

# *Harm Caused by Jewelry: A Deficiency in the Design Process*

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DOI: [10.22059/jdt.2026.411448.1188](https://doi.org/10.22059/jdt.2026.411448.1188)

Received: 17 February 2026, Revised: 21 April 2026, Accepted: 21 April 2026, Available Online from 21 April 2026.

## **A**bstract

*Jewelry design has traditionally been evaluated in relation to aesthetics, material properties, and cultural value, whereas ergonomic fit and user safety have received comparatively limited scholarly attention. This study aimed to identify the principal ergonomic and safety-related challenges associated with ring design and to assess the extent to which these issues are represented in the scientific literature. A mixed-method descriptive design was employed, drawing on four complementary sources of evidence: a structured questionnaire administered via Google Forms to approximately 30 frequent ring users, semi-structured interviews with jewelry and industrial designers, a review of ring-related injury cases reported by municipal fire and safety services in Rasht, Shiraz, and Shahriar, Iran, and a bibliometric analysis of publications indexed in Scopus and Web of Science. Questionnaire data were analyzed using descriptive statistics in SPSSWin 27, interview data were thematically coded, and bibliometric records were processed in Bibexcel and visualized using VOS viewer and Gephi. The findings identified recurring design-related concerns, including finger-size fluctuation, sharp or protruding forms, excessive weight, material-related skin reactions, and inadequate ergonomic fit. Bibliometric results further indicated that existing scholarship is concentrated primarily on the cultural, artistic, material, and technological dimensions of jewelry, while ergonomic and safety-oriented research remains scarce. The study underscores the need for a user-centered design framework that systematically integrates ergonomics, safety, and aesthetics in order to enhance comfort, usability, and injury prevention in contemporary ring design.*

## **K**eywords

*Safety, Ergonomics, Jewelry, Design Process.*

## Introduction

Industrial design aims to develop products that respond to user needs while integrating functionality, safety, and aesthetic value. Today, industrial design extends across a broad range of products, from household objects and electronic devices to clothing accessories and jewelry (Nabila, 2022; WIPO, 2025). In addition to fulfilling practical needs, designed artifacts reflect lifestyle, convey social meanings, and embody the cultural context of their time (Khodashenas et al., 2024).

Among wearable products, jewelry occupies a distinctive position. Although jewelry originally served practical and symbolic functions, it has increasingly become a means of expressing identity, social status, aesthetic preference, and emotion (Aydm et al., 2013). Rings, necklaces, earrings, and other forms of jewelry are widely used in everyday life and remain in direct contact with the body for prolonged periods. For this reason, their design should not be assessed solely in terms of visual appeal, but also with respect to comfort, safety, and usability.

Products may generally be categorized as functional, social/status-related, or inspirational/spiritual (Walker, 2009). Jewelry primarily belongs to the second and third categories, as it often communicates social affiliation, self-image, and symbolic meanings. However, because it is worn on the body, jewelry also has functional and ergonomic implications. In product and jewelry design, aesthetic considerations are therefore inseparable from safety and physical comfort.

Designers are expected to address user needs and solve practical problems within increasingly complex social and technological environments (Tebyani & Salimian Rizi, 2024). In the case of jewelry, this requires balancing attractive form with ergonomics and safety. A visually appealing piece that causes discomfort, skin reactions, entrapment, or injury cannot be considered fully successful. Conversely, an overly utilitarian design that neglects aesthetics may fail to satisfy users or to fulfill the symbolic and emotional roles of jewelry.

From an ergonomic perspective, products should be designed in accordance with human dimensions, capabilities, and limitations (Sadeghi Naeini et al., 2022; Sadeghi Naeini, 2022). Ergonomics seeks both to improve health and safety and to enhance performance and satisfaction (Sadeghi Naeini, 2020a, 2020b). In the context of jewelry, ergonomic quality depends on appropriate fit, form, weight, flexibility, and material compatibility. Rings, in particular, may create problems when their size does not accommodate daily or seasonal changes in finger dimensions, when edges are sharp, or when materials provoke allergic reactions. Safety is another essential dimension of wearable design. Product safety may be understood as the absence of conditions that can cause injury, illness, or damage (MIL-STD-883D). Although absolute safety is unattainable, designers and manufacturers must seek to minimize foreseeable risks (Karimi et al., 2012; Ahmadian et al., 2021). Rings may pose specific hazards such as entrapment in swollen fingers, skin damage due to poor-quality materials, or injury caused by protruding and sharp elements. Reports from fire and rescue organizations illustrate that ring entrapment is a practical safety concern requiring emergency intervention.



**Figure 1:** Finger injury caused by ring avulsion (The Plastics Fella, 2024).

Despite the direct contact of jewelry with the human body, ergonomic and safety considerations remain relatively underrepresented in both design practice and academic research. Much of the existing literature focuses on cultural history, artistic value, materials, and production technologies, whereas user comfort and injury prevention receive comparatively limited attention. This gap highlights the need for a more user-centered and interdisciplinary approach to jewelry design.

Accordingly, the present study investigates the ergonomic and safety-related challenges associated with ring design. By combining user feedback, expert perspectives, safety incident reports, and bibliometric analysis, the study aims to identify common sources of discomfort and injury and to examine the extent to which these concerns are reflected in current scholarly research. Ultimately, the study seeks to contribute to safer and more ergonomically appropriate jewelry design without compromising visual appeal.

## **M**ethods and Materials.

### **1. Research Design**

This study adopted a mixed-method descriptive case-study design to investigate ergonomic and safety-related issues in ring design. The research combined field-based user data, expert perspectives, safety incident reports, and bibliometric evidence in order to compare practical user concerns with the themes emphasized in the academic literature.

### **2. Field Data Collection**

Field data were collected through a structured questionnaire distributed via Google Forms to a purposive sample of approximately 30 participants. To be eligible, participants had to be active or frequent users of rings in daily life. The questionnaire focused on user experience in relation to comfort, fit, safety, perceived weight, material-related problems, and design preferences. The aim was to identify recurrent problems associated with ring use and to determine which design features most strongly affected user satisfaction and safety. To complement the questionnaire data, semi-structured interviews were conducted with experienced jewelry and industrial designers selected on the basis of their familiarity with wearable products, design practice, and ergonomic considerations. These interviews provided qualitative insights into common design limitations, material choices, form-related risks, and possible strategies for improving ring usability and safety.

### **3. Safety Incident Case Review**

To strengthen the practical relevance of the study, jewelry-related injury cases involving rings were reviewed using incident reports obtained from the fire departments and municipal safety services of Rasht, Shiraz, and Shahriar, Iran. These reports were examined to identify recurrent hazards, typical mechanisms of injury, and possible design-related contributing factors. The case review provided an applied safety perspective that complemented both the user-reported and expert-reported data.

### **4. Bibliometric Analysis**

A bibliometric analysis was conducted to map the existing research landscape related to jewelry, ergonomics, and safety. Data were retrieved from Scopus and Web of Science using combinations of the keywords “*jewelry*” or “*jewellery*,” “*ergonomics*,” and “*safety*.” The initial search yielded 4,330 records for jewelry-related terms; however, only one record was identified for jewelry/jewellery combined with ergonomics, and one record for jewelry/jewellery combined with safety. This result indicated a substantial gap in the literature regarding the integration of ergonomic and safety perspectives in jewelry research. The bibliometric records were managed using Bibexcel and subsequently exported to *VOSviewer* and *Gephi* for visualization and network mapping. This procedure enabled the identification of dominant research clusters, thematic concentrations, and underexplored areas.

## 5. Data Analysis

Questionnaire responses were analyzed in *SPSSWin 27* using descriptive statistics to summarize the frequency and relative importance of reported ergonomic and safety issues. Interview data were analyzed through thematic coding in order to identify recurring concepts and expert interpretations related to ring design. The safety incident reports were reviewed comparatively to detect patterns that aligned with or expanded upon the questionnaire and interview findings. Finally, the bibliometric visualizations were interpreted to determine whether the problems reported by users and experts were adequately represented in the scientific literature. The integration of these data sources allowed for triangulation and improved the robustness of the study findings.

# Results

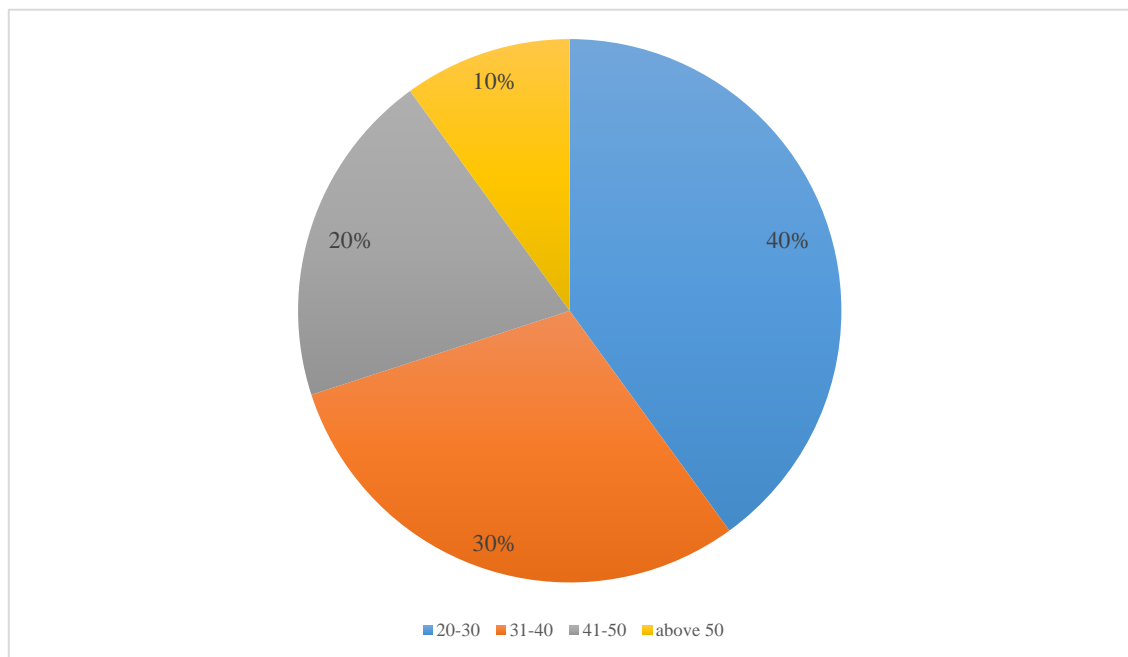
The results are presented in three parts:

1. Demographic characteristics of the participants
2. User-reported ergonomic and safety issues related to ring use
3. Bibliometric trends in the scholarly literature

This structure allows comparison between the practical concerns of users and the themes emphasized in academic research.

### 1. Participant Characteristics

To ensure the validity and representativeness of the data, demographic information was collected from the 30 participants included in this study. These details are summarized in [Figure 2](#).



**Figure 2:** Demographic Characteristics of Respondents ( $n = 30$ )

A total of 30 ring users participated in the questionnaire survey. The majority of respondents were between 20 and 40 years of age, and female participants comprised 60% of the sample. Most respondents reported between one and five years of regular experience wearing rings, suggesting that the sample was sufficiently familiar with everyday ring use to provide relevant feedback on ergonomic and safety-related problems.

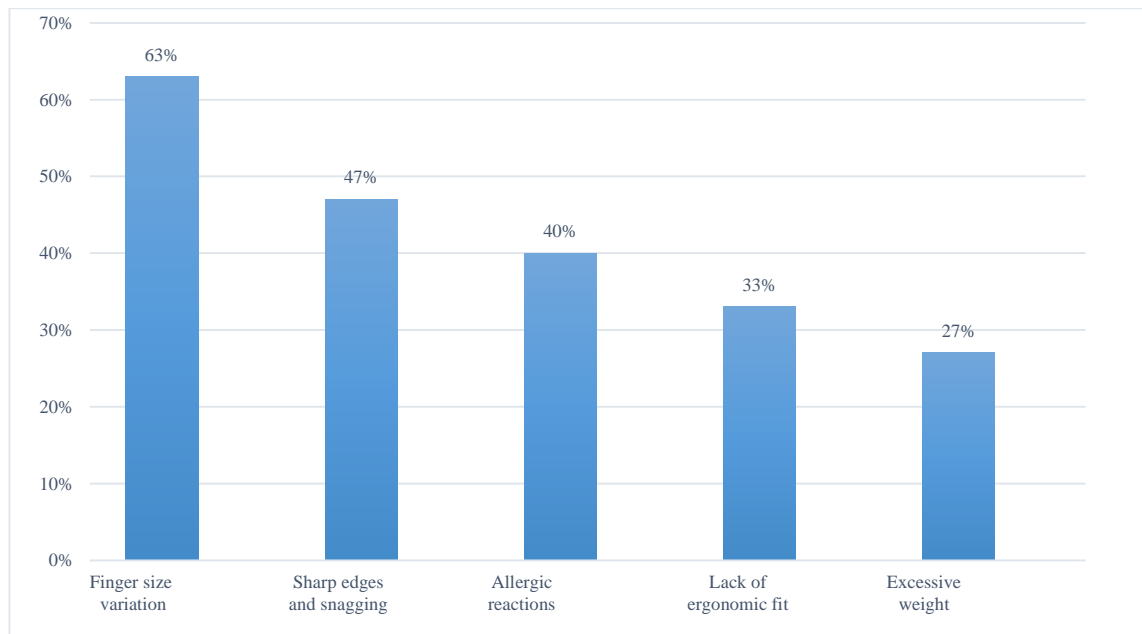
## 2. User-Reported Ergonomic and Safety Issues

The central findings of the questionnaire are presented in [Table 1](#), which consolidates the most frequently reported ergonomic and safety challenges encountered by users of rings.

**Table 1:** Common Ergonomic and Safety Issues with Rings.

Reported Issue	Percentage of Respondents	Notes
<i>Finger size variation</i>	63%	Daily/seasonal fluctuations
<i>Sharp edges &amp; snagging</i>	47%	Scratches, abrasion, entanglement
<i>Allergic reactions</i>	40%	Itching, redness, skin wounds
<i>Lack of ergonomic fit</i>	33%	Uneven pressure on finger
<i>Excessive weight</i>	27%	Heaviness, discomfort during use

As shown in [Table 1](#), variation in finger size was the most frequently reported issue (63%). Participants indicated that daily or seasonal changes in finger dimensions affected comfort and made rings difficult to wear or remove. Nearly half of the respondents (47%) reported problems caused by sharp edges or protruding forms that could scratch the skin or catch on clothing. Allergic reactions, such as itching and redness, were reported by 40% of respondents and were attributed to material quality. Other problems included lack of ergonomic fit (33%), resulting in uneven pressure or discomfort, and excessive weight (27%), which reduced wearability. To facilitate interpretation, these issues are illustrated in [Figure 3](#).



**Figure 3:** User-Reported Ergonomic and Safety Issues with Rings ( $n = 30$ )

The findings indicate that many problems arise from the interaction between ring design, material choice, and variability in the wearer's body. Taken together, these results emphasize the importance of incorporating ergonomics and safety into the design process.

## 3. Bibliometric Trends in Jewelry Research

The bibliometric analysis revealed a clear disparity between user-reported concerns and the focus of existing literature. VOS viewer keyword mapping identified six main thematic areas in jewelry research ([Figure 4](#)):



findings showed that existing research focuses predominantly on cultural history, aesthetic, material properties, and technological innovations. These results suggest that jewelry, despite being a wearable product with direct physical contact, has not received sufficient ergonomic and safety-oriented attention.

Among the issues identified in the questionnaire, finger-size variation was the most frequent. This finding is particularly important in ring design, as rings are rigid and in constant contact with the finger. Daily or seasonal changes in finger size may reduce comfort, impair circulation, and in extreme cases lead to ring entrapment. The safety incidents reviewed in this study, including cases requiring emergency ring removal by fire departments, demonstrate that these concerns are not merely theoretical but have practical consequences.

Sharp edges and snagging were also reported by a considerable proportion of participants. This finding is consistent with ergonomic principles emphasizing the need for smooth, rounded, and non-protruding forms in products that come into close contact with the body. Similarly, allergic reactions reported by 40% of respondents indicate the importance of material selection and the use of hypoallergenic alloys. Previous discussions of jewelry safety have highlighted the risks of low-quality materials and nickel sensitivity, yet such concerns remain peripheral in the broader literature.

The lack of ergonomic fit and the perceived heaviness of some rings further underscore the need to consider anthropometric compatibility and wearability in jewelry design. Batista (2015) emphasized that the comfort of jewelry depends on anatomical fit, shape, weight, volume, flexibility, and the pressure exerted on the body. The present results support this view and indicate that neglecting these factors can negatively affect user satisfaction and daily usability.

The importance of ergonomic design in wearables has also been demonstrated in adjacent fields. Chen et al. (2024) showed that ergonomic fit, reduced pressure points, and material flexibility significantly improve wearer satisfaction in safety harnesses, whereas heavy or rigid designs reduce willingness to use. Likewise, Sepehr et al. (2025) identified comfort and usability deficiencies as major reasons for non-use of safety harnesses among Iranian construction workers, and Sepehr et al. (2023) classified poor design and discomfort among the principal barriers to use. Although safety harnesses differ from jewelry in function and scale, both are wearable products that interact directly with the human body. These studies therefore support the broader principle that ergonomic shortcomings in wearable design can reduce satisfaction, discourage use, and increase risk.

Taken together, the findings of this study indicate that jewelry design should adopt a more user-centered and interdisciplinary approach, however, aesthetics considerations have a firm association with ergonomic design approaches (Jafarnejad et al., 2024) in which the role of designers is highlighted. Furthermore, designers should consider finger-size variability, avoid sharp and protruding forms, select hypoallergenic materials, and minimize unnecessary weight. Ergonomic evaluation of prototypes with representative users can help identify and correct these problems prior to production. In addition, a greater integration of ergonomics and safety into scholarly research would contribute to a more balanced understanding of jewelry as both an aesthetic and functional artifact.

## Conclusion

Jewelry, while valued for its aesthetic, symbolic, and cultural roles, may also create ergonomic discomfort and safety risks when user-centered design principles are neglected. Focusing on rings, the present study identified common problems reported by users, including finger-size fluctuation, sharp edges and snagging, allergic reactions, lack of ergonomic fit, and excessive weight. The review of safety incidents further demonstrated that ring-related injuries and entrapment can have serious practical consequences.

The bibliometric analysis revealed that although these ergonomic and safety concerns are highly relevant to users, they remain underrepresented in the academic literature, which is still largely centered on cultural,

historical, material, and technological aspects of jewelry. This mismatch highlights the need for more interdisciplinary research that integrates ergonomics, safety, materials science, and aesthetics.

From a practical perspective, the findings suggest that safer and more comfortable jewelry can be achieved through the use of adaptable sizing strategies, smooth and non-protruding forms, lightweight structures, and hypoallergenic materials. Incorporating ergonomic testing into the design process can improve user satisfaction and reduce the risk of injury. Overall, this study contributes to the emerging discussion on jewelry as a user-centered product and underscores the importance of balancing beauty with safety and comfort in contemporary design.

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