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**OPTIMIZING SPORTS SHOES SELECTION: AN AHP
APPROACH FOR EVALUATING PREFERENCES AND
DECISION-MAKING FACTORS**

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Abstract:

With increasing awareness of a healthy lifestyle, daily workouts have become essential for the lives of young adults in university. Consequently, sports shoes have become a necessary requirement in this situation. This paper explores the preference for sports shoes among Universiti Utara Malaysia (UUM) students. This study aims to analyse the attributes or important criteria that influence their choices and how much influence these factors have on students' preferences in sports shoe selection. The Analytical Hierarchy Process (AHP) method was employed to evaluate the important factors and alternatives and identify the criteria and alternatives that best represent the preferences of UUM students. The four key criteria examined were price, comfort, design, and brand loyalty, with the three alternatives being Nike, Adidas, and Skechers. The results indicated that design is the most influential factor, followed by price, comfort, and brand loyalty. Among the brands, UUM students preferred Adidas, while Skechers was the least favoured. This study significantly enhances our understanding of the factors influencing UUM students' sports shoes selection preferences, providing insight for better catering to the needs of this demographic.

Keywords:

Analytic Hierarchy Process, Pairwise Comparison, Sports Shoes, University Students, Youth

Introduction

Sporting activities necessitate the use of sports shoes, which are frequently worn during workouts. With an increased concern for health and fitness, people are becoming more conscious of purchasing shoes for sports. The youth age group typically engages in more workouts compared to other age categories. This demographic can also be more mindful of their health and be physically active. University students and other youths are often very active in such programs in a bid to develop fitness, promote healthy living, and generally adopt healthy lifestyles. The various brands of athletic footwear that have been introduced to the market in recent years have a reasonably comparable functionality and external appearance. This is especially true when there are high levels of product similarity and product differentiation. Brand choice differentiates itself as a key attribute for consumers (Chang et al., 2022; Kalashi et al., 2021; Bakhshizadeh et al., 2017; Wajid et al., 2020). Malaysia offers a wide range of brands of sports shoes, both imported and locally made. Increased usage of social media platforms means that university students who form the young generation are indeed interested in athletic shoe trends. They sometimes opt for athletic shoes that they find attractive while at the same time making them feel more confident.

In choosing sports shoes, some of the most significant criteria must be considered. The proper evaluation ensures that the chosen athletic footwear provides both satisfaction and affordability. This subsequently creates brand loyalty. To increase consumer loyalty, sports shoe companies must introduce specific techniques that will help distinguish them from other companies. This is possible by achieving the most significant value for customers to create a favourable customer-brand relationship. Also, for parts and accessories, manufacturers should offer different designs so that customers can choose various types of shoes under one brand. This not only improves customer satisfaction but also increases rivalry among sports shoe brands (Aziz, 2019). In choosing sports shoes, university students need to take into account several factors, including the comfort of the shoes, durability, appearance and brand image. This is compounded by the increasing role played by social media since students are aware of and influenced by trends or reviews. These are some examples of marketing that drive consumers to become more discerning and mindful of their purchasing decisions. Companies must have a thorough understanding of these aspects in order to effectively adapt their marketing strategies and product development activities. Specifically, firms should prioritise quality, cutting-edge features, and their capacity to meet the demands and expectations of young consumers.

In addition, the importance of technology in making the shopping experience even better cannot be ignored. The local markets allow students to compare different brands and models, read various reviews and make sound decisions from the comfort of their homes. It suggests that brands that utilise digital means and approaches to engage with consumers and provide more convenient ways of shopping online stand to gain a competitive advantage in the market. Thus, it is apparent that sports shoes are a crucial instrument that is indispensable in the lives of health-conscious university students. Consequently, due to intense rivalry, it is imperative to implement multiple tiers of brand uniqueness and devise effective strategies to gain market share and foster brand loyalty among customers. In this context, it is possible to affirm that by providing more styles, providing the best quality products and being available through digital media, sports shoe brands may achieve intense and lasting competition while establishing strong relationships with consumers.

Nike is a renowned sportswear company that operates within the worldwide footwear sector with other major multinational corporations. According to Tighe (2024), Nike alone controls the global sports footwear market by establishing sales of more than \$29 billion in 2022. This is quite a remarkable achievement, especially compared to its two main rivals, Adidas and Puma, in footwear sales. Nevertheless, Adidas still retains a relatively large percentage of the market share. Adidas has sold 420 million pairs of sports shoes in the year 2022, which proves its immaculate manufacturing process. Still, this number is not encouraging as it remains significantly lower than the absolute record level in 2019 when Adidas created over 450 million pairs of shoes. Puma has also recorded steady sales of footwear over the years but received a boost in the financial years ending 2021 and 2022 (Tighe, 2024). Perfection of Puma speaks of the company's plans to gain more market share in the highly competitive sportswear industry. The global market is crammed with many companies worldwide and large brands competing for consumers' attention.

Nike and Adidas stand out as the market leaders. Their resilience can be explained by several reasons, one of which is that their brand visibility differs from that of other firms, and they invest in marketing. Nike's excellent product innovation and advertisement, as well as its strategic personality, have placed it on a higher ranking. Adidas has similarly pursued product innovation and effective branding strategies to fulfil market demands. The evidence from the Nike and Adidas case further substantiates the theory by demonstrating their status as dominant players in the market and their likelihood of maintaining this position.

The ability to forecast future markets is the third factor contributing to their sustained performance due to the strong brand loyalty they have. According to Aylott and Young (2016), these measures are hoped to help those major brands gain more extensive brand awareness and customer loyalty as a competitive edge over their rivals. The examined global market segment of sports footwear continues to be intensively competitive. Yet, Nike and Adidas remain leading players owing to their advantages in terms of brand awareness, customer base, and positioning. These factors contribute to their acceptance and success while other competitors strive to gain their market share.

With an extensive range of brands, designs, and specifications available, finding the ideal pair that aligns with personal preferences and needs can be overwhelming. Individuals, especially students involved in sports, encounter considerable difficulties when choosing the appropriate running shoes. Various factors come into play in the selection process of sports shoes, such as fit, cushioning, support, durability and price. Students need to consider how these elements align with their personal preferences. The absence of a structured decision-making framework often leads to poor choices, which may influence students' comfort, performance, and satisfaction with their sports shoes. This study aims to address these challenges by identifying the critical criteria that influence the purchasing decisions of UUM students. By understanding these criteria, we can provide a more structured framework to help students make better-informed choices. Furthermore, the study aims to ascertain the brands that UUM students favoured the most. This information will not only aid students in their selection process but also provide valuable insights for manufacturers and retailers to better cater to the needs of this demographic.

Literature Review

Businesses must understand consumer preferences to design and market products that meet customers' demands and desires. Consumers are influenced by several factors when selecting sports shoes. Several studies present numerous factors as determinants of brand loyalty to sports footwear brands, including brand image, perceived quality, brand satisfaction, style, comfort, colour, price and endorsement (Chang et al., 2022; Shezi and Redda, 2022; Aziz, 2019; de Silva et al., 2020; Aylott and Young, 2016).

Brand image plays a crucial role in purchasing decisions, reflecting an overall impression of a brand influenced by consumers' knowledge and past interactions. A consistently positive brand impact fosters consumer trust and purchasing likelihood, while a negative impact creates consumer caution (Steven et al., 2021). A study by de Silva et al. (2020) indicated that brand image significantly influences consumer buying decisions and positively affects consumer decision-making. Brand loyalty, a key aspect of brand equity, secures a company's market position by reducing customer switching. Athletes who demand sport-specific footwear benefit from solid brand loyalty, which helps companies define themselves in a competitive market and achieve higher margins (Aaker, 1996). Celebrity endorsements also impact consumer behaviour, as athletes often promote sports brands, thus inspiring their supporters (Kim et al., 2020).

However, Aylott and Young (2016) found that while endorsements have a less direct effect on purchase decisions, they may exert a significant indirect influence. Brands like Nike and Adidas enhance recognition and association through substantial marketing investments. According to Phulkar and Vayuna (2021), 36% of students agreed with celebrity-endorsed brands, while 24% strongly disagreed. Price perception is another factor significantly influencing customers' decisions (Steven et al., 2021). Style and price are identified as the most relevant variables in the decision-making process for university students purchasing sports footwear (Aylott and Young, 2016). Footwear serves as a self-identification tool for the youth, with comfort being a critical factor impacting purchase preference (Shezi and Redda, 2022). The rise of lifestyle fashion sports shoes is a notable industry development, with top manufacturers offering more attractive options alongside high-performance shoes (Aylott and Young, 2016). While the style does not affect buyers' loyalty to athletic footwear brands, colour significantly impacts customer responses, influencing their perception and purchase decisions (Shezi and Redda, 2022). Tay et al. (2017) focused on analysing how the specific characteristics of running shoes, such as comfortable fit, cushioning ability, arch support, and shoe stability, affected the general preference for running shoes. Their work revealed that consumers were capable of distinguishing between the distinct features and verifying that the incorporated features can significantly enhance the prediction of which shoes are likely to be preferred.

Analytic Hierarchy Process (AHP) is a prominent Multi-Criteria Decision Making (MCDM) technique that aids in ranking criteria and selecting the best course of action from various options. Rooted in mathematics and psychology, AHP offers a systematic approach to organizing and deciphering complex decisions. It empowers decision-makers to choose options that best align with their objectives and understanding of the problem rather than dictating a singular "right" option. AHP provides a comprehensive and logical framework for defining decision problems, assessing their components, linking them to overarching goals, and evaluating potential solutions. In research, the AHP algorithm is often utilized to determine

optimal courses of action based on predetermined variables, leading to highly advantageous outcomes for those in need when these variables are present.

Methodology

This study targeted students enrolled at the School of Quantitative, UUM. Questionnaires were distributed online to these students, yielding 58 responses. The analysis involved developing a model using AHP by breaking it down into a hierarchy. There are three levels in the hierarchy. The primary goal is at the top level, the decision criteria are at the middle level, and the decision alternatives are at the bottom. The hierarchy is displayed in Figure 1.

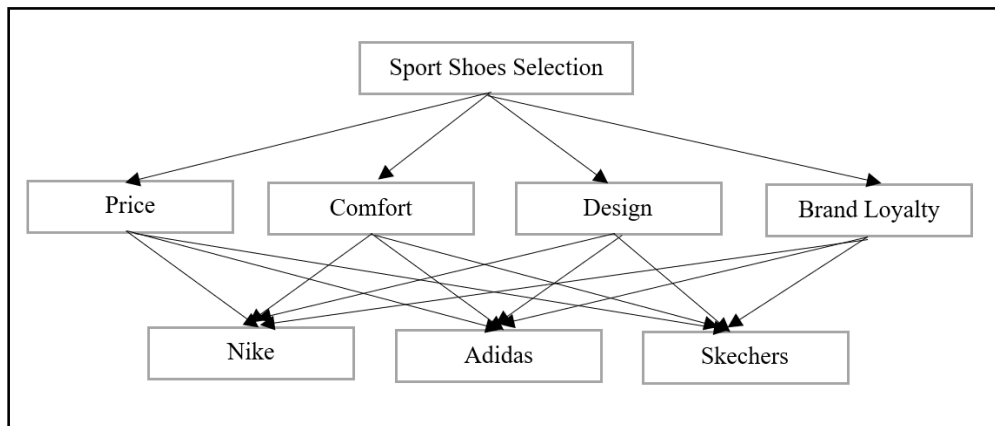


Figure 1. The Hierarchy of Analytic Hierarchy Process for Sports Shoe Selection

Drawing from the literature review, this study identified four key criteria for analysis: price, comfort, design, and brand loyalty. These factors were crucial in understanding students' preferences and behaviours. To explore these aspects, the study examined three leading sports shoe brands in Malaysia: Nike, Adidas, and Skechers. The selection of these alternatives was obtained from a questionnaire that was randomly distributed to students in UUM. By concentrating on these specific criteria and brands, the research aims to offer valuable insights into the preferences of UUM students. Next, a matrix using pairwise comparison was developed. This involved comparing the criteria and alternatives against each other using a scale ranging from 1 to 9, where each value represents the degree of preference. A higher numerical value on this scale indicates a stronger preference for one criterion over another. Conversely, a lower numerical value suggests a greater preference for the alternative criterion. The pairwise comparison method allows for a systematic evaluation of each criterion's relative importance. This process helps construct a comprehensive preference matrix that reflects the judgments of the respondents. The preference levels were represented by numerical values, indicating the rank or position of each criterion on the scale. This structured approach ensured that the comparisons were consistent, and it would facilitate an understanding of the preferences among UUM students.

The questionnaires were analysed and transformed into matrix format as in equation (1):

$$M = \begin{bmatrix} 1 & a_{12} & \dots & a_{1n} \\ a_{21} & 1 & \dots & a_{2n} \\ \dots & \dots & 1 & \dots \\ a_{m1} & a_{m2} & \dots & 1 \end{bmatrix} \quad (1)$$

The matrix was used to calculate the weights for each alternative and criterion, with Microsoft Excel facilitating the analysis process. Subsequently, the synthesis process was conducted to determine the preference matrix. This synthesis would produce the preference ranking for all the criteria as well as the preference alternatives with respect to each criterion. The computation of the overall score for each decision alternative was then carried out by multiplying these scores.

The consistency index (CI) was calculated in order to determine the validity of the questionnaires. Equation (2) shows the calculation of CI is as follows:

$$CI = (\text{Average of weighted score} - n) / (n - 1) \quad (2)$$

Where n represents the number of rows in the matrix. Random Index, as established by Saaty (1980), is detailed in Table 1.

Table 1. Random Index

n	2	3	4	5	6	7	8	9	10
RI	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.51

The degree of consistency (DC) was evaluated by finding the ratio of consistency index (CI) and random index (RI). The resulting ratio should not exceed 0.1, as recommended by Sathy (1980) and presented in equation (3).

$$DC = CI / RI \quad (3)$$

If the degree of consistency falls below 0.1, they are acceptable. Otherwise, the questionnaire must be eliminated and cannot be used for further analysis.

Analysis Result

Demographic of Respondents

The data was collected using Google Forms, a convenient method to collect data for a wide range of respondents. A total of 58 responses were received. The acceptable response rate is 52%, and these responses were verified as acceptable for analysis. The gender of the respondents is almost equally subdivided, which comprises 40% females and 57% males, as presented in Figure 2.

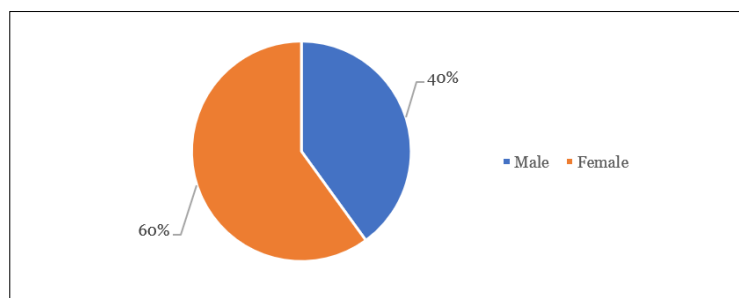


Figure 2. Gender of the Respondents

The distribution of the semester for the accepted responses is presented in Figure 3.

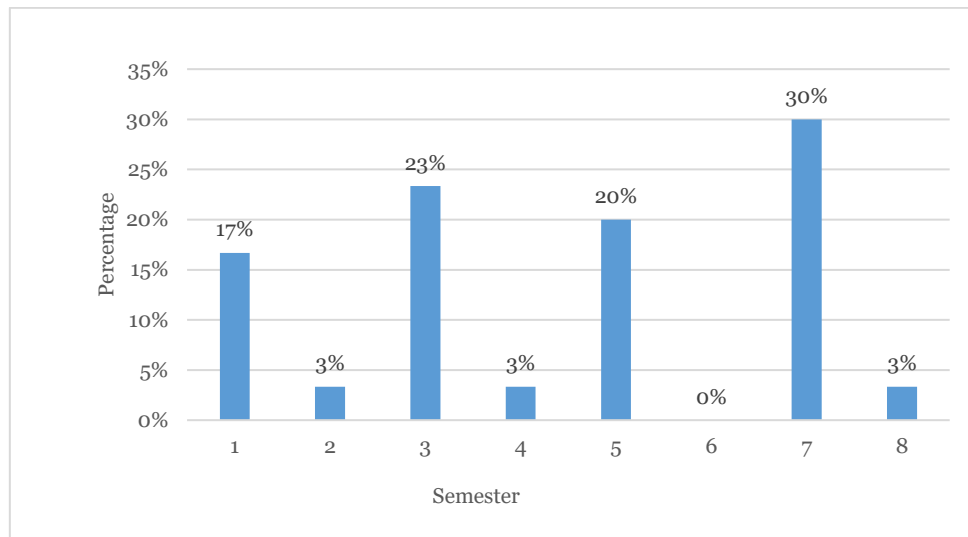


Figure 3. Semester of the Respondents

Analysis for Criteria

The questionnaires were analysed by transforming the score into the matrix form. This procedure enabled the responses to be quantified in relation to the respondent's preference. For example, Table 2 presents one of these matrices with examples of preference levels for the selected criteria. Finally, the diagonal of all the sub-matrices was also set to 1 because, in theory, one criterion is as good as any other, showing that all the criteria were used in the comparison. To illustrate, when it comes to the relative comparison between comfort and price if a respondent prefers comfort over price, he/she gives the comfort factor a score of 2. Then, this score is located in the matrix of the respective cell. For this respondent, the preference score implies that comfort is twice as significant as the price. As a result, the extent to which people opt for a price above comfort is 1/2 the scale. Their presence guarantees that the matrix is harmonious and bears consistent proportions between the organisational structure and the business functions. Once the matrix was pre-filled with all comparisons and ratings, each column's criterion score was added to furnish the column sum. The sum of the values given by the respondents to the criteria represented the total weight or total importance of the criteria. Evaluating these sums would provide a better understanding of the criteria that were prioritised over the others.

Table 2. Pairwise Comparison between Criteria

Criteria	Price	Comfort	Design	Brand Loyalty
Price	1.00	0.50	0.50	0.50
Comfort	2.00	1.00	2.00	2.00
Design	2.00	0.50	1.00	2.00
Brand Loyalty	2.00	0.50	0.50	1.00
Column Sum	7.00	2.50	4.00	5.50

Subsequently, the row averages were obtained by dividing every entry by its respective column sum. This process made it possible to obtain an average that provided a direct picture of the relative position of each score in the context of the entire column values. The outcome of these calculations was rounded down to two decimal places and presented in Table 3. This table in

detail illustrates how the row average works well and the specific scores that should be considered in the analysis.

Table 3. The Computation of Row Average

Criteria	Price	Comfort	Design	Brand Loyalty	Row Average
Price	0.14	0.20	0.13	0.09	0.14
Comfort	0.29	0.40	0.50	0.36	0.39
Design	0.29	0.20	0.25	0.36	0.27
Brand Loyalty	0.29	0.20	0.13	0.18	0.20
Column Sum	1.00	1.00	1.00	1.00	1.00

The row average value reflects the ranking of the criteria. In this example, since the data was derived from a single questionnaire, the ranking indicated the preferences of one specific respondent. Following this, the degree of consistency was assessed to ensure the validity of the questionnaire. The CI was calculated by multiplying the pairwise comparison scores with the row averages from Tables 2 and Table 3.

Table 4. The Score for Consistency Index

Criteria	Score	Weighted Score
Price	0.57	4.08
Comfort	1.61	4.16
Design	1.14	4.16
Brand Loyalty	0.81	4.08
Average		4.12

The following calculation is an illustrative example of calculating the score for the price criterion provided in Table 4. This example demonstrates the step-by-step process of determining the score, offering a clear and comprehensive explanation of how the price criterion is evaluated and quantified.

$$\text{Price Score} = (1.00 * 0.14) + (0.50 * 0.39) + (0.50 * 0.27) + (0.50 * 0.20) = 0.57$$

The weighted score was computed by dividing the price score by the row average obtained in Table 3.

$$\text{Price Weighted Score} = 0.57 / 0.14 = 4.08$$

The average of the weighted scores was then calculated and utilised in the Consistency Index (CI) formula.

$$CI = \frac{4.12 - 4}{4 - 1} = 0.04$$

The degree of consistency was calculated by finding a ratio of CI and RI. Based on Table 1, the RI value used for four criteria ($n = 4$) is 0.9.

$$DC = \frac{CI}{RI} = \frac{0.04}{0.9} = 0.044$$

The division of CI and RI gives a DC value of 0.044. Since this value was below 0.1, the questionnaire was deemed valid and was selected for further analysis.

Analysis for Alternatives

The subsequent process of analyzing pairwise comparisons was carried out by systematically evaluating and comparing the alternatives for each criterion. This analysis involved assessing how each alternative ranks based on specific criteria. Table 5 provides a detailed pairwise comparison matrix that was completed by one of the respondents. This matrix captures the respondent's evaluations and preferences, offering a comprehensive view of how each alternative performs compared to the others for the given criterion.

Table 5. Pairwise Comparison for Price

Brands	Price		
	Nike	Adidas	Skechers
Nike	1.00	0.33	0.20
Adidas	3.00	1.00	0.25
Skechers	5.00	4.00	1.00
Column Sum	9.00	5.33	1.45

The row average was calculated using a method similar to the one used for comparing criteria. Table 6 illustrates the computations of these row averages, providing a detailed view of the calculated values.

Table 6. The Computation of Row Average for Price

Brands	Price			Row Average
	Nike	Adidas	Skechers	
Nike	0.11	0.06	0.14	0.10
Adidas	0.33	0.19	0.17	0.23
Skechers	0.56	0.75	0.69	0.67
Column Sum	1.00	1.00	1.00	1.00

The row average values in the right column represent the preference of the specific respondent towards a criterion. For instance, according to the price criterion, the respondent prefers Skechers to Adidas and Nike. This approach of averaging the row was duplicated for all the criteria. The separate assessment of each criterion allows for building a comprehensive picture of the respondent's priorities and preferences regarding different brands or alternatives.

Overall Score

The average score was constructed based on the row average values from all valid responses. This process started with multiplying the row average for each criterion and alternative. This step ensured that each respondent's input was captured. The findings of this precise and comprehensive process provided useful information about the overall tendencies in this respondent group, as summarised and explained in Table 7 and Table 8.

Table 7. Average Score for Alternatives

Brands	Price	Comfort	Design	Brand Loyalty
Nike	0.34	0.34	0.42	0.44
Adidas	0.44	0.41	0.47	0.42
Skechers	0.22	0.25	0.11	0.14

Table 7 is the summary of the brand preferences based on all criteria. By comparing the average rating of Adidas and other brands in terms of price, comfort, and design, it can be concluded that Adidas has the highest rating pertaining to these aspects, which explains the brand's high popularity in terms of preferences regarding its features. However, Nike has a slightly higher score when it comes to the consumer loyalty index even though the Adidas brand is closely behind, indicating an immense rivalry between these two brands as far as customers are concerned. On the other hand, Skechers is the least preferred brand choice in terms of price, comfort, design and brand loyalty factors. This pattern shows that Skechers is not as popular as Adidas and Nike, as can be seen from the ratings given by the respondents. The detailed analysis shown in Table 7 is instrumental in highlighting how different brands are perceived based on certain attributes and, therefore, points to the main strengths of Adidas and Nike and the relative vulnerabilities of Skechers.

Table 8. Average Score for Criteria

Criteria	Average Score
Price	0.25
Comfort	0.24
Design	0.29
Brand Loyalty	0.22

In Table 8, it is demonstrated that while the differences in the average scores across the various criteria are relatively minor, the design stands out with the highest average score of 0.29. This score exceeds other criteria, such as price (0.25), comfort (0.24), and brand loyalty (0.22). These findings suggested that, among the UUM students, design was the most influential factor in their preference for sports shoes. Compared to price, comfort, and brand loyalty, the higher average score for design indicated that the aesthetic and functional aspects of design play a crucial role in their purchasing decisions. Although price, comfort, and brand loyalty are also important, they have slightly less impact on the students' choices. This highlights the dominant role of design in shaping their preferences, suggesting that well-designed sports shoes are likely more appealing to UUM students than one that excels in the other criteria alone.

The average score for the alternatives and criteria involves multiplying the average scores of the different alternatives by the scores associated with the various criteria. This allows for creating an overall standing of the alternatives based on the weighted criteria above. The final overall scores obtained from the accumulation of all the criteria scores for each of the alternatives are listed in Table 9 below. This table presents a balanced view of the performance of each alternative regarding the evaluated criteria to arrive at an overall score for each, giving a clear matrix of rankings.

Table 9. Overall Ranking

Brands	Average	Ranking
Nike	0.38	2
Adidas	0.43	1
Skechers	0.19	3

Table 9 presents the overall ranking of three alternative sportswear brands, namely Nike, Adidas, and Skechers, based on their average scores. Adidas is ranked first with the highest average score of 0.43, indicating that it is the most desired brand among UUM students. Nike trails closely with a commendable average score of 0.38, solidifying its position as the second most favoured brand. Skechers, with a score of 0.19, is ranked third. The higher score of Adidas indicates its superior influence and greater appeal, making it the most preferred brand among the three. Nike also has the second position, indicating that it is nearly as favoured as Adidas. Conversely, the results for Skechers are comparatively low, suggesting that students have a low preference for this brand.

Conclusion

In conclusion, the preference of the young generations for sports shoes is influenced by appearance as well as functionality. Adidas and Nike are world-renowned brands that have become the preferred choice by this group of respondents. The emphasis on young individuals' subjective experiences, regardless of their dedication to a healthy lifestyle, continues influencing their aesthetic appearance during physical activity. They strive to combine functionality with style in their exercise outfits, ensuring that their clothing not only enhances their fitness routines but also reflects their personality and current trends. Considering both health-promoting activities and stylish outfits, it can be concluded that today's young people are well-rounded when it comes to their physical well-being. Consequently, it provides a basic understanding of the consumers' preference for sports shoes for different activities, and this creates a reference framework for future research and business development in this domain. The present study has established a solid foundation for more effective and relevant approaches toward understanding demands in sports shoes in the academic domain. It also discusses shifts in customers' preferences, demonstrating how, in today's world, form and function are two distinct features yet closely connected. The findings can be used as a reference for manufacturers and marketers targeting this demographic. These support the assertion that it is imperative for brands to constantly evolve and that technology should be fused with modern aesthetics to address the requirements of functionality and fashion. The market for sports shoes will remain increasingly competitive. Therefore, such nuanced differences are necessary for creating a competitive advantage. Hence, the existing study not only provides novel insights into the domain area but is also beneficial for concrete application in industries aimed at targeting discerning consumers.

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