Influence of Material and Decoration on Design Style, Aesthetic Performance, and Visual Attention in Chinese-Style Chairs

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Abstract

Chinese-style chairs are appreciated by many consumers for their elegant design. The material and decoration have a significant impact on the design of Chinese-style chairs. Exploring the influence of these two factors on design styles and aesthetic expressions, as well as the related visual attention patterns, is of great importance for the design of Chinese-style chairs. This study aimed to investigate the impact of material (wood/metal) and decoration (pattern/no pattern) on the design style, aesthetic performance, and visual attention patterns of Chinese-style chairs. Fifty-six Chinese university students wore eye-tracking glasses to view four types of chair designs and completed subjective rating scales. The results show that material and decoration have both independent and interactive effects. Wood chairs exhibit a traditional design style and superior aesthetic performance compared to metal chairs. Traditional Chinese patterns enhance design style and aesthetic performance, particularly when applied to wooden chairs. Visual attention was not significantly different across chair designs, except for wooden chairs with traditional patterns on the backrest, which attracted more attention. These research findings provide reference for designers to design Chinese-style chairs.

Wood and metal are commonly used materials in chair design. Wood, an organic material, has been utilized in furniture making since ancient times, with the history of wood chairs tracing back to ancient civilizations (Smardzewski 2015). Wood offers not only good reliability and sustainability but also a unique aesthetic experience for consumers (Pakarinen 1999, Viholainen et al. 2021). In contrast, the popularity of metal chairs emerged later, following the development of metal-processing technologies after the industrial design revolution (Smardzewski 2015). Metal chairs also differ significantly from wood chairs in visual effect. Traditional Chinese-style chairs are mostly made of wood. However, with the influence of foreign styles and modern aesthetics on chair design, a type of chair that combines the traditional Chinese-style chair's form with modern design concepts, known as the new Chinese-style chair, has also become popular in China (Jiang et al. 2021). Metal materials play an important role in this chair, as their unique textures and charm are widely used in new Chinese-style furniture (Sun 2016).

Besides shape, color, material, and finishing (CMF) are crucial features in chair appearance design (Becerra 2016), influencing the design style (Liu 2020). The standardization of modern furniture shapes underscores the importance of material application in furniture design (Wang et al. 2009). Due to the long history of wooden furniture and its design continuity, wood chairs often evoke a traditional feel (Xinhong 2020). In China, wooden furniture, with a 7,000-year history, reflects the aesthetic consciousness and spiritual traits of Chinese culture, highlighting the traditional feel of wood in furniture design (Liu et al. 2013). Metal began to be widely used in chair design only in the 20th century, and its design is independent of traditional chairs, emphasizing a more modern feel compared to wood chairs (Ishmakhova et al. 2018).

The material significantly impacts the aesthetic evaluation of chair design (Zuo and Jones, 2005). The surface color and texture of the material affect consumers' visual perception, thereby altering their evaluation of furniture design (Zuo et al. 2016). One study recorded undergraduate students' evaluation of four materials (bamboo, wood, glass, and metal) after viewing tables made of these materials and tracking their eye movements (Ye et al., 2015). The results showed differences in the design evaluation scores of tables made from the four materials, which were related

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to eye movements. In another study, participants experienced five different chair materials (including wood and metal) and evaluated and described these materials (Almeida et al. 2022). The results indicated that both wood and metal were considered suitable materials for making chairs, but they evoked different feelings: Wood was warm, sturdy, and rustic, while metal was cold, durable, and noble. Overall, wood and metal play crucial roles in chairs, impacting not only the physical characteristics of the chairs but also influencing consumers' visual perception and evaluation of chair design.

Application of traditional Chinese patterns as decoration in furniture

Traditional Chinese patterns are an important part of Chinese traditional culture (Liu et al. 2018). These patterns have unique shapes and design features, not only serving a decorative purpose but also embodying profound cultural connotations (Zheng 2022). Ancient Chinese chairs were mostly made of wood, and traditional Chinese patterns were often used in their decoration. This design approach has continued to the present day, with these patterns being created through techniques such as painting, carving, and inlaying (Xinhong 2020). As a common decorative element in Chinese-style chairs, traditional Chinese patterns play a significant role in the design of chairs and are easily noticed by consumers. Eye-tracking data show that people's attention when observing furniture often focuses on the decorative parts, which are features that interest them (Wan et al. 2018). The proper application of traditional Chinese patterns can enhance the traditional feel of wooden furniture and improve the aesthetic appeal of products (Wu 2019). A study found that applying decorative patterns from the Jinsha Site gold to new Chinese-style furniture can enhance the furniture's sense of design and aesthetics (Zeng and Gu 2017). However, decorative elements in product design, if used inappropriately, can lead to a decrease in the product's aesthetic appeal and a lower evaluation of its design by consumers. For example, if the decoration in hotel products is too conspicuous and inappropriate, it can lead to a decrease in consumers' aesthetic evaluation of these products (Li et al. 2015). Therefore, the application of traditional Chinese patterns in Chinese-style chairs should also be used appropriately according to the style and characteristics of the products.

Eye tracking

Eye tracking is an objective measurement method of physiological indicators used to collect information about participants' eye movements. Eye tracking serves as an effective tool to explore human visual cognitive processes and analyze aesthetic evaluations of products (Wang et al. 2023). Eye-tracking technology compensates for the shortcomings of subjective evaluations, which are easily influenced by individual biases. In studies of visual perception, eye-tracking technology combined with subjective evaluation scales can deeply investigate a subject from both subjective and objective perspectives (Wan et al. 2021). Fixation refers to the process in which the fovea maintains a certain duration on the target to obtain sufficient visual image details, manifested in eye-tracking data as a point with coordinate and time information. Fixation time and/or number of fixations are often used as indicators to measure the attention to visual information in research (Wan et al. 2018, Liu et al. 2021, Ye et al. 2021). In order to compare the attention to different areas, stimuli in research are divided into specific regions, referred to as areas of interest (AOIs). AOI analysis can more intuitively show the areas that receive longer gaze durations (Faraji et al. 2023).

Eye tracking is widely used in furniture-related research. One previous study used eye-tracking technology to investigate laminated bamboo furniture and found that the material characteristics affected product evaluations, which were related to fixation (Wan et al. 2021). In another study, 60 participants viewed the design details of 40 chairs, and the results showed that participants' gaze behavior was related to aesthetic preferences (Ilhan and Togay 2024). A study on Chinese Tang-style chairs found that two factors affecting the emotional evaluation of chairs are shape and decoration, and the complexity and harmony of decoration affect participants' gaze patterns (Zhagn and Xu 2020). Furthermore, the study found that the main features affecting people's evaluations of chairs are the backrest, armrests, and chair legs. Another study also found a similar conclusion: People pay more attention to decorative parts, so designers can focus on decorations (Wan et al. 2018). This study analyzed participants' eye movements when viewing images of three-dimensional chairs and found that the backrest and seat are the key areas of focus for evaluating chair design (Wan et al. 2018). Eye-tracking technology has been proven to be an effective tool in furniture design research for exploring participants' attention allocation and search strategies when observing furniture. It can also be combined with other metrics for a more in-depth analysis of furniture design and consumer cognition.

The present study

Chinese-style chairs are products highly favored by Chinese consumers. Research in this area mainly focuses on history, industry, marketing, or design methods, with fewer empirical studies related to design evaluation and visual cognition. Currently, there are few studies that quantitatively analyze the impact of traditional patterns on the design style and aesthetic performance of wood chairs and metal chairs, as well as the interaction between the two. Studies combining eye-tracking data for analysis are even rarer to find. Therefore, this study aimed to explore the influence of the material (wood/metal) and decoration (patterned/nonpatterned) of Chinese-style chairs on design style, aesthetic performance, and visual attention patterns. This study fills a gap in research in this field, providing evidence for understanding consumers' aesthetic perception and visual attention patterns towards Chinese-style chairs. It also offers suggestions for designers.

Specifically, this study addressed three research questions:

RQ1. Do the material and decoration have an interactive effect on the perception of design style of chairs?

RQ2. Do the material and decoration have an interactive effect on the perception of aesthetic value of chairs?

RQ3. Do the material and decoration have an interactive effect on the visual attention patterns stimulated by chairs?

Materials and Methods

This study adopted a two (material: wood/metal) by two (decoration: patterned/nonpatterned) design.

Participants

In total, 60 university students participated in this study. Data from four participants were excluded due to incomplete data. Therefore, data from 56 participants (male = 32, female = 24) were included in the final analysis. Their average age was 19.6 (SD = 2.72), and all participants were Chinese. All participants were not design or art majors and had not received professional design education. Of the 56 participants, 34 participants majored in natural sciences (such as mechanical engineering, computer science), while 22 participants majored in humanities and social sciences (such as business administration, English). They all had normal or corrected-to-normal vision. All participants were informed of the experimental procedure before participating and signed informed consent forms. All participants received a gift as a token of appreciation after completing the experiment.

Stimuli

Participants viewed a series of images displaying chair designs during the experiment. All chair images used in the experiment were designed and drawn by the researchers. The design of all chairs was inspired by traditional Chinese-style chairs designs. Based on the material and decoration of the chairs, all chairs were categorized into four types (Fig. 1): wood nonpatterned (WN), metal nonpatterned (MN), wood patterned (WP), and metal patterned (MP). Since the backrest is the area of the chair design to which users pay most attention (Hsu et al. 2017, Zhang and Xu 2020), patterns were carved on the backrests. As shown in Figure 1, each image contains chairs of the four design types (WN, MN, WP, MP), all with the same basic design. The orientation of the four chairs in each image is the same, and the background is light gray. Each image used in the experiment was divided into eight AOIs: WN1, WN2, MN1, MN2, WP1, WP2, MP1, and MP2, corresponding to the backrest and the overall chair for each chair. Participants could not see the boxes and text in Figure 1, which were used by researchers for data analysis. The experiment used a total of eight images, and the design of the chairs in each image was different. To eliminate the influence of learning effects, the arrangement of the four types of chairs in each image was different. Stimuli are given in Appendix 1.

Instruments

The experiment was conducted in a soundproof laboratory to eliminate external interference. Participants sat on a stool and viewed a 24-inch monitor with a resolution of 1,920 by 1,080 pixels and a refresh rate of 144 Hz. The stimuli for the experiment were displayed in full screen. Tobii Glasses Pro 2 were used to collect participants' eye-movement data. The software used to record eye-movement data was Tobii Pro Glasses Controller (Tobii Pro, Stockholm, Sweden), and the software used to process eye-movement data and export it was Tobii Pro Lab (Tobii Pro). Participants wore the eye tracker and were able to adopt a comfortable sitting position and move their heads during the experiment. However, vigorous movements were not allowed to prevent the eye tracker from falling off.

A subjective rating scale with two items was used to collect participants' evaluations of design style (DS) and aesthetic performance (AP) (Fig. 2). The evaluation of each chair corresponded to its position in the images, totaling evaluations for 32 chairs. The first item assessed design style, where participants had to answer the question: "Do you think the design of this chair is traditional or modern?" The second item assessed aesthetic performance with the

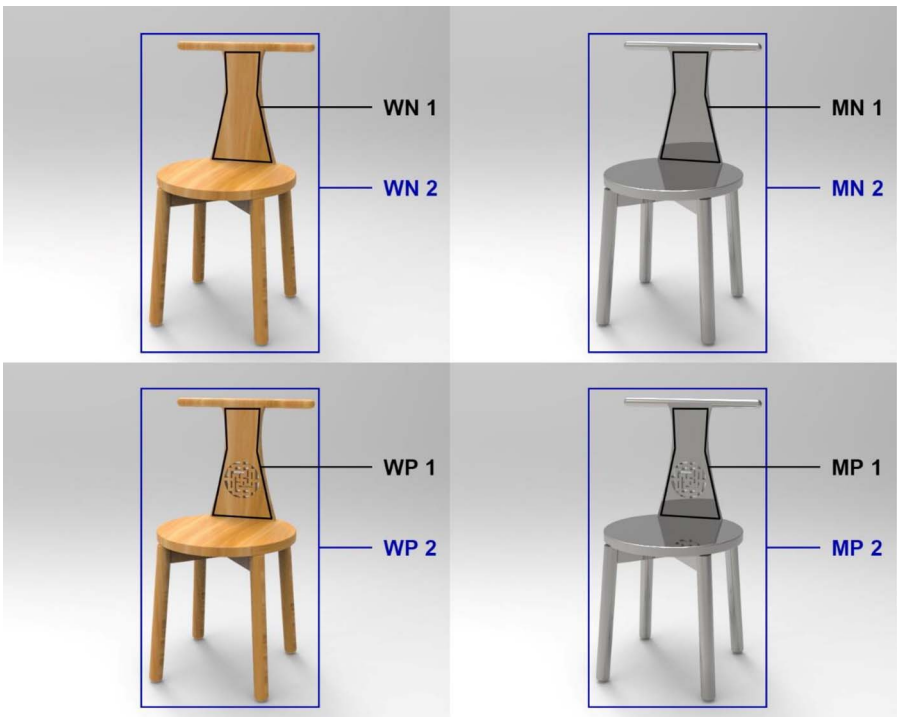

Figure 1.—Examples of the experimental materials and the division of areas of interest (AOIs) in the experimental materials. The four chairs from left to right, top to bottom, are wood nonpatterned (WN), metal nonpatterned (MN), wood patterned (WP), and metal patterned (MP).

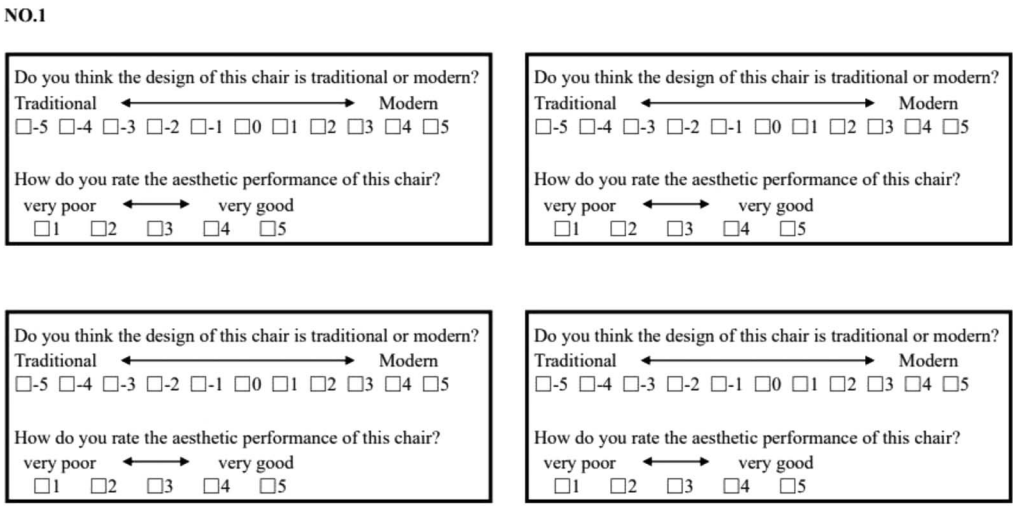

Figure 2.—The first page of the subjective rating scale for design style and aesthetic performance (the content is the same for the following seven pages except for the numbering).

question: "How do you rate the aesthetic performance of this chair?"

Procedure

The researcher explained the procedure and instructions of the experiment to the participants. After the participants indicated full comprehension and signed the informed consent form, the researcher fitted them with eye-tracking devices. Following calibration and pretesting to ensure that the equipment could accurately record eye-movement data and that the participants could engage correctly, the formal experiment began. The experimental procedure is illustrated in Figure 3. Before each image presentation, a black dot appeared in the center of the screen, followed by the stimulus after 1,000 ms. Participants had ample time to observe the four chairs displayed on the screen. Based on the positions of the chairs on the screen, participants rated the design style and aesthetic performance of each chair on the printed scale. After rating, participants pressed the spacebar. Subsequently, a black dot reappeared in the center of the screen, and after 1,000 ms, the next image containing four chairs appeared. This process was repeated eight times until participants had rated all 32 chairs.

Data analysis

The scores from the subjective evaluation scale (including DS and AP) were manually recorded by the researcher into an xlsx file. A higher absolute value of DS indicates that the participant perceived the design style of the chair to be stronger. A higher value of AP indicates that the participant perceived the aesthetic performance of the chair to be better.

Samples with an eye-tracking data collection rate below 90 percent were excluded. In the eye-movement data processing, all images were divided into AOIs by the researchers (Fig. 1). The eye-movement data for each AOI were processed using Tobii Pro Lab (Tobii Pro) and exported as xlsx files. The data from the subjective rating scales were manually entered into the xlsx files by the researchers.

The required eye-movement data for this study included the fixation time (FT) for each chair and the percentage of fixation time (PFT) for the backrest. FT could be exported directly from the software. Fixations with a duration of less

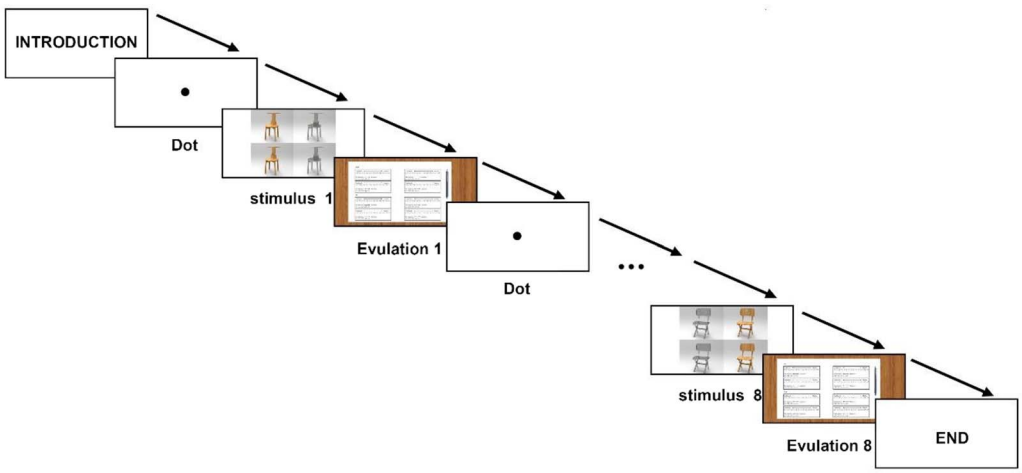

Figure 3.—Experimental procedure.

Table 1.—Results of design style.

	Design style		
	Nonpatterned	Patterned	Total
Material	Mean (SD)	Mean (SD)	Mean (SD)
Metal	2.83 (0.857)	1.56 (0.711)	2.20 (1.011)
Wood	1.89 (0.857)	3.08 (1.086)	2.48 (1.142)
Total	2.36 (0.975)	2.32 (1.191)	2.34 (1.086)

Table 2.—Results of aesthetics performance.

	Aesthetic performance		
	Nonpatterned	Patterned	Total
Material	Mean (SD)	Mean (SD)	Mean (SD)
Metal	2.35 (0.868)	1.38 (0.588)	1.86 (0.884)
Wood	2.04 (0.820)	2.74 (0.849)	2.39 (0.904)
Total	2.19 (0.855)	2.06 (1.000)	2.13 (0.930)

than 50 ms were not considered. PFT was calculated as the fixation time for the AOI corresponding to the backrest divided by the total fixation time for the AOI corresponding to the entire chair. For example, the PFT for WN in Figure 1 is the fixation time for WN1 divided by the fixation time for WN2. The numerical value for DS used the absolute value of the original data.

A statistical analysis of the data was performed using SPSS for Windows v. 26.0 (IBM, Armonk, New York, USA). Descriptive statistics were calculated for FT, PFT, DS, and AP for each chair. Analyses of main effects and interaction effects were conducted with material and decoration as independent variables and FT, PFT, DS, and AP as dependent variables. Correlation analyses were also conducted among FT, PFT, DS, and AP. A significance level of $p < 0.05$ was used.

Results

Design style

To address RQ1, the results for the design style of chairs made of metal and wood, with or without pattern, were analyzed. The results indicated that the design style scores for metal chairs were positive, while those for wood chairs were negative. To analyze the design style results, the scores for wood chairs were converted to the absolute values of the original data (Table 1).

The main effect of material was significant, with $F_{1,220} = 6.014$, $p = 0.015$, and $\eta^2 = 0.027$, but the main effect of decoration was not significant, with $p > 0.05$. There was a significant interaction between material and decoration (Fig. 4), with $F_{1,220} = 107.574$, $p < 0.001$, and $\eta^2 = 0.328$. Simple effects analysis revealed that in nonpatterned chairs, the design style of metal chairs was stronger than that of wood chairs, with $F_{1,220} = 31.358$, $p < 0.001$, and $\eta^2 = 0.125$. In patterned chairs, however, the design style of wood chairs was stronger than that of metal chairs, with $F_{1,220} = 82.230$, $p < 0.001$, and $\eta^2 = 0.272$. Among metal chairs, the design style of nonpatterned chairs was stronger than that of patterned chairs, $F_{1,220} = 57.558$, $p < 0.001$, and $\eta^2 = 0.207$, while among wood chairs, the design style of patterned chairs was stronger than that of nonpatterned chairs, $F_{1,220} = 50.144$, $p < 0.001$, and $\eta^2 = 0.186$.

Aesthetic performance

To address RQ2, the aesthetic performance of chairs made of metal and wood, with or without pattern, was analyzed (Table 2).

The main effect of material was significant, with $F_{1,220} = 24.977$, $p < 0.001$, and $\eta^2 = 0.102$, but the main effect of decoration was not significant, with $p > 0.05$. There was a significant interaction between material and decoration (Fig. 5), with $F_{1,220} = 63.267$, $p < 0.001$, and $\eta^2 = 0.223$. Simple effects analysis revealed that in nonpatterned chairs, the aesthetic performance of metal chairs was stronger than that of wood chairs, with $F_{1,220} = 4.370$, $p = 0.038$, and $\eta^2 = 0.019$. In patterned chairs, however, the aesthetic performance of wood chairs was stronger than that of metal chairs, with $F_{1,220} = 83.874$, $p < 0.001$, and $\eta^2 = 0.276$. Among metal chairs, the aesthetic performance of nonpatterned chairs was stronger than that of patterned chairs, with $F_{1,220} = 42.128$, $p < 0.001$, and $\eta^2 = 0.161$, while among wood chairs, the aesthetic performance of patterned chairs was stronger than that of nonpatterned chairs, with $F_{1,220} = 22.640$, $p < 0.001$, and $\eta^2 = 0.093$.

Fixation time and percentage fixation time

To address RQ3, the FT for chairs made of metal and wood, with or without pattern, was analyzed (Table 3).

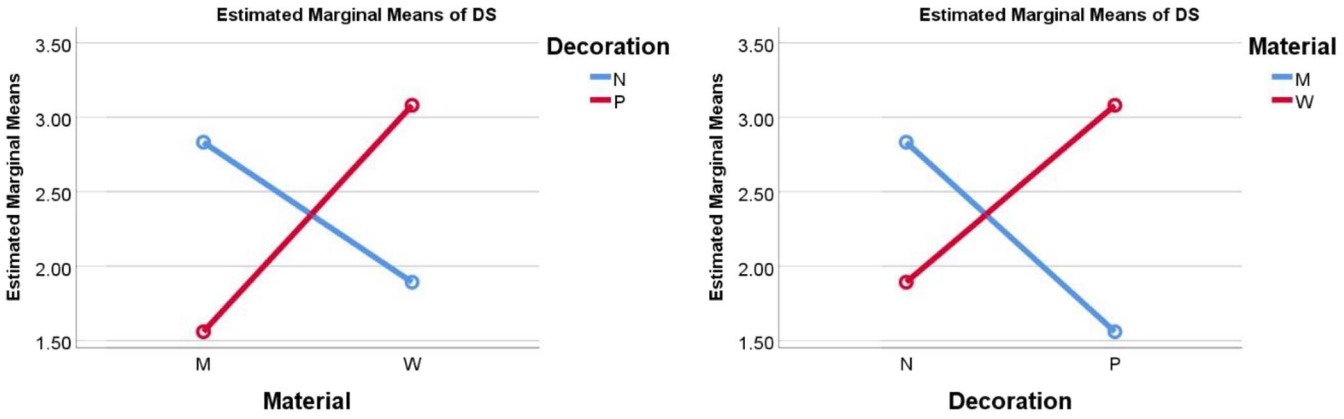

Figure 4.—Interaction of design styles.

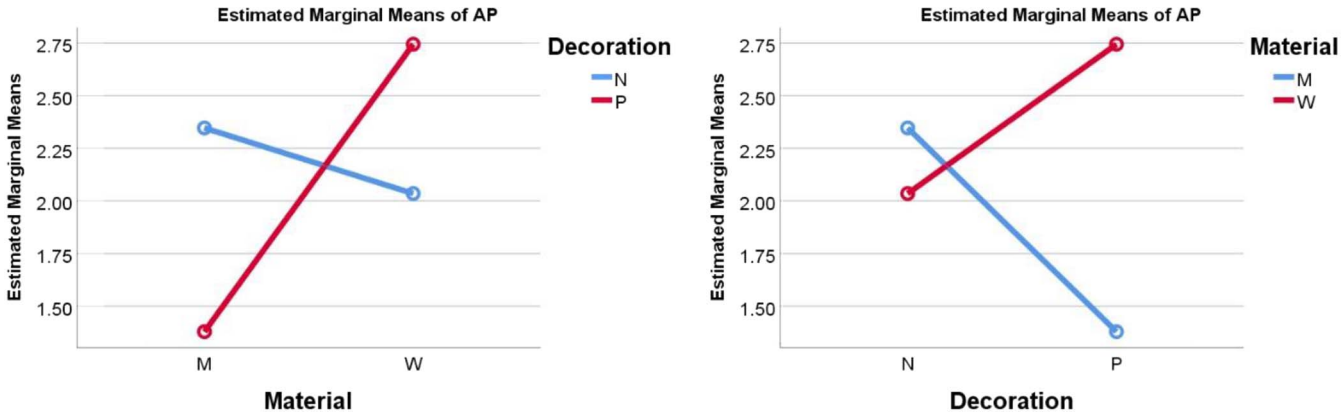

Figure 5.—Interaction of aesthetic performance.

The main effects of material and decoration, as well as the interaction between material and decoration, were not significant, all with $p > 0.05$.

To address RQ3, we also analyzed the results of PFT for metal and wood chairs with or without patterns (Table 4).

The main effect of material was not significant ($p > 0.05$), while the main effect of decoration was significant, with $F_{1,220} = 9.659$, $p = 0.002$, and $\eta^2 = 0.042$. There was a significant interaction between material and decoration (Fig. 6), with $F_{1,220} = 4.092$, $p = 0.044$, and $\eta^2 = 0.018$. Simple effects analysis showed that in chairs without pattern, there was no significant difference in PFT between metal and wood chairs ($p > 0.05$). However, in chairs with pattern, the PFT for wood chairs was higher than that for metal chairs, with $F_{1,220} = 7.389$, $p = 0.007$, and $\eta^2 = 0.032$. For metal chairs, there was no significant difference between nonpattern and pattern conditions ($p > 0.05$), while for wood chairs, the PFT for chairs with pattern was higher than that for chairs without pattern, with $F_{1,220} = 13.162$, $p < 0.001$, and $\eta^2 = 0.056$.

Correlation analysis

To further explore the relationship between chair design and visual attention, we conducted a correlation analysis of design style, aesthetic performance, FT, and PFT (Table 5). The results indicated a positive correlation between design style and aesthetic performance ($r = 0.334$; $p < 0.001$).

Discussion

In terms of design style, participants perceived wood chairs as traditional and metal chairs as modern. China's thousands of years of wood use have formed a wood culture that integrates social, aesthetic, furniture, and lifestyle cultures (Lin 2015). Wood furniture is the most important part of traditional Chinese furniture, and the design of many wood chairs is well known to the Chinese people (Liu et al. 2013). Wood culture has been inherited along with the long-term popularity of wooden furniture. Furthermore, the physical properties of wood give people a sense of nature, simplicity, and warmth (Li and Zhang 2018), which contributes to the traditional style of wood chairs. Metal furniture entered daily life during the Bauhaus period (1920s–1930s), and it was later introduced to China (Ertaş 2021). As a representative material of modern furniture, metal has a weaker cultural heritage and is easily associated with modern design styles by Chinese consumers (Wang 2013). Metal is bright in color, has strong reflectivity, and has a hard, smooth texture, unlike any organic material (Namicev and Tasevska 2019). Metal has never been popular in traditional Chinese chair design but has entered the Chinese furniture industry in a modern, foreign identity (Ertaş 2021). These factors give chairs made of metal a modern design sense for Chinese consumers. Therefore, for furniture designers, wood is a better choice to enhance the traditional feel of chair design, while metal is a better choice than wood when designers want to give chairs a more modern design feel.

Wood chairs exhibit a stronger traditional design style than metal chairs. Additionally, wood chairs show stronger aesthetic performance than metal chairs. The results of the experiment also indicated a positive correlation between design style and aesthetic performance. This suggests that the material can simultaneously influence the design style and the aesthetic performance of chairs, and in the case of Chinese-style chairs, wood performs better than metal. The current popular furniture design styles in China are influenced by the Ming and Qing dynasties (two dynasties in China's feudal period), which still retain the design characteristics of traditional Chinese wood chairs (Appiah-Kubi et al. 2021).

Table 3.—Results of fixation time.

	Fixation time (second)		
	Nonpatterned	Patterned	Total
Material	Mean (SD)	Mean (SD)	Mean (SD)
Metal	9.93 (1.299)	9.93 (1.389)	9.93 (1.339)
Wood	9.97 (1.244)	10.28 (0.899)	10.13 (1.092)
Total	9.95 (1.266)	10.10 (1.178)	10.03 (1.223)

Table 4.—Results of percentage of fixation time.

	Percentage of fixation time		
	Nonpatterned	Patterned	Total
Material	Mean (SD)	Mean (SD)	Mean (SD)
Metal	0.22 (0.090)	0.23 (0.096)	0.23 (0.093)
Wood	0.22 (0.083)	0.28 (0.075)	0.25 (0.084)
Total	0.22 (0.086)	0.26 (0.089)	0.23 (0.089)

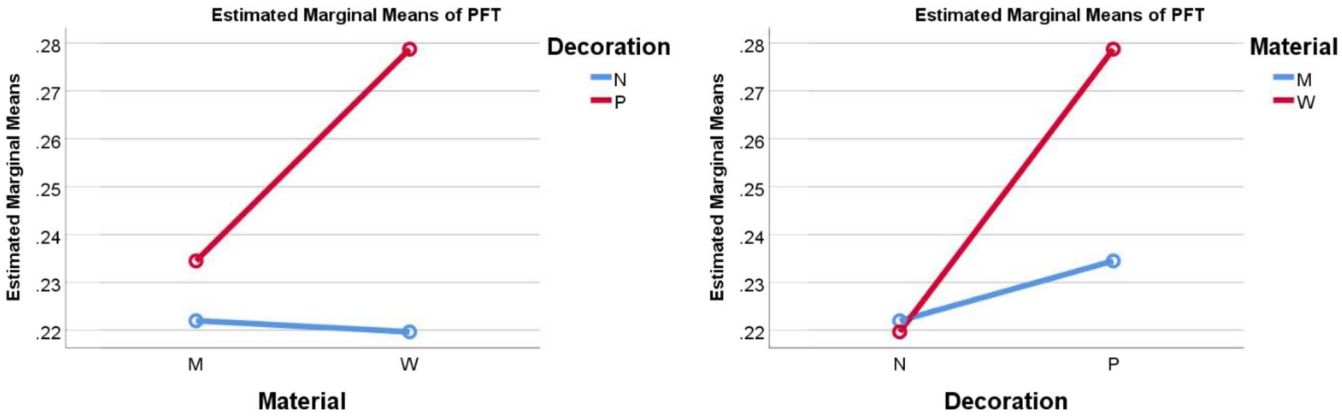

Figure 6.—Interaction of percentage fixation time.

The designs of the chairs used in the experiment were inspired by traditional Chinese chair designs. Wood has a higher compatibility with traditional Chinese aesthetics and reflects the aesthetic consciousness and spiritual uniqueness of Chinese culture (Liu et al. 2013). Chinese people advocate harmony and inheritance. Combining the traditional feel of wood with the traditional feel of chair design helps to enhance the product's design style and aesthetic performance.

When both material and traditional Chinese patterns are present, their interaction becomes apparent. In simple terms, the combination of wood and traditional Chinese patterns can enhance the design style (traditional), while metal without traditional Chinese patterns can also enhance the design style (modern). This interactive effect is similarly reflected in aesthetic performance. Traditional Chinese patterns are aesthetically pleasing and carry cultural value. When used as a decorative element in wooden furniture, they can enhance the aesthetics of the furniture and evoke associations with traditional Chinese culture (Wu 2019) and can even have a positive impact on users' spirituality and beliefs (Appiah-Kubi et al. 2023). These pleasant experiences contribute to higher evaluations of the design style and aesthetic performance of the chairs. Decoration is a method that can enhance the aesthetic and artistic value of a product (Mohamed 2022), but adding decoration does not guarantee success. The aesthetic performance of a product can only be improved when the decoration matches the design characteristics of the product, especially for products with modern design styles. This is because modernism prohibits decoration because it is dissonant with the material, structure, and function (Riisberg and Munch 2015). In addition, when decoration becomes overstyled, consumers' evaluations of the product decline (Hagtvedt and Patrick 2014). Traditional Chinese patterns themselves have good aesthetic characteristics and strong design styles (Zheng 2022). However, when paired with modernly designed metal materials, they do not have a positive effect. For metal chairs with a highly modern design, incorporating traditional Chinese patterns is "inappropriate" and "overstyled," thus having a negative impact on design style and aesthetic performance.

Participants did not show significant differences in FT when viewing the four different types of chair designs. However, there were differences in the PFT focused on the backrest. Specifically, chairs with traditional Chinese patterns had a higher PFT on the backrest compared to chairs without traditional Chinese patterns. Furthermore, the PFT for chairs with patterns in wood was highest. The backrest is an easily focused area when people observe chair designs (Hsu et al. 2017, Zhang and Xu 2020). This may be related to the larger area of the chair back and the potentially rich details that may exist. People tend to observe the details in product design, as confirmed in chair design studies (Wan et al. 2018). In this study, traditional Chinese patterns appeared on the chair backrests, and these decorative details often attract attention. Therefore, participants spent more time looking at the backrests of chairs with patterns than those without patterns. When considering the material, chairs with patterns in wood were more attractive than those with patterns in metal. This is consistent with the results of design style and aesthetic performance analyses. Although there was no overall difference in FT, participants invested more visual attention on chairs with decorative differences for better design evaluations or more culturally sensitive seat designs. This tendency has also been found in other studies (Villani et al. 2015, Mitrovic et al. 2020). Therefore, using appropriate decorations on chair backrests that are

Table 5.—Results of correlation analysis.

	Design style		Aesthetic performance		Fixation time		Percentage of fixation time	
Variables	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*
Design style	—	—	0.334**	<0.001	–0.063	0.346	–0.060	0.371
Aesthetic performance	0.334**	<0.001	—	—	0.079	0.238	0.099	0.139
Design performance	–0.063	0.346	0.079	0.238	—	—	0.047	0.488
Percentage fixation time	–0.060	0.371	0.099	0.139	0.047	0.488	—	—

Note: ** means $p < 0.001$.

likely to attract user attention should be beneficial for enhancing user evaluations of chair design.

In summary, this study demonstrates that the material and decoration have independent and interactive effects on the design style, aesthetic performance, and visual attention patterns of Chinese-style chairs. Traditional Chinese patterns are suitable for application on wood chairs, further enhancing the design style and aesthetic performance. Metal material is not suitable for representing traditional styles, and traditional Chinese patterns are not suitable for metal combinations in Chinese-style chair design. In terms of visual attention, there was no significant difference in overall FT, but differences were observed for focus on the chair backrest, which aligns with the results for design style and aesthetic performance. Carving traditional Chinese patterns on the backrest of wood chairs can attract more visual attention. Therefore, designers can focus on the design of the backrest and appropriately incorporate traditional Chinese patterns to decorate the chair. However, traditional Chinese patterns may not be a good choice for metal chairs.

This study provides insights into chair design, but it still has limitations. The chairs in this study were all Chinese-style chairs, mainly targeted at Chinese people and those with a strong sense of Chinese cultural identity. The findings of the study provide some guidance for designers of Chinese-style chairs, but they may lack practical significance for non-Chinese furniture markets. The stimuli used in the experiment, namely, chair designs viewed by participants, although representative, cannot encompass all forms of Chinese-style chair designs. The evaluation of the design style and aesthetic performance of chair designs was based on participants' subjective evaluations of each chair. Because there were 32 chair designs in total, a more comprehensive evaluation may not be possible. Finally, the participants in the experiment were all Chinese university students, which limits the generalizability of the findings.

Conclusions

The design style and aesthetic performance of a product are important indicators for users to evaluate a product and a significant source of user satisfaction, which can greatly determine whether they will purchase the product. This perception is closely related to visual attention. Analysis of people's aesthetic cognition and visual processing when facing different designs of Chinese-style chairs is of great significance for the design of Chinese-style chairs. It can enhance the appeal of Chinese-style chairs to users, increasing their desire to purchase these products. This study analyzed the effects of material (wood/metal) and decoration (pattern/no pattern) on the design style, aesthetic performance, and visual attention patterns of Chinese-style chairs using subjective questionnaire data and eye-tracking data. The study is beneficial for designers to understand the complex relationship between chair design and users' visual cognition. The results indicate that both material and decoration have independent and interactive effects:

1. Material influences design style: Wood chairs exhibit a traditional design style, while metal chairs exhibit a modern style.
2. The design style and aesthetic performance of wood chairs are superior to those of metal chairs.
3. Traditional Chinese patterns positively affect design style and aesthetic performance only when applied to wooden chairs; conversely, metal chairs are better suited to designs without traditional Chinese patterns.
4. There were no significant differences in visual attention among chairs with different designs. However, chairs with Chinese traditional patterns carved on the back attracted more attention from participants to the backrest.

The study provides valuable insights for the design of Chinese-style chairs. Both the material and decoration play important roles in the perception of Chinese-style chairs. Furthermore, their interaction should also be considered by designers. Adding decorative elements can attract users' attention, which is an effective way to increase their desire to purchase the product. However, it is important to ensure that the decoration matches the overall style of the Chinese-style chairs.

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Appendix 1.—Stimuli