple-serving context, these elongated, prepoured drinks were then shown to positively influence the actual consumption volume while negatively influencing the perceived consumption volume (study 4). The rationale for this finding is that the elongation creates high-volume expectations, which are not met by the consumption experience. Because participants are dissatisfied with the volume of the drinks they received, they respond by drinking additional glasses.

Because Raghubir and Krishna (1999) prepoured the drinks for their respondents (in contrast to letting them pour for themselves), their research effectively demonstrated the importance of the effects of elongation on consumption volume in situations where a parent, or a waiter, serves a drink. What remains unknown, however, is how elongation influ-

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ences consumption volume when people pour for themselves. Transferring the pouring task to consumers themselves triggers questions such as (1) How does the elongation of glasses influence how much people pour and how much they believe they have poured? (2) Are people aware of the influence of the elongation on their pouring behavior? (3) Do these influences result in overpouring or underpouring, relative to specific norms?

To address these questions, we replicate, extend, and generalize Raghubir and Krishna's (1999) study. We use three field studies to replicate their research by examining the effect of elongation on perceptions of self-poured volumes. We extend their research by examining the effect of elongation on how much people pour when they pour for themselves. We generalize their research by examining the consistency across various populations (children, adults, and bartenders), pouring tasks (the self-serving of juice in a cafeteria and the serving of alcohol in a bar), glass sizes (22.3 and 12.0 oz), and beverages (juice and liquor). Understanding how elongation affects pouring volume and consumption is important for policy makers, managers, health professionals, and dieters or diabetics who are concerned with monitoring and better controlling food and beverage consumption.

Building on Raghubir and Krishna's (1999) notion that the elongation of a glass positively influences its perceived capacity, we hypothesize that the elongation negatively influences the actual volume one pours. The rationale for this hypothesis is that the larger perceived capacity of a more elongated glass should have a correspondingly negative influence on how much a person believes he or she needs to pour to reach the volume he or she intends to pour. Hence, we expect a person will pour relatively less into a tall, slender glass and relatively more into a short, wide glass. If a person drinks all that he or she pours, the elongation of a glass thus negatively influences the actual consumption volume in a single-serving context. We assume that the volume people intend to pour is not affected by the perceived capacity of the glasses and that the glasses are large enough to hold the total volume they intend to pour. Furthermore, we hypothesize that the elongation of the poured drink inside glasses positively influences the perceived volume poured.

Three controlled field studies are conducted to examine how elongation influences pouring and consumption in natural environments. Study 1 shows that diet-conscious children in a self-service cafeteria pour and consume more juice when given short, wide glasses compared to those given tall, slender glasses that have the identical holding capacity. It also shows they mistakenly believe the opposite to be true. Study 2 confirms these same biased pouring and perceptual tendencies among nonvigilant adults. Finally, study 3 examines how the elongation of glasses and the experience level of professional Philadelphia bartenders influences the amount of alcohol they pour compared to the established industry norm.

STUDY 1: HOW ELONGATION INFLUENCES THE PERCEIVED AND ACTUAL VOLUME OF JUICE POURED BY CHILDREN

Study 1 builds on the foundation provided by Raghubir and Krishna (1999) by using a controlled field setting to determine if a trained, vigilant population will be influenced by the elongation of glasses. We expect them to pour and consume more when given short, wide glasses than when given tall, slender glasses that have the same capacity. To provide a conservative test, we examined individuals who were actively monitoring how much they ate and drank, who were trained to evaluate their portion size, and who were motivated to restrict their consumption. If we find significant effects with such individuals, it will underscore the robustness of the effects we are investigating.

Method

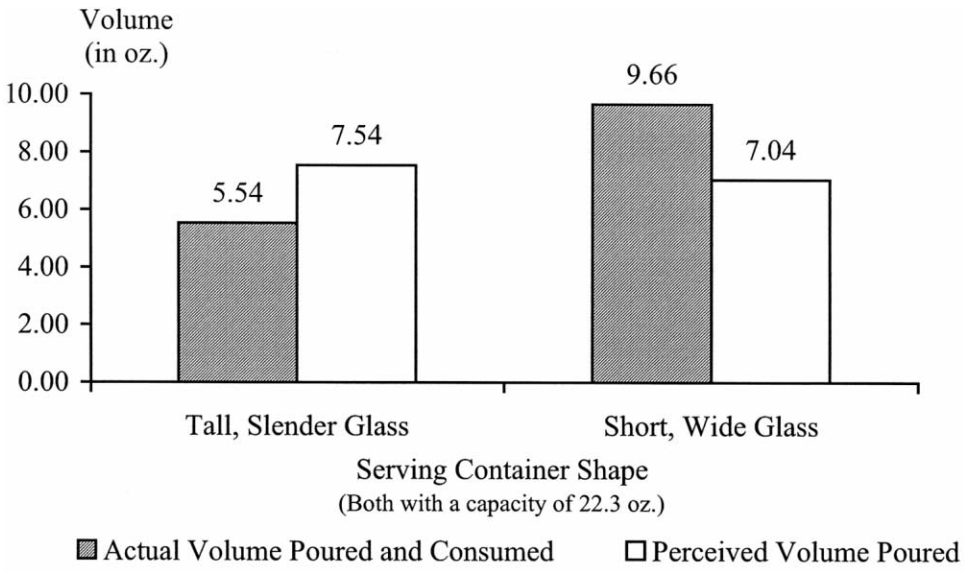
After a series of pilot tests, the main study involved 97 children (44 male) who were involved in a six-week health and fitness camp in northern New Hampshire. During the first week of camp, the children had been taught about dieting, portion control, consumption monitoring, and nutrition through daily demonstrations and lectures. A questionnaire they answered upon arrival to the camp indicated that "losing weight" was one of the primary goals for attending the camp (after "having fun" and "meeting new friends"), hence the group was motivated to lose weight as well as trained to monitor how much they consumed. The campers ranged in age from 12 to 17 (with the average of 15) years old.

Upon entering the cafeteria line for breakfast on the ninth day of the camp, the children were randomly given a 22.3-oz juice glass that was either relatively short or relatively tall. The height of the former was 10.6 cm, the latter 18.9 cm. As campers helped themselves to one of the juices in the cafeteria line, they were unaware of the use of different-shaped glasses. On their way out of the line (and out of sight of others entering the line), those who had selected one of the available juices as one of their breakfast items were asked how many ounces they thought they had poured. They were next asked questions such as how thirsty they were (1 = not very thirsty; 9 = very thirsty) and how many times in a week they typically drink juice. As they were being asked these questions, their glass of juice was weighed. Only three campers poured slightly over 14 oz of juice, still well below the total capacity of the glasses. Hence, in line with our assumption, we conclude that the glasses were large enough to hold the volumes that the campers intended to pour. Upon completion of their meal, it was found that 97% of the campers finished their drinks, and this percentage did not significantly vary between the two conditions ($p > .10$).

To test our hypotheses, ANOVAs were conducted, with age, gender, thirst, juice consumption frequency, and juice

FIGURE 1

HOW ELONGATION INFLUENCES THE PERCEIVED AND ACTUAL VOLUME OF JUICE POURED BY CHILDREN



type included as covariates. With respect to the actual volume of juice poured, a gender effect was found ($p < .05$); females poured less juice than males. There was no interaction between gender and glass shape; the shape of glasses equally influenced both males and females. None of the other covariates influenced the actual volume of juice poured, and none influenced the perceived volume poured. Because the basic pattern of findings was consistent across genders, age groups, and juice type, the data are presented in aggregate.

Results and Discussion

Recall that it was expected that campers would pour more juice when they poured into short, wide glasses than into tall, slender glasses, even though they believe themselves as having poured less. Indeed, campers who had been given short, wide glasses poured and consumed 74.37% more juice than those given tall, slender glasses (9.66 vs. 5.54 oz; $F(1, 90) = 93.72$; $p < .05$), but they perceived themselves as having poured less (7.04 vs. 7.54 oz; $F(1, 90) = 3.83$; $p = .05$). This gap between actual and perceived volume poured is illustrated in figure 1.

These results underscore two key findings that extend and replicate Raghubir and Krishna's (1999) research. First, we find that the elongation of glasses negatively influences pouring volume when people pour their own drinks. Because 97% of the campers finished their drinks, we conclude that elongation negatively influences consumption volume in a single-serving context. Campers poured and consumed more juice when they poured into short, wide glasses than into tall, slender glasses.[1] Second, campers tended to believe they poured less into the short, wide glass than into the tall, slender glass. This supports the well-documented notion that elongation positively influences perceived volume and continues to do so even when the opposite is true.

STUDY 2: HOW ELONGATION INFLUENCES THE PERCEIVED AND ACTUAL VOLUME OF JUICE POURED BY ADULTS

Piaget, Inhelder, and Szeminska (1960) were among the first to comprehensively describe the effects of elongation on volume perception. They showed that children perceive taller containers to hold more of a product than shorter containers with larger diameters. Piaget's (1969) centration hypothesis attributes these kinds of illusory distortions to the way in which attention is deployed across visual fields (horizontal and vertical dimensions). The initial viewing of an object is characterized by centration, the focusing of attention on one specific dimension (Ginsburg and Opper 1988). It is the centering of attention on the vertical dimension that is believed to account for its relative over-

[1]While this difference may be caused by a tendency to overcompensate for the lower perceived capacity of short glasses, we did not explicitly measure the perceived capacity of the glasses in this particular study. However, both the perceived capacity of glasses and the volumes poured were measured in a separate study. Following the procedure proposed by Baron and Kenny (1986), we found that the effect of the elongation of glasses on the actual volume poured was mediated by the perceived capacity of the glasses studied ($p < .05$).

estimation. Piaget (1969) argues that a young child's attention tends to be caught and fixed by one portion of the field (the vertical dimension), whereas adults utilize a strategy that allows them to isolate and compare various elements (vertical and horizontal dimensions). Nevertheless, the tendency to overestimate the vertical dimension persists, so that even adults have a propensity to mistakenly perceive a greater volume in a tall, slender container. By sampling an adult population in a naturalistic setting, study 2 will further solidify and substantiate Raghubir and Krishna's (1999) findings that elongation influences volume perceptions. In turn, we will extend their work by examining the effect of elongation on the volume that adults self-pour and consume.

Method

After a series of pilot tests, the main study involved 89 adults (69 male) eating breakfast in a cafeteria in western Massachusetts. The participants were attending a weekend camp on jazz improvisation and ranged in age from 16 to 82 years, with the average age being 37.2. The basic procedure was similar as that with study 1. Upon entering the cafeteria line for breakfast on the second morning of the camp, these adults were randomly given a 22.3-oz glass that was either relatively short or relatively tall. They were allowed to help themselves to one of five types of juice and were unaware of the use of different-shaped glasses.

On their way out of the line, those who had selected one of the available juices were asked how much they thought they had poured (in ounces). They were asked questions such as how thirsty they were (1 = not very thirsty; 9 = very thirsty) and how many times in a week they typically drink juice. As they were being asked these questions, their glass of juice was weighed. None of them poured over 14 oz of juice. Hence, we conclude that the glasses were large enough to hold the volumes the adults intended to pour. After completing their meal, it was found that 98% of the participants finished their drinks, and this percentage did not significantly vary between the two conditions ($p > .10$).

As in study 1, our hypotheses were tested using ANOVAs, and age, gender, thirst, juice consumption frequency, and juice type were included as covariates. None of the covariates influenced the actual or perceived volume of juice poured. Because the basic pattern of findings was consistent across genders, age groups, and juice type, the data are presented in aggregate.

Results and Discussion

As expected, adults who were given short, wide juice glasses poured and consumed 19.44% more juice than those given tall, slender glasses (6.88 vs. 5.75 oz; $F(1, 82) = 11.02$; $p < .05$). Recall that the children in study 1 poured 74.37% more into the short, wide glasses than into the tall, slender glasses. These results are consistent with Piaget's (1969) notion that older people are less likely to focus their attention merely on the vertical dimension and are better able to account for the other dimensions as well. Nevertheless, while the results of studies 1 and 2 suggest that age may reduce the effect of elongation on the volume poured and consumed (a 19.44% bias vs. a 74.37% bias), age does not eliminate this effect of elongation. It is important to note that these two populations may have differed across dimensions other than their age (such as their pouring experience), so our conclusions about the moderating impact of age are not without caveat.

In general, the specific patterns of results for pouring, consumption, and estimation were robust across both study 1 and study 2. Consistent with the results we found for children, study 2 found that adults who poured into the short, wide glasses perceived themselves to have poured less than those pouring into tall, slender glasses (5.76 vs. 7.15 oz; $F(1, 82) = 11.99$; $p < .05$).[2] As indicated in figure 2, this resulted in a gap between the actual and perceived volume poured. The difference between how much they poured and how much they perceived themselves as having poured indicated that those given short glasses poured and consumed more than they thought, while those given tall glasses poured and consumed relatively less (1.12 vs. −1.40 oz; $F(1, 82) = 81.77$; $p < .01$). Of those given short glasses, 79% underestimated how much they poured compared to 17% of those given tall glasses ($\chi^2 = 31.94$; $p < .01$).

The inconsistencies between how much participants actually poured and how much they thought they poured suggest that people are generally unaware of the effect of elongation on pouring volume (cf. Nisbett and Wilson 1977). The general surprise participants exhibited during the debriefings (e.g., "You're kidding!" "Really?" "Can you weigh it and show me?") is consistent with this lack of awareness.

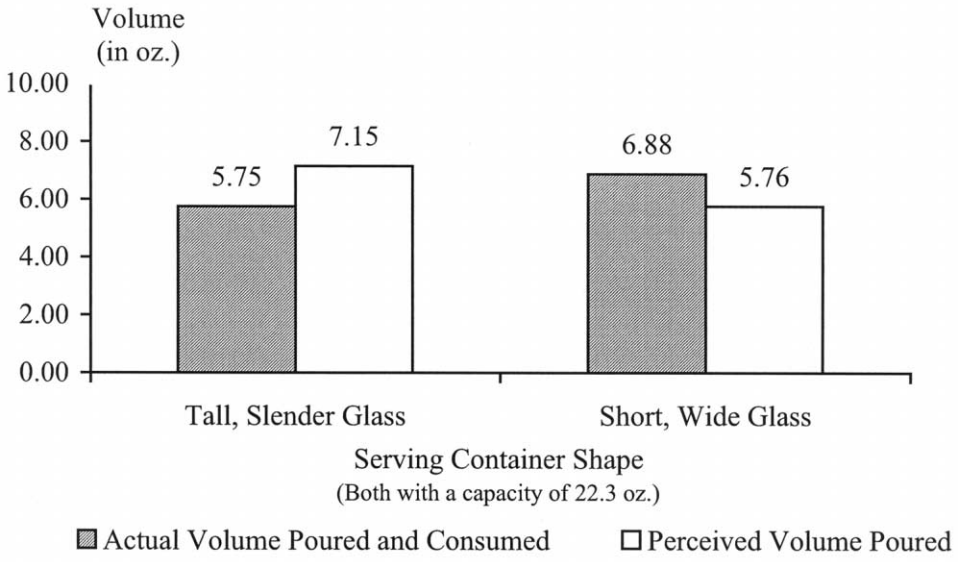
STUDY 3: HOW ELONGATION BIASES PROFESSIONAL BARTENDERS

The results of studies 1 and 2 suggest that the elongation of glasses negatively influences the volume poured when people pour their own drinks. The results further suggest that people are unaware of this effect of the elongation of glasses. What remains unknown is (1) whether these influences result in overpouring or underpouring relative to specific norms and (2) whether deviations caused by elongation represent overpouring for short, wide glasses or underpouring for tall, slender glasses. The answer to these questions is important for policy makers as well as for those people who wish to more carefully monitor their consumption for dietary or health reasons. Moreover, addressing these questions will provide key insights into one of our research assumptions. Recall that we assume that the target volume people intend to pour is unaffected by the perceived capacity of the glasses. In studies 1 and 2, it remains unclear if this assumption actually holds and, more important,

[2] This difference in perceived volume (24.13%) is larger than the one found in study 1 (7.10%). This may be due to the large volume poured into the shorter glasses by the children in study 1.

FIGURE 2

HOW ELONGATION INFLUENCES THE PERCEIVED AND ACTUAL VOLUME OF JUICE POURED BY ADULTS



whether a possible violation of this assumption would influence the results. In study 3, we hold the target volume constant and examine if the same effects of elongation are found.

Assertions of either overpouring or underpouring are difficult to investigate because consumption norms vary between people and situations—there is usually not a "correct" consumption volume (Wynder, Weisburger, and Ng 1992). We examine a pouring task in which the "correct" volume is well established—bartending. The bartending context is ideal because well-established norms exist. If a bartender pours 1.5 oz of rum into a rum and Coke, he has poured the ideal volume of rum. If he pours 1.8 oz, he has overpoured.

Furthermore, we examine if pouring experience decreases the pouring bias related to elongation. Because experts can better account for the vertical and horizontal dimensions of glasses (cf. Kling and Riggs 1971), we expect their experience to reduce the optical illusory effects of elongation.

Method

As part of a larger study, 45 Philadelphia bartenders (24 male) with an average of 5.1 years of experience were contacted at their place of employment and asked to participate in a five-minute study on "alcohol and other consumer behavior-related issues" in exchange for $4.00. To increase participation likelihood, bartenders were contacted between 7:00 P.M. and midnight on one of the two slowest nights of the week (Sunday and Monday) during one of four different weeks. Five bartenders declined to participate in the study.

The study involved a 2 × 2 between-subjects design involving glass shape (short, wide vs. tall, slender) by bartending-experience level (less than five years experience vs. more than five years experience) and four different drink replications. Four experimenters each visited between eight and 14 bartenders and administered the four conditions in a randomized pattern during their visits. Each bartender was asked to pour the well-established standard amount of alcohol that would be used in each of four different drinks (1.5 oz). To avoid any misunderstanding, the bartenders were explicitly told to pour 1.5 oz of each drink. This was generally done in the least conspicuous or obtrusive part of the establishment, typically at the end of the bar or at a corner table.

The experimenter supplied the serving glasses and the bottles of liquor, and each bartender poured directly from full 1,500 ml bottles (50.6 oz) without the aid of a pouring spout or measuring device (such as a shot glass). After being given the 1,500 ml bottle, the bartenders were asked to pour the amount of gin used to make a gin and tonic. Half of the bartenders were given tall, slender 12-oz ("highball") glasses and the others were given short, wide 12-oz ("tumbler") glasses. In addition, they were asked to pour the amount of rum in a rum and Coke, the amount of whiskey in a whiskey on the rocks, and the amount of vodka in a vodka tonic. The order in which they poured the drinks was rotated. The number of years of bartending experience was used as an indicator for pouring experience. Using the median-split criterion, we divided the sample in to less (<5 years) and more (5+ years) experienced bartenders. The average number of years experience in the less experienced condition was 2.1 years, while those in the more experienced condition had an average of 9.4 years of bartending experience.

After the four drinks were poured, their volumes were

measured. Because we did not expect to find much variation in the perceived volume poured (the bartenders had just been asked to pour 1.5 oz of liquor moments earlier), we did not measure the perceived volume poured. To determine whether the type of drink influenced the pattern of results, a MANOVA was conducted for repeated measures, and dummy variables for the shape of glass and for experience were included as independent variables. Variables indicating which experimenter conducted the interview, the order of drinks poured, and the gender of the bartender were included as covariates. The effects of the type of drink and the interactions between the type of drink and the independent variables and covariates were not significant ($p > .10$). Thus, the type of drink bartenders poured during the experiment did not influence the results. None of the covariates influenced the amount of liquor poured ($p > .10$).

Results and Discussion

The results were consistent with those of the previous studies. Despite an average of 5.1 years of experience, bartenders were biased by the elongation of the glasses into which they poured. On average, bartenders poured 27.16% more into short, wide glasses than into tall, slender glasses (2.06 vs. 1.62 oz; $F(1, 33) = 29.83$; $p < .01$). Since the industry norm for each of these drinks is 1.5 oz, table 1 illustrates a general tendency to overpour.

As shown in figure 3, the shape of the glass significantly interacted with bartenders' pouring experience ($F(1, 33) = 10.30$; $p < .01$). Less experienced bartenders poured more into the short glasses than into the tall glasses (2.23 vs. 1.59 oz; $F(1, 18) = 29.24$; $p < .01$). This tendency was less apparent—yet still not eliminated—with more experienced bartenders who poured an average of 0.15 oz more into the short glasses than the tall glasses (1.80 vs. 1.65 oz; $F(1, 12) = 3.46$; $p < .05$). Our notion that short, wide glasses lead to overpouring more than tall, slender glasses lead to underpouring in the range examined is supported by the fact that, when compared to the well-established norm of 1.5 oz, there was a tendency to overpour in tall, slender glasses by both less experienced bartenders ($1.59 > 1.5$ oz; $t = 2.84$, $p < .05$) and more experienced bartenders ($1.65 > 1.5$ oz; $t = 2.42$, $p < .05$). As figure 3 underscores, in no case does underpouring occur. Still, short, wide glasses contribute to a greater degree of overpouring than tall, slender glasses do.

These findings suggest that pouring experience attenuates the tendency to overpour into short, wide glasses, but it does not fully eliminate this tendency (cf. Coren and Hoenig 1972; Krider, Raghubir, and Krishna 2001). Hence, merely increasing a person's experience with the pouring task does not altogether solve the problem. Other strategies are needed to help people pour the correct volume to reach their target volume. As we did not actually manipulate pouring experience but chose instead to operationalize it based on the number of years of bartending experience, some caution should be taken with respect to our conclusions on the moderating effect of experience.

GENERAL DISCUSSION

This research replicates, extends, and generalizes the findings of Raghubir and Krishna (1999) by examining self-serving contexts in natural environments. We extend their research by showing that elongation of glasses negatively influences how much people pour. The results of the first two studies additionally suggest that this effect of elongation may be even larger among children than for adults. Furthermore, elongated glasses lessen the general tendency to overpour, while short glasses increase the tendency to ov-

TABLE 1

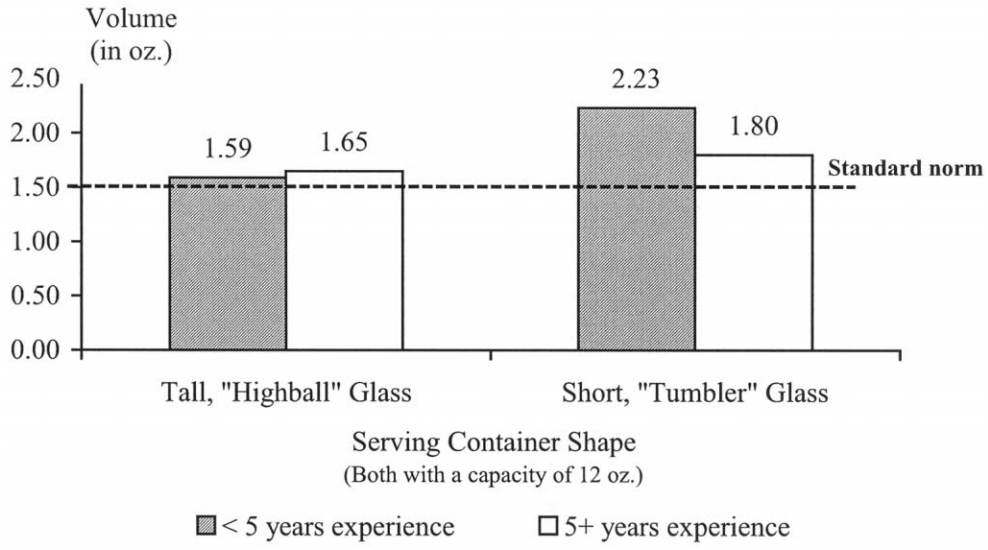
HOW GLASS SHAPES BIAS PROFESSIONAL BARTENDERS

	Ounces poured into a tall, slender (highball) glass		Ounces poured into a short, wide (tumbler) glass		*F*-values ($df = 1,33$)		
Ounces poured	Less experienced (<5 years)	More experienced (5+ years)	Less experienced (<5 years)	More experienced (5+ years)	Shape of glass	Years of experience	Shape of glass
All drinks	1.59 (.12)	1.65 (.10)	2.23 (.36)	1.80 (.21)	29.79*	5.17*	10.30*
Gin for a gin and tonic	1.63 (.17)	1.70 (.13)	2.30 (.39)	1.77 (.21)	17.83*	6.37*	9.49*
Rum for a rum and Coke	1.59 (.08)	1.67 (.06)	2.27 (.36)	1.82 (.21)	30.46*	4.84*	11.38*
Vodka for a vodka tonic	1.57 (.09)	1.64 (.09)	2.20 (.31)	1.81 (.24)	32.31*	3.69*	9.10*
Whiskey for a whiskey on the rocks	1.56 (.13)	1.61 (.12)	2.18 (.40)	1.80 (.23)	21.12*	2.59	5.13*

NOTE.—Standard deviations are in parentheses.
*$p < .05$.

FIGURE 3

THE ELONGATION OF GLASSES BIASES THE NUMBER OF OUNCES OF LIQUOR POURED BY PROFESSIONAL BARTENDERS



erpour. Pouring experience among bartenders reduces—but does not eliminate—the effects of elongation.

We replicate Raghubir and Krishna's (1999) work by showing that the elongation of the self-poured drinks positively influences the volume people believe they have poured. We actually find that a gap exists between how much of a drink a person poured and how much he or she believes he or she poured. People pour more in shorter glasses than in taller glasses, yet they believe the opposite to be true. These inconsistencies between actual and perceived volumes poured suggest that people are unaware of the effect of elongation on pouring behavior.

Since 97% of the campers in study 1 and 98% of the musicians in study 2 finished their self-poured drink, we conclude that the elongation of glasses negatively influences consumption volume from large-capacity glasses in a single-serving context. Over multiple servings, Raghubir and Krishna (1999) show that the elongation of prepoured drinks positively influences consumption volumes from smaller-capacity glasses filled to capacity. This is partly because people overestimate the degree to which the beverage in the tall glass will satisfy them. At some point, however, a person would become sated (Inman 2001) and would not be constrained by the capacity of a glass. If the glass were relatively large, this would occur with a single serving; if the glass were small, this would occur on the *n*th serving. It is at this point—where there is no capacity constraint—where people would consume more from a tall, slender glass than a short, wide glass.

We generalize basic findings by showing results that are consistent across three populations (children, adults, and bartenders), two pouring tasks (the self-serving of juice in a cafeteria and the serving of alcohol in a bar), two glass sizes (22.3 and 12.0 oz), and two types of drinks (juices and liquors). As a result, we conclude that these findings have considerable generality in self-service contexts with large-capacity glasses.

Limitations and Future Research

Before discussing the implications of our research, the natural settings used for these studies resulted in limitations that should be addressed. One limitation is that while we measured the perceived capacity of the glasses in a separate unreported study, we did not do so in our controlled field studies. While there is already substantial evidence that elongation influences perceived capacity, measuring the perceived capacity of the empty glasses in the reported studies would have allowed us to explicitly test the effect of perceived capacity on how much people pour.

To keep the studies as unobtrusive as possible, no process measures were collected. Hence, our interpretation of cognitive processing should be taken with care and can be addressed in the future. While our research replicates the most important findings of Raghubir and Krishna's work, future research could also examine how elongation influences perceived consumption as well as perceived satisfaction when people pour their own drinks.

It would also be useful to know why some people appear to be relatively impervious to the biases found. While study 2 showed that 79% of the adults underestimated how much they poured into the short glass, 21% did not. Likewise, more research on the boundary conditions of our findings needs to be conducted. This could examine what happens

if the target volume increases beyond 1.5 oz, or what happens as the degree of elongation increases. For instance, our prestudies indicated that as the degree of elongation becomes more exaggerated it has an increasing influence on the pouring biases and estimation biases of adults.

When there are serious consequences to overpouring, it will also be important to determine whether the size of the package from which the product is poured interacts with this elongation effect. In our studies, people poured from large-capacity sources, such as full 1,500 ml bottles. If we analogously view these sources as operationally equivalent to large packages (cf. Wansink 1996), it may be that smaller packages would lessen the effect of elongation.

Examining boundary conditions may also reveal circumstances in which people underpour instead of overpour. With medicine consumption, for instance, inaccurately pouring a liquid medication or over-the-counter drug could result in either inefficacy or overdose. To fully understand the effects of elongation, the next steps should investigate individual differences and boundary conditions.

Implications for Research

Besides impacting consumption behavior, the ubiquitous nature of pouring and self-serving may also unknowingly impact the research results of sensory studies and nutrition studies. In these two contexts, the consumption volume of foods is often precisely measured to the one-hundredth of a gram or milliliter. Yet, when a person is serving himself or herself, the shape of a glass (or possibly a plate or bowl) may lead to sizable variations in how much they would otherwise consume. Not accounting for the different shapes of serving containers can invalidate these precise measurements and reduce the ability to make comparisons across studies. Our research results suggest that it is necessary, at the very least, for sensory and nutritional research to use standard shapes of serving containers when trying to establish benchmarks for longitudinal studies.

Similarly, consumption-monitoring studies often carefully train diary panelists to be able to estimate their food and beverage consumption in situations where the quantities and volumes cannot be easily measured. Such careful training, however, does not involve showing panelists how the shape of serving containers influences their estimates. In addition to emphasizing how containers can bias consumption estimates, our results suggest that it would be useful to have panelists note the serving containers used during their meals.

It has been shown that increasing pouring experience can help reduce but not eliminate the effect of elongation on pouring and consumption. Other tactics to reduce biases may involve systematically manipulating the perceptual style of people through the instructions that are given to them. By varying the viewing strategy or by voluntarily redirecting or restricting attention, it may be possible to reduce the effects that shapes have on consumption volume. For instance, when participants are instructed to carefully focus on one dimension of the stimuli (such as the width), they show a significant reduction in illusion magnitude when compared with observers who view the illusion under the usual instructions (Coren and Girgus 1972; Krider et al. 2001).

Implications for Controlling Consumption

A wide range of people and institutions would like to better control a person's consumption of a product. Those in the hospitality industry want to decrease costs (via serving size) without decreasing satisfaction. Those in public policy want to decrease waste. Those in health and dietetics fields want to decrease overconsumption. Those on restricted diets want to decrease calories, fat, or sugar intake. Consistently reminding someone to be aware of how much they are using would be impractical and would overburden their vigilance. Instead, there might be more structural changes that could make it easier for people to monitor their consumption volume.

Consider the bartender study. If short, wide glasses (tumblers) encourage bartenders to pour more alcohol than tall (highball) glasses, the selection of glasses has an impact on costs as well as on safety. One easy solution to these related problems would be to either simply use tall glasses or to etch target alcohol-level marks (such as 1.5 oz) on the glasses (as is sometimes done in European countries). Similarly, it may be possible to indicate an acceptable pouring range on the cap of a cleaner or personal care product by using a clear band that indicates a lower and upper limit. In other contexts, packages might also be modified so they are less easy to pour and require more concentration (cf. Folkes, Martin, and Gupta 1993). Although more concentration may not eliminate the effect of elongation, it may reduce the impact (Coren and Girgus 1972).

The effort that needs to be made to control pouring accuracy depends on the benefit or harm associated with inaccuracy. With foods and nonalcoholic beverages, there may be less of a need than with cleaners or personal care products. Aside from alcohol, perhaps the most immediate areas for concern, however, are with medications and over-the-counter drugs. In these cases, the inefficacy that can result from underpouring can be as dangerous as the overdosing that can result from overpouring.

Whereas the majority of this discussion has focused on controlling or limiting consumption, there are circumstances where there is a desire to stimulate an increased consumption of healthy beverages. This has long been a concern in outdoor contexts where dehydration presents a health risk to people, such as athletes, soldiers, laborers, or rescue workers (Meiselman 1995). There is also often a need for increasing consumption with the undernourished young and old. For instance, a parent may want to encourage a child to pour and drink more milk at home, and a dietician may want nursing home patients to consume more juice in the cafeteria. In these cases, short, wide glasses would encourage more consumption than the slender 6-oz glasses that are often provided.

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