



A Preliminary Study on Factors Influences the Design of Soccer Shoes Among Malaysian Soccer Players

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KEYWORDS

*Soccer Shoes
Anatomy
Anthropometry
Biomechanics
Design*

ARTICLE HISTORY

*Received 8 September 2022
Accepted 12 September 2022
Available online 13 September
2022*

ABSTRACT

Soccer is a contact sport, so a soccer shoe's design is important because it affects the kick's accuracy, speed, and ability to avoid foot injuries. A research study with an appropriate experimental design and precise execution is necessary to produce high-quality results. A pilot study can be conducted as an external pilot study apart from the main study or as an internal pilot study integrated into the main study's research plan. This paper will review the research conducted from a pilot project to identify the design factors such as anatomy, anthropometry, biomechanics and physical characteristics for a soccer shoe popular amongst Malaysian soccer players. The objectives of this research are to determine the accuracy of the questionnaire items. The initial sample consisted of 50 Men soccer players from Peninsular Malaysian states are randomly selected from various levels of the game and have at least one year of playing experience. This study used the quantitative method, whereby questionnaires were applied to obtain information from respondents and findings were analyzed using SPSS software version 23.0 to calculate the Cronbach's Alpha reliability index. The validation of the instrument involves a total of two expert panels. A total of 84-item survey is divided into 4 sections, covering the demographic information of the respondents, their professional backgrounds, their opinions on soccer shoes, and their perceptions on shoe design elements. This study has shown that 81 items were appropriate to be utilized to measure the selection of soccer shoes design. Overall, these results indicate that the analysis has statistically proved that the items in this instrument has a high degree of validity and reliability and can be used for study's actual sample. The high value of the alpha coefficients suggest that the instruments is very reliable and capable of determining the accuracy of the questionnaire items.

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1. INTRODUCTION

Soccer is a global sport that attracts fans of all ages and genders from all over the world including Malaysia [1]. Soccer games comes with a high risk of injury and ankle injuries are the most common. Innumerable studies have been conducted,

and a wide range of factors have been revealed that contribute to the problem. These include bad kick posture, shoe difficulties, and field surface factors [2,3]. Foot damage can occur if the wrong shoe size is chosen. 'Calluses' on the soles and sprained ankles are two-foot diseases induced by

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inappropriate shoe wear [4]. Improper shoe sizing also reduces a player's steadiness and thus his or her performance. Another issue is the potential for user-caused musculoskeletal illnesses, which would limit movement and performance.

Soccer shoes are essential for players because they help them move quickly on the field and provide comfort and protection for their feet when they kick. To keep up with soccer players' changing needs, soccer shoes have undergone significant changes [5,6]. A soccer player's performance can be enhanced and injuries can be prevented with proper shoe design [7,8,9,10]. When it comes to soccer shoes, players have a wide range of options to choose from, such as the arrangement and number of studs, materials used in their construction, and even how tall or light they are. Almost all of the research done on soccer shoe design is concerned with stud configuration and number, especially in relation to injury and pitch type [11]. There haven't been many studies done to date looking at the best football shoe design options for improving football players' performance, especially in Malaysia. The weight and height of a Soccer player differs from player to player. It is because of this differentiation that players have varying degrees of performance consistency and strength. The dearth of data regarding Malaysian foot size is a prevalent problem in the production of soccer shoes. The design of soccer shoes that are ergonomic and suitable for the type of pitch prevalent in Malaysia must also be studied. Because each field in Malaysia is different, our research enables players to wear shoes that are appropriate for the surface and so avoid foot problems.

A pilot study is the preliminary stage of a research procedure, and it is typically a smaller-scale study that aids in the planning and adjustment of the major study [12, 13]. The feasibility of the study is validated by conducting a pilot study that mirrors the procedures of the full study. This includes determining who will be included and excluded from the study, how the instruments will be stored and tested, and how the researchers and research assistants will be prepared for the study [14]. One of the most important reasons for doing a pilot study is to collect the preliminary data needed to determine an adequate sample size for the study's primary outcome [15]. In order to determine the sample size, it is necessary to collect preliminary data for each outcome. If preliminary data suggests a range of sample sizes, the greatest of those estimates is utilised for the primary study. This is done so that the primary outcome with the highest sample size can be maintained while the power of the other primary outcomes is increased. In order to determine the appropriate size of a study's final sample, a pilot study is often conducted first. However, care must be used while estimating the size of the primary trial's sample population. The standardised effect size (i.e., Cohen's d) is needed to calculate the necessary number of participants for the primary trial. Researchers can cut down on the time and number of participants needed for the main study by using data from the pilot study [16, 17].

Not all research questions can be answered using a questionnaire. Its usefulness is conditional on the nature of the research issue and the respondents the researcher seeks. The goal of a questionnaire in research is to collect authentic data in a trustworthy and valid way. Validity and reliability, in the context of research technique, refer to the trustworthiness and dependability of a survey or questionnaire. Having respondents who are familiar with the material and capable of answering the questions is essential for the success of any survey that relies on

a questionnaire. The questions asked must be of interest to the respondents, and the respondents must have the resources to answer the questions [18]. The purpose of this research is to determine the validity and reliability of a questionnaire about the design of soccer shoes among Malaysian soccer players.

2. METHODOLOGY

2.1 Research stage

Questionnaire surveys are widely used in academic and marketing research. Online questionnaire surveys, for example, have recently gained popularity [19]. Online surveys allow respondents to answer at a time that suits them, take as long as they need to answer questions, and complete surveys in many sessions. The survey techniques, content, and platforms must be tested with potential participants [20,21]. It is important to do pilot studies to check the questions are appropriate and the information is complete, as well as the technology (e.g; download time), skipping patterns, and data compatibility/transfer difficulties. Figure 1 show the study's flowchart.

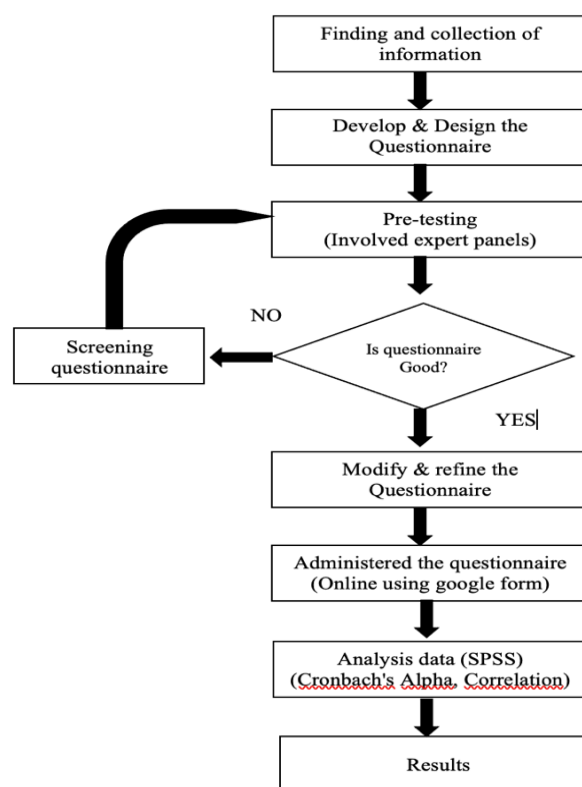


Fig. 1. Pilot Study Flowchart.

2.2 Sample

In this research, the pilot study is designed as a survey, utilizing quantitative approaches such as questionnaires. This quantitative data was gathered from 50 male respondents who are soccer players via a questionnaire. This study was undertaken in peninsular Malaysia's states of Kelantan, Terengganu, Pahang, Perlis, Kedah, Penang, Perak, Selangor, the Federal Territory of Melaka, Negeri Sembilan, and Johor.

By conducting a pilot study on a subset of respondents in the population who have similar characteristics to the study's actual sample, an estimate of the study's findings can be made.

2.3 Instrument

The study data were gathered using a series of questionnaire questions divided into four sections. The first section of the questionnaire collects respondents' personal information, including their age, race, occupation, household income, state/place of birth, address, level of education, and weight and height. The second section of the questionnaire is devoted to eliciting information on one's experiences. This section will examine the respondents' experiences with football. Part 2 includes five items: playing experience, game level, playing position, dominant foot, and the size of the foot/football shoe utilized. The third section of this questionnaire aims to elicit information about a player's desired or desired football shoes. Among the topics included in the shoe information are the price, the shoe brand presently being worn, the factors that influence shoe selection, a favorite shoe brand, and how to make a shoe purchase. The purpose of Part 4 of this questionnaire is to ascertain players' perceptions of six topics: Geographic Information System (GIS), Foot Anatomy, Anthropometry, Biomechanics, Shoe Design, and purchase criteria. The level of measurement used in this study was a nominal scale and a 5-point Likert ordinal scale.

2.4 Pilot Study

A pilot study is a small-scale study undertaken prior to the actual study that tries to develop and increase the research instrument's validity and reliability [22]. To guarantee the items' reliability and applicability, pilot research was conducted on 50 male respondents in peninsular Malaysia to determine their validity. This proposal is based on Chua's (2006) minimum number of respondents for the pilot study, which is at least 30 [23]. This study is critical to ensuring that the questionnaire's developed instruments are easily understood by the real respondents. The researcher used the comments from the pilot study to strengthen the questionnaire's flaws, ensuring that this research has a high level of validity and reliability. The Cronbach's Alpha reliability index was calculated using SPSS software version 23.0. The reliability of items used to measure a construct is expressed by the Cronbach's alpha coefficient, which ranges from 0 to 1. The larger the value of the coefficient, the more reliable the item [24].

3. RESULTS AND DISCUSSIONS

3.1 Sample

Table 1. Demographics of respondent

Demographics	Factor	No	Percentage
Age	19 - 24	41	82
	Above 25	9	18
Race	Malay	47	94
	Chinese	1	2
	Indian	1	2
	Others	1	2
Occupation	Gov	6	12
	Industry	8	16
	Student	22	44
	Others	14	28
Salary (RM)	< 1000	19	38

	1000 - 3000	25	50
	< 3000	6	12
State	Kelantan	6	12
	Terengganu	7	14
	Pahang	2	4
	Negeri Sembilan	5	10
	Melaka	1	2
	Johor	2	4
	Perak	7	14
	Selangor	3	6
	Kuala Lumpur	7	14
	Kedah	2	4
Experience	Perlis	4	8
	Pulau Pinang	4	8
Level of Play	< 1 years	3	6
	2-4 years	8	16
	Above 4 years	39	78
Position	School	2	4
	State	26	52
	University	3	6
	Professional	10	20
	Others	9	18
Foot domain	Goal Keeper	2	4
	Defend	20	40
	Midfield	17	34
	Striker	11	22
Foot Size	Left	9	18
	Right	33	66
	Left and right	8	16
Shoes price	6 to 7.5	28	56
	8 to 9	16	32
	others	6	12
Brand	< 100	1	2
	100 - 250	18	36
	>250	31	62
Purchased methods	Adidas	20	40
	Nike	23	46
	Puma	4	8
	Lotto	3	6
	Others	0	0
Purchased methods	Sport shop	37	74
	Online	5	10
	Sport boutique	8	16

Table 1 summarizes the demographic characteristics of the study respondents, who included 50 soccer players aged 19 to 24 years (41 individuals) and 9 individuals above the age of 25 years. A total of 47 respondents are Malays and while Chinese, Indians and others each with one respondent. The survey respondents' jobs included 6 government employees, 8 industrialists, 22 students, and 14 others. In terms of income, 19 respondents make less than RM 1000, 25 earn between RM 1000 to RM 3000, and 6 earn more than RM 3000. According to the state, Kelantan has six respondents, Negeri Sembilan has five, Selangor has three, Terengganu, Kuala Lumpur, and Perak each have seven, Pahang, Johor, and Kedah each have two, Perlis and Penang each have four and Melaka each has one. In terms of experience, 3 people have less than a year of experience, 8 have 2 to 4 years of experience, and 39 have more than 4 years of experience. A total of 2 participants competed at the school level, 26 at the state level, 3 at the university level, 10 at the professional level, and 9 at the other levels. Two responders played goalkeeper, 20 defended, 17 mid-field, and 11 strike. Nine people used the left foot domain, 33 people used

the right foot domain, and eight people used both feet domains. In terms of foot size, 28 people had a size 6 to 7.5, 16 people had a size 8 to 9, and 6 people had other sizes. Regarding shoe prices, 18 respondents purchased soccer shoes priced between RM100 to RM250, 31 purchased shoes priced above RM250, and one purchased shoe priced less than RM100. When it came to shoe brands, 20 people chose Adidas, 23 people chose Nike, 4 people chose Puma, and 3 people chose Lotto. A total of 37 respondents purchased shoes from sports stores, 5 purchased online, and 8 purchased from a sports boutique store.

3.2 Validity

Table 2. Results of the questionnaire review and expert feedback

No. Item	Expert 1	Expert 2	CVI
66	58	66	
CVI Value	0.88	1	0.94

Table 2 summarises the results of the questionnaire review and expert feedback. Two experts were consulted regarding the veracity of field specialists. In general, the expert panel agreed that both study instruments were capable of measuring relevant components of the material. However, some expert opinions on the questionnaire's substance have been observed. The researcher has taken action in response to the experts' advice by refining the instruments that have been created. The Content Validation Index (CVI) was utilised to measure the level of inter-expert dependability attained. For new instruments, the CVI value acknowledged or agreed upon by experts is 0.8 or above [25]. This study, the researcher used Davis's (1992) CVI value of 0.8 for the new instrument, which was consistent with the study's purpose. Based on table 2, the CVI value for this study is 0.94.

3.3 Reliability Analysis of Questionnaires

Table 3. Reliability of Questionnaire Items on the perception of Geographic Information System (GIS)

Geographic Information System	Item	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
	A1	0.65	0.985
	A2	0.756	0.985
	A3	0.684	0.985
	A4	0.719	0.985
	A5	0.723	0.985

The reliability of the questionnaire items on aspect of geographic information systems is shown in Table 1. According to table 1, each item in the area of geographic information systems (GIS) has a Cronbach Alpha value of 0.85 and a corrected item correlation value of 0.65 to 0.756.

Table 4. Reliability of Questionnaire Items on the perception of Foot Anatomy

Foot Anatomy	Item	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
	B1	0.722	0.985
	B2	0.704	0.985
	B3	0.753	0.985
	B4	0.678	0.985
	B5	0.74	0.985
	B6	0.731	0.985
	B7	0.779	0.985
	B8	0.802	0.985

The Reliability of the Questionnaire Items on the Anatomy of the Foot is shown in Table 4. The Cronbach Alpha value for each item in the foot Anatomy aspect is 0.985, and the correlation value for the corrected item with a total score of 0.678 to 0.802 is presented in Table 4.

Table 5. Reliability of Questionnaire Items on the perception of Anthropometry

Anthropometry	Item	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
	C1	0.812	0.985
	C2	0.796	0.985
	C3	0.789	0.985
	C4	0.675	0.985
	C5	0.819	0.985
	C6	0.679	0.985
	C7	0.731	0.985
	C8	0.81	0.985
	C9	0.707	0.985
	C10	0.715	0.985

The Reliability of Questionnaire Items on Aspects of Anthropometry is shown in Table 5. According to Table 5, each item in the Anthropometry aspect has a Cronbach Alpha of 0.985 and a corrected item correlation value of 0.675 to 0.819.

Table 6 Reliability of Questionnaire Items on the perception of Biomechanics

Biomechanic	Item	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
	D1	0.773	0.985
	D2	0.877	0.985
	D3	0.714	0.985
	D4	0.764	0.985
	D5	0.851	0.985
	D6	0.85	0.985
	D7	0.854	0.985
	D8	0.898	0.985

Table 6 illustrates the item dependability for the biomechanical aspect, indicating that each item had a Cronbach Alpha value of 0.985 and a corrected item correlation value ranging from 0.714 to 0.898.

Table 7 Reliability of Questionnaire Items on the perception of Shoes design

Shoes Design	Item	Corrected Item- Total Correlation	Cronbach's Alpha if Item Deleted
	E1	0.751	0.985
	E2	0.789	0.985
	E3	0.705	0.985
	E4	0.787	0.985
	E5	0.804	0.985
	E6	0.666	0.985
	E7	0.684	0.985
	E8	0.725	0.985
	E9	0.68	0.985
	E10	0.763	0.985

The Reliability of Questionnaire Items on Shoe Design is shown in Table 7. Each item in the shoe design category has a Cronbach Alpha value of 0.985, and the correlation coefficient for the corrected item with a total score of 0.68 to 0.804 is presented in Table 7.

Table 8. Reliability of Questionnaire Items on the perception of shoe purchased

Shoe Purchased	Item	Corrected Item- Total Correlation	Cronbach's Alpha if Item Deleted
	F1	0.4	0.986
	F2	0.579	0.985
	F3	0.63	0.985
	F4	0.773	0.985
	F5	0.648	0.985
	F6	0.639	0.985
	F7	0.514	0.985
	F8	0.687	0.985
	F9	0.714	0.985
	F10	0.336	0.986
	F11	0.651	0.985
	F12	0.365	0.986
	F13	0.623	0.985
	F14	0.701	0.985
	F15	0.567	0.985
	F16	0.631	0.985
	F17	0.725	0.985
	F18	0.766	0.985
	F19	0.726	0.985
	F20	0.754	0.985

The Reliability of Questionnaire Items on Shoe Purchase Factors is shown in Table 8. This aspect utilised a total of 20 items and revealed that each item in the shoe purchase factor domain had a Cronbach Alpha value of 0.985 and a corrected item correlation value ranging between 0.5 and 0.773.

Table 9. Reliability of Questionnaire Items on the perception of System/apps development

System/Apps Development	Item	Corrected Item- Total Correlation	Cronbach's Alpha if Item Deleted
	G1	0.797	0.985
	G2	0.784	0.985
	G3	0.774	0.985
	G4	0.821	0.985
	G5	0.811	0.985

Table 9 summarises the questionnaire item's dependability in terms of system development. Each item in the System Development component has a Cronbach Alpha value of 0.985, and table 9 shows the corrected item correlation value for a total score of 0.774 to 0.821

Following the pilot research and reliability tests, numerous items of the questionnaire were discovered with item correlation values of 0.600 and total corrected scores of 0.600. F1 (0.4), F2 (0.57), F7 (0.514), F10 (0.336), F12 (0.365), and F15 were the items (0.567). Except for F1, F10, and F12, these items have been corrected. However, the Cronbach Alpha reliability score for geographic information system items ranged between 0.756 and 0.985, while that for foot anatomy items ranged between 0.82 and 0.985. anthropometric items between 0.819 and 0.985, biomechanical items between 0.898 and 0.985, shoe design items between 0.804 and 0.985, and shoe buying factor factors between 0.773 and 0.985. According to Pallant (2020), this is a high Cronbach Alpha rating; an alpha coefficient near 1.00 suggests that the items are very reliable.

REFERENCES

- [1] Farhan A.F., Stephany M. J. & Mahammed S. K. (2017). Prevention of Soccer-Related Ankle Injuries in Youth Amateur Players: A Randomized Controlled Trial. *Movement, Health & Exercise*, 6(1), 39-45.
- [2] Blanchard S., Palestri J., Guer J.L. & BEHR M. (2018). Current Soccer Footwear, Its Role in Injuries and Potential for Improvement. *Sports Medicine International Open* 2018; 2: 52-61.
- [3] Weizman Y. & Fuss F. K. (2015). Sensor Array Design and Development of Smart Sensing System for Kick Force Visualization in Soccer. *The International Design Technology Conference, DesTech2015. Procedia Technology* 20, 138-143
- [4] Saluta, Jonathan, and Nunley J. A. (2010). Managing foot and ankle injuries in athletes: quick return to sports activity without disability is the challenge. *The Journal of Musculoskeletal Medicine*, 27(8), 355
- [5] Conenello R. M. (2010). *Athletic Footwear and Orthoses in Sports Medicine*. I. New York: Springer. Soccer, 239-246
- [6] Kashuk K. B., Savard M., and Smith T. (2010). Football. in M. B. Werd & E. L. Knight (Eds.), *Athletic Footwear and Orthoses in Sports Medicine*, 225-237
- [7] Daack C. W., & Senchina D. S. (2014). A Field Study of Low-Top vs. Mid-Top vs. High-Top American Football Cleats. *Sports*, 2(4), 85-98
- [8] Hennig E. M. (2014). Plantar pressure measurements for the evaluation of shoe comfort, overuse injuries and performance in soccer. *Footwear Science*, 6(2), 119-127
- [9] Hennig E. M. and Sterzing T. (2010). The influence of soccer shoe design on playing performance: a series of biomechanical studies. *Footwear Science*, 2, 3 - 11.
- [10] Kinchington M., Ball K.A. and Naughton G. (2012). Relation between lower limb comfort and performance in elite footballers. *journal of the Association of Chartered Physiotherapists in Sports Medicine* 13(1), 27-34
- [11] Wei F. and Meyer E. G. (2013). Footwear properties and football injuries. *Lower Extremity Review*, 5(2)

- [12] Arnold DM, Burns KE, Adhikari NK, Kho ME, Meade MO, Cook DJ. The design and interpretation of pilot trials in clinical research in critical care. *Crit Care Med* 2009; 37(1 Suppl): S69-74.
- [13] Thabane L, Ma J, Chu R, Cheng J, Ismaila A, Rios LP, et al. A tutorial on pilot studies: the what, why and how. *BMC Med Res Methodol* 2010; 10: 1.
- [14] Bengier J, Coates D, Davies S, Greenwood R, Nolan J, Rhys M, et al. Randomised comparison of the effectiveness of the laryngeal mask airway supreme, i-gel and current practice in the initial airway management of out of hospital cardiac arrest: a feasibility study. *Br J Anaesth.* 2016; 116:262–268.
- [15] Junyong I. (2017). Introduction of a pilot study. *Korean J Anesthesiol* 70(6): 601-605
- [16] Lancaster GA, Dodd S, Williamson PR. Design and analysis of pilot studies: recommendations for good practice. *J Eval Clin Pract* 2004; 10: 307-12.
- [17] Leon AC, Davis LL, Kraemer HC. The role and interpretation of pilot studies in clinical research. *J Psychiatr Res* 2011; 45: 626-9.
- [18] Roopa S, Rani MS. Questionnaire Designing for a Survey. *J Ind Orthod Soc* 2012;46(4):273-277
- [19] Van S. M. and Jankowski N. (2006). Conducting online surveys. *Qual Quant.* 40(3), 435-456.
- [20] Van T. E. and Hundley V (2002). The importance of pilot studies. *Nurs Stand.* 16(40), 33-36
- [21] Lumsden J. (2007). Online-questionnaire design guidelines: Handbook of research on electronic surveys and measurements. London: Idea Group Reference, 44-64
- [22] Fraenkel J. R. and Wallen N. E. (2009). "How to Design and Evaluate Research in Education" (7th ed. New York. McGraw-hill
- [23] Chua. Y. P. (2006). Kaedah dan statistik penyelidikan Kaedah Penyelidikan. Mc Graw- Hill Education.
- [24] Pallant, J. (2020). SPSS survival manual: A step by step guide to data analysis using IBM SPSS. Routledge.
- [25] Davis L. L. (1992). Instrument review: Getting the most from a panel of experts. *Applied Nursing Research* 5, 194-197.