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The Impact of Visual Complexity on the Elderly and Young Consumers: Browsing in a Clothing Store

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Abstract

The aging of the world's population will have a considerable impact on the consumer market. Basically, the elderly is less able to accept online purchases than young people. Therefore, many elderly consumers are still accustomed to buying in physical stores. The spatial visual complexity of the store may have an impact on the elderly consumers' perception, which in turn affects their shopping emotions and behavior. The primary purpose of this study is to empirically explore how visual complexity affects consumers' perception and psychology in a retail environment; and to further explore the effects on the experiences of the elderly and young consumers. The findings of this study indicate that the combinations of spatial layout and pattern decoration have different influences on the elderly and young consumers' perceptions and psychological responses in a clothing store. The elderly consumers believe that the higher visual complexity, the more easily their attention is disturbed, and they do not like shopping in the highest spatial visual complexity. In terms of the impact of visual complexity on pleasant emotions, the elderly consumers have stronger impact than the young consumers. The finding suggests that if retailers want the elderly consumers to concentrate on searching for merchandise, they can simplify spatial layouts and decoration patterns to reduce the visual complexity of the space.

Keywords: elderly, visual complexity, consumer psychology, consumer behavior

1. Introduction

With the acceleration of the aging of the global population, the problems faced by the elderly have gradually become one of the most important social issues in the world. Globally, the number of older people is expected to more than double, from 841 million in 2013 to more than 2 billion in 2050 (Kulik & Ryan, et ai., 2014). The increase in the proportion of the elderly population has not only brought a huge impact on the social demographic structure, but also began to change the existing consumer market. According to the finding from Rahman & Yu (2019), most senior consumers prefer to shop in physical stores compared to online shopping. In addition, elderly consumers often meet different problems when purchasing different products; therefore, retailers must understand the needs of the psychological and physiological changes of elderly consumers from different perspectives. Among many consumption categories, clothing is important for the elderly as some elderly people want to socially hide their physical aging caused by aging (Çivitçi, 2004). Studies have also shown that clothing, as an indispensable consumer demand for elderly consumers, occupies a very important position in the consumption industry (GÜZEL, 2013). In addition, according to the research on the consumer market of elderly women, clothing produced for the colors and styles preferred by elderly women will have a positive impact on the psychology of the elderly and improve the quality of life and satisfaction of elderly women.

Due to the deterioration of physical functions in the elderly, there is a certain weakening trend in vision, hearing and touch, as well as comprehension, memory and judgment (Lee, 2001). Consumers often have a special consumption experience in commercial spaces because of spatial visual appeal. Therefore, consumers are often influenced by the interior design of stores, thereby affecting their shopping behavior and increasing their willingness to purchase (Jang et al., 2018). Some scholars have found that visual complexity has different effects on consumers in grocery stores, and consumers will have different shopping cognitions in the spaces with different visual complexity (Orth & Crouch, 2014; Orth et al., 2016). Therefore, by controlling different levels of visual complexity, the quality of commercial environment can be improved. In addition, elderly consumers'

pleasure and satisfaction will be increased, which will have positive effects on the elderly and the consumer market.

2. Theoretical Background and Hypotheses

2.1 The Impact of Environmental Stimuli on Consumers

Environmental stimuli have an obvious impact on consumers, so store image and environment are important factors that can affect consumer shopping behavior (Baker et al., 1994). According to the finding from Wu et al., (2014), the furniture layout design of the space has a significant impact on consumers' emotion, which in turn has a further impact on consumers' purchase intention and is helpful for improving consumers' satisfaction (Cil, 2012). This can even create and change consumers' needs and preferences (Simonson, 1999). Kleinginna (1981) believes that the characteristic factors of the environment can induce emotional fluctuations, and emotions can trigger the following effects: triggering emotional experiences such as alert responses, feelings of pleasure or unhappiness; generating cognitive processes, such as perception, evaluation and classification work; activating general physiological adaptations into a state of alertness; and causeing expressive, purpose-directed, and adaptive behavior.

Through data of experiments, Foxall and Greenley (1999) proved that happiness, arousal and dominant emotions can become factors for consumers to decide to purchase. Peter and Olson (2005) further stated that consumers should be made to experience good, pleasant, happy and satisfied feelings in the store. In addition, according to the environmental psychology model of Mehrabian and Russell (1974), environmental stimuli will affect consumers' emotions, and then make consumers respond to approach or avoidance. Russell (1980) believes that the emotional states of shoppers can be divided into: pleasure, arousal and dominance. In addition, the emotions generated by consumers can also be summarized as positive emotions and negative emotions, where positive emotions include pleasant and arousing emotions, and negative emotions include unpleasant and sleepy emotions (Machleit & Eroglu, 2000, Russell, 1980). According the findings from Jang et al. (2018), higher visual complexity may produce higher arousal, while lower visual complexity may produce more pleasure. Different arousal and pleasure may lead to different shopping behaviors of consumers.

In the study of Law et al., (2012), it is pointed out that the display elements, colors, lighting and other appliances in clothing stores will trigger emotional reactions of consumers, and ultimately affect consumers' purchase intentions. The spatial atmosphere in the store has a greater impact on the emotional arousal of consumers, and a well-designed store layout can help promote a positive shopping atmosphere, which in turn increases retail store sales (Juel-Jacobsen, 2015). Scholars such as Vrechopoulos et al., (2004) stated in their research that the three most commonly used layout types in stores are: freeform layout, grid layout, and racetrack layout. For consumers, different layout types play an important role in the impression of a store in consumers' minds. Grid layout: parallel aisles can provide consumers with an efficient and fast shopping experience. It is currently the preferred layout type for supermarkets. (Levy & Weitz, 2008; Vrechopoulos et al., 2004). This type of layout coexists with vertical and horizontal shelf arrangement in an orderly manner, which can help consumers quickly find what they need (Levy & Weitz, 2008). In the study of Lee, et al., (2001), it is also shown that the grid layout can maximize the sales efficiency of the space, and effectively control and guide the flow of people passing through the store through parallel aisles. Freeform layout: An unstructured arrangement of aisles, shelves, and displays, as opposed to a grid layout (Vrechopoulos et al., 2004). This type of layout is usually dominated by relatively low shelves, which can enable consumers to extend the shopping time in the layout, thereby promoting consumption, which is more common in clothing stores (Anić & Radas, 2006). Racetrack layout: The layout is shaped like a racetrack, providing consumers with an unusual and interesting shopping experience, including a central main aisle along which consumers can browse the entire store (Lewison, 1994; Vrechopoulos et al., 2004). Palmer (1999) proposed that people's perception of the complexity of the environment depends on the independence of the number of objects in the perception grouping, and some regular displays with symmetry, repetition and similar characteristics can reduce the visual complexity. Generally speaking, stores with low spatial complexity are arranged in a regular layout, while stores with high spatial complexity are arranged in an irregular layout (Orth & Wirtz, 2014).

Over the years, the concept of visual complexity has been applied to different fields such as psychology, computer science, cognitive science, artistic creation, etc. Visual complexity is broadly defined as the level of detail or complexity contained in an image (Snodgrass & Vanderwart, 1980). Some scholars have shown in their research that perceived complexity and picture diversity are positively correlated (Heylighen, 1997), which means that the richer the pattern diversity, the higher the perceived complexity. For indoor space, the space can be composed of various factors such as lighting, color, furniture, and furnishings. Because the patterns and

numbers of elements in the space are different, it may cause differences in the visual complexity of the space, thus resulting in differences in the visual and psychological perception of people in the space. For commercial spaces, when consumers look for or browse goods in the space, any visual factors that hinder consumers' search may cause negative reactions (Babin et al., 1994). Therefore, visual complexity can have an effect on arousal and attract the viewer's attention, but it can also interfere with attention when shopping (Gil & Droit-Volet, 2012). The study of Zhang et al. (2004) used the number, clutter, organization, symmetry, and color changes that affect visual complexity to classify scenes into groups of different levels of complexity to identify viewers' visual complexity. On the other hand, some scholars have found that repetitive and uniform textures and patterns have lower visual complexity than complex or chaotic patterns (Heaps et al., 1999; Oliva et al., 2001).

Baker's study shows that a store's layout, especially its spatial arrangement, can facilitate consumers' approach behavior (1986). According to the findings from Orth and Wirtz (2014), stores with low spatial complexity arranged components in regular columns and rows, however, stores with high spatial complexity arranged components in an irregulate manner. Orth and Wirtz (2014) also found that visual complexity of a store negatively impacts consumers' affective and behavioral responses. In addition, Jang et al. (2018) manipulated the levels of visual complexity with the presence of decorative patterns as a design element and the type of layout (grid vs. free-form). In their experiments, stores with high visual complexity placed decorative patterns on ceilings, walls, furniture and carpets. On the other hand, for a store with low visual complexity, decorative patterns were not used on ceilings, walls, furniture and carpets. Instead, relatively simple colors and shapes were used in these places. The finding from their experiment shows that the combination of these two spatial factors, decoration and layout, can indeed produce visual complexity and affect consumers' pleasure and arousal. In addition, Vrechopoulos et al. (2004) also mention that the layout of retail spaces can influence consumers' shopping behavior.

2.2 Differences in Cognition and Emotion between the Elderly and the Young

Many studies have mentioned that research on cognition and emotion of the elderly and young people cannot be measured in the same way. The difference in age does cause different psychological and physiological responses (Sullivan, 2007). Some studies have mentioned that cognitive deficits among elderly people in relation to speed of processing, memory, and attention (Renter-Lorenz & Park, 2010; Grady, 2008). Elderly people acquire visual information much slower than young people, and their visual cognition is also relatively poor. For example, the speed of reading text becomes slower than that of young people (Ebaid & Crewther, 2019). Changes in visual abilities in older people include several characteristics such as the beginning of a deterioration in chiaroscuro sensitivity; visual persistence to external stimuli gradually diminishes; the sensitivity to color decreases, especially the ability to distinguish red and green begins to decrease. For the reduced adaptability of lighting to light and dark, the illuminance of the light must be increased by two to three times. In addition, older people's eyes have reduced oculomotor modulation, making it more difficult to track fast-moving objects. It takes a long time to process the information, so it is more difficult to read the text, and the eyes are more easily tired, which leads to a decrease in the reading effect, and more lighting and rest are required for work and reading (Stokes 1992). Due to the deterioration of vision, the elderly cannot receive external information as quickly as young people and clearly distinguish the environment and objects around them (Stokes, 1992). The visual complexity of the environment and objects can interfere with the speed at which older people receive information. Therefore, the more complex visual images and spaces have an impact on the reception of information on the elderly, which will also affect the mood of the elderly (Madden,2007). Hence, there are differences in visual cognition between the elderly and the young. Differences in visual cognition also affect people's emotions. According to the findings from isaacowitz et al. (2008), their study investigated attentional biases among older people using the dot probe task in conjunction. Their findings show that older people and younger people have different emotional responses to happy and sad images. These different images show positive and negative preferences, and these positive and negative visual preferences produced different emotional responses to older and young people. In addition, according to Sullivan's research (2007), there are indeed differences in the visual gaze of interesting objects between the elderly and the young.

2.3 Hypotheses

According to the relevant theories obtained from the literature analysis, the perception of the elderly consumers on the store is often affected by the layout of the furniture and display cabinets in the space, as well as the figures, patterns, and decorations in the space. The level of complexity in these spaces directly or indirectly affects consumers' visual attention and emotional responses, including pleasure, arousal, and approach-avoidance behavior. The more complex the space, the more it will interfere with consumers' attention when searching for goods, and the more complex the images in the space, the greater the impact on consumers' emotions. After

consumers' psychological emotions are affected, it may directly affect their shopping behavior, as well as their preference for stores or products.

Due to the decline and aging of the optic nerve in the elderly, the response to spatial complexity may be different from that of the young. According to Sullivan's research, there are psychological differences between the elderly and the young (2007). The research of Ebaid & Crewther (2019) also shows that the visual cognition of the elderly is much worse than that of the young, and the speed of visual cognition also becomes very slow. Older people's eyes have reduced oculomotor modulation, making it more difficult to track fast-moving objects. Due to the deterioration of vision, the elderly cannot receive information as quickly as young people (Stokes, 1992). Therefore, compared to young consumers, elderly consumers may have different attention to specific products and preferences for store atmosphere when shopping.

According to the findings from Orth & Wirtz, (2014), stores with low spatial complexity are arranged in a regular layout, while stores with high spatial complexity are arranged in an irregular layout. In addition, Jang et al. (2018) state that complex pattern decoration of the space can generate the highest visual complexity. Conversely, simple arrangements of decoration and furniture produce less visual complexity. The elderly need to spend more time looking for objects and reading; therefore, the more complex the spatial image, the more likely it is to interfere with the attention of the elderly (Ebaid & Crewther, 2019). In addition, the more complex visual images have an impact on the reception of information on the elderly, which will also affect the mood of the elderly, especially in the higher visual complexity (Madden, 2007). Compared with young people, the degeneration of visual cognition of the elderly is more serious, so the interference of the external environment may be greater than that of young people. Therefore, the lower visual complexity in the space should make the elderly feel more comfortable.

Therefore, this study proposes the following hypotheses:

H1: There are emotional differences between the elderly and young consumers in clothing stores with different visual complexity.

H2: A combination of freeform layout and complex pattern decoration of the space can generate the highest visual complexity.

H3: A combination of grid layout and simple pattern decoration of the space can result in minimal visual complexity.

H4: Compared with young consumers, elderly consumers' attention is more easily affected by higher spatial visual complexity.

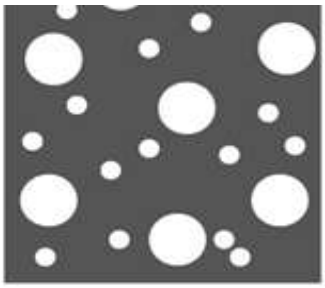
H5: Compared with young consumers, elderly consumers' emotion is more easily affected by higher spatial visual complexity.

H6: In a clothing store with low visual complexity, elderly consumers can produce high-level pleasant emotions.

3. Method

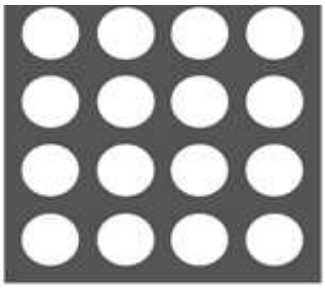
3.1 Stimuli and Experimental Space

Based on the layout regularity, repetition, symmetry and uniformity mentioned in the literature, this study screened out the grid layout with the lowest visual complexity and the freeform layout with the highest visual complexity in the space. Take both as factors in constructing the test sample. At the same time, considering the influence of color on visual complexity, this study decided to set the color of the decorative pattern as achromatic, (white RGB 255, 255, 255, gray RGB 120, 120, 120), to uniformly reduce the experimental variable interference of color-weak and non-color-weak elderly subjects, and refer to circular decorative patterns used by Jang et al., (2018) in their experiments on visual complexity. On this basis, combined with the finding from Heaps and other scholars (1999): the visual complexity of decorative patterns is judged by the criterion of whether the pattern has repeated and uniform texture. In this study, the decorative pattern is set as a white image on a gray background, and the patterns are arranged in descending order of visual complexity as follows: 1. irregular and non-repetitive circular decorative patterns; 2. regular and repetitive decorative patterns; and 3. only use single color as a decorative pattern.



(1)

Irregular and non-repetitive image decoration



(2)

Regular and repetitive image decoration

(3)

No image, only gray color as decoration

Figure 1. Variations of Decorative Patterns (Lin, 2019)

From the above conclusions, the layout and pattern decoration combinations of different visual complexity are sorted out, as shown in Table 1. This study conducted a 2 (store layout) x 2 (decoration) experimental design. Store layout includes grid layout and freeform layout, and decoration includes simple pattern decoration and complex pattern decoration. For the convenience of reading, "complex pattern decoration" is used to indicate "irregular and non-repetitive pattern decoration", and "simple pattern decoration" is used to indicate "regular and repeated pattern decoration".

Table 1. Components of the Experimental Scenes

Scene	Store layout	Decoration
1	Grid layout	Simple pattern decoration
2	Freeform layout	Complex pattern decoration
3	Grid layout	Complex pattern decoration
4	Freeform layout	Simple pattern decoration

The experimental virtual store is constructed based on the finding from literature and by researchers with interior design background. The space of the experimental store is around 100 square meters, the floor height is 3 meters, and there are no door and window elements in the space that interfere with the visual complexity. A 15.6-inch laptop screen was used as the experimental tool. The virtual store of the experiment is shown in Table 2.

Table 2. Four Experimental Scenes with different Visual Complexity (Lin, 2019)

Scene	1	2	3	4
layout mode	Grid layout	Freeform layout	Grid layout	Freeform layout
Decorative elements	Simple pattern decoration	Complex pattern decoration	Complex pattern decoration	Simple pattern decoration
Experimental virtual store				

This study used the above four clothing store images witn different visual complexity to explore the differences in questionnaire responses between the elderly and the young subjects.

3.2 Sampling Procedures

This study was divided into two groups, the elderly group and the young group. The purpose of the experiment is to carry out comparisons of within-groups and between-groups to find out whether visual complexity has different psychological effects on the elderly and young consumers.

This study selected subjects by convenience sampling. The subjects were 34 young students from Fu Jen Catholic University in Taiwan, and 34 seniors who participated in the senior citizen course attached to Fu Jen Catholic University. The screening conditions for young people are those without obvious hearing impairment or visual impairment, and their comprehension and language skills are no different from normal people. The elderly subjects are required to be over 65 years old, and the physical requirements are that they have no obvious hearing impairment and visual impairment, and they have all received education above the middle school. Their

comprehension and language skills belong to the normal elderly people.

3.3 Experimental Manipulation

"Commercial space and consumer sentiment"; "commercial space and consumer behavior"; "definition of visual complexity"; and "the impact of images on visual complexity" were used as the main content of the questionnaires. The questionnaire has a total of 34 questions. The first part has 5 basic information questions, and the second part has 29 questions, which is a seven-point Likert scale based on literature review. The 29 questions in the second part contain 5 variables: visual complexity, attention, pleasure, arousal, and approach behavior. The questions for visual complexity were modified from Orth and Wirtz (2014) and Orth et.al. (2016). The questions for attention were modified from Forsythe et al. (2011) and Orth and Wirtz (2014). The items for pleasure were selected from Peter and Olson (2005) and Russell (1980). The items for arousal were selected from Voss (2002) and Wakefield and Blodgett (1994). The items for approach behavior were selected from Mano (1999) and Mebrabian and Rusell (1974). In this study, Cronbach's α reliability test was performed on the questionnaires corresponding to four different simulated stores to ensure that the questionnaires could achieve internal consistency after the same questionnaire was administered with different simulated store.

The experimental steps are as follows:

First, before the experiment begin, the researcher needs to explain the experiment, so that the subjects can understand the purpose of the experiment. During the test, the researcher has to ensure that each subject's eye-to-screen viewing distance is the same (55cm). Second, the experiment uses a laptop computer as a testing tool. During the experiment, the researcher has to ensure that the computer screen does not have ambient light reflections and glare that would affect subjects' visual reactions. Before the start of the formal experiment, three elderly people were invited to conduct a pretest. According to the results of the pretest, we determined the level of visual complexity produced by the four scenes. The order of the virtual store images was discussed with experts with interior design background, and it was confirmed as 1. the combination of grid layout and simple pattern decoration; 2. the combination of freeform layout and complex pattern decoration; 3. the combination of grid layout and complex pattern decoration; and 4. the combination of freeform layout and simple pattern decoration.

The following adjustments were made after the pretest:

1. Filter out those subjects with special color and high degree of spectacle lenses.

2. When the subjects fill in the questionnaire, there must be a researcher beside them. If necessary, they can explain the questionnaire item by item.

Third, the whole experiment was divided into two groups. The elderly group and the young group were tested with the same four virtual store images. While the experiment was in progress, the subjects were asked to fill in the answers one by one using the Likert seven-point scale for the above-mentioned four scenes with different visual complexity. After the experiment, the researchers used SPSS for quantitative analysis of the questionnaire.

4. Data Analyses and Results

4.1 Statistical Analysis

The questionnaire is analyzed according to descriptive statistics, reliability analysis, and ANOVA.

4.1.1 Descriptive Statistics

A total of 68 subjects were tested, including 34 young people and 34 elderly people, and 47 women (69%) and 21 men (31%). In terms of age, there are 32 subjects aged 65-75 years old (48%), one subject aged 76-85 years old and one subject aged 86-95 years old (1% each). In the youth group, 27 subjects (40%) are 20-25 years old, 6 subjects (9%) are 26-30 years old, and 1 subject (1%) is 31-35 years old. In terms of occupation, 13 subjects (19% each) are engaged in agency occupations and other industries, 6 subjects (8%) are engaged in hospitality and manufacturing, and 2 subjects (2%) are engaged in agriculture and transportation, and also including 34 students (50%). In the statistics about visiting clothing stores, 27 subjects visit clothing stores 12 times a year (40%), 18 subjects visit three to six times a year (26%), and 15 subjects visit seven times a year to eleven times (22%), 5 subjects visit twice a year (7%), and 2 subjects visit once a year (3%).

4.1.2 Cronbach's α Reliability Test

To ensure that different store images can still achieve internal consistency when faced with the same questionnaire, this study has conducted Cronbach's alpha reliability test for all questionnaires respectively, as shown in Table 3.

Table 3. Cronbach's α Reliability Test

Different dimensions	Scene 1 questionnaire	Scene 2 questionnaire	Scene 3 questionnaire	Scene 4 questionnaire
Overall internal consistency	.915	.795	.872	.807
Visual complexity	.864	.876	.859	.705
Attention	.928	.935	.921	.839
Pleasure	.947	.962	.969	.944
Arousal	.941	.948	.965	.927
Approach behavior	.838	.753	.789	.875

The cronbach α values of the five variables in the four questionnaires are the lowest at 0.753 and the highest at 0.969. The average cronbach's α values is between 0.8 - 0.9. Experimental scene 1 questionnaire Cronbach's α = .915，experimental scene 2 questionnaire Cronbach's α = .795，experimental scene 3 questionnaire Cronbach's α = .872，and experimental scene 4 questionnaire Cronbach's α = .807, all the four groups of questionnaires have high reliability.

4.1.3 Analysis of Variance for Visual Complexity

The main method of analysis in this study is a two-way mixed variance analysis. The dimensions analyzed are "visual complexity", "interference of visual complexity on attention", "effect of visual complexity on pleasure emotion", "effect of visual complexity on arousal emotion" and "visual complexity on approach behavior". Because the combined layout patterns and decorative patterns are different, the visual complexity presented by the four scenes of stores are also different. The number of samples for both elderly subjects and young subjects is 34, and the total number is 68. The specific analysis is shown in Table 4.

Table 4. Descriptive Statistics for Visual Complexity (the higher the mean, the lower the visual complexity)

Experimental scenes	The subjects	mean	standard deviation	N
Scene 1	elder	6.29	.486	34
	youth	6.61	.400	34
	total	6.45	.470	68
Scene 2	elder	3.20	1.26	34
	youth	2.75	1.31	34
	total	2.98	1.29	68
Scene 3	elder	4.76	1.00	34
	youth	3.95	1.31	34
	total	4.36	1.23	68
Scene 4	elder	5.05	.980	34
	youth	5.33	.497	34
	total	5.19	.783	68

It can be seen from the above table that the elderly and young people think that the visual complexity of scene 2 (m = 3.20) is the highest, followed by scene 3 (M = 4.76), and then scene 4 (M = 5.05). They believed that scene 1 has the lowest visual complexity (M = 6.61).

Table 5."Visual Complexity" and ANOVA for the within-subject Group Test

Sources		Type III sum of squares	df	Mean square	F	Sig.
Visual complexity	Sphericity assumed	434.76	3	144.92	213.81***	.000
Visual complexity* subject	Sphericity assumed	15.81	3	5.27	7.77***	.000

*p < .05, **p＜.01,***p < .001

According to the above table, in the test of the interaction effect between visual complexity and subjects, the P value has reached a significant level of .05. It indicates that the interaction between the two independent variables of the elderly group and the young group on the scenes with different visual complexity is significant. In other words, the two groups of subjects judged the visual complexity of the four scenes differently. The above test is a repeated measure. In order to clarify the accuracy of the sample, one-way repeated measurement ANOVA was performed. Table 6 only shows that F value has reached a significant level.

Table 6. One-way ANOVA of Visual Complexity

Visual complexity		Sum of Squares	df	Mean square	F	Sig.
Scene 1	Between groups	1.70	1	1.70	8.57**	.005
	Within groups	13.08	66	.198		
	Total	14.78	67			
Scene 3	Between groups	11.32	1	11.32	8.31**	.005
	Within groups	89.97	66	1.36		
	Total	101.29	67			

*p < .05, **p＜.01,***p < .001

It can be seen from the above table that there is a significant difference in the mean of scene 1 and scene 3 between the elderly group and the young group.

4.1.4 The Effect of Visual Complexity on Attention

The four scenes with different visual complexity may have different degrees of interference with the subjects' attention when looking for objects. Table 7 shows the results of the questionnaire.

Table 7. Descriptive Statistics for Attention

Experimental scenes	The subjects	mean	standard deviation	N
Scene 1	elder	2.16	.904	34
	youth	1.76	.726	34
	total	1.96	.839	68
Scene 2	elder	4.78	1.432	34
	youth	5.69	1.386	34
	total	5.23	1.472	68
Scene 3	elder	4.39	1.503	34
	youth	4.81	1.186	34
	total	4.59	1.360	68
Scene 4	elder	2.79	.921	34
	youth	2.35	.896	34
	total	2.57	.929	68

As can be seen from the above table, both the elderly group and the young group believe that the visual complexity presented in the scene 1 and 4 will not interfere with their attention when looking for objects. In addition, they believed that the visual complexity presented in the scene 2 and 3 would interfere with their attention when searching for objects. It can be seen from the test data that both groups of subjects believe that the visual complexity of the scene 2 (M = 5.23) has the highest degree of interference with attention, followed by the scene 3 (M = 4.59), and then the scene 4 (M = 2.57), the lowest visual complexity is the scene 1 (M = 1.69).

Table 8. The Effects of Visual Complexity on Attention and ANOVA for the within-group Test

Sources		Type III sum of squares	df	Mean square	F	Sig.
Attention	Sphericity assumed	503.860	3	167.95	156.82***	.000
Attention * subject	Sphericity assumed	22.315	3	7.43	6.94***	.000

*p < .05, **p＜.01,***p < .001

The above table shows that there is a significant difference between the two groups in the interference of visual complexity on attention. Subjects believe that the four scenes have different interference on subjects' attention, but the specific interference degree needs to be further verified by the one-way ANOVA. Table 9 only shows that F value has reached a significant level.

Table 9. One-way ANOVA of the effect of Visual Complexity on Attention

Visual complexity affects attention		Sum of squares	df	Mean square	F	Sig.
Scene 1	Between groups	2.78	1	2.78	4.13*	.046
	Within groups	44.36	66	.672		
	Total	47.139	67			
Scene 2	Between groups	14.13	1	14.13	7.11*	.010
	Within groups	131.10	66	1.986		
	Total	145.23	67			
Scene 4	Between groups	3.36	1	3.36	4.07*	.048
	Within groups	54.51	66	.826		
	Total	57.87	67			

*p < .05, **p＜.01,***p < .001

It can be seen from the above table that the mean of the scene 1, 2 and 4 all show significant differences. In the scene 1, P value = .046 < .05, reaching the .05 significance level. Both groups of subjects believed that the visual complexity in the scene 1 presented a difference in attention, and the elderly group (M = 2.16) agreed more than the young group (M = 1.76). F value is equal to 4.13, P value =.046 < .05, reaching the .05 significant level. The scene 2, F value is equal to 7.12, P value = .010 < .05, reaching a significant level, and the scene 4, F value is equal to 4.07, P value =.048 < .05, reaching a significant level.

In the scene 1, the elderly group (M = 2.16) is more agreeable than the young group (M = 1.76) that the visual complexity presented in the scene 1 do not interfere with attention. In the scene 2, the young group (M = 5.69) agreed more than the elderly group (M = 4.78) that the visual complexity presented in the scene 2 could interfere with attention. In the scene 4, the young group (M = 2.80) is more agreeable than the elderly group (M = 2.35) that the visual complexity presented in the scene 4 could interfere with attention.

4.1.5 The Effect of Visual Complexity on Pleasure

The two groups of subjects may have different levels of pleasant emotions when stimulated by the store with different visual complexity. Table 10 shows the results of the questionnaire.

Table 10. Descriptive Statistics for Pleasure

Experimental scenes	The subjects	mean	standard deviation	N
Scene 1	elder	5.07	1.400	34
	youth	4.35	1.166	34
	total	4.71	1.329	68
Scene 2	elder	3.32	1.579	34
	youth	2.71	1.108	34
	total	3.01	1.388	68
Scene 3	elder	3.81	1.593	34
	youth	2.70	1.126	34
	total	3.25	1.479	68
Scene 4	elder	4.56	1.234	34
	youth	4.61	.899	34
	total	4.59	1.072	68

It can be seen from the above table that the subjects in the scene 1 (M = 4.71) can experience the most pleasant emotions, followed by the scene 4 (M = 4.59), then the scene 3 (M = 3.25), and finally the scene 2 (M = 3.01). Elderly consumers are the most likely to produce pleasant emotions in the visual complexity presented in the scene 1 (M = 5.07), and the least likely to produce pleasant emotions in the scene 2 (M = 3.32). Young people are the most likely to have pleasant emotions (M = 4.61) in the visual complexity presented in the scene 4, and the least pleasant emotions (M=2.70) in the scene 3. Next, a within-subject ANOVA is performed to determine whether the "influence of visual complexity on pleasure" is significant.

Table 11. The Effects of Visual Complexity on Pleasure and ANOVA for the within-subject Test

Sources		Type III sum of squares	df	Mean square	F	Sig.
Pleasure	Sphericity assumed	158.48	3	52.82	38.79***	.000
Pleasure * subject	Sphericity assumed	11.989	3	3.99	2.93*	.035

*p < .05, **p＜.01,***p < .001

It can be seen from Table 11 that the two groups of subjects showed significant differences in the "interference of visual complexity on pleasure", and they all showed differences in the four scenes with different visual complexity. At the same time, it was verified by one-way ANOVA.

Table 12. One-way ANOVA of the Effect of Visual Complexity on Pleasure

Visual complexity affects pleasure		Sum of squares	df	Mean square	F	Sig.
Scene 1	Between groups	8.708	1	8.708	5.241*	.025
	Within groups	109.660	66	1.662		
	Total	118.368	67			
Scene 3	Between groups	20.864	1	20.864	10.954**	.002
	Within groups	125.717	66	1.905		
	Total	146.582	67			

*p < .05, **p＜.01,***p < .001

There are significant differences in the means for both scene 1 (P = .025) and scene 3 (P = .002). The results show that the degree of pleasure produced by the two groups of subjects under the stimulation of scene 1 and 3 is significantly different. From the mean, it shows that the young group (M = 5.07) agrees more with scene 1 than the elderly group (M = 4.35) to make them feel pleasant emotions. Similarly, scene 3 also made the young group (M = 3.81) feel more pleasant emotions than the elderly group (M = 2.70).

4.1.6 The Effect of Visual Complexity on Arousal

Table 13. Descriptive Statistics for Arousal

Experimental scenes	The subjects	mean	standard deviation	N
Scene 1	elder	4.42	1.34104	34
	youth	3.85	1.09742	34
	total	4.13	1.24940	68
Scene 2	elder	3.23	1.45000	34
	youth	2.64	1.12825	34
	total	2.93	1.32245	68
Scene 3	elder	3.81	1.46437	34
	youth	2.93	1.31817	34
	total	3.37	1.45243	68
Scene 4	elder	4.50	1.15651	34
	youth	4.37	.89429	34
	total	4.44	1.02817	68

Table 13 shows that the scenes that are most likely to induce the subjects' arousal are ranked as: scene 4 (M = 4.43) > scene 1 (M = 4.13) > scene 3 (M = 3.37) > scene 2 (M = 2.93). Both the elderly group (M = 4.50) and the young group (M = 4.37) believed that scene 4 is the most likely to cause emotional arousal. Both groups of subjects believed that the visual complexity presented in scene 2 (M = 3.23, for the elderly group, and M = 2.64 for the young group) is the least likely to cause emotional arousal of shopping.

Table 14. The Effects of Visual Complexity on Arousal and ANOVA for the within-subject Test

Sources		Type III sum of squares	df	Mean square	F	Sig.
Arousal	Sphericity assumed	96.927	3	32.309	27.753***	.000
Arousal * subject	Sphericity assumed	4.863	3	1.621	1.392	.246

*p < .05, **p＜.01,***p < .001

Table 14 shows that there are significant differences between the two groups of subjects in the dimension of "the effect of visual complexity on arousal emotion". However, under the stimulation of the four scenes, the elderly group and the young group does not show a significant interaction effect. Therefore, this study further tests whether the main effects of the two independent variables are significant.

Table 15. One-way ANOVA of the Effect of Visual Complexity on Arousal

Visual complexity affects arousal		Sum of squares	df	Mean square	F	Sig.
Scene 3	Between groups	13.235	1	13.235	6.819*	.011
	Within groups	128.10	66	1.941		
	Total	141.34	67			

*p < .05, **p＜.01,***p < .001

There is a significant difference in the shopping emotions of the two groups in scene 3 (F value is equal to 6.82, P value = .011 < .05, reaching a significant level). In addition, the elderly group (M = 3.81) is more likely to cause the arousal of shopping emotions when viewing scene 3 than the young group (M = 2.93).

4.1.7 The Effect of Visual Complexity on Approach Behavior

The two groups of subjects may have different approach intentions when faced with four scenes with different visual complexity. Therefore, the test situation in "the effect of visual complexity on approach intention" is shown in Table 16.

Table 16. Descriptive Statistics for Approach Behavior

Experimental scenes	The subjects	mean	standard deviation	N
Scene 1	elder	4.60	1.133	34
	youth	4.55	1.068	34
	total	4.57	1.093	68
Scene 2	elder	3.59	1.364	34
	youth	3.21	.963	34
	total	3.40	1.187	68
Scene 3	elder	4.18	1.220	34
	youth	3.68	1.120	34
	total	3.93	1.189	68
Scene 4	elder	4.64	1.224	34
	youth	4.87	1.027	34
	total	4.75	1.127	68

The subjects disliked the space of visual complexity presented in scene 2. Therefore, the subjects will not have the willingness to stay in this space, nor will they be reluctant to recommend this space to friends (M = 3.40). Their favorite is the space presented in scene 4 (M = 4.75). Followed by scene 1 (M = 4 .57) and scene 3 (M = 3.93). Whether it is the elderly group or the youth group, they all think that the space presented in scene 4 is the most likely to make them have positive approach intentions (M = 4.64 in the elderly group, M = 4.87 in the youth group), followed by scene 1 (M = 4.60 in the elderly group, M = 4.55 in the youth group), and followed by scene 3 (M = 4.18 in the elderly group, M = 3.68 in the youth group). What they dislike the most is scene 2 (M = 3.59 for the elderly group, M = 3.21 for the youth group).

Table 17. The Effects of Visual Complexity on Approach Behavior and ANOVA for the within-subject Test

Sources		Type III sum of squares	df	Mean square	F	Sig.
Approach	Sphericity assumed	78.676	3	26.225	28.124	.299
Approach * subject	Sphericity assumed	5.617	3	1.872	2.008**	.03

*p < .05, **p＜.01,***p < .001

Table 17 shows that there is no significant effect of approach behavior between the two groups of subjects under all experimental scenes with different visual complexity, so there is no significant difference.

5. Discussions and Conclusion

According to the results of data analysis, it is found that the elderly and the young consumers do have differences of perception and emotions in clothing stores with different visual complexity. This finding supports H1 that there are emotional differences between the elderly and young consumers in clothing stores with different visual complexity. On the other hand, both the elderly and the young groups believe that the visual complexity of the four scenes are arranged in the following order from high to low: scene 2 (freeform layout + simple pattern decoration) > scene 3 (grid layout + complex pattern decoration) > scene 4 (freeform layout + complex pattern decoration)> scene 1 (grid layout + simple pattern decoration). This finding supports H2 that a combination of freeform layout and complex pattern decoration of the space can generate the highest visual complexity and also supports H3 that a combination of grid layout and simple pattern decoration of the space can result in minimal visual complexity.

In the analysis of visual complexity on attentional interference, it was found that the two groups of subjects did not feel the attentional interference in scene 1 and scene 4. However, both scene 2 and scene 3 made two groups of subjects feel that their attention was disturbed. When the visual complexity was the lowest (scene 1), the attention of the older subjects was the least disturbed, and the elderly group felt more intensely than the young group. On the other hand, when the visual complexity is the highest (scene 2), the attention of the elderly group was the most easily disturbed, but the young group felt more strongly than the older group. Therefore, this result supports H4 that elderly consumers' attention is more easily affected by higher spatial visual complexity. In addition, in the attention variable, there is no difference between the elderly and the young in scene 3. According to the theory of Orth & Wirts (2014), stores with low spatial complexity are arranged in a regular layout, while stores with high spatial complexity are arranged in an irregular layout. On the other hand, according to Jang et al. (2018), wall decorations and patterns will generate high visual complexity. The spatial image of scene 3 is visually complex on the wall, and the arrangement of furniture on the ground is stable. This spatial arrangement may produce the same feeling for the elderly and young people. As a result, there is no significant difference in the response of the two groups to attention. This is a possible inference, and related research can be carried out in the future.

In the two scenes of scene 2 and scene 4, there is no difference between the pleasure of the elderly and the young. The reason may be that the arrangement of the furniture is irregular, so the pleasure of the subjects is not significant. In scene 1 and scene 3, the young group felt more pleasant emotions than the elderly group. In the test of the effect of visual complexity on pleasure, it was found that the elderly group was most likely to produce pleasant emotions correspondingly under the stimulus of scene 1 with the lowest visual complexity. In the scene 2 stimulus with the highest visual complexity, it was the least likely to produce pleasant emotion. Therefore, the finding supports H5 that elderly consumers' emotions is more easily affected by higher spatial visual complexity and also H6 that in the low visual complexity, elderly consumers can produce high-level pleasant emotions. However, the youth group responded quite differently. They did not have the strongest pleasure response to scene 1 with the lowest visual complexity and scene 2 with the highest level of visual complexity. They believed that scene 4 was the most pleasant emotion for them, and scene 3 was the least likely to make them feel pleasant emotion. The wall pattern of scene 3 is complex. Therefore, according to the theory of Gil & Droit-Volet (2012), a space with high visual complexity tends to produce high arousal. High arousal has a greater impact on young people, so it may cause their pleasure to decrease in scene 3. According the findings from Jang et al. (2018), higher visual complexity may produce higher arousal, while lower visual complexity may produce more pleasure. This theory should also apply to young people's emotional responses to visual complexity in stores.

In the test of the influence of visual complexity on shopping emotional arousal, it is found that scene 2, which has the highest visual complexity, is the least likely to cause the shopping emotional arousal of the elderly group and the youth group. While scene 2 with the least visual complexity is not the easiest to arouse their shopping emotions, but scene 4 is the easiest to cause their shopping emotional arousal. Moreover, in the scene 3, the

elderly subjects show a more significant shopping emotional arousal than the youth. However, the survey data shows that both the elderly and the young consumers find scene 4 most likely to cause arousal, the reason may be that although the ceiling and wall patterns are not complicated, the arrangement of the furniture is irregular. Both the elderly and the young focus on the irregularly arranged furniture, which results in a higher arousal. This part also needs further research.

In the test of approach behavior, although in the descriptive statistics, both the elderly group and the young group indicated that the scene 2 with the highest level of visual complexity was the least likely to produce the approach intention, and both believed that they were most willing to recommend the visual space presented in scene 4 to their friends. However, for the two groups of subjects, in further significance analysis, it was found that visual complexity had no significant effect on approach behavior. According to the results of data analysis, visual complexity has no absolute impact on shopping approach and preference. Visual complexity has a significant impact on attention and emotional response but has a relatively low impact on spatial preference and shopping behavior. This study in-depth explores the psychological and behavioral responses of the elderly to clothing spaces with different visual complexity and proposes suggestions for improving the friendly visual environment.

From the results of the study, it was found that the perception of visual complexity in the elderly group and the young group were close to the same. For example, facing a clothing store with the same grid layout and simple decorative patterns, both of them consider the visual complexity of the space to be low.

When the pattern decoration of the space is simple, regardless of whether the layout is in the form of grid or freeform, the elderly consumers do not think that the visual complexity will interfere with their attention to search for goods. In terms of the effect of visual complexity on attention, the elderly consumers experienced a stronger effect than the younger subjects. When the visual complexity of a scene is higher, the elderly is more likely to feel that their attention is disturbed, but when the visual complexity of a scene is lower, the elderly think that their attention is not easily disturbed.

In terms of the impact of visual complexity on pleasant emotions, the elderly consumers have stronger impact than the young consumers. Taking scene 1 and scene 3 as an example, the elderly group felt more pleasant emotions than the young group. Regarding the influence of visual complexity on arousal emotions, the shopping emotions of the elderly group is more likely to be awakened than the young group. For example, in the visual complexity presented in scene 3, although the statistical results of the two groups are both significant, the elderly consumers were more willing to spend in the space than young consumers.

The findings of this study can provide suggestions and design principles for the space planning of clothing stores:

1. The elderly believe that the higher the visual complexity, the more easily their attention is disturbed. Therefore, if retailers want the elderly consumers to concentrate on searching for goods, they can simplify the spatial layout and decoration patterns to reduce the visual complexity of the space. The combination of low spatial visual complexity can refer to the grid layout and simple pattern decoration used.

2. When the space layout is a grid layout, regardless of whether the pattern decoration is simple or complex, the pleasure of the elderly is stronger than that of the youth. Therefore, when planning the space of the clothing store for the elderly consumers, if retailers want the elderly consumers to maintain a happy mood, more attention should be paid to the form of space layout. The most pleasing combination of visual complexity is the grid layout and simple pattern decoration.

3. The elderly do not like shopping in the combination with the highest spatial visual complexity (freeform layout and complex pattern decoration). However, it is not that the simpler the visual complexity, the easier it is for the elderly to consume. It is easier for them to consume under the combination of freeform layout and simple pattern decoration. At the same time, they are also willing to recommend it to friends in this type of space.

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