

## ABSTRACT

*The main objective of this work is to contribute to jewelry design area, by presenting ergonomic guidelines that help the designer during the activity of project. This study has a qualitative approach and several exploratory techniques were applied in order to investigate, clarify and interpret the data that was provided by people involved with the theme. Thru this research, it was observed that there is a vast variety of earrings available on the market with the most diverse models, styles, weight and sizes. It was identified that some of the earlobe injuries were caused by the use of earrings. As results of this study, it was described ergonomic aspects that the designer must consider during the earring design. These aspects were separated on the following categories: safety and comfort, usability and product quality. It is also relevant that, in order to assure comfort, practicality and safety to jewelry users, it is necessary to make an ergonomic evaluation with the jewelry prototypes, considering that issues that may not have been previously perceived by the projector can now be detected and corrected, yet before the product goes to production lines. Finally, the corrections and adjustments on the prototype are made. It can also be made several evaluations in order to prove the ergonomic quality of the product in case the designer considers it is necessary.*

*Keywords: Jewelry Design, Human Adornment, Injury, Earlobe, Human Factors.*

## 1 INTRODUCTION

Apart from beauty and originality, jewelry must be comfortable, safe, practical and to present quality. However, it was noticed that the ergonomic approach to jewelry design is still incipient on the current available literature. That is the reason why this work focuses on Jewelry Design, since it belongs to an area that has been gradually gaining space in the Brazilian market.

From the research made by Batista (2011), where the objective was to identify several aspects of jewelry users' behavior, it was found that 53% of the interviewed people had chosen the earring as the most used piece of jewelry (among others data collected). This scenery was the first step for this current work, which was conducted by the following research question: might earrings cause injuries or be harmful to users' well being?

The main objective of this work is to contribute to jewelry design area, by presenting ergonomic guidelines that help the designer during the activity of project. This study has a qualitative approach and several exploratory techniques were applied in order to investigate, clarify and interpret the data

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that was provided by people involved with the theme; technical procedures of bibliographic research were also adopted in order to find the most recent publications that concern jewelry design and ergonomics.

This study's structure follows this line: section 1 brings a panoramic vision about the subject. Section 2 argues about themes such as human adornment and jewelry design. Section 3 talks about earring design; the use of big and/or heavy earrings and the risk of injuries in the earlobe; and Ergonomics applied to Earring Design. In section 4, final considerations are made.

### 2 HUMAN ADORNMENT AND JEWELRY DESIGN

Human beings have always adorned their bodies, regardless of sex, culture or period, as figure 1 shows it.



Figure 1 – Human adornments through times. Source: Batista (2012, p. 5).

Along with human civilization development, uses, habits and culture have also changed; cities expanded, new occupations emerged, technology progressed. However, the desire of personal ornamentation remained through times.

The most appreciated and valued human adornment of all times is the jewelry: an artefact made from noble materials (usually, noble metals<sup>1</sup> and gemstones<sup>2</sup> (BATISTA, 2008). In the past, as well in current times, jewelry are wore in order to satisfy vanity, represent wealth, show power (such as kings and queens

<sup>1</sup> Are called noble metals those that cannot be damaged by acids or salts; they do not oxidize, are quite rare to find in nature and always remain pure. As noble metals, are classified Gold, Silver and Platinum. (SCHUMANN, 2001)

<sup>2</sup> Gemstones: Also known as precious stones, they are minerals or substances of organic or biologic origin, and due to its typical properties (structure, color, shine, hardness, perfection, rarity and durability) they are used specially in personal adornments and art pieces. (SCHUMANN, 2001)

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crowns) or simply by symbolism (commitment/marriage rings, crucifix) or superstition (amulets). Jewelry can also mean status, beauty and sentimental aspects from people. (BATISTA, 2004)

The jewel – as a product of jewelry industry – is a result of a long process that involves creativity and design, quality of materials, the use of modern manufacture technology, specialized professionals (smelters, cutters, setters, assemblers) and the perfection of a final piece. (BATISTA, 2008)

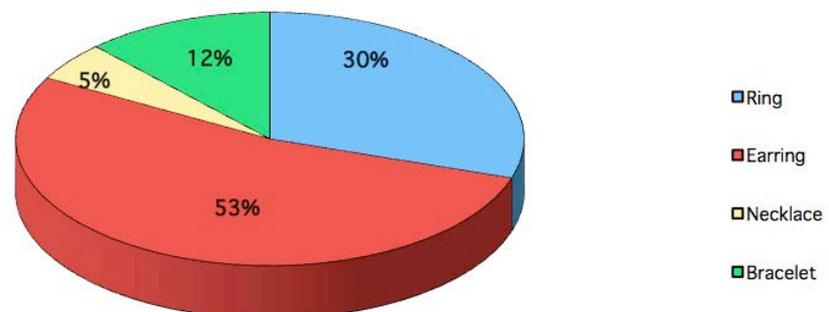
The Jewelry Design is an activity that involves research, creativity, planning the serial production of jewelry pieces, focusing on the aesthetic function, comfort (ergonomics) and durability. In other words, it is a set of tasks established by the designer, who always takes in consideration the generation of new concepts, the material selection, the piece's visual aspect, practicality, even before taking it to the production line. (BATISTA, 2004)

To the Brazilian Institute of Precious Gemstones and Metals: "Design is, essentially, concept and innovation. Its function is to shape the product, aggregate value to creation processes in order to differentiate the final object; also to make them more efficient, attractive, close to the needs and expectations from those who recognize the product and relate to it through personal visual identities". (IBGM, 2012, p. 3)

### 3 EARRING DESIGN

In a research made in the jewelry design area, Batista (2011) aimed to identify some aspects concerning the behavior of jewelry users. Therefore, 176 women (between the age of 17 and 64) were interviewed in the University campus (UFSC) from August until October of 2011. On the interview, one of the questions was about the most used piece – the user's favorite type of jewelry. In this question, it was adopted a restrict system where the interviewed person could only choose one option. The available options for choice were: ring, earring, necklace, piercing, bracelet and anklet.

According to the opinion of this group of women, the earring was the most optioned piece. In the graphic 1, the results can be visualized.



Graphic 1 – User's preference: the favorite/most used piece. Source: Batista (2011).

From 176 women that participate, 94 of them (53%) settled the earring as the most worn piece; to 52 (30%) interviewed women, the ring is the most worn piece; to 21 (12%), the bracelet is the most worn piece; to 9 (5%), the necklace

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is the most worn piece; none of them optioned for piercing or anklet as their favorite.

As this research reveals, the earring is one favorite jewelry piece. Considering its variety of models, styles, weight and sized available on market (as represented by figure 2), a new research emerges in order to investigate aspects related to earring design.



Figure 2 – Different sizes and styles of earrings. Source: Batista (2011).

The function of earrings is to adorn women or men's ears, in several cultures, in the five continents. They can be fixed in the earlobe or in another external area of the ear, as figure 3 shows it.



Figure 3 – Place of earrings fixation. Source: Batista (2012).

The Figure 4 presents models that demand a hole in the user's earlobe, such as: friction post/tension back; friction post/clutch back; threaded post/threaded back; protector post/back; omega clip; lever back; hinged earwire; earwire/shepherds hook. However, if the user does not want to pierce his earlobe, he might as well wear the model fixed only by pressure (clip on).

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Figure 4 – Earrings components. Source: Anjolee (2014).

### 3.1 THE USE OF BIG AND/OR HEAVY EARRINGS AND THE RISK OF INJURIES IN THE EARLOBE

The maxi earrings (see figure 5) arrived in catwalks of renowned stylists and became a strong trend for the following seasons; these earrings can be seen in every fashion magazine and store. (TERRA, 2013; BIANCHINI, 2014)



Figure 5 – The Maxi Earrings trend. Source: Bianchini (2014).

Some of these earrings are light on weight, and consequently do not generate tension on the earlobe. However, professionals from the medical area (such as plastic surgeons) alert for the risk of earring traction: “it happens when the earring is pulled down inadvertently by the user, who binds the earring somewhere, or by others, such as kids, animals and others. The ear is split immediately and might cause pain and bleeding. [...] The ear might be totally or partially split”. (ZAMARIAN JR., 2013).

Another factor related to the risk of earlobe injuries is the use of heavy earrings (RIBEIRO et al., 2009). Picture 6 shows the tension on the earlobe generated by the excessive weight of the earring.

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Figure 6 – Heavy earrings generate tension on the earlobe. Source: Globo (2013).

The holes that hold the earrings are extended/supersized due to the use of heavy earrings. They become gaps and this process occurs without pain or bleeding. The frequent use of heavy earrings, for months or years, might cause the total split of the gap, making the bifid earlobe (split), as presented in figure 7. The earring weight that the ear can hold depends on personal characteristics. Therefore, there is not a pre-determined weight capable of provoking lobe alterations (RIBEIRO et al., 2009; NIAMTU, 2002). If an earring provokes tension on the ear, it should be replaced by a lighter one.



Figure 7 – The hole in the earlobe. Source: Arnaut (2010).

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The partial or total split lobe can be repaired with zeta-plasty, with incision and suture treatment or even with a retail technique. The plastic surgeon will decide which one of the reconstruction techniques is the most appropriate for each case. (NIAMTU, 2002; RIBEIRO et al., 2009)

There is also the deformity in the ear lobe due to the use of ear reamers. Plastic surgeons aware that such deformity (see figure 8) can only be repaired by chirurgic reconstructions.



Figure 8 – Earlobe deformed by the use of reamers. Source: Lapin (2012).

Another type of lobe injury is the dermatitis of contact by the use of earrings (see figure 9). The cause of this organism reaction is usually the sensibility that some people have to Nickel, one of the substances present in the metal league used to produce costume jewelry. The most common symptoms of Nickel allergy are: itch, redness and, if the object (earring) is not soon removed, it can cause inflammation, followed by infection. (LAPIN, 2012)



Figure 9 – Earlobe inflammation due to Nickel contact. Source: Lapin (2012).

In Jewelry manufacture it is used a league of noble metals, were Nickel is not utilized. This is the reason why jewelry made with gold, silver, platinum and titanium do not cause allergy/dermatitis of contact. It is necessary to be careful with veneered jewelry, since the Nickel penetrates the thin layer of gold and silver, causing reaction on those who are allergic to this metal. Pieces made with wood, plastic, resin, bones and other materials that do not contain nickel also do not cause allergy/dermatitis of contact.

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### 3.2 ERGONOMICS APPLIED TO EARRING DESIGN

According to the International Ergonomics Association – IEA: “Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well being and overall system performance”. (IEA, 2014)

Ergonomics focuses on different areas, such as: Working Medicine, Working Psychology, Working Safety, Architecture, Design and others. It has an interdisciplinary approach that aims to define parameters that provide safety, health, comfort and human well being.

To Chapanis (1995), the designer must prioritize Ergonomics in his projects in order to obtain safer and more adequate products, adjustable to human dimensions, comfortable, easy to wear, among other qualities.

In the Jewelry Design environment, the comfort of wearing jewelry is a result of an anthropometric adequacy, shape and weight of the piece. Besides verifying if the piece has an adequate anatomic shape, it is also important to “verify a couple of functional questions related to weight, size, volume, flexibility/rigidity and pressure” that the piece might cause on the user’s body. (FRISONI, 2003, p. 10)

In literature, the ergonomic aspects related to jewelry design are still incipient. It was not found specific ergonomic recommendations concerning earring design. Therefore, in order to contribute to this area, it was made a list with aspects that must be considered by the designer during the project.

- Regarding user’s **safety** and **comfort**, earrings must:
  - Have edges and vertices softened/rounded; pointed and perforating forms must be avoided, not to bruise the user;
  - Have a shape that does not stick to clothes, in order to avoid possible traumatism and/or ear deformation;
  - Be light. Heavy earrings make the lobe hole turn into a partial or even a total gap (bifid lobe). The most appropriate manufacture process is electroformation, which allows the achievement of hollow and light pieces for several applications.
- Regarding **usability**, earrings must provide:
  - Easy and practical handling;
  - Easy and quick placement and removal.
- Regarding **product quality**, the earrings must have:
  - The gems well inserted in order to avoid its loss;
  - Safe closures in order to avoid the jewelry loss;
  - Efficient fitting mechanisms/systems

### 4 FINAL CONSIDERATIONS

As in literature the ergonomic aspects related to jewelry design are still incipient, the jewelry designer has a lack of support and information while basing the proposed solutions. Within the gaps in this area, it is noticeable the lack of anthropometric data regarding the Brazilian female population, leading the designer to take “conventional jewelry measures”. These measures were established through solutions found by several goldsmith generations. However,

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"the conventional measures and measuring equipment used by goldsmiths are not enough to ensure the suitability of pieces to users", affirms Frisoni (2003, p. 10).

Therefore, in order to ensure comfort, practicality and safety to jewelry users, it is necessary to make an ergonomic evaluation with the jewel prototypes, since it is possible to detect and correct problems before the product goes into a production line.

The ergonomic evaluation must be made with users. It is necessary to get a population with a similar profile to the future jewelry user. The jewelry prototype must be provided to each person to handle, wear and analyze the product. It is important to verify how the person interacts with the prototype. A questionnaire can be given for the person to express opinions about the product. By this moment, it is possible to detect existent problems in the jewelry prototype. Finally, corrections and adjustments are made. If the designer finds it necessary, several evaluations can be made in order to prove the ergonomic quality of the product.

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