



To squeeze or not to squeeze: How squeeze tubes affect consumers' serving sizes



Elke Huyghe^{a,*}, Maggie Geuens^{a,b}, Iris Vermeir^a

^a Ghent University, Tweeakerkenstraat 2, 9000 Ghent, Belgium

^b Vlerick Business School, Reep 1, 9000 Ghent, Belgium

ARTICLE INFO

Article history:

Received 31 May 2016

Received in revised form

22 December 2016

Accepted 23 December 2016

Available online 26 December 2016

Keywords:

Squeeze tubes

Packaging

Motor fluency

Ease of consumption monitoring

(un)restrained eating

ABSTRACT

Squeeze tubes increasingly complement traditional packaging. But, would squeeze tubes - besides offering ease of use - also affect consumers' serving sizes? And if so, in what way? To answer these questions, we contrast the motor fluency hypothesis (i.e., bodily movements affect judgments) with the consumption monitoring hypothesis (i.e., paying attention to quantities eaten affects consumption). Two studies reveal that consumers use less of a product when it comes in a squeeze tube versus a traditional container, providing initial evidence for the consumption monitoring hypothesis. A third study also provides evidence that the ease of consumption monitoring drives the squeeze tube effect, which is more prominent for unrestrained eaters. These findings have important implications for consumers, public policy makers, and product manufacturers.

© 2016 Elsevier Ltd. All rights reserved.

1. Introduction

Food products come in various packages that provide different levels of convenience. For example, many condiments, such as mayonnaise, are not only offered in jars, but squeeze tubes were launched to increase the ease of handling the package. User-friendly packaging is becoming more important to consumers so demand for and supply of squeeze tubes is likely to increase further, in line with their product differentiation and convenience advantages. Therefore, more knowledge on how the type of packaging (new, easy-to-handle vs. traditional, less easy-to-handle) affects serving sizes is crucial. This paper identifies user-friendly packaging as a key attribute, with substantial implications for the serving sizes consumers choose. We focus on squeeze tubes versus traditional containers (e.g., jars, packs), because squeeze tubes are widely used and subject to increasing demand (Bharat Book Bureau, 2015), and because theoretically, this packaging should affect consumers' serving sizes, according to two distinct hypotheses.

First, motor fluency can affect judgments (Alter & Oppenheimer, 2009; Beilock & Holt, 2007; Elder & Krishna, 2012; Ping, Dhillon, & Beilock, 2009). Easy-to-handle packaging such as squeeze tubes likely create a motor fluency effect, which could lead consumers to consume more of a product. This motor fluency (Ping et al., 2009) or embodied cognitive fluency (Alter & Oppenheimer, 2009) prompts

theory that indicates fluent processing of stimuli leads to more positive evaluations. Specifically, motor fluency means that easily performed actions give rise to positive feelings that spill over to the object of attention, because a feeling of ease results from bodily feedback, namely, motor behavior. This motor fluency effect explains why products that are easy to interact with tend to be liked better by consumers. Because they eliminate the need for cutlery, squeeze tubes are very easy to interact with, such that consumers simply squeeze the package to obtain the desired product. Therefore, we predict that consumers might use more of a product that comes in an easy-to-handle package, such as a squeeze tube, rather than in less easy-to-handle packaging, because the experience of the motor fluency effect facilitates their consumption. On the basis of this reasoning, we hypothesize:

H₁: Consumers' serving sizes are larger when the product comes in a squeeze tube versus a traditional container.

Second, consumption monitoring is a key determinant of how much a person eats (Giner-Sorolla, 2001; Polivy, Herman, Hackett, & Kuleshnyk, 1986; Scott, Nowlis, Mandel, & Morales, 2008; Wertenbroch, 1998). Because consumers can see the volume of the product slowly increasing as they use a squeeze tube, their attention is drawn to the serving size which might make consumers more conscious of how much they are serving and as such disrupt mindless serving. As a consequence, the ease of consumption

* Corresponding author.

E-mail address: Elke.Huyghe@ugent.be (E. Huyghe).

monitoring that comes along with squeeze tubes could reduce consumers' serving sizes. Monitoring and paying attention to quantities consumed has been shown to be important for successful, or failed, self-control in a wide variety of contexts (Baumeister, 2002; Carver & Scheier, 1998). For example, Coelho do Vale, Pieters, and Zeelenberg (2008) show that consumers deliberated more before consuming, and thus consumed less, when tempting products came in large packages, but small packages remained unnoticed. In Polivy et al.'s (1986) study, participants ate fewer candies when they were aware of how much they were eating. Similarly, in research into the effects of transparent versus opaque packaging on food consumption, the transparent package reduced consumption, due to a monitoring effect. Because consumers could monitor the remaining food in a transparent package more easily, they were more conscious of the quantity of food they had already consumed and they stopped eating sooner than they did when the package was opaque (Deng & Srinivasan, 2013). We believe that the ease of handling the product, due to its packaging, similarly may affect serving sizes due to the ease of consumption monitoring. When using a squeeze tube, the product can come out very slowly or faster, depending on how hard one squeezes the tube. In other words, one can easily control the flow of the product. On top, and perhaps even more important, the volume of the product served, for subsequent consumption, increases steadily with each squeeze of the tube which further facilitates consumption monitoring. The ongoing confrontation with how much consumers are serving themselves, likely reduces mindless serving and triggers consumers to more deliberately define their serving size. If such tubes enable consumers to monitor their consumption more easily and accurately, squeeze tubes may reduce consumers' serving sizes in a similar way as transparent packaging reduce consumption. Therefore, we formulate a second, rival hypothesis:

H₂: Consumers' serving sizes are smaller when the product comes in a squeeze tube versus a traditional container.

But will the predicted squeeze tube effect always occur? Probably not. We also investigate individual differences in restrained eating as a boundary condition. The food environment in modern, developed nations offers a large variety of cheap, tasty, easily available sweet and fatty foods, as well as healthy foods. Some consumers thus purposefully restrain their eating, and individual differences in restrained eating likely affect the predicted squeeze tube effect. According to previous research, consumption depends on how concerned consumers are about their weight (e.g., Cavanagh, Kruja, & Forestell, 2014). For example, adding caloric information to packaging leads restrained eaters to eat more of an unhealthy cookie if it features a low-calorie label but more of a healthy cookie when no label appears on the packaging. In contrast, unrestrained eaters eat more of the healthy cookie, regardless of the caloric information provided (Cavanagh et al., 2014). The size of the packaging also affects consumption by (un)restrained eaters, such that restrained eaters consume more calories from small food in small packages, but unrestrained eaters consume more calories from large food in large packages (Scott, Nowlis, Mandel, & Morales, 2008).

Restrained eaters thus can be misled by cues of calorie labels and package sizes (Cavanagh et al., 2014; Scott et al., 2008), yet in general, they restrict their food intake to avoid gaining weight. Because they pay a lot of attention to what and how much they consume, we do not expect substantial differences due to an easy-to-handle, versus a less easy-to-handle, package, as long as the packaging does not provide misleading cues. Indeed, irrespective of the packaging, restrained eaters do not consume mindlessly but are very conscious of what and how much they eat. Among unrestrained eaters, who are less concerned with their weight, we predict that the

packaging effect will be more prominent as in these consumers the steadily increasing serving size might draw attention to their serving size and disrupt unconscious or mindless consumption patterns.

H₃: The squeeze tube effect will be more prominent for unrestrained than for restrained eaters.

To test our hypotheses, we set up three studies. Specifically, in Study 1 we investigate the existence and nature of the squeeze tube effect to answer our central research question: Does easy-to-handle packaging influence consumers' serving sizes, and if so, do the servings increase or decrease? Study 2 replicates the effect, while controlling for consumers' perceptions of the substance, shape and healthiness of the products. Study 3 investigates the underlying mechanism and shows that restrained eating is a boundary condition for the squeeze tube effect.

2. Study 1

With Study 1, we investigate whether squeeze tubes facilitate or reduce consumers' chosen serving sizes and thus whether motor fluency theory or ease of consumption monitoring theory holds. We selected baking butter as the focal product, which is available in both an easy-to-handle squeeze tube and a less easy-to-handle butter pack in reality, with widespread adoption of both formats in the country in which we conducted this study.

2.1. Method

2.1.1. Participants

In total, 82 respondents from a large western European university participated in Study 1. Three respondents were excluded because they did not use any butter to fry their egg, as required by the experiment, or because they made the precise measurement of their butter usage impossible. Thus, 79 students (41 women; $M_{\text{age}} = 20.64$ years, $SD_{\text{age}} = 0.88$) entered the analyses. To test participants' varying consumption, depending on product packaging, we created a between-subjects design with two conditions (squeeze tube vs. traditional container), to which they were randomly assigned.

2.1.2. Procedure

Participants were invited to the university consumer lab and received the same assignment: "We would like to ask you to fry an egg as we are interested in the actions consumers undertake to break an egg. In the room next door, you will find the equipment you need to fry an egg (electrical fire, egg, butter, pan, ...). You can fry the egg any way you like (sunny side up, scrambled egg, omelet, ...) and you can choose whether you want to eat the egg afterwards or not." By giving each participant these instructions, we concealed the purpose of the experiment; that is, participants focused on breaking the egg rather than on the volume of baking butter they used.

Each participant entered the room separately and received all the noted equipment, including butter. We carefully measured upfront the weight of the butter before providing it, as random fluctuations in weight are common, even for standardized products. Moreover, we gave each participant a full, unused butter package (squeeze tube or butter pack), which ruled out the possibility that a respondent might determine the portion on the basis of what a previous person took (i.e., anchoring effect; Tversky & Kahneman, 1974). Participants in the easy-to-handle condition received baking butter in a squeeze tube; those in the less easy-to-handle condition used a baking butter pack. The brand, weight, and colors on the packaging were the same for both conditions; only the way participants handled the packages differed. After reading the assignment, each participant fried an egg and provided additional information, such

as their age, gender, and their weight and height. We weighed how much butter they had used after they completed the experiment.

2.2. Results and discussion

A one-way analysis of variance (ANOVA)^{1,2} shows that participants using the squeeze tube used less of the baking butter than participants using the traditional container ($M_{\text{squeeze tube}} = 4.52$ g, $SD_{\text{squeeze tube}} = 2.75$; $M_{\text{pack}} = 6.42$ g, $SD_{\text{pack}} = 3.38$; $F(1, 77) = 7.47$, $p = 0.008$), in preliminary support of H_2 rather than H_1 (Fig. 1).

Thus, by investigating the effect of an easy-to-handle squeeze tube versus a traditional, less easy-to-handle container on respondents' serving sizes, we found support for H_2 , which aligned with the ease of consumption monitoring theory. However, this preliminary evidence for H_2 suffers three shortcomings. First, the squeeze tube contained fluid butter, whereas the traditional container contained solid butter. The difficulty of estimating a solid substance compared with a fluid substance might have biased the findings. Second, respondents' perceptions of the healthiness of solid versus fluid butter may differ, which also could have induced a bias. Third, both products contained the same amount of baking butter, but the squeeze tube had a vertical shape, whereas the butter pack was horizontal, which might have led to a bias. Previous research has shown that people only use vertical dimensions to estimate portions (Piaget, 1969; Raghuram & Krishna, 1999). Therefore, consumers might have perceived that the squeeze tube contained more of the product, compared with the butter pack, which could have affected their consumption. To overcome these shortcomings, the experimental condition in Study 2 maintains both the type of substance and the vertical–horizontal positioning constant and measures respondents' healthiness perceptions.

3. Study 2

In Study 2, we use mayonnaise; its product substance is the same in the easy-to-handle and less easy-to-handle conditions, and both packages (squeeze tube and jar) have vertical shapes. Both formats also are available in reality and widely adopted in the study setting. Participants in the easy-to-handle condition used mayonnaise in a squeeze tube; participants in the less easy-to-handle condition used mayonnaise in a jar with a teaspoon (5 ml = 0.17oz). Because we could not perfectly match the weight of both packages, we chose to use a 300 ml (instead of 550 ml) jar and a small spoon compared with a 450 ml squeeze tube. Previous research has shown that bigger packages and bigger spoons accelerate usage volume (Wansink, 1996, 2004), and we wanted to ensure that the effect could not be attributed to this bias. Therefore, as a more conservative test, we used the smaller 300 ml jar with a small spoon instead of the bigger jar.

3.1. Method

3.1.1. Participants

In total, 83 students from a large western European university participated in Study 2. Of these, 12 were excluded due to incomplete data (8 did not use any mayonnaise, and 4 did not complete some of the questions). Thus, the analyses were based on 71 respondents (39 women; $M_{\text{age}} = 21.86$ years, $SD_{\text{age}} = 3.73$). To test whether participants' consumption differed depending on the product packaging they used, we created a between-subjects design with two conditions (squeeze tube vs. jar), to which they were randomly assigned.

3.1.2. Procedure

University students who were subscribed to participate in lab experiments received the following information upfront: "We are looking for students who want to participate in a taste test of soft drinks. To arouse thirst, French fries will be provided." By providing this information, we concealed the purpose of our experiment, such that participants likely focused on the taste of soft drinks. We also chose to provide French fries, because mayonnaise is often consumed with French fries in the country under investigation.

Participants were invited to the university consumer lab. Before they completed the soft drink taste test, each participant entered the lab separately and was told that he or she could put some mayonnaise on a plate and that the French fries would be served soon. As in Study 1, we gave each participant a new package, to rule out any anchoring effects (Tversky & Kahneman, 1974). Participants in the easy-to-handle condition received mayonnaise in a squeeze tube, and those in the less easy-to-handle condition used mayonnaise in a jar. The weight of both packages was carefully measured upfront. The brand, vertical orientation of the product, and colors on the packaging were the same for both conditions. Once they served themselves mayonnaise, participants entered another room and received their French fries, then started the soft drink taste test. After they finished this taste test, they completed a survey that asked about how user friendly the packaging was ("The packaging increases the user friendliness" and "I can easily use the mayonnaise due to the packaging"; 1 = "totally disagree," to 7 = "totally agree"), how healthy they thought mayonnaise was (1 = "not healthy at all," to 7 = "very healthy"), their experience with the packaging ("I have experience with the packaging of the product"; 1 = "totally disagree," to 7 = "totally agree"), their gender, age, weight and height. Each time a respondent left the room, the experiment leader carefully weighed the remaining squeeze tube or jar.

3.2. Results and discussion

First, we confirmed that participants perceived the squeeze tube as more user friendly than the jar. The two statements measuring user friendliness correlated at 0.82. A one-way ANOVA showed that participants perceived the squeeze tube as more user friendly ($M_{\text{squeeze tube}} = 5.68$, $SD_{\text{squeeze tube}} = 0.19$; $M_{\text{jar}} = 3.32$, $SD_{\text{jar}} = 0.18$; $F(1,69) = 78.15$, $p < 0.001$). However, participants' healthiness perceptions of the mayonnaise did not differ between the two conditions ($F(1,69) = 0.40$, $p = \text{ns}$): They considered the mayonnaise in the jar ($M = 2.16$, $SD = 0.15$) equally unhealthy as mayonnaise in the squeeze tube ($M = 2.03$, $SD = 0.15$). Second, a one-way ANOVA^{1,2} showed that participants in the easy-to-handle condition used less mayonnaise than those in the less easy-to-handle condition ($M_{\text{squeeze tube}} = 8.38$ g, $SD_{\text{squeeze tube}} = 3.97$; $M_{\text{jar}} = 13.08$ g, $SD_{\text{jar}} = 5.13$; $F(1,69) = 18.35$, $p < 0.001$), in additional support of H_2 and ease of consumption monitoring theory (Fig. 2). Adding experience with the type of packaging as a covariate did not influence these results either.

4. Study 3

Study 2 replicated the findings of Study 1, such that participants used more when they dealt with packaging that was less easy to handle, so the ease of consumption monitoring appears to be driving the outcomes, rather than motor fluency. In Study 3, we seek to provide more hard evidence that the ease of consumption monitoring mediates the relationship between packaging and consumers' serving sizes, while ruling out a motor fluency explanation. In addition, we test whether the ease of consumption monitoring is different for (un)restrained eaters (H_3). Because restrained eaters pay a lot of attention to what and how much they consume, we do not expect substantial differences across packages. In other words, we argue that for

¹ Similar results are obtained with non-parametric tests.

² Gender distribution, age, and BMI did not differ significantly across the experimental groups.

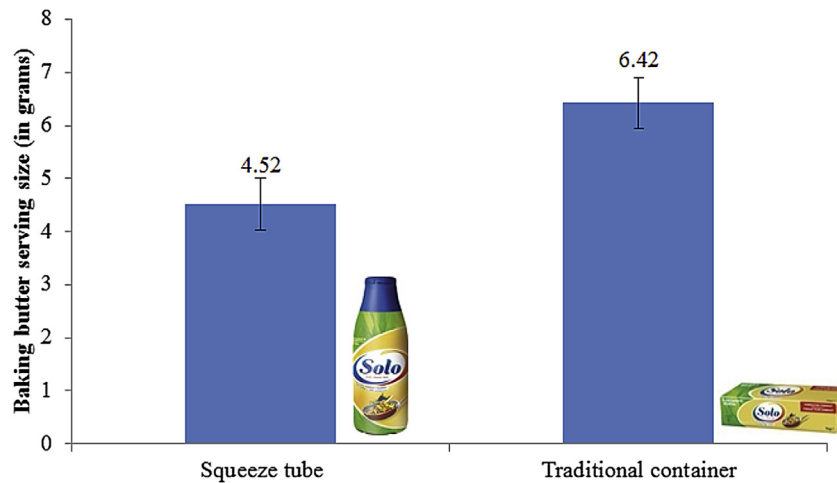


Fig. 1. Study 1: Main effect of squeeze tube vs. traditional container on baking butter serving size. (The standard error of the mean is marked by bars).

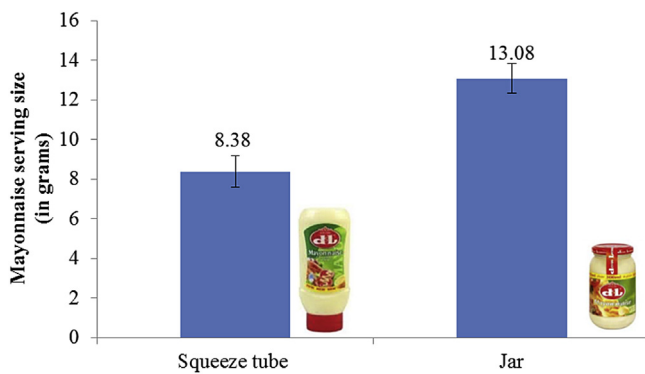


Fig. 2. Study 2: Main effect of squeeze tube vs. jar on mayonnaise serving size, holding substance and vertical positioning constant. (The standard error of the mean is marked by bars).

restrained eaters, consumption monitoring will be likely and easy for both easy-to-handle and less easy-to-handle packages as long as the packaging does not provide misleading cues. This because restrained eaters are used to monitor their consumption. Among unrestrained eaters, who are less concerned with their weight, we predict that the ease of consumption monitoring will differ across packages.

4.1. Method

4.1.1. Participants

In total, 128 students from a large western European university participated in Study 3. Twenty participants were excluded because they never eat mayonnaise, leaving 108 participants (63 women; $M_{\text{age}} = 21.50$ years, $SD_{\text{age}} = 2.15$) for the analyses. To test the underlying process driving the packaging effects, we created a between-subjects design with three conditions, to which participants were randomly assigned: (1) easy-to-handle condition (mayonnaise in a regular squeeze tube, 450 ml), (2) less easy-to-handle condition (mayonnaise in a 300 ml jar and a teaspoon (5 ml)), and (3) a third condition in which we adapted the easy to handle packaging and made the opening bigger. Thus, the motor fluency experience is constant across conditions 1 and 3, both squeeze tubes require the same type of movement, a consumer needs to squeeze the bottle. In other words, the fluency that arises from the use of the motor system, is the same for both squeeze tubes (see Appendix for pictures). However, the ease of consumption monitoring is impeded in the latter as the opening is made bigger.

4.1.2. Procedure

Similar to Study 2, participants were told that they would take part in a soft drink taste test and that French fries would be provided. After they put mayonnaise on their plate, received French fries, and participated in the taste test, they completed a survey that measured ease of consumption monitoring (three items: “I have the feeling that I unconsciously used too much mayonnaise,” “I was able to monitor how much mayonnaise I took,” and “It was easy to keep track of how much mayonnaise I put on the carton plate”; seven-point scales: 1 = “totally disagree,” to 7 = “totally agree”, Cronbach's $\alpha = 0.65$), restrained eating (Dutch Eating Behavior Questionnaire with five-point scale; van Strien, Frijters, Bergers, & Defares, 1986; e.g., “Do you watch exactly what you eat?”; 1 = “never,” to 5 = “very often”, Cronbach's $\alpha = 0.93$), their perceptions of the healthiness of mayonnaise (1 = “not healthy at all,” to 7 = “very healthy”), their gender, age, weight and height.

4.1.3. Results and discussion

A one-way ANOVA^{1,3} shows that the consumers' serving sizes differed across package formats ($F(2,105) = 16.61$, $p < 0.001$). Planned contrasts show that participants using the regular squeeze tube ($M_{\text{regular squeeze tube}} = 6.57$ g, $SD_{\text{regular squeeze tube}} = 3.10$) used less mayonnaise than participants using either the jar ($M_{\text{jar}} = 13.72$ g, $SD_{\text{jar}} = 5.73$; $t(59.16) = -6.56$, $p < 0.001$) or the adapted squeeze tube ($M_{\text{adapted squeeze tube}} = 12.19$ g, $SD_{\text{adapted squeeze tube}} = 6.04$; $t(61.08) = -5.06$, $p < 0.001$; Fig. 3). Consumption by participants using the squeeze tube differed significantly from that of participants using the adapted squeeze tube ($M_{\text{squeeze tube}} = 6.57$ g, $M_{\text{adapted squeeze tube}} = 12.19$ g; $t(61.08) = 5.06$, $p < 0.001$). This finding excludes motor fluency as an explanatory variable as motor fluency was held constant in both conditions. Furthermore, healthiness perceptions of the mayonnaise did not differ across the three conditions ($F(2,105) = 0.71$, $p = \text{ns}$).

Finally, we tested our prediction that the ease of consumption monitoring was underlying the squeeze tube effect and that ease of consumption monitoring differs across (un)restrained eaters. To this end, we ran a moderated mediation analysis, with the normal squeeze tube versus the jar as the independent variable, serving volume as the dependent variable, ease of consumption as a mediator, and restrained eating moderating the effect of the packaging type on ease of consumption monitoring (Fig. 4).

³ Gender distribution, age, BMI and restrained eating did not differ significantly across the experimental groups.

With a test of moderated mediation (Preacher & Hayes, 2008), we assessed the strength of the hypothesized indirect effect, conditional on the value of the moderator (i.e., restrained vs. unrestrained eaters). We focused on the effect of the easy-to-handle (regular squeeze tube) vs. less easy-to-handle (jar) package on consumption, with ease of consumption monitoring as a mediator of which the a path (i.e., from packaging type to ease of consumption monitoring) is moderated by restrained eating. A 5000-resample bootstrap analysis indicated a significant conditional indirect (i.e., moderated mediation) effect at the $p < 0.05$ level for participants scoring low on the restrained eating scale (i.e., unrestrained eaters, mean–1SD) (95% confidence interval [CI] 0.40 to 3.96, effect size = 1.84). That is, the easy-to-handle packaging made monitoring easier ($a = 2.32$, $p < 0.001$), which led to smaller serving sizes ($b = -1.20$, $p < 0.05$). The same conclusion can be drawn for participants who scored neutral on the restrained eating scale (95% CI, 0.25 to 2.80, effect size = 1.27). For participants scoring high on the restrained eating scale (i.e., restrained eaters, mean + 1SD), the indirect effect was not significant (95% CI, 0–0.2 to 2.28). In line with our expectations, for these eaters, packaging had no effect on serving sizes. Furthermore, as the direct effect (see Fig. 4, $c' = -5.90$, $p < 0.001$) remains significant after controlling for the mediator, ease of consumption monitoring only partially mediates the relationship between packaging type and serving size. Finally, the total effect of the moderated mediation analysis is significant ($c = -8.69$, $p < 0.001$).

5. General discussion

The results from a series of three studies provide consistent evidence for our proposition that using squeeze tubes, versus traditional containers, decreases the serving sizes that consumers choose for themselves, and that the ease of monitoring drives this effect. Because squeeze tubes increase the ease of monitoring, more attention is paid to the serving size and consumers serve themselves less of the product. Being an unrestrained (restrained) eater enhances (attenuates) this effect: Whereas restrained eaters already pay attention to their serving sizes and are used to monitoring both easy-to-handle squeeze tubes and less easy-to-handle jars, unrestrained eaters greatly benefit from their use of squeeze tubes, because they see the volume of the product steadily increasing on their plate while squeezing the tube.

All three studies provide strong support for our main proposition and rely on actual behavioral data, but each study also makes a unique contribution. Study 1 provides the initial evidence for the proposed effect, showing that consumers use less baking butter to fry an egg when it comes in a squeeze tube. Study 2, with a different product, shows that people put less mayonnaise on their plate when it comes in a squeeze tube. This study also controls for the substance,

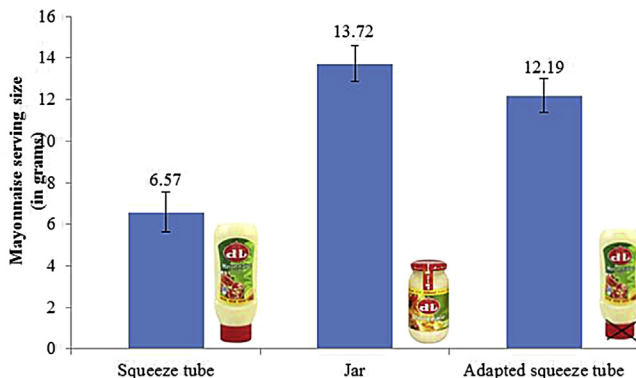
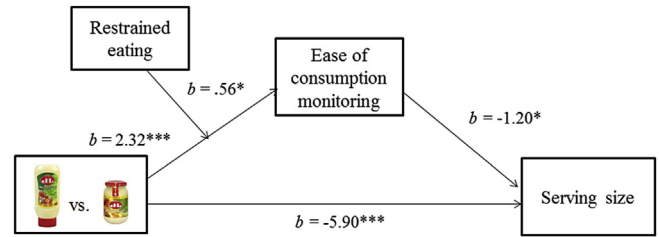


Fig. 3. Study 3: Mayonnaise serving size of squeeze tube, traditional container, and adapted squeeze tube. (The standard error of the mean is marked by bars).



$p < .05$; *** $p < .001$

Fig. 4. Moderated mediation analysis: unstandardized regression coefficients for the relationship between packaging type and serving size, mediated by ease of consumption monitoring and moderated by restrained eating.

healthiness perceptions, and product orientation (vertical vs. horizontal) as potential confounding variables. Finally, Study 3 pinpoints the ease of monitoring as a determinant of the packaging effect, while also identifying (un)restrained eating as a boundary condition.

5.1. Theoretical contributions

We extend previous research by introducing user-friendly packaging as a key attribute, with substantial implications for consumption behavior. As consumers nowadays expect that products come in user-friendly packaging, the demand for and supply of squeeze tubes is likely to grow even further. As such, a better understanding of how squeeze tubes impact consumers' serving size was called for.

Second, by comparing an easy-to-handle package against a more traditional package, we add to consumption monitoring literature and theory about how people reduce discrepancies between their perceived and actual consumption (Baumeister, 2002; Carver & Scheier, 1998; Polivy et al., 1986). Extant consumption monitoring research focuses almost exclusively on the impact of visual cues, such as package sizes (Coelho do Vale et al., 2008) or material (Deng & Srinivasan, 2013). We show that the ease of handling the package also affects the ease of consumption monitoring, because the product's substance—not the packaging per se—becomes more prominent for the consumer.

Third, we add to extant literature regarding the influence of restrained eating (e.g., Cavanagh & Forestell, 2013; Rogers & Hill, 1989; Scott et al., 2008). Rather than focusing on the impact of visual cues, such as food labeling (Cavanagh & Forestell, 2013) or package sizes (Scott et al., 2008), we reveal that the effect of the ease of handling the package, through the ease of monitoring, on consumers' serving sizes is moderated by (un)restrained eating.

With these insights, we thus respond to calls for more research and a better understanding of how product manufacturers might influence consumers' serving size choices, through their packaging designs.

5.2. Consumer, public policy, and managerial implications

This research has important implications for understanding the potential contributors to overeating, as well as for defining optimal packaging strategies. Many consumers pursue health goals but also fail to resist the many temptations that surround them. Therefore, strategies other than simply promoting the pursuit of health might be more effective. In this sense, our study findings offer consumers an effective tool for decreasing their servings of unhealthy products: Changing the type of packaging they use might help them avoid overconsumption of such products.

Product manufacturers can also benefit from our findings. They have vested interests in understanding the effects of ease of product handling on the serving sizes that consumers choose.

Product manufacturers have control over the extent to which they promote their products in squeeze tubes. As consumers use more of a product when it comes in a traditional container, product manufacturers might promote products traditional containers or raise the price of squeeze tubes.

5.3. Limitations and further research

This study has several limitations that suggest avenues for research. First, we conducted all three studies in the same European country. The relative prices of squeeze tubes and traditional containers, healthiness perceptions, (un)restrained eating attitudes, and adoption rates for squeeze tubes all might vary across countries, which suggests that the impact of squeeze tubes, through the ease of consumption monitoring, on consumers' serving sizes might differ across countries too. Further research should seek to replicate our findings across countries. The impact of consumption monitoring already has been demonstrated in a North American context (Giner-Sorolla, 2001; Polivy et al., 1986; Scott et al., 2008; Wertenbroch,

1998), so we predict that the differences we observed in this European context hold in other Western nations as well.

Additional research also should consider more long-term effects and investigate whether the decrease in consumers' serving sizes when they used squeeze tubes persists over time, according to retail data. Lastly, our studies focus on relatively unhealthy products, for which most consumers want to restrict their consumption. It would be interesting to see whether this packaging effect also applies to healthy foods in squeeze tubes.

Acknowledgements

This research was financially supported by the Research Foundation Flanders (FWO, 3G063110W).

Appendix

Regular squeeze tube



Adapted squeeze tube



References

- Alter, A. L., & Oppenheimer, D. M. (2009). Uniting the tribes of fluency to form a metacognitive nation. *Personality and Social Psychology Review*, *13*(3), 219–235.
- Baumeister, R. F. (2002). Yielding to temptation: Self-control failure, impulsive purchasing, and consumer behavior. *Journal of Consumer Research*, *28*(4), 670–676.
- Beilock, S. L., & Holt, L. E. (2007). Embodied preference judgments: Can likeability be driven by the motor system? *Psychological Science*, *18*(1), 51–57.
- Bharat Book Bureau. (2015). *Tube & stick packaging market demand in the US to 2018*. Retrieved April 29, 2016, from <http://prsync.com/bharat-book-bureau/tube-stick-packaging-market-demand-in-the-us-to-663252/>.
- Carver, C. S., & Scheier, M. F. (1998). *On the self-regulation of behavior*. New York: Cambridge University Press.
- Cavanagh, K. V., & Forestell, C. A. (2013). The effect of brand names on flavor perception and consumption in restrained and unrestrained eaters. *Food Quality and Preference*, *28*(2), 505–509.
- Cavanagh, K. V., Kruja, B., & Forestell, C. A. (2014). The effect of brand and caloric information on flavor perception and food consumption in restrained and unrestrained eaters. *Appetite*, *82*, 1–7.
- Coelho do Vale, R., Pieters, R., & Zeelenberg, M. (2008). Flying under the radar: Perverse package size effects on consumption self-regulation. *Journal of Consumer Research*, *35*(3), 380–390.
- Deng, X., & Srinivasan, R. (2013). When do transparent packages increase (or decrease) food consumption? *Journal of Marketing*, *77*(4), 104–117.
- Elder, R. S., & Krishna, A. (2012). The visual depiction effect in advertising: Facilitating embodied mental simulation through product orientation. *Journal of Consumer Research*, *38*(6), 998–1003.
- Giner-Sorolla, R. (2001). Guilty pleasures and grim necessities: Affective attitudes in dilemmas of self-control. *Journal of Personality and Social Psychology*, *80*(2), 206–221.
- Piaget, J. (1969). *The mechanisms of perception*. London: Routledge & Kegan Paul.
- Ping, R. M., Dhillon, S., & Beilock, S. L. (2009). Reach for what you like: The body's role in shaping preferences. *Emotion Review*, *1*(2), 140–150.
- Polivy, J., Herman, C. P., Hackett, R., & Kuleshnyk, I. (1986). The effects of self-attention and public attention on eating in restrained and unrestrained subjects. *Journal of Personality and Social Psychology*, *50*(6), 1203–1224.
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in simple and multiple mediator models. *Behavior Research Methods*, *40*(3), 879–891.
- Raghubir, P., & Krishna, A. (1999). Vital dimensions in volume perception: Can the eye fool the stomach? *Journal of Marketing Research*, *36*, 313–326.
- Rogers, P. J., & Hill, A. J. (1989). Breakdown of dietary restraint following mere exposure to food stimuli: Interrelationships between restraint, hunger, salivation, and food intake. *Addictive Behaviors*, *14*(4), 387–397.
- Scott, M. L., Nowlis, S., Mandel, N., & Morales, A. C. (2008). The effects of reduced food size and package size on the consumption behavior of restrained and unrestrained eaters. *Journal of Consumer Research*, *35*(3), 391–405.
- van Strien, T., Frijters, J. E. R., Bergers, G. P. A., & Defares, P. B. (1986). The Dutch eating behavior questionnaire (DEBQ) for assessment of restrained, emotional and external eating behavior. *International Journal of Eating Disorders*, *5*, 747–755.
- Tversky, A., & Kahneman, D. (1974). Judgement and uncertainty: Heuristics and biases. *Science*, *185*(4157), 1124–1131.
- Wansink, B. (1996). Can package size accelerate usage volume? *Journal of Marketing*, *60*, 1–14.
- Wansink, B. (2004). Environmental factors that increase the food intake and consumption volume of unknowing consumers. *Annual Review of Nutrition*, *24*, 455–479.
- Werthenbroch, K. (1998). Consumption self-control by rationing purchase quantities of virtue and vice. *Marketing Science*, *17*(4), 317–337.