Original Scientific Paper https://doi.org/10.24867/GRID-2026-p35

Consumer Experiences with Screw-Closure Packaging: Ergonomic Challenges and User Difficulties

ABSTRACT

Understanding consumers' needs and preferences provides a basis for the systematic assessment of the ergonomic quality of packaging solutions. Therefore, this study aimed to investigate consumers' experiences with commercially available bottles and jars with screw closures, with particular emphasis on perceived difficulties during use, problematic packaging characteristics, and strategies adopted to overcome these difficulties. An online questionnaire was conducted using Google Forms and completed by 240 participants aged 19-25 years. The results showed conventional glass jars with metal lids and plastic bottles with plastic caps were frequently identified as problematic packaging types. Participants associated opening difficulties with closure dimensions, surface texture, sharp edges, closure height, and packaging body shape. Participants reported various difficulties when opening packages, including slipping, pain, and difficulty applying sufficient force. Some participants stated that they used improvised tools or asked other people for help. In some cases, difficulties with opening led participants to stop using a product. The findings provide insight into consumer experiences with packaging usability and identify perceived ergonomic challenges that should be considered in the design and development of user-oriented packaging solutions.

Gordana Bošnjaković
Gojko Vladić
Katarina Maričić Picajkić
Teodora Gvoka

University of Novi Sad, Faculty of Technical Sciences, Department of Graphic Engineering and Design, Novi Sad, Serbia

KEY WORDS
Packaging ergonomics, screw closures, consumer experience, opening difficulties

1. Introduction

The opening of packaging represents an important stage of interaction between the consumer and the product. It is often considered a trivial everyday task, as difficulties encountered during opening can sometimes be overcome by using additional aids such as scissors or knives, or by asking another person for assistance (Yoxall et al., 2010). From the consumer perspective, the perceived functionality of packaging, including its ease of opening and handling, may represent an important aspect of the overall user experience (Duizer, Robertson & Han, 2009; Wenk et al., 2016). In particular, the application of excessive force during opening may present a challenge for users with different levels of physical ability or hand function (Theobald & Winder, 2006). Packaging that does not accommodate the diverse abilities of users may negatively affect the consumer experience and may even lead consumers to avoid certain products (Yoxall, Rodriguez-Falcon & Luxmoore, 2013; Bošnjaković & Vladić, 2020). Inclusive design represents an approach aimed at developing products and services that are accessible and easy to use for the widest possible range of users without the need for special adaptation or specialised design (British Standards, 2005). In the context of packaging, this approach focuses on making everyday packaging easier to open and use by a broad range of consumers rather than developing specialised solutions for a particular user group (Clarkson et al., 2003; Keates & Clarkson, 2003; Waller et al., 2015). Consumer feedback can provide valuable information about packaging characteristics perceived as problematic during everyday use and can contribute to the assessment of the ergonomic quality of packaging solutions. Investigating consumers' experiences may therefore help identify difficulties encountered during opening and closing, as

well as the strategies users adopt to overcome them. Therefore, this study aimed to investigate consumers' experiences with commercially available bottles and jars with screw closures, with particular emphasis on perceived difficulties during opening and closing and packaging characteristics associated with these difficulties.

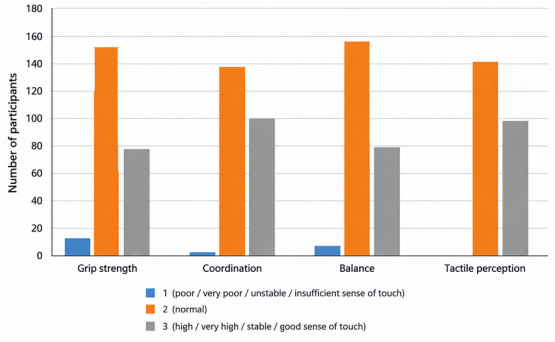
2. Methodology

An online questionnaire was developed using Google Forms to collect subjective data on consumer preferences and experiences related to commercially available packaging. The questionnaire was distributed via a web link and completed electronically by the participants. The questionnaire addressed participants' demographic characteristics, physical activity, previous hand injuries, self-assessed hand abilities, and experiences with opening and closing bottles and jars with screw closures. It also explored participants' subjective evaluations of packaging characteristics, perceived difficulties during use, and strategies adopted to overcome these difficulties. Participants were asked to identify the most and least favourable characteristics of selected packaging examples and to describe their positive and negative experiences during use. A total of 240 participants completed the questionnaire. The collected data were analysed using descriptive statistics. The results are presented as frequencies, showing the number of participants who selected each response option, to describe their experiences with opening and closing packaging and the packaging characteristics associated with opening difficulties.

3. Results and discussion

3.1. Demographic data of the participants

A total of 240 participants aged 19–25 years participated in the study. The mean body weight was 66 kg (range: 43–105 kg), while the mean body height was 173 cm (range: 154–200 cm). Most participants were right-hand dominant (212 participants). Physical activity was reported by 209 participants, with the most frequently reported activities being gym-based exercise (132 participants), volleyball (50 participants), and basketball (35 participants), alongside various other activities. Participants reported different levels of involvement, ranging from recreational to semi-professional and professional activity. Regarding hand-related characteristics, 206 participants reported no previous hand injuries, while 34 reported previous injuries, including sprains, ligament strains, or finger fractures. In addition, 205 participants reported no current problems affecting the skin of the dominant palm, whereas 35 reported issues such as blisters, excessive sweating, or allergic reactions. Participants also provided self-assessments of hand abilities in terms of strength, coordination, balance, and tactile perception. The distribution of these self-assessments is presented in Figure 1. The majority of participants rated their hand abilities as normal or above average across all four assessed categories. This finding indicates that the study sample generally perceived their hand abilities as adequate for everyday activities. Considering the relatively young age of the participants, the predominance of normal or above-average self-assessments provides a relevant context for interpreting the reported difficulties in handling packaging, as these difficulties cannot be predominantly attributed to a generally perceived lack of hand ability within the study sample.

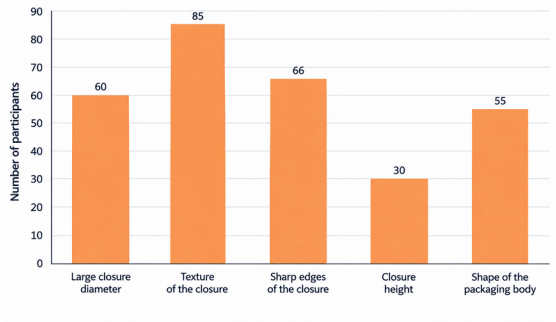


» **Figure 1:** *Participants' self-assessed hand abilities*

3.2. Difficulties in Opening and Closing Packaging

Questions concerning difficulties encountered when opening and closing bottles and jars were included to assess users' experiences during packaging handling. Regarding the frequency of difficulties when opening screw closures, 26 participants reported that they never experienced difficulties, while 108 participants experienced difficulties rarely. A total of 80 participants reported experiencing difficulties sometimes, 23 almost always, and 3 always. Among the packaging types identified as problematic, conventional glass jars with metal lids were most frequently reported, with 160 participants identifying this type of packaging as difficult to open. Plastic water and juice bottles with plastic caps were also identified as problematic by 75 participants. These findings show that difficulties were reported for both glass jars and plastic bottles, suggesting that perceived ergonomic challenges were not limited to a single packaging type. Participants were also asked to identify specific packaging characteristics that contributed to difficulties during use. The characteristics perceived as problematic included closure size, closure texture, sharp closure edges, closure height, and the shape of the packaging body (Figure 2). These findings indicate that difficulties in handling screw closures may be associated with several physical characteristics of both the closure and the packaging itself. In

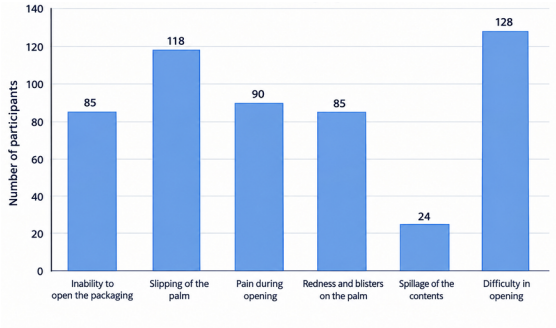
particular, closure dimensions and surface characteristics may affect the user's ability to establish and maintain an adequate grip during opening.



» **Figure 2:** *Packaging characteristics perceived as problematic by participants*

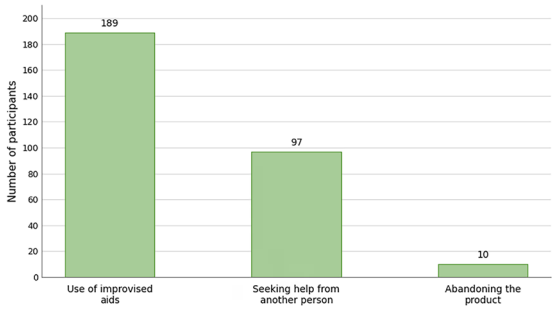
3.3. Problems Experienced and Strategies for Overcoming Difficulties

Participants were also asked to identify the problems they experienced during the initial opening of packaging (Figure 3). The reported problems included inability to open the packaging, palm slipping during opening, pain during opening, the occurrence of redness and blisters on the palm, spillage of the contents during opening, and difficulty in opening the packaging. These responses highlight the range of difficulties encountered during initial opening, including both handling-related problems and physical discomfort.



» **Figure 3:** *Problems reported by participants during initial packaging opening*

When faced with difficulties during packaging opening, participants reported several strategies for overcoming them (Figure 4). The most frequently reported responses included the use of improvised aids, such as cloths to improve grip or a knife to release the vacuum in jars, as well as seeking assistance from another person. In some cases, participants reported abandoning the use of the product when they were unable to overcome the opening difficulty. These responses suggest that difficulties with screw closures may extend beyond temporary inconvenience, leading users to adopt alternative methods, seek external assistance, or discontinue product use. The reported use of improvised aids also highlights potential limitations in the usability of some packaging solutions under everyday conditions.



» **Figure 4:** *Participants' responses to difficulties encountered when opening packaging closures*

In contrast to the difficulties reported during opening, problems during the closing of bottles and jars were considerably less frequent. The majority of participants, 221 in total, reported that they never or rarely experienced difficulties when closing the packaging. Furthermore, subsequent opening and closing of the same packaging was generally perceived as easier than the initial opening. This may be related to the need to overcome the original closure resistance and, in some cases, an initial vacuum seal.

Overall, the findings highlight several aspects of packaging usability that may affect the user experience during opening. The reported difficulties, problematic packaging characteristics, and strategies used to overcome them indicate that some users may rely on improvised aids or assistance from others when handling screw-closure packaging. These findings provide a basis for further consideration of ergonomic requirements in the design and evaluation of screw-closure packaging.

4. Conclusion

This study provided insight into consumers' experiences with commercially available bottles and jars with screw closures, with particular emphasis on difficulties encountered during opening and closing. The findings showed that opening was a more challenging stage of packaging handling than closing. Conventional glass jars with metal lids and plastic bottles with plastic caps were among the packaging types most frequently identified as problematic. Participants identified several packaging characteristics as problematic, including closure size, texture, sharp edges, closure height, and packaging body shape. Participants reported various difficulties during initial opening. To overcome these difficulties,

they often used improvised aids or asked other people for help, while some abandoned the use of the product. Difficulties during closing were less frequent, and subsequent opening and closing were generally perceived as easier. Overall, the findings highlight the importance of considering users' experiences when evaluating the ergonomic quality of screw-closure packaging. The identified difficulties show that closure dimensions, surface texture, edge design, closure height, and packaging body shape are important aspects to consider in packaging design and evaluation. Considering these characteristics together with users' experiences may contribute to the development of packaging that is easier to use and better accommodates users' needs.

5. Acknowledgments

This research has been supported by the Ministry of Science, Technological Development and Innovation (Contract No. 451-03-34/2026-03/200156) and the Faculty of Technical Sciences, University of Novi Sad through project "Scientific and Artistic Research Work of Researchers in Teaching and Associate Positions at the Faculty of Technical Sciences, University of Novi Sad 2026" (No. 01-3609/1).

6. References

British Standards. (2005) BS 7000-6:2005. Design management systems – Part 6: Managing inclusive design. London: British Standards.

Bošnjaković, G. and Vladić, G. (2020) 'Research methodologies for assessing the ergonomics of packaging products – a review'. In: 10. *International Symposium on Graphic Engineering and Design GRID*, Novi Sad: Faculty of Technical Sciences, Department of Graphic Engineering and Design, 12–14 November 2020, pp. 335–345. ISBN 978-86-6022-303-8.

Clarkson, J., Coleman, R., Keates, S. and Lebbon, C. (2003) *Inclusive Design: Design for the Whole Population*. London: Springer-Verlag.

Duizer, L.M., Robertson, T. and Han, J. (2009) 'Requirements for packaging from an ageing consumer's perspective', *Packaging Technology and Science*, 22(4), pp. 187–197. DOI: 10.1002/pts.834

Keates, S. and Clarkson, J. (2003) Countering Design Exclusion – An Introduction to Inclusive Design. London: Springer.

Theobald, N. and Winder, B. (2006) *Packaging Closures and Sealing Systems*. Oxford: Blackwell Publishing Ltd.

Waller, S., Bradley, M., Hosking, I. and Clarkson, P.J. (2015) 'Making the case for inclusive design', *Applied Ergonomics*, 46(Part B), pp. 297–303. DOI: 10.1016/j.apergo.2013.03.012

Wenk, S., Brombach, C., Artigas, G., Jarvenpaa, E., Steinemann, N., Ziesemer, K. and Yildirim, S. (2016) 'Evaluation of the accessibility of selected packaging by comparison of quantitative measurements of the opening forces and qualitative surveys through focus group studies', *Packaging Technology and Science*, 29(11), pp. 559–570. DOI: 10.1002/pts.2237

Yoxall, A., Langley, J., Janson, R., Lewis, R., Wearn, J., Hayes, S.A. and Bix, L. (2010) 'How wide do you want the jar?: The effect on diameter for ease of opening for widemouth closures', *Packaging Technology and Science*, 23(1), pp. 11–18. DOI: 10.1002/pts.874

Yoxall, A., Rodriguez-Falcon, E.M. and Luxmoore, J. (2013) 'Carpe diem, Carpe ampulla: A numerical model as an aid to the design of child-resistant closures', *Applied Ergonomics*, 44, pp. 18–26. DOI: 10.1016/j.apergo.2012.04.006



© 2026 Authors. Published by the University of Novi Sad, Faculty of Technical Sciences, Department of Graphic Engineering and Design. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license 4.0 Serbia (http://creativecommons.org/licenses/by/4.0/rs/).