



The Effect of Vertical Orientation of Sportswear Images on Attracting Customers' Visual Attention

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ABSTRACT

Purpose: Today, consumer behavior has changed from traditional methods to online methods. However, the factors that may attract consumer visual attention online have yet to be studied. Therefore, using an eye-tracking approach, the current research investigated the effect of the vertical orientation of sportswear images on attracting customers' visual attention.

Methodology: This research was designed as a semi-experimental study. Two critical factors, fixation count (FC) and total fixation duration (TFD), extracted the vision data of 32 participants purchasing Majid brand sportswear. Pupil capture and pupil player software were utilized to record and analyze research data. The extracted data were analyzed in the next step through repeated measure ANOVA.

Findings: The results showed that the vertical orientation of sportswear images affects customers' visual attention. In most cases, images without human models and in higher positions attract more visual attention than those in lower positions. The results have practical implications for website designers, online sellers, and sports marketers regarding the appropriate placement of products in website design.

Originality: This research investigates the effect of the vertical orientation of sportswear images on attracting the visual attention of customers in Iran using eye-tracking technology for the first time. This article can encourage sportswear businesses to evaluate the visual stimuli of their website design using eye-tracking studies. By catching customers' attention, they can develop and optimize their website design.

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1. Introduction

Sports consumers seek experiences obtained from sports and their benefits to satisfy their needs and desires (Funk et al., 2016). Sports consumer behavior focuses on the cognitive and behavioral responses before, during, and after choosing and consuming a sports product or brand (Funk et al., 2022). Meanwhile, sports consumption refers to the consumption behavior that people use money to buy various goods and services related to sports (Wang et al., 2024). It is worth noting that the income of the sports industry's revenue amounted to over 403 billion US dollars in 2022, and it is also predicted that this market will be worth more than 680 billion dollars by 2028 (Statista, 2023). However, the COVID-19 pandemic caused restrictions on customers' access to stores. Therefore, traditional businesses and retailers began selling their products online or expanding their existing online business (Al-Hattami, 2021). In addition, increasing trust in technology, the ability to use information and communication technology, and online payment methods caused consumer behavior to change from traditional approaches to online methods (Braumllari & Nerjaku, 2021).

The change in consumer behavior and increased online customers have created intense competition for online stores to attract customers' limited attention (Kaushik et al., 2020). Customers' attention is directly related to their cognitive processing of information displayed in website design (Hwang & Lee, 2018). Furthermore, attention focuses on attractive images and information to customers (Wedel & Pieters, 2008). Therefore, visual attention is one of the essential prerequisites for buying products (Boardman et al., 2023). But since the mental capacity of customers is limited, and they cannot remember and pay attention to all the elements displayed in the website design, it is always busy gathering information and evaluating the best choice for attention (Wang et al., 2017).

As mentioned, customers pay attention to website design elements selectively. For this reason, customers may only pay attention to some of the information provided online and ignore other information in the limited time they spend checking online products; therefore, how to design a website to attract the visual attention of customers is an important issue (Wang et al., 2017). One of the elements of website design that affects customers' visual attention is the orientation of an image. The orientation of an image means the location of that image on a website page. Of the two types of orientation, namely vertical and horizontal, the former refers to the area of product images at the top and bottom of a website page, and the latter refers to the position of product images on the right, middle, and left side of a website page (Sulikowski et al., 2021). Moreover, identifying the best location for placing product images and knowing which areas of the website have the most or least effect on attracting customers' attention can help website designers design and effectively present products (Modi & Singh, 2023).

In addition, in the era of globalization and market saturation with similar products and a wide range of online sellers, it is difficult for companies to identify customer behaviour (Vukasović & Petrič, 2022). Traditionally, web user behavior is studied using web mining techniques (Velásquez et al., 2011), where web log files containing records of web users' activities are processed (Roy & Giduturi, 2019). Studying web user behavior on a website using only web log files would not be a good idea because we cannot recreate exactly a

user session and know what the user sees on each page visited. Meanwhile, web log files contain a lot of noise, and it is usually impossible to identify directly a web user session, the sequence of web elements viewed, and the time spent on each page by the web user (Slanzi et al., 2017). Better approximations of web user session reconstruction have been developed employing Neuro-marketing techniques (Mičík & Kunešová, 2021). Neuro-marketing focuses on the consumer decision-making process and uses neuroscience to analyze and understand human behavior in the market and market exchanges (Bočková et al., 2021). Neuro-marketing tools can identify relationships between marketing stimuli. These tools can measure the effects of stimuli on the system of vision, mind, sense, emotion, and, in general, the brain system of a person (Vecchiato et al., 2013).

The eye-tracking device is one of the new neuro-marketing tools researchers used to measure audience attention to website design (Slanzi et al., 2017). Eye movements recorded by this device can provide an objective source of user interface evaluation data containing information for designing websites (Djamasbi et al., 2010). Fixation Count (FC) and Total Fixation Duration (TFD) are two critical factors in tracking eye movements, which indicate the viewer's attention to visual stimuli (Yang, 2015). FC and TFD indicate how many and how long customers' eyes stay focused on an Area of Interest (AOI) on a website page (Hwang & Lee, 2018).

It is worth noting that many studies for processing visual information of people on job websites (Mičík & Kunešová, 2021), tourism websites (Aicher et al., 2016), news websites (Simonov et al., 2023), and web Shopping sites (Beşer et al., 2022) utilized the eye tracking technique. However, few studies have investigated the design elements of sportswear websites (especially the vertical orientation of images) and their effect on attracting customers' visual attention. Therefore, according to the mentioned research gap, the present research seeks to answer whether the vertical orientation of sportswear images affects attracting customers' visual attention.

2. Theoretical background

2.1. Visual attention and vertical orientation of images

Attention is a cognitive process in which the mind focuses on a specific stimulus or stimuli from the environment, ignoring other environmental stimuli (Boardman et al., 2023). Thus, the attention a stimulus receives reflects the cognitive load required to process it (Scott & Hand, 2016). According to the theory of visual marketing attention (Wedel & Pieters, 2008), when people look at marketing stimuli, visual attention is guided by a combination of top-down and bottom-up factors. Top-down factors are primarily relevant to personal characteristics such as mentality, motivation, expectations, and user goals and refer to the internal direction of attention (Scott & Hand, 2016). These factors are also called goal-driven because visual attention is drawn more to stimuli related to the user's behavioral goal (Huang et al., 2021).

Furthermore, if participants are given research tasks, a top-down approach explains the guidance of visual attention (Hwang et al., 2009). If the bottom-up factors are related to the characteristics of the visual stimuli the person looks at, they are called stimulus-

driven (Cortinas et al., 2019). Therefore, in a website page, features such as size, shape, content, bright colors, and the position of an image are bottom-up factors affecting people's attention (Meißner et al., 2019). It is worth noting that limited research has investigated the interaction between top-down and bottom-up attention in users' online shopping. Thus, future research will enable researchers to explore this aspect further (Boardman et al., 2023).

In addition to the mentioned theory, the Visual Hierarchy Model (Faraday, 2000) believes that the position of elements on a web page affects the visual attention of users, and the elements placed at the top of the page are considered more important. The meaning of position of an image is the location of that image in the vertical orientation (up and down) and horizontal orientation (right, middle, and left) on a website page (Sulikowski et al., 2021). According to Still (2017), the spatial position of images can predict customers' visual attention. In this regard, the research results of Espigares-Jurado et al. (2020) revealed that the main pictures placed at the top of the hotel reservation website attract more visual attention than the photos at the bottom. Sulikowski et al. (2021) also reported in their research that the upper positions (first and second) of a vertical layout attract more visual attention. By contrast, the results of Goodrich's research (2010) displayed that people pay more attention to online advertisements in low than high positions. The research results of Muñoz-Leiva et al. (2021) also showed that the fixed image of the room on the hotel reservation website in the upper proper position attracts more attention. However, the research results of Li et al. (2018) demonstrated that customers' attention is focused on the books on the top and left side of the website. Schröter et al. (2021) research showed that clothing images presented by human models and located in the upper middle area were visited by more participants. The research results of Boardman & McCormick (2019) also showed that human models are the features of product presentation attracting the most attention on clothing sales websites.

3. Methodology

In the current research, a semi-experimental method was utilized to determine the effect of the vertical orientation of sportswear images on attracting customers' visual attention.

3.1. Participants

Using an online and face-to-face survey with the male students of Shahid Chamran University of Ahvaz (2nd semester of 2022-2023), 36 people were selected to participate in the experiment with a targeted sampling method. All students belong to Millennials or Generation Y. This generation consists of people aged 18-32, which has become an essential part of the market and a unique population for study due to the everyday use of the Internet and technology (Djamasbi et al., 2010). These students were familiar with Majid's website. Familiarity here was consistent with the number of previous online purchases reported in the survey between one and three times per year (Modi & Singh, 2023). It should be noted that there were several reasons for choosing Majid's website:

1. Majid Manufacturing Company is one of the Iranian manufacturing companies in the production of sportswear that has been able to compete among foreign brands (Moghadas & Kalateh Seyfari, 2017),
2. Students had the experience of shopping online from this website,
3. This website had both credibility and the Electronic Trust symbol¹.

Moreover, according to the research entry criteria, no participants had vision problems such as color blindness, eye deviation, or poor vision. Three participants were excluded due to absence on the test day and one due to eye calibration problems; thus, the final number of valid participants reached 32. The sampling size and method selection were based on previous similar studies (Bočková et al., 2021; Mo et al., 2023). Meanwhile, according to the type of product (men's T-shirt), only male students participated in this research (Hwang & Lee, 2018). A summary of the most important demographic characteristics of the subjects is presented in Table 1.

Table 1. Demographic characteristics of the subjects.

	Categories	Frequency	Percent
Age	18 to 22	21	65.6
	23 to 27	8	25
	28 to 32	3	9.4
Education level	Bachelor's degree	25	78.1
	Master's degree	7	21.9

3.2. Measuring Tool

The visual attention of all participants was measured using moving eye-tracking glasses (Pupil Labs Core, Germany). These glasses had two eye cameras with a frequency of 200 Hz and a resolution of 192 x 192 pixels to record the information on the pupil of one eye (right eye). The glasses also had a scene camera with a frequency of 60 Hz and a resolution of 720 pixels, recording data with high precision using infrared light. The data recording software was Pupil Capture, and the data analysis software was Pupil Player. The five-point method calibrated the device (Asadi et al., 2023). Other equipment used in this experiment was a plasma Panasonic model TX-P42UT30B device, two laptops, an HDMI cable, and a wireless mouse. One laptop was connected to the plasma Panasonic device, and the other was attached to the eye-tracking device.

3.3. Research Implementation Method

After each participant entered the testing environment and filled out the demographic characteristics form, they were asked to sit on a chair with adjustable height in front of the screen. At the same time as the eye-tracking device was installed, the height of the camera and the responding eyes were set at the same level. Next, participants were presented with an online shopping task, where they were asked to imagine buying a T-

¹ The electronic trust symbol is a sign for internet businesses that is issued by the e-commerce development center belonging to the Ministry of Industry, Mines and Trade for the purpose of organizing, verifying their identity and eligibility.

shirt for themselves. Participants searched for their favorite T-shirt by scrolling through a product search page. Since people of different ages wear T-shirts often, the researchers selected this product (Schröter et al., 2021). They were also asked to click add to cart to indicate the end of the experiment (Li et al., 2018). To ensure the visual processing behavior of people regularly, the participants were informed about the real purpose of the research after completing the experiment (Oboudi et al., 2023). Eye tracking data were also collected on several pages, but for the present study, the focus was on the product search page. On this page, product images were presented in four rows. Some of the photos had human models, as well. These features can be observed in Figure 1.

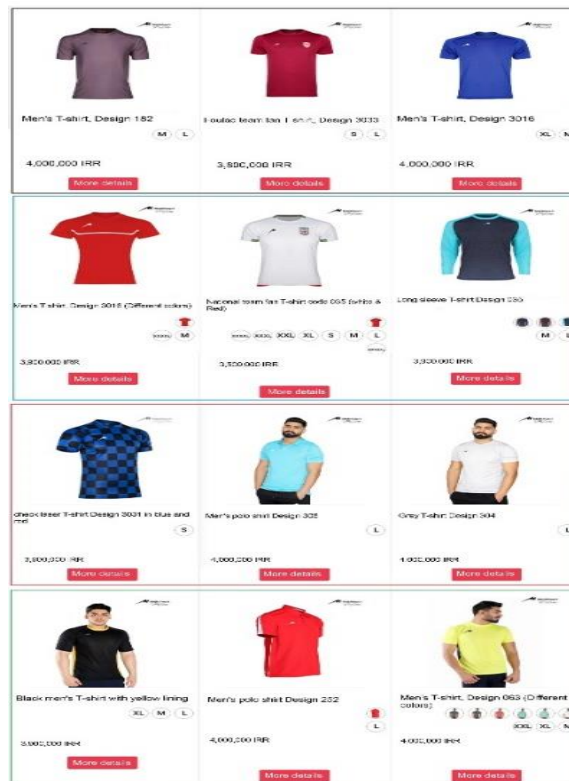


Figure 1. The image of the Majid sportswear online store with AOI is marked with black color (row 1), blue color (row 2), red color (row 3), and green color (row 4).

3.4. Data Analysis

Two measures, namely fixation count and total fixation duration, were utilized to measure participants' visual attention. These two measures were calculated as average values in milliseconds. It is worth noting that the product information (including image, description, and price) was defined as four AOIs in four rows (Hwang & Lee, 2018). This helped facilitate eye-tracking experiments and specify the products' vertical orientation (rows). The defined AOIs are displayed in Figure 1 and Table 2.

Table 2. AOIs are defined in the product search page on the Majid sportswear website.

AOIs	AOI-1	AOI-2	AOI-3	AOI-4
Stimulus (Rows)	Row 1	Row 2	Row 3	Row 4

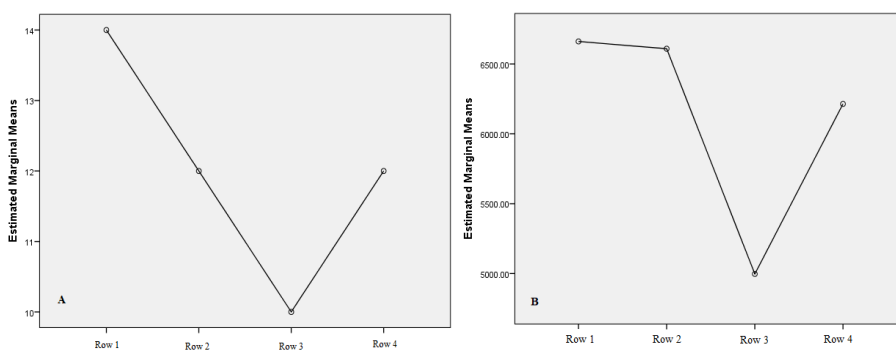
After collecting and interpreting the vision data of customers using IBM SPSS statistics v.24 statistical software, repeated measures analysis of variance test was employed to answer the research question. In addition, the Bonferroni test was conducted for all pairwise comparisons since the number of comparisons made is more than three groups (Agbangba et al., 2024). The alpha level was set at 0.05 for all analyses. Normality and equality of variances were checked with the Shapiro-Wilk and Mauchly's sphericity test, respectively. Also, there is no reason to reject the null hypothesis if the probability value (p-value) for Mauchly's test statistic is higher than that of type 1 error (α). In this case, we can accept the assumption of sphericity for repeated measures ANOVA, and as a result, we will use the Sphericity Assumed correction line.

4. Results

The eye-tracking data of the participants in the AOIs related to the vertical orientation of the product images were analyzed. As shown in Table 3 and Figure 2, the average visual attention of customers (FC, TFD) is different from each other in the vertical orientation of the images.

Table 3. Descriptive indicators (mean (standard deviation)) related to the amount of visual attention (FC, TFD) of customers.

Variable	FC	TFD (ms)
Row 1	14.72 (6.76)	6661.92 (2999.34)
Row 2	12.72 (4.66)	6609.89 (3047.38)
Row 3	10.63 (5.06)	4997.47 (2417.11)
Row 4	12.75 (6.02)	6214.01 (2834.00)

**Figure 2.** Charts A and B related to customers' estimated marginal means FC and TFD.

Also, the repeated measures ANOVA was used to check the difference in the averages of customers' visual attention (FC, TFD). Table 4 shows a statistically

significant difference between customers' visual attention to the vertical orientation of images ($P < 0.05$).

Table 4. The indicators related to the repeated measures ANOVA test to compare customers' visual attention (FC, TFD) to the rows.

Source		Sum of Squares	df	Mean Squares	F	Sig	Partial Eta Squared
FC	Sphericity Assumed	268.28	3	89.43	4.27	0.007	0.12
TFD (ms)	Sphericity Assumed	57682052.84	3	19227350.95	3.83	0.012	0.11

Bonferroni's post hoc test was also used to determine the location of differences. The results of this test are presented in Table 5. The results revealed that the difference is caused by the difference between rows 1 and 3 with more visual attention to row 1 (FC: MD= 4.09, $p < 0.05$) and also rows 2 and 3 with more visual attention to row 2 (TFD: MD = 1612.41, $p < 0.05$). No statistically significant difference was found between customers' visual attention to other rows.

Table 5. Bonferroni's post hoc test results related to the pairwise comparison of customers' visual attention (FC, TFD) to the rows.

Variable	Rows	MD	SE	Sig
FC	Row1, Row2	2.00	1.16	0.562
TFD (ms)	Row1, Row2	52.03	600.78	1.000
FC	Row1, Row3	4.09*	1.36	0.031
TFD (ms)	Row1, Row3	1664.44	626.87	0.074
FC	Row1, Row4	1.97	1.38	0.985
TFD (ms)	Row1, Row4	447.91	575.84	1.000
FC	Row2, Row3	2.09	0.89	0.148
TFD (ms)	Row2, Row3	1612.41*	507.74	0.020
FC	Row2, Row4	0.03	1.01	1.000
TFD (ms)	Row2, Row4	395.88	569.20	1.000
FC	Row3, Row4	-2.12	0.97	0.219
TFD (ms)	Row3, Row4	-1216.54	464.58	0.081

5. Managerial implications

By measuring customers' visual attention as one of the influencing factors in customer purchase intention, valuable recommendations can be provided to all website designers, online sellers, and sports marketers. Firstly, they must consider the effects of the vertical orientation of product images. Secondly, sportswear that needs special promotion must be placed in the areas that attract the most visual attention. In a website's upper half, bottom, and middle rows, respectively. Thirdly, all products should be presented similarly through attractive human models because this form of presentation has a competitive advantage and makes it easier to evaluate the suitability and make purchasing decisions of customers. Therefore, the findings of this research can indirectly help businesses' income, sales promotion, and website page revisit rate. Moreover, our research findings can encourage sports businesses to evaluate the visual

stimuli of their websites using eye-tracking studies. In this way, they can attract customers by developing and optimizing their websites.

6. Discussion and conclusion

The current research aimed to investigate the effect of the vertical orientation of sportswear images on attracting customers' visual attention. The results of the present research largely agreed with the existing literature. They showed that the vertical orientation of sportswear images affected attracting customers' visual attention. This finding is consistent with Still's (2017) research, which found that the location of website design elements can predict users' visual attention. In addition, most of the time, by scrolling the customers from the top to the bottom of the website page, the amount of visual attention of the customers to the information of the products (sports t-shirts) has a downward trend and decreases. Faraday's visual hierarchy model (2000) also acknowledged that the upper elements of the website design attracted more attention than those at the bottom (Djamasbi et al., 2010). However, research Djamasbi et al. (2010) showed that people paid more attention to online advertisements in low positions than in high positions. One of the reasons for this inconsistency is the use of different tools to measure people's visual attention since visual attention in this study was estimated based on the percentage of clicks on a specific area. In this study, eye tracking with infrared light technology, which has higher accuracy, was used to measure people's visual attention.

Furthermore, the research results revealed no statistically significant difference between the customers' visual attention to rows 1 and 2. The information on sports products in rows 1 and 2 attracted the same attention. This finding is consistent with the research results of Schröter et al. (2021) and Li et al. (2018) regarding paying more attention to the upper half of the website page. Since rows 1 and 2 are located in the upper middle area of the product search page on Majid's website (Figure 1), this matching can be justified.

In addition, the current research results showed that customers' visual attention to the information on sports products (T-shirts) in rows 1 and 2 is more than in row 3. This finding is consistent with the research results of Espigares-Jurado et al. (2020), Muñoz-Leiva et al. (2021) as well as Sulikowski et al. (2021). indicating that more visual attention is paid to the images at the top of the website rather than to those at the bottom of the website, and is inconsistent with the research results of Schröter et al. (2021) as well as Boardman & McCormick (2019), who claimed more attention is paid to human models on websites selling clothes. The possible reason for this inconsistency is that the human models in the mentioned research are in the upper half of the website. Still, in the present study, all the models are in the lower half (Figure 1). There seems to be competition between images with higher positions and images with human models on Majid's website to attract customers' attention. In the meantime, images with higher positions have performed better in attracting customers' visual attention.

It should be mentioned that no statistically significant difference was found between the customers' visual attention to row 4 compared to other rows (rows 1 to 3). This

finding shows the importance of the last row of products, indicating no difference between customers' visual attention to the information on sports T-shirts in row 4 compared to other rows. The downward trend of customers' visual attention stops in the last row and is associated with a relatively insignificant increase. In this regard, [Gidlöf et al.'s research \(2017\)](#) showed that products of any quality and popularity are more likely to be purchased if placed on the lower and upper shelves instead of the middle shelves. Therefore, paying equal attention to the top and bottom rows on Majid's websites is consistent with the research findings. The research results of [Lagun & Lalmas \(2016\)](#) on online news sites also clearly showed that most users read articles from top to bottom, and some scroll up before leaving the page. Therefore, it seems that the relative increase in the customers' visual attention in the last row of the website means that the customers scroll up again to find the sports T-shirt they want.

Meanwhile, researchers have found that the laboratory is different from the participant's natural environment, and the research findings are influenced by the tasks and laboratory environment of the research ([Djamasbi et al., 2010](#)). The results of the study of [Pieters & Wedel \(2004\)](#) also indicated that the visual attention of consumers is affected by the test tasks. In the current research, considering the presentation of the online shopping task and the limitations created in the laboratory space (such as browsing and checking the visual attention of customers on a website page), the relative increase in visual attention in row 4 can be justified.

Sports marketing relies mainly on consumer experiences, but most consumers need help to express these experiences. Eye-tracking technology provides a way to investigate hidden consumer behaviors empirically. Therefore, this research analyzed customers' visual attention to the vertical orientation of sportswear images using eye-tracking technology. This study showed that the vertical position of product images affected customers' visual attention. In most cases, images without human models and in higher positions attracted more visual attention than those in lower positions. Also, the visual attention to the pictures of sports products presented in the upper half of the website (rows 1 and 2) was the same. It is worth mentioning that the visual attention to the images of the last row was the same as other rows, and this row had particular importance in attracting customers' visual attention.

7. Limitations and future research

This research had two limitations. Firstly, only male students were selected for this study due to the product type (men's T-shirts). This might reduce the external validity and generalizability of the findings because studies indicated that gender is influential in the visual attention pattern of customers ([Hwang & Lee, 2018](#)). Secondly, the number of participants could have been increased due to the experimental nature of the research and the necessity of working with the eye-tracking device. It is suggested that future research study the effect of the vertical orientation of images with more participants, rows, and pages. Also, due to the contrast between the characteristics of clothing ([Mo et al., 2023](#)), it is suggested to investigate the color, type, and print patterns of clothing with familiar and unfamiliar fonts and their effect on customers' visual attention. Since not all

customers' visits to a website are targeted, it is suggested that their visual attention patterns be investigated without any experimental task. It is also indicated that customers' visual attention to other sports products be compared with multiple targeted experimental tasks.

It should be noted that research has shown that fandom affects the experiences and behavior of users when interacting with sports websites (Scelles et al., 2017). It is, therefore, suggested that future researchers pay attention to this fact in processing people's visual attention patterns. Also, considering the optimal performance of neuro-marketing tools in providing accurate information in the field of sports marketing, it is suggested that future researchers investigate the amount of visual attention customers pay to website design elements by combining eye tracking and electroencephalography (EEG) with other quantitative and qualitative research methods.

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تأثیر جهت‌گیری عمودی تصاویر پوشاک ورزشی بر جلب توجه دیداری مشتریان

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کلیدواژه

خرید آنلاین
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رفتار مصرف‌کننده ورزشی
طراحی وبسایت
عوامل پایین به بالا

نوع مقاله

پژوهشی اصیل

چکیده

هدف: امروزه، رفتار مصرف‌کننده از روش‌های سنتی به روش‌های آنلاین تغییر کرده است. با این حال، عواملی که ممکن است توجه دیداری مصرف‌کننده را در یک محیط آنلاین جلب کند، کمتر مورد مطالعه قرار گرفته است. بنابراین پژوهش حاضر با هدف بررسی تأثیر جهت‌گیری عمودی تصاویر پوشاک ورزشی بر جلب توجه دیداری مشتریان با استفاده از رویکرد ردیابی چشم انجام شد.

روش: این پژوهش به روش نیمه تجربی طراحی شد. داده‌های بینایی ۳۲ شرکت‌کننده در خرید پوشاک ورزشی برند مجید با دو عامل مهم تعداد تثبیت (FC) و مدت زمان تثبیت کل (TFD) استخراج شد. برای ثبت و تحلیل داده‌های تحقیق از نرم افزار Pupil Player و Pupil Capture استفاده شد. در مرحله بعد، داده‌های استخراج شده با استفاده از آزمون آنالیز واریانس با اندازه‌گیری مکرر مورد تجزیه و تحلیل قرار گرفت.

یافته‌ها: نتایج نشان داد که جهت‌گیری عمودی تصاویر پوشاک ورزشی بر توجه دیداری مشتریان تأثیر دارد. در بیشتر موارد، تصاویر بدون مدل انسانی و در موقعیت‌های بالاتر توجه دیداری بیشتری نسبت به موقعیت‌های پایین‌تر به خود جلب می‌کردند. نتایج، پیامدهای عملی برای طراحان وبسایت‌ها، فروشندگان آنلاین و بازاریابان ورزشی در رابطه با چیدمان مناسب محصولات در طراحی وبسایت دارد.

اصالت و ابتکار مقاله: این پژوهش برای اولین بار با استفاده از فناوری ردیاب بینایی به بررسی تأثیر جهت‌گیری عمودی تصاویر پوشاک ورزشی بر جلب توجه دیداری مشتریان در ایران می‌پردازد. این تحقیق می‌تواند کسب و کارهای پوشاک ورزشی را تشویق کند تا محرک‌های دیداری طراحی وبسایت خود را با استفاده از مطالعات ردیابی چشم ارزیابی کنند. به این ترتیب، با جلب توجه مشتریان، آنها می‌توانند طراحی وبسایت خود را توسعه و بهینه کنند.

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