Interface design of sports app based on joint analysis method

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ABSTRACT. Purpose Explore the design approach for the interactive interface of a sports app. Methods The key design elements of sports APP interface design were firstly determined by using literature research and competitive analysis method, and the element level of each key element was determined, then 16 typical design combination solutions were determined by orthogonal experimental design, and the virtual design solutions were scored according to users' needs and preferences and statistical data were collected, and finally the utility value and importance of each element and element level were calculated through experimental data to obtain the optimal interface design solution and determine the design principles of sports APP interface design. Conclusion As a multivariate statistical analysis method, the conjoint analysis method is feasible and efficient to be applied to the interface design of sports APP, which can enable designers to design a sports APP that is more in line with the psychological needs of users, and has certain theoretical guidance significance to the interface design of sports APP.

Keywords: conjoint analysis; sports app; app interactive interface design; user preference

1   Introduction

As people's awareness of fitness increases and the concept of national fitness takes root, sports APPs have increased people's freedom to exercise and fitness while meeting their needs for exercise, so that people's exercise is no longer limited to gyms and playgrounds. The emergence of sports apps has also brought about many problems, such as the homogenisation of sports apps, poor user experience and the cluttered design of the app interface. The interface is the bridge between human and machine, from the design point of view, the interface is the new face given to the object by the designer; from the interaction point of view, the interface is a traditional sense of human-computer interaction experience equipment [1].

Through studying the relevant literature, it is found that most scholars explore the principles and methods of sports APP interface design from the perspective of user experience. For example, Yuan Hao analyzed the existing sports APP cases, explored the possibility of analyzing the design of sports APP information visualization interface

from the perspective of user experience, and summarized the relevant principles and methods of sports APP interface design[2]. Long Juanjuan introduces the concept of "unintentional blindness" into the interface design of sports APPs with the aim of improving the user experience of sports APPs, and explores the strategies and methods of sports APP interface design[3]. Through analysing the existing cases of different sports and fitness apps, Cao Enguo concluded that these products all have similar persuasive tendencies, and came up with the persuasive design strategy and design methods of persuasive design theory in sports apps[4]. However, less research has been conducted to explore the interface design of sports APPs in terms of user psychology and user preferences. Therefore, this paper proposes the use of conjoint analysis to study the interface design of sports APPs and explore the interface design of sports APPs in line with users' psychological intention and usage preference.

2   Concepts and applications of the conjoint analysis method

Conjoint Analysis was introduced in the 1940s by statistician Tukey and mathematical psychologist Luce as a multivariate statistical method [5]. Conjoint analysis is a simulation of consumer choices and decisions to determine the attributes and levels of products of interest. The workflow of the conjoint analysis method can be divided into five steps: determining the attributes and levels of attributes of a product or service (in this paper, the components of a sports app interface and the different types of elements), experimental design, data collection and analysis, calculation of attribute utility and relative importance, and interpretation and application of results. Conjoint analysis is a statistical analysis of multiple factors that can effectively determine the utility value of each element, i.e. the utility impact of multiple elements on the whole and their respective weights [6].

3   Joint analysis of the interactive interface of the sports app

3.1   Technical processes

In order to explore the design method of sports APP interface that is more in line with users' psychological intention and usage preference, this paper applies the joint analysis method to the APP interface design. Firstly, the design elements and the levels of each design element were determined through research, competitor analysis and expert data collection; secondly, the full profile method was used to generate the combination scheme, and then the orthogonal experimental design was used to optimise the combination scheme; then, a questionnaire survey was conducted and users were asked to score on a 5-point Likert scale; then the utility value and importance of each element and the level of each element were calculated through SPSS; finally, the experimental The results were then analysed and applied. The technical route is shown in Figure 1.
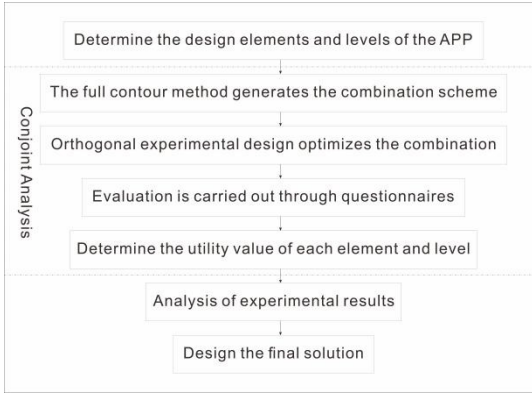
Fig. 1. Technical route

3.2   Sports APP interface components and element levels

Through the collection and collation of sports APPs in the application market and related literature, expert interviews on the interface design of sports APPs were conducted, while 6 elements of the interface design of sports APPs were identified after further interviews with some users of playgrounds and gyms.

3.2.1. Interface design styles.

The sports app interface design style can be broadly divided into three interface design styles depending on the elements and presentation: realistic photo style, flat graphic style and illustration style. The realistic photo style mainly uses real photos and text to design the interface, and allows users to identify different functions and themes through different photos. The flat graphic style uses simple graphics and blocks of colour to create a sense of design, making it easy for users to recognise and communicate. The illustration style is based on vivid and graphic illustrations, which are matched to different themes and content. The illustration style has a vividness and liveliness that other styles do not have, and the ability to render the theme, so the illustration style is interesting and storytelling in the interface design.

3.2.2. Exercise information visualisation.

After the user has used the sports app for the corresponding exercise, the app will give the user a certain amount of exercise data feedback and form the user's personal unique data information base, which is presented to the user by the information visualisation design. The user's exercise data, videos, graphics, tests, etc. make up the exercise information, and depending on the type and content, different forms of visual representation are selected for presentation, which can generally be divided into static images and dynamic images. The static image form of information visualisation design is more convenient for users to view and review their own motion data in real time and at any time, without the constraints of time. In addition, dynamic images make data changes

more vivid and give the user a more intuitive feeling of the changes in their own movement data.

3.2.3. Themed colour schemes.
The thematic colour scheme for sports app interfaces can be divided into warm, cool and medium tones depending on the feeling given to the user.

3.2.4. Functional categories.
The functional categories of sports app can be divided into many kinds according to the different needs of users, such as statistical sports data, sports teaching training, sports reminders, etc.

3.2.5. Number of functions.
When the number of functions of the sports APP is high, the APP is more complee and at the same time increases the complexity of its oeration, and when the number is low the APP is easy to operate and may bring the shortcomings of a single function.

3.2.6. Feedback prompts.
The feedback prompts for the user during use of the sports app can be divided into image prompts, sound prompts and vibration prompts.

Based on the above analysis, the six elements have been collated and numbered through the different element levels, as shown in Table 1.

Table 1. Interactive interface elements and their levels

Serial number	Design element	Feature level	Type number
1	Interface design style	Realistic photo style	1
		Illustration style	2
		Flat panting style	3
2	Data information visualization	Moving image	4
		Static image	5
3	Colour settings	Cool colours	6
		Warm colours	7
		Medium colours	8
4	Feature category	More	9
		Less	10
5	Number of features	More	11
		Less	12
6	Feedback prompts	Pictures	13
		Sounds	14
		Vibrations	15

3.3   Orthogonal experimental design

According to Table 1, six key elements and 15 element levels can be obtained, and 216 (3×2×3×2×2×2×3) interface design element combination samples were generated using the full profile method. To enhance the feasibility and accuracy of the samples, the orthogonal experimental design module of SPSS software was used to optimise them, resulting in 16 interface design combination solutions, as shown in Table 2.

Table 2. Eighteen sets of typical interface combination design

Serial number	Interface design style	Data information visualization	Colour settings	Feature category	Number of features	Feedback prompts
1	Flat panting style	Static image	Warm colours	More	More	Pictures
2	Flat panting style	Static image	Cool colours	Less	Less	Pictures
3	Illustration style	Static image	Cool colours	Less	More	Pictures
4	Illustration style	Static image	Medium colours	More	Less	Pictures
5	Realistic photo style	Static image	Medium colours	Less	More	Sounds
6	Realistic photo style	Moving image	Warm colours	Less	More	Pictures
7	Illustration style	Moving image	Cool colours	Less	More	Vibrations
8	Realistic photo style	Static image	Cool colours	More	Less	Vibrations
9	Realistic photo style	Static image	Warm colours	Less	Less	Vibrations
10	Flat panting style	Moving image	Medium colours	More	More	Vibrations
11	Flat panting style	Moving image	Cool colours	Less	Less	Sounds
12	Realistic photo style	Moving image	Medium colours	Less	Less	Pictures
13	Illustration style	Moving image	Warm colours	More	Less	Sounds
14	Realistic photo style	Static image	Cool colours	More	More	Sounds
15	Realistic photo style	Moving image	Cool colours	More	Less	Pictures
16	Realistic photo style	Moving image	Cool colours	More	More	Pictures

3.4   Data collection and evaluation

A questionnaire was designed based on the 16 interface design combinations from the above orthogonal experimental design, and interviews were conducted offline and a questionnaire was distributed online.

A random sample of 50 people was selected for scoring. To ensure the breadth of the research, the sample population included athletes, university students, ordinary office workers and housewives, all aged between 20 and 60 years old. A 5-point Likert scale was used to score the questionnaire (strongly dislike as 1, dislike as 2, indifferent as 3, like as 4, strongly like as 5). The reliability of the questionnaire was measured and the Cronbach's alpha coefficient was calculated to be 0. 863, with an alpha coefficient greater than 0. 7, indicating that the validity of the questionnaire was high.

The data obtained from the questionnaire was analysed by conjoint analysis in SPSS to derive utility, importance and constant statistics for the six interface design elements and 15 element levels. The analysis of the utility and importance values of the different elements allowed for the determination of the interface design strategy for the sports app by measuring the intentions of the research population. The overall utility and importance values are particularly important as a measure of the intentions of the research population, i.e. the positive and negative utility values reflect the attitude of the people who like or dislike the element type, and the size of the value reflects the degree of liking or disliking; the importance reflects the proportion of the element in the whole, i.e. the degree of attention it receives in the overall interface design. The utility and importance values for the six interface design elements and 15 element levels for the sports app are shown in Table 3.

Table 3. Overall utility value & importance

Design element	Feature level	Utility Estimate	Importance values/%
	Realistic photo style	-0.193	
Interface design style	Illustration style	0.051	12.147
	Flat panting style	0.142	
Data information visualization	Moving image	0.171	25.145
	Static image	-0.171	
	Cool colours	-0.036	
Colour settings	Warm colours	-0.047	9.053
	Medium colours	0.083	
Feature category	More	0.254	23.023
	Less	-0.254	
Number of features	More	0.075	12.328
	Less	-0.075	
	Pictures	-0.092	
Feedback prompts	Sounds	-0.023	18.304
	Vibrations	0.115	

4   Analysis of results and design

According to Table 3, among the six interface design elements of the sports app, the visual form of sports information is the most important, followed by the functional categories, feedback prompts, number of functions, interface design style and finally the colour setting of the interface respectively. This shows that users care more about the functional settings and the interactive experience of the app than the visual effects in the app. In terms of visualisation of movement information, users prefer dynamic images to static charts; in terms of functional categories, users want more kinds of functions; in terms of interaction design, users prefer vibrating feedback reminders to images and sounds; in terms of number of functions, users prefer more functions; in terms of interface design style, users prefer realistic In terms of the number of functions, users prefer a larger number of functions; in terms of interface design style, users prefer a flat graphic style to a realistic photo style and an illustration style; in terms of the app's interface theme colour scheme, users find neutral tones more comfortable than warm and cool tones. The results of the experiment show that the tenth design solution - flat graphic style, neutral tones, dynamic information visualisation, multi-functional categories and a high number of functions, and feedback prompts in the form of vibrations - is the most preferred interface design solution.

4.1   Interface design style

In visual design, flat design emphasises minimalism and advocates the aesthetic concept of "less is more", which is a minimalist approach to design that intuitively presents effective information to users through a combination of simple graphics, colours and text[7]. Flat design not only improves access to information and highlights important information for the user[8], but flat graphics give the user a sense of fun and vivid expression that is unmatched by other styles. The flat graphics give the user a sense of fun and vividness that no other style can match. The welcome screen of the Gudong app has different forms of road graphics, which metaphorically represent the different states of the exercise process.

4.2   Visualisation of motion information

As a sports app, the presentation of sports information is the most important interface design for users. Dynamic information visualisation is more popular with users than static forms. Dynamic information visualisation allows users to feel the changes brought by sports information more intuitively, and it also gives the visual information a sense of life, which makes users feel a sense of achievement and pleasure at the same time. For example, the donut diagram in the Lake-Power APP indicates the completion rate of exercise goals. The APP will determine the curvature of the donut diagram according to the user's completion rate, and when the user completes the exercise goal, he or she will get a complete rainbow-coloured circle, allowing the user to gain a sense of achievement and pleasure through the process of drawing the donut diagram.

4.3   Interface theme colour scheme

The overall colour palette of the interface reflects the characteristics of the sports app product and the user's impression of the product, and the organic combination of colours can achieve a good visual experience[9]. The overall colour palette of the interface will influence the user's perception of the characteristics of the sports app and the user's impression of the app. Neutral tones are more popular with sports apps than cool and warm tones, as they give users a comfortable, calm and reliable feeling, and they are also versatile, with different colours playing different roles. The Xiaomi Sports App uses a neutral colour palette of black, white and grey, giving a simple and calm feel to the whole. In addition, blue and green are used in the sports interface to give people a sense of health and vitality; in the weather interface, blue and orange are used according to the weather and air quality, so that people can have a clear idea of the weather conditions before they exercise.

4.4   Function setting

There are a variety of sports APPs on the market today, depending on their functions, but users have a variety of needs for sports, so they prefer to experience more types of functions in one sports APP. In the APP set fitness training section, through the online fitness coach recorded in advance professional fitness video, scientific and professional sports and fitness; set sports social section, users can publish fitness tips in the social circle, share fitness goodies and so on, users through the social section and other users in the conversation, to obtain a sense of achievement and a sense of belonging, is conducive to users adhere to the exercise, improve APP user The shopping section allows users to browse through the shopping section and buy missing sports and fitness equipment while exercising, which is convenient for users to buy and also increases the income of running the APP; the game function is added, so that users can participate in the game during exercise and set up a corresponding reward mechanism. This is a good way to attract users to participate.

4.5   Feedback tips

When exercising, users often prefer to reduce the tedium of exercise by playing music. Vibrating feedback allows users to be alerted without stopping the music, and therefore users are more comfortable with vibrating feedback. In addition, studies have shown that adding a tactile approach to visuals makes it easier for the user to be perceived when processing information. Kinetic effects are the art of experience regarding the interface and operation, which can highlight the functionality of an APP while enhancing the fun and pleasure of the user's operation [10]. The introduction of kinetic effects into sports can enhance the user experience and attract users to use sports APPs when exercising, such as the Goudong APP, where the system senses movement through vibrations and gives feedback. Users can use the vibrations to perceive their movement, such as whether they have completed their tasks in the required time, whether they have done strength training, etc.

5   CONCLUSION

In this paper, we apply the joint analysis method to the interface design of sports APP from the perspective of the existing problems and user needs of sports APP, and determine the key elements of interface design and the level of elements, optimize the combination scheme by running the orthogonal test design in SPSS, and arrive at the optimal interface design combination scheme. The results of the experiment were used to analyse the existing popular sports APPs in the market, and to provide some reference for the future interface design of sports APPs.

The analysis of the experimental results shows that users place more importance on the visualisation of sports information and the types and categories of functions than on the design and colour scheme of the interface, and that users place more emphasis on functionality than on visuals when using sports apps. The first thing users want to do with a sports app is to record and present sports data, so the visualisation of sports information is the most important element for users. Dynamic visualisation of sports information allows users to observe changes in sports data more intuitively and therefore prefers dynamic visualisation of sports information. The functionality of the sports app is the second most important element for users, who would like to have a greater variety and number of features to meet the different requirements of different users of the sports app. Secondly, the feedback cues of the sports app, users prefer vibrating feedback due to their habit of music when exercising. The last aspect is the visual presentation of the interface which users do not care about, i.e. the design style of the app and the colour scheme of the interface. Users prefer a simple, flat interface design, as it allows them to capture the content they need more quickly when exercising. In addition, the comfort, calmness and versatility of neutral tones means that users prefer medium tones to warm and cool tones.

The most critical element of user interaction with a sports app is the interface design, which takes into account the user's psychological intentions and habits when designing the app's interface. This paper uses a more subjective joint analysis method and a limited number of samples, which has certain limitations, and will be further improved later by using a more objective approach and increasing the number of samples.

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