

THE ROLE OF HAPTIC PRODUCT EXPERIENCE IN CONSUMER EVALUATION: AN EYE-TRACKING AND PUPILLOMETRY STUDY OF REUSABLE BOTTLES

Jan Vrána¹, Stanislav Mokrý¹, Michal Pšurný¹

¹Department of Marketing and Trade, Faculty of Business and Economics, Mendel University in Brno, Zemědělská 1, 613 00 Brno, Czech Republic

DOI: https://doi.org/10.11118/ecos2026_041

ABSTRACT

This study examines how physical and digital product presentation shape consumer evaluation in the context of reusable water bottles. The research focuses on whether the possibility of direct tactile interaction with a product influences perceived attractiveness, purchase intention, certainty of evaluation, and pupil response. An experimental design combining eye-tracking, pupillometry, and a post-exposure questionnaire was used to compare electronic product presentation with physical presentation involving product handling. The findings suggest that tactile interaction did not systematically change perceived product attractiveness. However, for selected products, the form of presentation affected purchase intention and certainty of evaluation, indicating that haptic information may become relevant when material or functional product characteristics are salient. The pupillometry results showed differences between physical and electronic presentation, although pupil dilation was not consistently associated with product attractiveness or purchase intention. Overall, the study contributes to sensory marketing research by showing that physical product experience may influence selected aspects of consumer decision-making, while its effect depends on the specific product and evaluated attribute. The results also highlight both the potential and limitations of pupillometry as a complementary method for studying consumer responses to haptic product presentation.

Keywords: haptics, product presentation, eye-tracking, pupillometry, consumer decision-making, sensory marketing, reusable bottles

JEL Code: M300, M310



This article is licensed under CC BY-SA 4.0 Attribution-ShareAlike 4.0 International license. <https://creativecommons.org/licenses/by-sa/4.0/deed.en>

1 INTRODUCTION

Online shopping has become an increasingly common way of purchasing a wide range of goods and services. This trend is reflected in the growing number of online shoppers and the increasing revenues generated by e-commerce. In the online environment, products are typically presented through several formats, most commonly photographs accompanied by product descriptions, zoom functions, product videos (Boardman and McCormick, 2019), or virtual mirrors (Cho and Schwarz, 2012). These presentation formats are designed to introduce the product to consumers, communicate its features, and motivate purchase.

Their main purpose is to provide consumers with relevant product information that supports the purchase decision-making process. However, most online presentation formats rely primarily on visual stimuli, or on a combination of visual and auditory stimuli. As a result, consumers are unable to touch, try, or physically experience the product due to the barrier between the virtual and physical shopping environments. Product presentation can therefore range from purely digital or multimedia-based formats to direct physical contact with the product, where information is acquired not only through vision and hearing but also through other senses, particularly touch.

This study is situated within the field of sensory marketing and focuses on the effect of product presentation form on consumer decision-making. Specifically, it compares two forms of product presentation: electronic and physical. Reusable water bottles were selected as the product category because their material, weight, shape, and handling characteristics may be relevant to consumer evaluation. The study uses eye-tracking with pupillometry to capture changes in pupil size, which may reflect consumers' physiological responses to product stimuli. These data are complemented by a questionnaire assessing consumers' perceptions of the different presentation forms.

2 LITERATURE REVIEW

2.1 Haptics and its effect on the consumer decision-making process

Although online shopping and various forms of digital product presentation have become common, e-commerce may still be perceived as less suitable for evaluating products with specific physical characteristics, such as material, texture, workmanship, and overall quality (Suh *et al.*, 2018). These attributes are often difficult to assess online, although they may play an important role in the consumer decision-making process. Their limited accessibility can therefore complicate product evaluation and increase the perceived risk associated with purchase decisions (Verhagen *et al.*, 2016). The absence of physical contact is particularly relevant because sensory perception influences emotions, memories, preferences, product choice, and product use (Suh *et al.*, 2018). Touch is especially important in retail settings, where direct product contact is a natural part of product evaluation and consumer behaviour (Holbrook, 1983).

Previous research suggests that the possibility of touching a product can influence consumers' attitudes, purchase decisions, trust in the product, and perceived product attractiveness. Direct physical contact enables consumers to evaluate the physical characteristics of a product more accurately. Peck and Childers (2003) argue that consumers often prefer to touch products before purchase, particularly when material characteristics are relevant to product evaluation. Vision

and touch are among the dominant senses through which consumers explore product characteristics (Balaji *et al.*, 2011). Similarly, Schifferstein and Cleiren (2005) suggest that when both visual and tactile information are available, consumers may form a stronger and more confident evaluation of the product.

The importance of touch in consumer behaviour has also been demonstrated in several empirical studies. Balaji *et al.* (2011) examined the effect of tactile and visual stimuli on product attitude, product evaluation, and purchase intention. Their findings indicate that tactile product information can significantly influence product evaluation. In their study, tactile stimuli had a stronger effect on attitude and purchase intention than visual stimuli. Participants also evaluated products more positively and with greater certainty when they were able to touch them; in contrast, the absence of touch could negatively affect product perception. Similar conclusions were reported by Subhash *et al.* (2019), who examined the role of touch in overall product evaluation. Their study, conducted in the United States and replicated in India, found that touch had a positive effect mainly for products with characteristics that needed to be explored haptically, such as blankets. For products for which touch was less relevant, such as flash drives, this effect was not confirmed. However, Vieira (2012) did not find evidence that touch necessarily changes purchase probability.

2.2 Tactile research using neuroscientific and psychophysiological methods

Haptics has also been studied using neuroscientific and psychophysiological methods. Compared with self-report methods, these approaches can provide more immediate and less verbally mediated data on consumer responses. They may also reduce some limitations associated with retrospective questioning, because self-reported answers are typically collected after exposure to the stimulus and may be influenced by memory, interpretation, or response bias. However, only a limited number of studies have examined haptics in relation to marketing and consumer decision-making using such methods (Vrána and Mokřý, 2020).

Park *et al.* (2015, 2018), for example, investigated the relationship between the physical characteristics of a product and consumer preference and satisfaction using EEG. Their findings showed an association between preference and gamma oscillations. Francis *et al.* (1999) also demonstrated that different types of touch, including pleasant, neutral, and painful touch, are associated with activity in different brain areas. Despite their potential, neuroscientific methods are not yet widely used in this research area, partly because they are often costly, technically demanding, and time-consuming (Vrána and Mokřý, 2020). For this reason, less demanding methods, such as eye-tracking and pupillometry, may offer a useful alternative for studying consumer behaviour.

Pupillometry is based on the measurement of changes in pupil size. According to Loewenfeld (1993), pupil size is not influenced only by the amount of light in the environment, but may also respond to non-visual stimuli, emotions, and cognitive processes. Pupil responses have been linked to mental effort, surprise, attention, decision certainty, belief formation, and information gain (Zénon, 2019). Pupil dilation has also been associated with food preference, taste, and music perception (Sirois and Brisson, 2014). These findings suggest that pupillometry may be useful for capturing physiological responses that accompany product evaluation.

Bertheaux *et al.* (2020) used pupillometry to measure emotional responses during tactile interaction with different material surfaces. Their results showed changes in pupil size during the first two seconds of touch, and the pattern of pupil response was consistent with findings reported by Bradley *et al.* (2008). Pupil dilation was observed in response to both positively and negatively

evaluated stimuli when compared with neutral stimuli. Similar use of pupil dilation as an indicator of consumer response can be found in Laeng *et al.* (2016), who focused on wine labels, and in Ramsøy *et al.* (2017), who examined clothing and found a relationship between pupil dilation and product preference.

2.3 Hypotheses development

The main objective of this study is to determine whether the form of product presentation, i.e. electronic or physical, influences consumer decision-making in the context of reusable water bottles. To achieve this objective, the study combines eye-tracking and pupillometry with questionnaire-based evaluation. The following hypotheses were formulated in relation to the research objective.

H1: There is no difference between electronic and physical product presentation in perceived bottle attractiveness.

This hypothesis is based on Peck and Wiggins (2006), who suggest that the possibility of touching a product may increase its perceived attractiveness.

H2: There is no difference between electronic and physical product presentation in purchase intention.

This hypothesis is based on McCabe *et al.* (2003), Peck and Wiggins (2006), and Balaji *et al.* (2011), whose studies indicate that consumers may be more likely to purchase a product when they are able to touch it before making a decision.

H3: There is no difference between electronic and physical product presentation in certainty of product evaluation.

This assumption follows Grohmann *et al.* (2007) and Balaji *et al.* (2011), who suggest that consumers may be more certain about their evaluation when they can physically interact with the product.

H4: There is no difference in pupil response between electronic and physical product presentation.

This hypothesis builds on the assumption that pupil dilation may reflect mental effort or arousal (Kahneman, 2013). Since physical product presentation involves product handling and tactile exploration, it may elicit a different pupil response than electronic presentation.

H5a: There is no difference in pupil response across levels of perceived attractiveness during electronic product presentation.

H5b: There is no difference in pupil response across levels of perceived attractiveness during physical product presentation.

H6a: There is no difference in pupil response across levels of purchase intention during electronic product presentation.

H6b: There is no difference in pupil response across levels of purchase intention during physical product presentation.

These hypotheses are based on previous studies suggesting that pupil dilation may occur in response to emotionally or motivationally relevant stimuli, including both positively and negatively evaluated stimuli, compared with neutral stimuli (Bertheaux *et al.*, 2020; Bradley *et al.*, 2008; Laeng *et al.*, 2016; Ramsøy *et al.*, 2017). In the present study, pupil response is therefore examined in relation to perceived attractiveness and purchase intention under both electronic and physical presentation conditions.

3 METHODOLOGY AND DATA

3.1 Preparatory phase of research

Reusable water bottles were selected as stimuli for this study. This product category was chosen because reusable bottles differ in several physical characteristics, such as material, weight, shape, and surface properties. These characteristics may be relevant for product evaluation and may increase the importance of touch during physical product presentation (Klatzky and Lederman, 1992, 1993; Chen *et al.*, 2009; Vieira, 2012).

In total, 25 reusable bottles were selected. Their prices ranged from 39 to 999 CZK, their volume ranged from 0.5 to 1 litre, and they represented six different types of material. The products were divided into two comparable groups for the purpose of A/B testing. Bottle no. 25 was used only during the preparatory phase and was not included in the main analysis.

Graphical materials were prepared for each stimulus. These materials consisted of real product photographs obtained from online sources and were supplemented with specific product information, including manufacturer, product name, volume, weight, height, material, price, and additional characteristics.

The eye-tracking experiment was created in SR Research Experiment Builder, version 2.2.61, and consisted of two versions, A and B. Both versions included 24 reusable bottles. In version A, the first 12 bottles from the first product group were accompanied by a hand symbol, indicating that participants would see the bottle on the screen and could also touch and manipulate the physical product. The remaining 12 bottles were accompanied by an eye symbol, indicating that the product would be presented only visually on the monitor. Version B used the opposite assignment of presentation forms to product groups. This design ensured that each product was presented in both conditions across participants, while each participant evaluated a given product in only one presentation condition. Therefore, comparisons between electronic and physical presentation for individual products were treated as between-group comparisons.

The experiment was conducted in a room with covered windows in order to reduce changes in pupil size caused by variations in ambient light. Participants also wore noise-cancelling headphones, which reduced surrounding noise by 27 dB.



Fig. 1: An overview of reusable bottles used in the research

3.2 Research realization phase

The research was conducted at the Faculty of Business and Economics, Mendel University in Brno, between 3 March and 12 March 2020. The sample consisted of 22 participants, including 10 men and 12 women, mostly students aged 18–26. All participants took part in two experimental sessions, which were conducted exactly seven days apart. Eye-tracking data were recorded using a stationary SR Research EyeLink 1000 Plus eye-tracker.

Before each product stimulus was displayed, either a hand symbol or an eye symbol appeared on the monitor for 6,000 ms. If the eye symbol was displayed, participants were informed that the product would be presented only on the monitor. If the hand symbol was displayed, participants saw the product on the monitor and were also given the corresponding physical bottle, which they could touch and manipulate.

All product stimuli, symbols, and fixation crosses were presented on a white background (RGB: 255, 255, 255). Each product stimulus was displayed for 25,000 ms. During the physical presentation condition, a shading desk was placed under the chin rest to prevent participants from

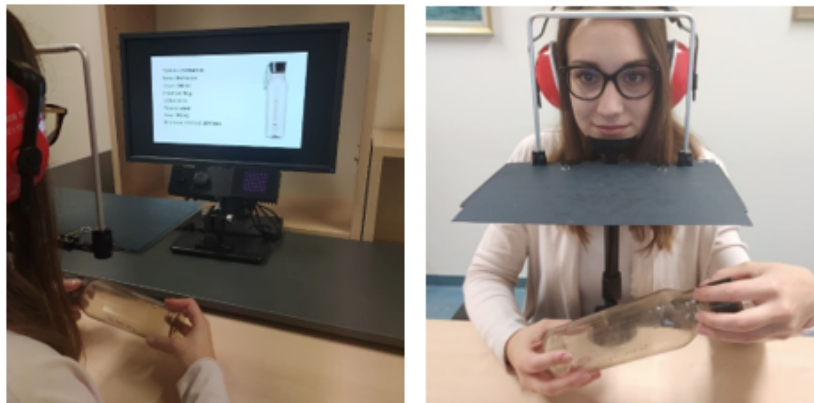


Fig. 2: The experimental procedure: participant handling a test bottle

looking directly at the physical bottle in their hands instead of the image displayed on the monitor. The sequence of stimuli was randomized so that electronic and physical presentation conditions alternated throughout the experiment.

After all stimuli had been presented, participants were informed that the eye-tracking part of the experiment had ended. They then completed an electronic questionnaire displayed on the monitor. In the questionnaire, participants evaluated each bottle in terms of perceived attractiveness, purchase intention, and certainty of evaluation using a seven-point Likert scale.

3.3 Data processing and statistical analysis

The collected data were analysed using IBM SPSS Statistics 25, Microsoft Excel, and SR Research EyeLink Data Viewer. Eye-tracking data were exported for the right eye only, as this was considered sufficient for the purposes of the study. Several variables were used for data analysis and hypothesis testing.

Questionnaire responses were measured on a seven-point Likert scale and were therefore treated as ordinal data. The pupillometric part of the analysis was based on a dilation/constriction coefficient, which captured changes in pupil size during the first two seconds of stimulus exposure. This time window was selected because previous research suggests that the most pronounced pupil response to tactile stimulation may occur shortly after stimulus onset (Bertheaux *et al.*, 2020).

Pupil data were recorded at a sampling frequency of 1,000 Hz. For easier processing, the data were averaged in EyeLink Data Viewer before further analysis. The pupil-size change coefficient was then calculated using the following formula:

$$[d(t) - d(25)] / d(25) \quad (1)$$

In this formula, $d(25)$ represents the mean pupil size during the 25-second stimulus presentation, while $d(t)$ represents pupil size at time t during the first two seconds of exposure. The resulting pupil-size change coefficients were averaged across the first two seconds and used as the main pupillometric variable in hypothesis testing.

The hypotheses concerning the effect of presentation form on perceived bottle attractiveness, purchase intention, and certainty of evaluation were tested using the Wilcoxon rank-sum test. This test was selected because each participant evaluated a given product in only one presentation condition; therefore, the comparison between electronic and physical presentation was based on independent groups. Analysis of variance (ANOVA) or the non-parametric Kruskal–Wallis test was used to determine the effect of perceived attractiveness and purchase intention on pupil-size change in the two presentation conditions. When the assumption of normality was violated, the non-parametric test was used.

4 RESULTS

4.1 Hypothesis 1

As shown in Fig. 3, perceived bottle attractiveness varied for some products depending on the form of presentation. The largest differences were observed for bottles no. 4, 3, and 1, for which physical presentation led to higher attractiveness ratings. In contrast, bottles no. 16, 23, 24, and particularly bottle no. 17 received higher attractiveness ratings in the electronic presentation condition.

However, the Wilcoxon test did not confirm a statistically significant difference in perceived attractiveness between the two presentation forms. Bottles no. 4 and 17 were closest to statistical significance. For bottle no. 4, physical presentation had a positive effect on perceived attractiveness, whereas for bottle no. 17 the opposite pattern was observed.

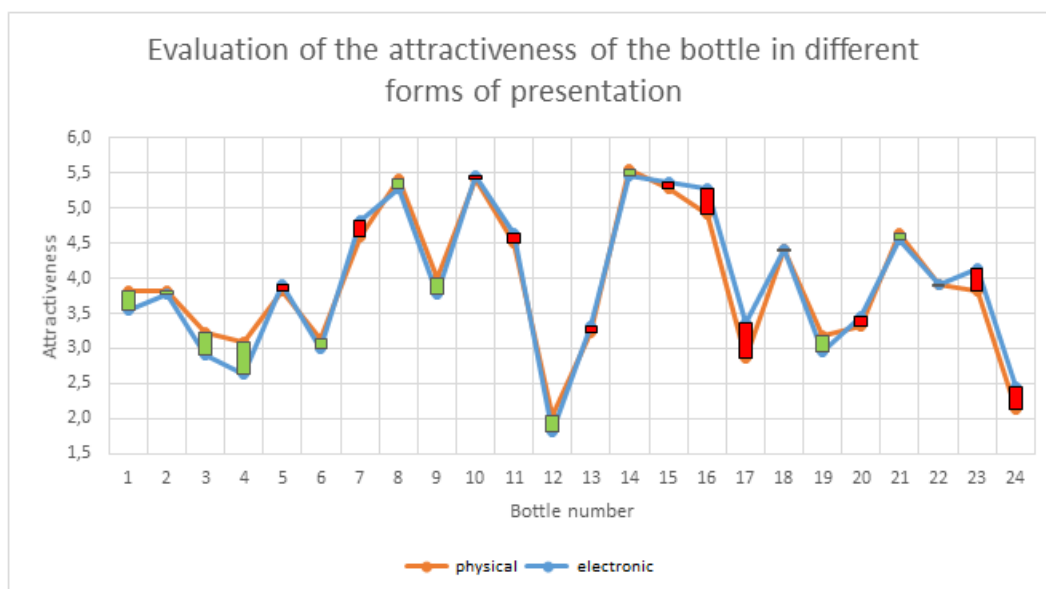


Fig. 3: Bottle attractiveness ratings by presentation form (1 – very unattractive; 7 – very attractive)

4.2 Hypothesis 2

As shown in Fig. 4, purchase intention tended to be more positively affected by physical presentation than by electronic presentation for several products. Positive differences were observed particularly for bottles no. 12 and 13, which were also among the bottles with the lowest overall purchase intention ratings. In contrast, bottle no. 7 showed a substantial decrease in purchase intention in the physical presentation condition.

The Wilcoxon test confirmed a statistically significant effect of presentation form on purchase intention for two bottles. Although differences were also observed for several other bottles, these differences were not statistically significant. Physical presentation had a negative effect on purchase intention for bottle no. 7, whereas a positive effect was observed for bottle no. 12.

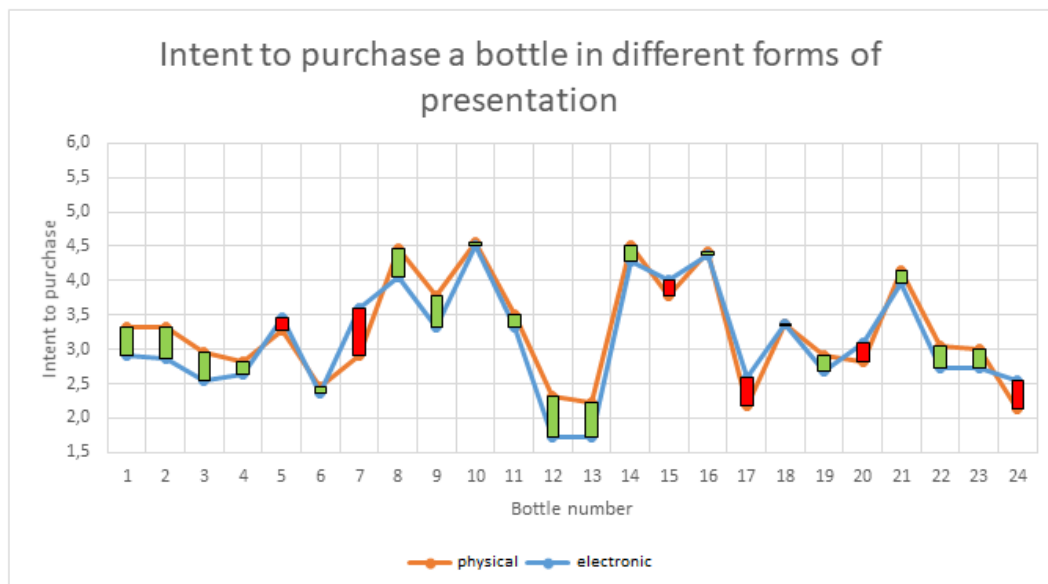


Fig. 4: Purchase intention ratings by presentation form (1 – I am certainly not interested to purchase; 7 – I am certainly interested to purchase)

4.3 Hypothesis 3

The final self-reported variable examined was participants' certainty of evaluation for individual bottles in relation to presentation form. As shown in Fig. 5, differences in certainty ratings were generally small across all products. Mean certainty values ranged between 5.2 and 6.2, indicating relatively high certainty in both presentation conditions.

The Wilcoxon test confirmed a statistically significant effect of presentation form only for bottle no. 20. For the remaining bottles, the differences between electronic and physical presentation were not statistically significant.

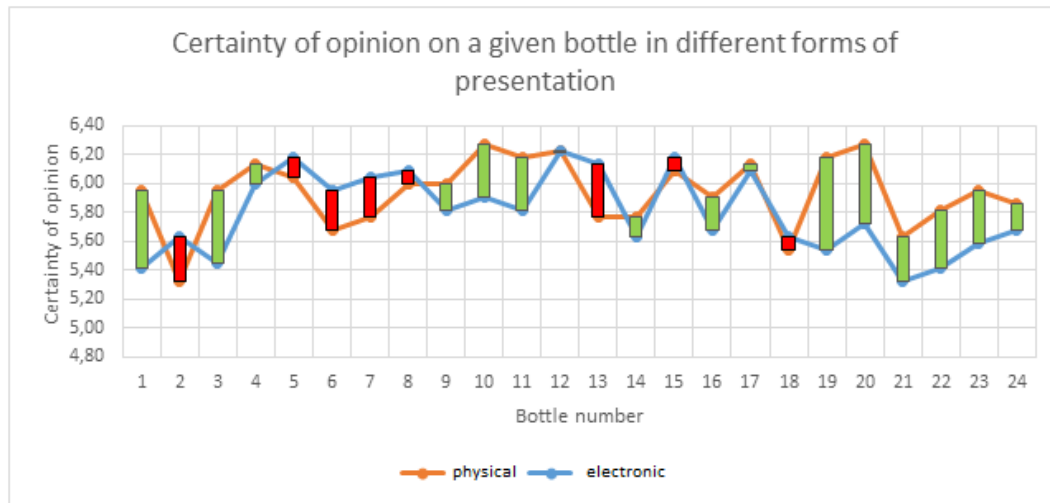


Fig. 5: : Certainty of evaluation by presentation form (1 – I am not certain at all; 7 – I am completely certain) 7 – I am certainly interested to purchase)

4.4 Hypothesis 4

The results showed that presentation form affected pupil-size change in 17 bottles, representing 71% of the analysed products. In the remaining seven bottles, specifically bottles no. 2, 7, 8, 9, 10, 11, and 22, the mean pupil size was higher in the physical presentation condition than in the electronic presentation condition, but these differences were not statistically significant.

Overall, the results indicate a general tendency towards stronger pupil response during physical product presentation. This pattern may be related to the additional effort involved in handling and manipulating the bottles during the physical presentation condition.

4.5 Hypothesis 5a, 5b

Pupil size was used as the dependent variable, while perceived attractiveness was used as the independent variable. The hypotheses were tested using all bottles simultaneously. For the electronic presentation condition, the assumption of normality was met, and analysis of variance was therefore used. For the physical presentation condition, the assumption of normality was not met, and the non-parametric Kruskal–Wallis test was applied.

The results did not confirm a statistically significant effect of perceived attractiveness on pupil-size change in either presentation condition. In both cases, the p-values were above the selected significance level of $\alpha = 0.05$. Therefore, the null hypotheses were not rejected. The physical presentation condition was also tested using the parametric variant of the test for verification, and the results remained unchanged.

4.6 Hypothesis 6a, 6b

The effect of purchase intention on pupil-size change was also not statistically significant. Although the p-values were lower than those obtained for perceived attractiveness, they remained above the selected significance level of $\alpha = 0.05$. Therefore, the null hypotheses were not rejected for either presentation condition.

Figures 6 and 7 illustrate the course of pupil-size change during the first two seconds of stimulus exposure. The bottles were divided into three groups according to purchase intention. The first group included the eight bottles with the highest purchase intention ratings, the second group included eight bottles with medium purchase intention ratings, and the third group included the eight bottles with the lowest purchase intention ratings.

Only small differences between these groups were observed, particularly around 1,000 ms after stimulus onset. However, the statistical tests did not confirm these differences as significant.

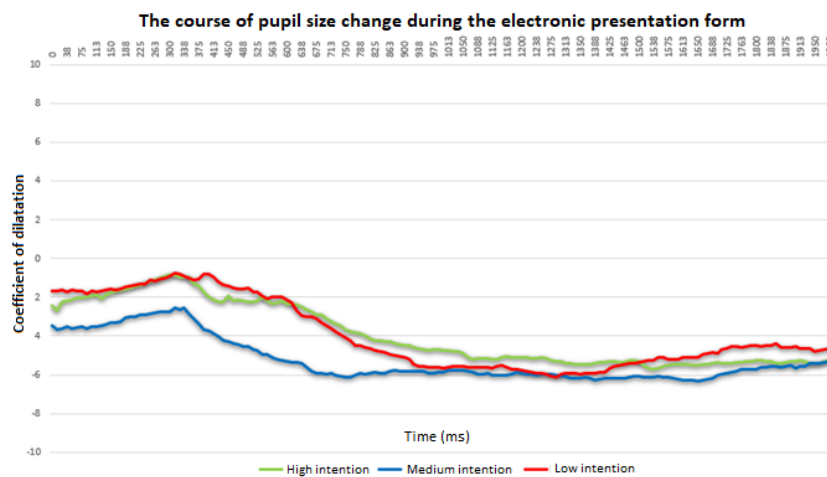


Fig. 6: Pupil-size change during the first two seconds of exposure according to purchase intention in the electronic presentation condition

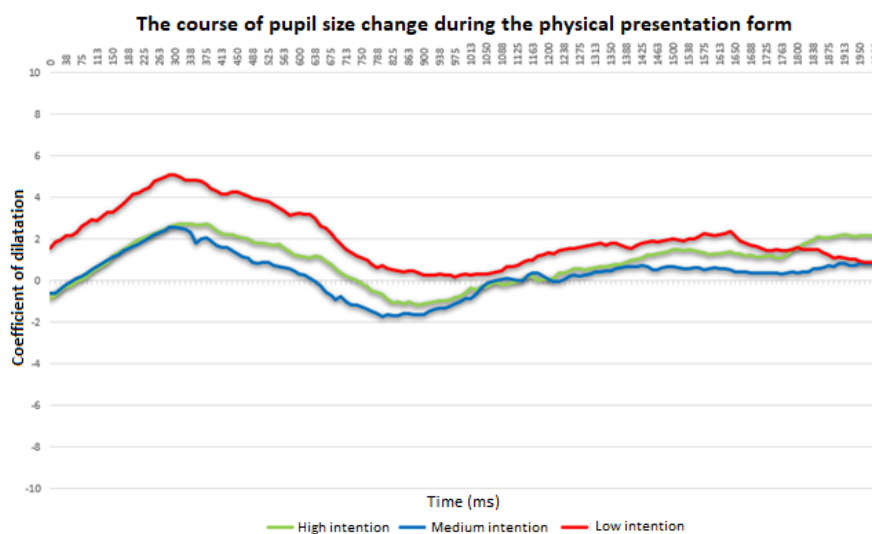


Fig. 7: Pupil-size change during the first two seconds of exposure according to purchase intention in the physical presentation condition

5 DISCUSSION AND CONCLUSION

The results of this study did not confirm a significant effect of presentation form on perceived product attractiveness. The difference between the present findings and those reported by Subhash *et al.* (2019) may be explained by the fact that this study focused specifically on perceived attractiveness, whereas Subhash *et al.* (2019) examined overall product evaluation. Although these constructs are closely related, they are not identical. Another possible explanation is the product category used in the research. In the study by Subhash *et al.* (2019), presentation form affected mainly products with haptically relevant characteristics, such as blankets and sweaters, while this effect was not observed for products for which touch was less important, such as flash drives and DVDs. It is therefore possible that, in the case of reusable water bottles, haptic characteristics such as material, weight, or surface properties are related more to perceived usability and quality than to perceived attractiveness.

The results also indicate that presentation form may affect purchase intention to some extent. Similar conclusions have been reported in previous research. Balaji *et al.* (2011) found a positive effect of physical product presentation on purchase intention for tissue papers, whereas Vieira (2012) did not find a relationship between touch and purchase probability in the case of hand soaps. These findings are also consistent with McCabe (2003), who suggests that physical product examination is more important for material products, where characteristics such as material, weight, temperature, and surface texture are relevant, than for geometric products, where shape and size are the main attributes. In the present study, a statistically significant effect of presentation form was found only for two bottles. This may suggest that the haptic characteristics of most bottles were not sufficiently distinctive to substantially influence purchase intention.

Another hypothesis concerned the effect of touch on certainty of product evaluation. Previous studies by Grohmann *et al.* (2007) and Balaji *et al.* (2011) suggest that tactile input may increase consumers' certainty when evaluating products. In the present study, however, this effect was confirmed only for bottle no. 20. For bottles no. 1, 3, and 19, a similar tendency was observed, but the differences were not statistically significant. One possible explanation is that, during the electronic presentation condition, written descriptions provided detailed information about product characteristics that would otherwise be accessible mainly through touch. As a result, participants may have been able to form a relatively clear evaluation of the products even without physical contact. The availability of detailed product information may therefore have increased certainty in the electronic presentation condition and reduced the additional value of touch.

The relationship between presentation form and pupil-size change was also examined. The results showed that physical presentation was associated with pupil dilation in most of the analysed bottles. Since pupil size can be influenced by many factors that are difficult to fully control, these results should be interpreted with caution (Sirois and Brisson, 2014). The stronger pupil response observed during physical presentation may reflect the additional sensory, attentional, or motor demands associated with handling the product. However, it cannot be interpreted as a direct indicator of preference or emotional response without considering other possible explanations.

Previous studies by Bertheaux *et al.* (2020), Bradley *et al.* (2008), Laeng *et al.* (2016), and Ramsøy *et al.* (2017) suggest that pupil dilation may occur in response to both positively and negatively evaluated stimuli when compared with neutral stimuli. In this study, pupil-size change was examined in relation to perceived attractiveness and purchase intention under both presentation conditions. However, the results did not confirm a statistically significant relationship between pupil-size change and these evaluation variables. Although small differences between

the best-rated, medium-rated, and lowest-rated groups were visible in the time course of pupil-size change, particularly during the first second after stimulus onset, these differences were not statistically significant. One possible explanation is the absence of sufficiently extreme evaluations. The mean ratings of most bottles ranged from 1.9 to 5.4 on a seven-point scale, which means that highly positive evaluations were largely absent. Since pupil dilation is expected to be more pronounced for highly positive or highly negative stimuli, the limited range of evaluations may have reduced the likelihood of detecting significant differences.

As online shopping continues to grow, the barrier between virtual and physical product experience remains an important topic for consumer research. This study contributes to sensory marketing by examining how electronic and physical product presentation influence consumer evaluation and pupil response. The findings suggest that touch does not necessarily increase perceived attractiveness, but it may influence purchase intention and certainty of evaluation for selected products. The results also show that pupillometry can capture differences between presentation forms, although its interpretation requires caution.

Future research should further examine product categories with more distinctive haptic characteristics. In the case of reusable water bottles, future studies could include metal bottles and bottles with more diverse shapes, such as rectangular designs. It would also be useful to separate the two presentation conditions more clearly. In the electronic condition, participants could evaluate only product photographs or videos on a monitor, whereas in the physical condition they could freely handle and visually inspect the real product without simultaneous presentation on the screen. This would make it possible to compare digital and physical product experience more directly and reduce potential overlap between the two presentation forms.

Acknowledgments

This paper was supported by the project CZ.02.1.01/0.0/0.0/16_017/0002334 Research Infrastructure for Young Scientists, co-financed by Operational Programme Research, Development and Education.

REFERENCES

- BALAJI, M. S., RAGHAVAN, S., JHA, S. 2011. Role of tactile and visual inputs in product evaluation: a multisensory perspective. *Asia Pacific Journal of Marketing and Logistics*. 23(4), 513–530. <https://doi.org/10.1108/13555851111165066>
- BERTHEAUX, C., TOSCANO, R., FORTUNIER, R., ROUX, J.-C., CHARIER, D., BORG, C. 2020. Emotion measurements through the touch of materials surfaces. *Frontiers in Human Neuroscience*. 13, 455. <https://doi.org/10.3389/fnhum.2019.00455>
- BOARDMAN, R., MCCORMICK, H. 2019. The impact of product presentation on decision-making and purchasing. *Qualitative Market Research: An International Journal*. 22(3), 365–380. <https://doi.org/10.1108/QMR-09-2017-0124>
- BRADLEY, M. M., MICCOLI, L., ESCRIG, M. A., LANG, P. J. 2008. The pupil as a measure of emotional arousal and autonomic activation. *Psychophysiology*. 45(4), 602–607. <https://doi.org/10.1111/j.1469-8986.2008.00654.x>
- CHEN, X., SHAO, F., BARNES, C. J., CHILDS, T., HENSON, B. 2009. Exploring relationships between touch perception and surface physical properties. *International Journal of Design*. 3(2), 67–76.

- CHO, H., SCHWARZ, N. 2012. I like your product when I like my photo: misattribution using interactive virtual mirrors. *Journal of Interactive Marketing*. 26(4), 235–243. <https://doi.org/10.1016/j.intmar.2012.03.003>
- FRANCIS, S., ROLLS, E. T., BOWTELL, R., MCGLONE, F., O'DOHERTY, J., BROWNING, A., CLARE, S., SMITH, E. 1999. The representation of pleasant touch in the brain and its relationship with taste and olfactory areas. *NeuroReport*. 10(3), 453–459. <https://doi.org/10.1097/00001756-199902250-00003>
- GROHMANN, B., SPANGENBERG, E. R., SPROTT, D. E. 2007. The influence of tactile input on the evaluation of retail product offerings. *Journal of Retailing*. 83(2), 237–245. <https://doi.org/10.1016/j.jretai.2006.09.001>
- HOLBROOK, M. B. 1983. On the importance of using real products in research on merchandising strategy. *Journal of Retailing*. 59(1), 4–23.
- KAHNEMAN, D. 2013. *Thinking, Fast and Slow*. New York: Farrar, Straus and Giroux.
- KLATZKY, R. L., LEDERMAN, S. J. 1992. Stages of manual exploration in haptic object identification. *Perception & Psychophysics*. 52(6), 661–670. <https://doi.org/10.3758/BF03211702>
- KLATZKY, R. L., LEDERMAN, S. J. 1993. Toward a computational model of constraint-driven exploration and haptic object identification. *Perception*. 22(5), 597–621. <https://doi.org/10.1068/p220597>
- LAENG, B., SUEGAMI, T., AMINIHAJIBASHI, S. 2016. Wine labels: an eye-tracking and pupillometry study. *International Journal of Wine Business Research*. 28(4), 327–348. <https://doi.org/10.1108/IJWBR-03-2016-0009>
- LOEWENFELD, I. E. 1993. *The Pupil: Anatomy, Physiology, and Clinical Applications*. Detroit, MI: Wayne State University Press.
- MCCABE, D. B., NOWLIS, S. M. 2003. The effect of examining actual products or product descriptions on consumer preference. *Journal of Consumer Psychology*. 13(4), 431–439. https://doi.org/10.1207/S15327663JCP1304_10
- PARK, W., KI, D., KIM, D.-H., KWON, G. H., KIM, S.-P., KIM, L. 2015. EEG correlates of user satisfaction of haptic sensation. In: *2015 IEEE International Conference on Consumer Electronics (ICCE)*. IEEE. pp. 569–570. <https://doi.org/10.1109/ICCE.2015.7066529>
- PARK, W., KIM, D.-H., KIM, S.-P., LEE, J.-H., KIM, L. 2018. Gamma EEG correlates of haptic preferences for a dial interface. *IEEE Access*. 6, 22324–22331. <https://doi.org/10.1109/ACCESS.2018.2827023>
- PECK, J., CHILDERS, T. L. 2003. Individual differences in haptic information processing: the “Need for Touch” scale. *Journal of Consumer Research*. 30(3), 430–442. <https://doi.org/10.1086/378619>
- PECK, J., WIGGINS, J. 2006. It just feels good: customers' affective response to touch and its influence on persuasion. *Journal of Marketing*. 70(4), 56–69. <https://doi.org/10.1509/jmkg.70.4.056>
- RAMSØY, T. Z., JACOBSEN, C., FRIIS-OLIVARIUS, M., BAGDZIUNAITE, D., SKOV, M. 2017. Predictive value of body posture and pupil dilation in assessing consumer preference and choice. *Journal of Neuroscience, Psychology, and Economics*. 10(2–3), 95–110. <https://doi.org/10.1037/npe0000073>
- SCHIFFERSTEIN, H. N. J., CLEIREN, M. P. H. D. 2005. Capturing product experiences: a split-modality approach. *Acta Psychologica*. 118(3), 293–318. <https://doi.org/10.1016/j.actpsy.2004.10.009>
- SIROIS, S., BRISSON, J. 2014. Pupillometry. *Wiley Interdisciplinary Reviews: Cognitive Science*. 5(6), 679–692. <https://doi.org/10.1002/wcs.1323>
- JHA, S., BALAJI, M. S., STAFFORD, M. B. R., SPEARS, N. 2020. Haptic information processing and need for touch in product evaluation. *Journal of Consumer Marketing*. 37(1), 55–64. <https://doi.org/10.1108/JCM-02-2018-2554>
- SUH, Y., KIM, S., KIM, W. 2018. Visual tactile attributes in online product presentations for improving purchase intention. *International Journal of Contents*. 14(2), 7–15. <https://doi.org/10.5392/IJOC.2018.14.2.007>

- VERHAGEN, T., VONKEMAN, C., VAN DOLEN, W. 2016. Making online products more tangible: the effect of product presentation formats on product evaluations. *Cyberpsychology, Behavior, and Social Networking*. 19(7), 460–464. <https://doi.org/10.1089/cyber.2015.0520>
- VIEIRA, V. A. 2012. An evaluation of the Need for Touch scale and its relationship with need for cognition, need for input, and consumer response. *Journal of International Consumer Marketing*. 24(1–2), 57–78. <https://doi.org/10.1080/08961530.2012.650139>
- VRÁNA, J., MOKRÝ, S. 2020. Haptics and its effect on consumers' intentions using neuroscientific methods: literature review. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*. 68(2), 451–457. <https://doi.org/10.11118/actaun202068020451>
- ZÉNON, A. 2019. Eye pupil signals information gain. *Proceedings of the Royal Society B: Biological Sciences*. 286(1911), 20191593. <https://doi.org/10.1098/rspb.2019.1593>

Contact information

Jan Vrána: e-mail: vranjes@email.cz

Stanislav Mokrý: e-mail: xmokry@mendelu.cz

Michal Pšurný: e-mail: xpsurny@mendelu.cz