International Journal of Global Optimization and Its Application
Vol. 3, No. 1, March 2024, pp.18-29
e-ISSN: 2948-4030

DOI: 10.56225/ijgoia.v3i1.344

Review Article

Development of Conceptual Framework of User Decision Making on Purchasing Running Shoes through Ergo-Aesthetic Value on Sight Behavioral Assessment

Zazarida Rifin [1,*] and Khairul Aidil Azlin Abd.Rahman [1]

[1] Department of Industrial Design, Faculty of Design and Architecture, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia; drkhairulazlin@upm.edu (K.A.A.A.R.)

* Correspondence: zazaizham@gmail.com (Z.R.)

Citations: Rifin, Z., & Rahman, K.A.A.A., (2024). Development of Conceptual Framework of User Decision Making on Purchasing Running Shoes through Ergo-Aesthetic Value on Sight Behavioral Assessment. *International Journal of Global Optimization and Its Application*, 3(1), 18-29.

Received: 8 October 2023 Revised: 22 February 2024 Accepted: 6 March 2024 Published: 31 March 2024

Abstract: A few scholars have highlighted the association between ergonomics and aesthetics with behavior. For this study, it should be noted that deviations in ergonomics and aesthetics are inevitable as human behavior and cultural experience change constantly. Nevertheless, applying ergonomics and aesthetics through behavior evaluation inside a design process can significantly improve the created item's visual appearance and comfort level. Moreover, culture and behavior will affect the product's visual assessment and the design's final quality. Therefore, the user's sight behavior is an important factor in judging the ergonomics and aesthetics of the running shoe selection. According to this paper, user decision-making will influence the purchase of suitable running shoes. Therefore, due to the COVID-19 pandemic, consumers face difficulty purchasing suitable running shoes in stores, malls, or shoe outlets. This dilemma might influence a consumer to make their decision making to choose suitable running shoes in a very short time. The uncommon ground between ergonomics and aesthetics may become an unpleasant medium for designers to use in terms of ergonomic and aesthetic values in each design process. This dilemma may result in ineffective design process flow, increasing the cost of developing a certain product.

Keywords: Ergo aesthetic; Running shoes; Sight behavioral; Decision making

1. Introduction

Recently, consumer and user decision-making on purchasing running shoes in the store are influenced by different sight behavioural assessments, causing more time. This scenario also happened due to the COVID-19 pandemic 2 years ago. After the pandemic ends, consumers will purchase their favourite running shoes in shopping malls or online platforms.

2. Materials and Methods

This paper will study the development of the conceptual framework of user decision-making when purchasing their favourite running shoes. The first data will be gained from a structured survey. The analysis will mostly involve a descriptive statistical analysis based on a well-structured question sheet. This structured question has been derived from the theoretical framework and past literature, which will contribute to a more suitable data generalisation. Accurate measures have been strategised to ensure validity, and the reliability of the data obtained is at its highest quality. Then, an expert survey will take part to validate the pre-framework of ergo-aesthetic regarding its content validation. Due to the COVID-19 pandemic, the data collection process for the survey will be conducted through online distribution and a face-to-face survey. For an online survey, the questionnaire will be distributed using an online platform, Google Forms. For a face-to-face survey, the item will be distributed using a printed questionnaires booklet and distributed to the respondent that the researcher identified. All respondents will thoroughly brief about each attribute's insides of all particular sections regarding the term and definition used. Throughout the validation process for the structured survey, a pilot test was conducted online to determine the validity and applicability of the questionnaire set. The first phase, which is more about how to design the questionnaire, also includes the layout and structure of the text.

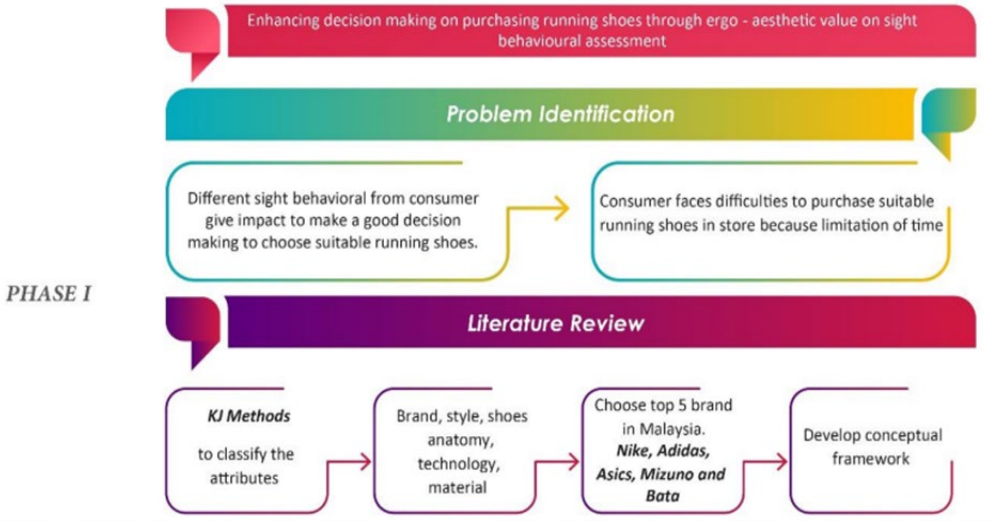

Figure 1. The phase 1 to clarify the research design use for this research

3. Ergonomics

Ergonomics arose because of the design and operational problems presented by technological advances in the last century. It owes its development to the same historical processes that gave rise to other disciplines such as industrial engineering and occupational medicine (Bridger, 2008) ; (Christensen, 1987) 6 points out that the importance of a "good fit" between humans and tools was probably realised early in the development of the species. As an example, the selected of pebble tools and made scoops from antelope bones in a clear display of selecting/creating objects to make tasks easier. After World War II, the focus of concern expanded to include worker safety as well as productivity. Research began in various areas such as the definition of ergonomics and the principle of ergonomics.

According to Lehto et al. (2007), the field got its name in summer of 1949 when a group of interests' individuals assembled in Oxford, England to discuss the topic of human performance. The group consists of anatomists, physiologists, psychologists, industrial medical officer, industrial hygienists, design engineers, work-study engineers, architects, illuminating engineers, and anyone who is concerned some aspect of human performance. Then it is decided that they would coin new word ergonomics, which couples ergo, the Greek word for work and Nomo's, meaning natural laws. Sometime later, the term human factors were coined in U.S for a society of similar purpose.

3.1. Definition of Ergonomics

The term ergonomics comes from the words with many definitions that can be derived from contexts pertaining to the knowledge of ergonomics such as the study (or science) of the interaction between humans and their working environment, which may be classified as factors associated with human. It has had a long and successful history of influencing the uptake of human centered design processes in different domains, such as the automotive industry and defense, and, to a lesser extent, medicine and surgery. Ergonomics can also be looked on as a bridge between human behavior and technology, striving to guarantee the usability of future devices. As for the precise definitions that have been use worldwide, it can be seen from the international standards, in this case from the International Ergonomics Association;

Ergonomics (or human factors) is the scientific discipline concerned with understanding interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design to optimise human well-being and overall system performance. (Karwowski, 2006)

To support the definition above, two more extracts are placed below, both of them elaborate in their own words, with their specific definitions:

Ergonomics is a science focused on studying human fit and decreasing fatigue and discomfort through product design. Ergonomics applied to office furniture design requires considering how our products fit the people using them. (Openshaw & Taylor, 2006)

Ergonomics is a multidisciplinary activity striving to assemble information on people's capacities and capabilities and to use that information in designing jobs, products, workplaces and equipment. (Chengalur et al., 2004)

By the definition, ergonomics is a science discipline to obtain a working environment that is fit for people to work. It is also making the job to be fit to the worker. That is why it is stated in definition that ergonomics is also designing jobs and work related material. It also means that we are creating a job that basically does not affect the human health.

3.2. Principle of Ergonomics

Over the past few decades, several basic principles have emerged in the field of ergonomics. While many of these principles may appear simple, one should not underestimate the power of new fundamental ideas applied systematically. These principles must be followed in their basic form so that the design work can fit the worker. The principles are comfort, safety, ease of use, aesthetics and productivity/ performance (Dul & Weerdmeester, 2003).

For the first principle is comfort. It's known to be one of the desired criteria in designing a product. People in the world today always want be comfortable in all things. It's the first elements when they want to choose something related to their body. The comfortable environment when performing tasks tends to motivate the works to work hard. Furthermore, it can relax the workers and release the stress that can cause ergonomics failure among the workers. The environment in which work is performed can directly and indirectly affect not only the comfort and health of people but also the quality and efficiency of the work being done (MacLeod, 1994).

The next principle is safety, which is very important since it is an element everyone looks for when performing a task. Ergonomics promotes safety when designing tasks for workers. Safe jobs are relevant and practical for use in the world. Safety also includes the working environment and the working tools. Work areas must be designed with enough space to complete the task and have easy access to everything needed. So, the safety of our body in doing the task is completely safe without any danger because there is no obstruction between a person and the items needed to accomplish the task. Working tools need to be handled safely. That is why many tools that move around are equipped with safety measurements. Some tools, such as the lathe machine, are equipped with an emergency stop button and automatic emergency stop button. The emergency stop button is important in case something bad happens and the machine must stop immediately.

The other principles are eased to use. These principles basically related with the working accessories and tools equipment. We must keep tools or everything in easy reach to make it easy. Long reaches can strain the body, make work more difficult, and waste time. An easy way to make tasks more user-friendly is

to keep frequently used items such as knobs, switches, tools and parts within easy reach. Basically, different jobs required different types of tools but one thing that must be considered and almost the same for all tolls is the fact that it needs to be easy to use.

3.3. Aesthetics

Aesthetics of beauty are commonly related to things like clothes, cars, houses, and many more. All people like things that is beauty and being beautiful. Something beautiful has elements that people like. The elements will make people feel comfortable and suitable to use it. Because beauty is wanted globally, ergonomics implements this part to produce jobs that fit the workers. Aesthetic values or beauty are usually associated with tools related to the job. Even chair needs to be aesthetics for it to be selling as well as to be like. Making the workplace full of aesthetic value will cause the workers feels less stress when doing job. It can also be considered a psychological measure in attracting interest.

Productivity and performance are also two of the principles of ergonomics. Productivity is correlated with performance. The performance is directly proportional to the productivity. Workers' performance lies within the working aspects, including the ergonomics itself. In order to produce productivity and performance, ergonomics will design job that will fit the workers according to the basic needs. From all the principles stated above, it's very important to ensure that the worker will produce good results if all the principles are combined in a single task. It can also avoid the worker from injuries and disease many more. From the research that has been done, this principle is very good to know to be effective in solving ergonomics problems at work.

3.4. Ergonomics in running shoes

Ergonomics can coordinate well with capabilities and limitations when designing a gadget or product. If they are not coordinated well, the product outcome, for example, the running shoes, may be utilised wrongly, and the data may be deciphered inaccurately. Every one of these results could, eventually, influence a human life. The user necessities are a basic component in implementing the outcome as a part of the design development process. The field of ergonomics has a chance to help and empower a more broad thought of the user amid the development of medical products. Concurrently, only a few distributed works exists on the ergonomic parts of the medicinal device development by the little advice accessible to developers on which issues to consider amid the process of designing and advancement or proposals for good practice regarding the techniques and methodologies approaches which are expected to catch the full scope of the user requirements in ergonomics. In conjunction to that, the Multidisciplinary Assessment of Technology Center for Health mind (MATCH), a research collaboration that is working in with industrial collaborators, apply ergonomics methods to real case study projects with a definitive point of delivering an industry-centered manual for applying ergonomics standards in medical device development.

The most essential part in the medical design field is to know how the device works for its intended users, which the ergonomics, anthropometrics, and psychological and other human variables issues may influence. These elements needed to be taken into consideration throughout the whole design process. The system performance can be optimised while maximising human wellbeing and operational effectiveness as ergonomics embraces a range of human-centred issues relevant to equipment or systems design and training, including body size (anthropometry), motion, and strength capabilities (biomechanics). In relation to basic human operations, it is inclusive of sensory-motor capabilities such as vision, hearing, haptic, (which refers to force and touch), dexterity, cognitive processes and memory (including situational awareness), training and current knowledge relating to equipment, systems, practices, and medical conditions (including emergency conditions), expectations and cultural stereotypes relating to the operation of equipment and general health, age, motivation, stress levels, mental fatigue, and performance under drug treatment.

The discipline of ergonomics has attempted to make important changes over half a century by introducing human centered processes to the design of equipment, systems, and working practices in many domains of activity, including health care. Yet despite the research and development community's enthusiasm for innovation, the end users practitioners and specialists are often ignored during the design and development processes, sometimes with serious consequences. The growing relevance of ergonomics or human factors principles and methodologies emphasises moving away from the "technology push" (the assumption that a high-tech approach to designing information technology systems will always provide a robust and reliable solution). Using ergonomics in a design process can reduce the costs of procuring and maintaining products. It can also minimise injury or longer term incidence from poor working environments. Subsequently, an ergonomics task analysis can help to identify the key components of

surgical skill, ensuring that students have affordable, appropriate, valid, and reliable training. It is along these lines basic that the directions that will impact the outline of an item are distinguished ahead of schedule in the plan procedure.

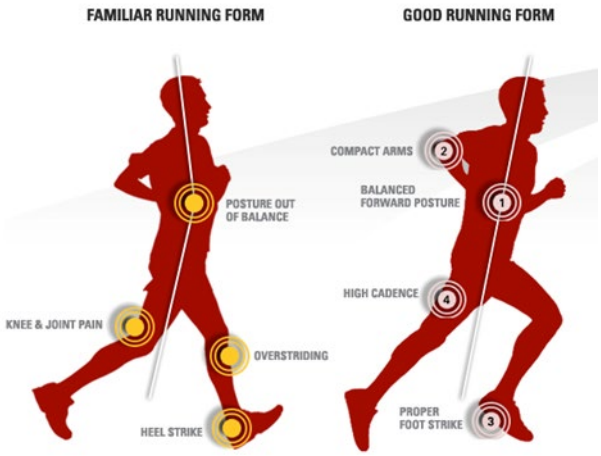

Figure 2. The perfect body for running position

3.5. Running shoes

Past 10 years, most running shoes contained a moderate amount of cushioning and were categorised by the amount of rear foot control they offered. However, despite significant innovations in shoe design over this period, runners' injury rates remained very high. Therefore, to attenuate these high injury rates, many shoe companies have recently begun altering the amount of cushioning in their shoes, offering both minimally and maximally cushioned options. According to Frederick et al., (1984) running shoe design can affect performance enabling athletes to run faster and more economically, or it can protect them from chronic and acute injuries ranging from simple blisters to stress fractures. Many speculations have been made about the factors in shoe design that cause injury, but there is almost no experimental evidence proving such associations.

Figure 3. The perfect anatomy of running shoes

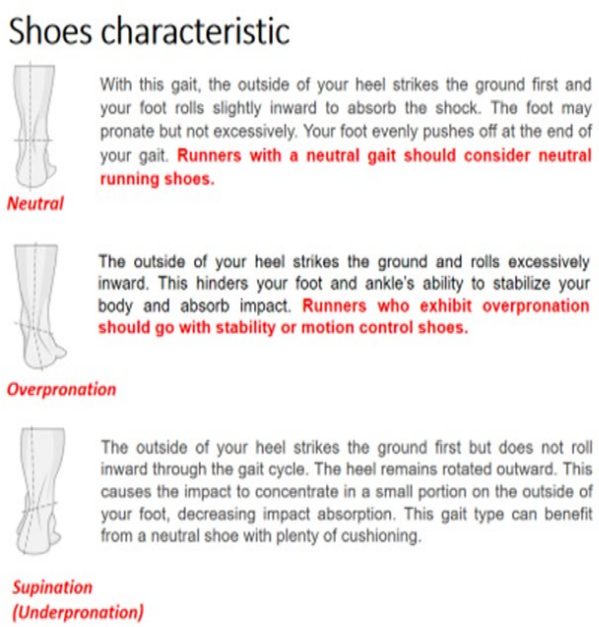

Figure 4. Foot type and characteristic

There are characteristics of good design features that preferably be met for production of a running shoes design. The first characteristic is originality. It does not copy existing product forms, ideally first of its kind. Originality must be clearly visible in all functions of the product. However technological development present new possibilities for innovative solutions. The second feature is product usefulness. A product serves its defined function in both primary and supplementary purposes. The most important task of design is optimising the utility of a product.

The next characteristic often very central to design is on a product's aesthetics quality, which is an integral part of the utility. However, the integral issue surrounding aesthetic quality can be broken down into two parts. First, it is difficult to explain the beauty aspect of a product as different people have different perspectives on what beauty is to their liking. Secondly, aesthetic quality deals with a whole variety of visual elements and principles such as details, color preference, harmony and equilibrium that are only appreciated and fully understood by those in the arts and design field. Understanding good design is fundamental and vital to creating products that meet the user's expectation. The next characteristic of a good design is user-friendly. It simplifies the structure and makes do with an ease in application of the product as well as being unobtrusive. An example of product that satisfies this criterion is common hand tools such as a hammer or a screwdriver. They are designed to be very functional devices where aesthetics may not be of primary concern. Their design should therefore be balanced between function and the user's usage.

A reliable product is one that serves its function and does not manipulate buyers and users. Durability in design is another important feature of good design. Being long-lasting through time is one major attribute that differentiates a good design from a lesser one. Detailing and accuracy in design are equally desired in the product and its functions. Good design will have achieved excellence if sustainability is being given due consideration. Being environmentally conscious does not cause damage or upset the stability of the environment and a rational use of raw materials. The last good design characteristic is compactness of the product not only of size but also its composite functions. Hence a good design need not be complex but simplicity in design with maximum and effective utility is desired. This is a worthy marketability consideration in today's smart and high tech world. It also helps to facilitate storage and easy handling of product. A good product with a potential market value will sell by itself with the right marketing efforts. All these years, products used are basically designed based on the required functions only. A new approach with new ideas and aesthetics will help the designer expand the product design market, creating an emotional link between the consumer and a product or experience. In addition, when the user feels safe and comfortable to use the suitable running shoes it will enlighten the burden on decision-making.

4. Aesthetics and Brands

According to Redford & Redford (1966), Aesthetic design is not just a matter of good appearance but has its roots in a more involved relationship that fully comprehended by the man who has had training both in the workshops and in the design office and has also had experience of the machine or structure in its operating environment. While according to Kaljun & Dolšak, (2011) aesthetic characteristics is crucial during the conceptual design phase of an industrial product, where the product is incompletely defined and the generation of the first model is mainly driven by designers' creativities and high-level constraints. Most of influential design factors will be adapted to the conceptual design during phases yet to come. There is, however, one influential factor, ergonomics, which has to be considered simultaneously with aesthetics. This is needed because the parameters regarding ergonomics are derived at from anthropometric and biomechanical data of the human body and cannot be changed in order to suit aesthetics. Aesthetic characteristics must incorporate ergonomic design elements.

Aesthetics is the inclusion of appearance, or aesthetics, as a major design metric represents both an augmentation to conventional engineering design and an intersection with artistic endeavor. Aesthetics in the context of product design refers to all visual aspects – the statics and dynamics of form, proportion, color, patterns, and textures, including reflectivity. Aesthetics affects humans psychologically and physiologically and proffers opportunities for improving human efficiency and "attitude" – thereby increasing overall productivity and enjoyment. Aesthetics and appearance have always played a role in product and system design, and this role will dramatically increase in the 21st century as society and the market become more sophisticated and manufacturing technologies develop further. To compete and succeed in the marketplace, manufacturers will have to look beyond reliability and physical quality and pay more and more attention to their products' aesthetics and subjective quality. In the more established technology sectors, product reliability is a "given" to the customers and is often regarded as a basic qualifying "ticket" to enter the marketplace.

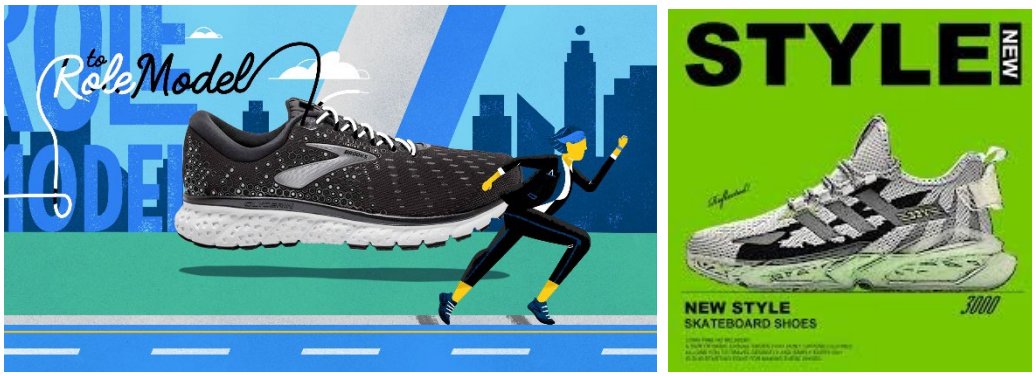

Figure 5. The examples on running shoes advertising.

4.1. Decision Making

Decision making is just what it sounds like: the action or process of making decisions. Sometimes they make logical decisions, but they often make emotional, irrational, and confusing choices. Past experiences can impact future decision making. Karlsson et al. (2005) indicated past decisions influence people's future decisions. It stands to reason that when something positive results from a decision, people are more likely to decide similarly, given a similar situation. On the other hand, people tend to avoid repeating past mistakes (Sagi & Friedland, 2007). This is significant because future decisions based on past experiences are not necessarily the best. In decision making, cognitive biases influence people by causing them to over rely or lend more credence to expected observations and previous knowledge, while dismissing information or observations that are perceived as uncertain, without looking at the bigger picture. While this influence may lead to poor decisions sometimes, the cognitive biases enable individuals to make efficient decisions with the assistance of heuristics (Shah & Oppenheimer, 2008).

4.2. Sight Behavioral

According Cash et al., (2017) Behavior can described in terms of antecedent (trigger) behavior consequence (result) (Simó-Pinatella et al., 2013). This interpretation has been elaborated in other fields by Michie et al., (2008) and Hardeman et al., (2005), amongst others, and is recognised in design by authors

such as Lehman & Geller, (2004) and Wood & Newborough, (2003). Antecedent strategies use interventions that occur prior to a behavior, influencing it in a desired direction (Bechtel & Abrahamsen, 2005). Consequence strategies use interventions that occur during or after a behavior has been performed (Bechtel & Abrahamsen, 2005) e.g. using rewards, fees, and feedback. Critically, consequence strategies primarily rely on the subject reflecting on their actions. But according to Gallop, (2013) Eye Movements: Tracking is the ability to visually follow a moving target or switch attention from one object to another. Fixation is the ability to look directly and steadily at a specific object.

Eye movements facilitate efficient sampling of visual information from the world around us. For example, in everyday social interactions, we often understand, predict, and explain the behavior and emotional states of others by how their eyes move (Adams & Nelson, 2016). The exact mechanisms by which eye movement is controlled, and the range of factors that can influence it, are subject to intense research (Wolfe, 1994); (Martinez-Conde et al., 2004); (Foulsham et al., 2011); (Rucci & Victor, 2015). Massaro et al., (2012) Eye-tracking results showed that static human-content images, on average, guided visual exploration on fewer precise areas than static nature images. The attraction exerted by human-content images was independent of dynamism, while nature-content stimuli attracted attention to few specific areas only in the case of dynamic images. Skill on Visual Behavior that will include in this study:

• ***Visual Spatial Relationship***

This skill involves understanding the relationship between objects in space. It is important for tasks such as reading maps and creating designs. Examples include determining how far apart two objects are, or how two objects fit together. Visual-spatial arrays that represent, or are symbols for, objects, events, or more abstract information In the case of visual displays, the representational medium is a display that is perceived by the visual system and distributed over space. It can be printed on paper or displayed on a computer screen. Visual displays can be categorised into different types based on the relation between the representation and its referent and the complexity of the information represented.

• ***Sequential Memory***

This skill involves remembering a series of events or items in the order in which they occurred. Examples include remembering a list of instructions or a sequence of numbers. Visual sequential memory is the ability to remember and recall a sequence of objects and/or events in the correct order. For example, a child with poor visual sequential memory may read the word 'felt' as 'left' or 'cat' as 'act. '

• ***Visual*** **Discrimination**

This skill involves being able to distinguish between different visual stimuli. Examples include being able to differentiate between similar-looking letters like "b" and "d" or tell the difference between two different shades of cooler. Visual discrimination activities include identifying opposites, sorting cards, doing puzzles, and ordering blocks Matching cards, taking nature walks, and picking out an image or object that is not like the others in a group are also visual discrimination activities.

• ***Form Constancy***

This skill involves recognising an object regardless of its size, shape, or orientation. Examples include recognising a letter "A" whether it is large or small, or whether it is turned upside down or right side up. Form constancy is a visual perceptual skill that allows understanding that a form, shape, objects stays. The same even when it changes it size, position or is in a different environment.

• ***Visual Memory***

Visual Memory: This skill involves being able to remember visual information. Examples include being able to recall the details of a picture or a scene or remember a face. Examples of perceptual constancy include brightness constancy, cooler constancy, shape constancy, and size constancy. Visual constancy is a key mechanism that allows the perception of familiar objects at a “standardised” shape, size, or cooler and is also critical for the invariant identification of objects regardless of changes in perspective, distance, lighting or the size of the retinal image (Weintraub & Gardner, 1970); (Wright, 1984)

• ***Visual Closure***

This skill involves being able to recognise a complete object when only parts of it are visible. Examples include being able to recognise a letter even if only part of it is visible. Visual closure is a visual perceptual skill that allows knowing what an object is even when the object is only partially visible. For example, if

your sock is sticking out from under your bed you recognise it is your missing sock. Another example, is reading words together instead of every letter at a time.

• ***Visual Figure Ground***

This skill involves being able to distinguish between an object and its background. Examples include being able to pick out a particular object in a busy scene. Visual discrimination activities include identifying opposites, sorting cards, doing puzzles, and ordering blocks. Matching cards, taking nature walks, and picking out an image or object unlike the others in a group are also visual discrimination activities.

• ***Ability***

This is a general term that refers to an individual's level of proficiency in a particular skill or task. For example, an individual may have a high level of ability in visual spatial relationships but a lower level of ability in visual closure. A major problem for the rapidly growing population of older adults (age 65 and over) is age-related declines in vision, which have been associated with increased risk of falls and vehicle crashes. Research suggests that this increased risk is associated with contrast sensitivity and declines in visual acuity.

• ***Eyes Movement***

This skill involves the ability to control eye movements. Examples include being able to track a moving object with the eyes or shift the focus of the eyes from one object to another. Viewing a picture has no obvious output, and eye movement patterns are rather less constrained than in the preceding activities. Nevertheless Bus well, in his 1935 book ‘How people look at pictures’ found that patterns of eye fixations were related to the structures in the pictures, albeit in a rather loose way. Two of his conclusions were particularly interesting. First, he observed that fixation patterns changed during the viewing period, with later fixations being of longer duration than earlier ones, and spread out more across the picture. He suggested that the viewer changed from an initial quick survey to a more detailed study of limited regions.

• ***Focusing***

This skill involves the ability to adjust the focus of the eyes. Examples include being able to focus on an object up close or far away. Behavioral focusing optometry acknowledges the brain's connection to vision. And, the impacts on behavior that poor vision can have. It's incredibly important for children with perceived vision problems to see a behavioral optometrist.

• ***Eyes Tearing***

This is not a visual behavior skill, but rather a physical response of the eyes to produce tears when irritated or lubricate the eyes. Our eyes can water or tear up for many reasons, including weather, allergies or, more seriously, an infection. If you find yourself tearing up suddenly, pay attention to what you're doing or the environmental factors you're being exposed to when it occurs.

• ***Peripherals Awareness***

This skill involves being aware of visual stimuli outside of the central field of vision. Examples include being able to notice something in the corner of your eye or being able to keep track of multiple objects in a wide field of view. Peripheral vision is fundamental for many real-world tasks, including walking, driving, and aviation. Peripheral vision is used to monitor the environment (e.g., road edges, traffic signs, or malfunctioning lights), in ways that differ from basic research. Applied research uncovers new actions that one can perform solely with peripheral vision (e.g., steering a car, climbing stairs). An important use of peripheral vision is that it helps compare the position of one’s body/vehicle to objects in the world. In addition, many real-world tasks require multitasking, and the fact that peripheral vision provides degraded but useful information means that trade-offs are common in deciding whether to use peripheral vision or move one’s eyes.

Figure 6. Diagram on conceptual framework

Sight behavior, also known as visual behavior, refers to the patterns of eye movements and gaze fixations that occur when an individual is visually inspecting an object or scene. The analysis of sight behavior involves using tools such as eye trackers to record and measure eye movements, saccades, and fixations. Eye trackers are used to collect data on where and for how long a person's eyes fixate on specific areas of an object or scene, as well as how they move their eyes to explore the visual field. Researchers typically rely on quantitative measures such as fixation duration, saccade amplitude, and gaze direction to analyse sight behaviour. They may also use qualitative observations to interpret the meaning of certain patterns or behaviors observed during the analysis.

In the case of analysing sight behavior when looking at a pair of shoes, researchers may segment the shoes into different areas or features, such as the toe box, heel, sole, and laces. Using an eye tracker, they can then record and analyse where participants fixate on the shoes and for how long. This can provide insight into which features of the shoe's consumers pay the most attention to when purchasing. For example, a study may find that participants fixate on the toe box of the shoes first, followed by the sole and heel, and then the laces. Shoe designers could use this information to highlight or modify certain features of the shoes to attract consumers' attention better and increase the likelihood of a purchase. Other examples of methods that can be used to analyse sight behavior besides eye trackers. Here are a few examples:

Heat maps: Heat maps visually represent where people look on a screen or object. They use color-coding to show the areas where people's gaze lingers the longest, indicating areas of high visual interest. Heat maps can be created using eye tracking data or other methods such as mouse tracking or clickstream data.

Retrospective verbal protocols: In this method, participants are asked to describe their thought process and visual attention after viewing an object or scene. This method assumes that people can accurately report their own thought processes and provide insight into why they looked at certain areas or features.

Facial expression analysis: Facial expression analysis involves using computer vision and machine learning algorithms to detect and analyse facial expressions. It can be used to understand how people react emotionally to different visual stimuli and can provide insight into which features of an object or scene elicit positive or negative emotions.

EEG (electroencephalogram) and FMRI (functional magnetic resonance imaging): These are neuroimaging techniques that can be used to study visual processing in the brain. EEG measures electrical activity in the brain, while fMRI measures changes in blood flow. They can be used to understand the neural mechanisms underlying sight behavior and visual attention.

Overall, the choice of method for analysing sight behavior depends on the research question, the object or scene being studied, and the available resources. Each method has its strengths and limitations, and researchers may choose to combine multiple methods to gain a more comprehensive understanding of sight behavior.

5. Conclusion and Knowledge Contribution

This study seeks to formulate and develop a framework that can be used by shoe designers, manufacturers, and users; hence, to accomplish these contributions, the information on the design process was collected, organised, and compiled. The product development methodologies of the design process are also identified and evaluated. The findings and results from this paper may become the best practices and contributions for shoe designers developing and designing the best running shoes for consumers and users worldwide.

Author Contributions: Conceptualisation, Z.R. and K.A.A.A.R.; methodology, Z.R.; software, Z.R.; validation, Z.R. and K.A.A.A.R.; formal analysis, Z.R.; investigation, Z.R.; resources, Z.R.; data curation, Z.R. and K.A.A.A.R.; writing—original draft preparation, Z.R. and K.A.A.A.R.; writing—review and editing, Z.R. and K.A.A.A.R.; visualisation, Z.R.; supervision, K.A.A.A.R.; project administration, K.A.A.A.R.; funding acquisition, Z.R. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Acknowledgments: The authors would like to thank Universiti Putra Malaysia for supporting this research and publication. We would also like to thank the reviewers for their constructive comments and suggestions.

Conflicts of Interest: The authors declare no conflict of interest.

References

Adams, R. B., & Nelson, A. J. (2016). Eye behavior and gaze. In *APA handbook of nonverbal communication.* (pp. 335–362). American Psychological Association. https://doi.org/10.1037/14669-013

Bechtel, W., & Abrahamsen, A. (2005). Explanation: a mechanist alternative. *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences*, *36*(2), 421–441. https://doi.org/10.1016/j.shpsc.2005.03.010

Bridger, R. (2008). *Introduction to Ergonomics*. CRC Press. https://doi.org/10.1201/9781439894927

Cash, P. J., Hartlev, C. G., & Durazo, C. B. (2017). Behavioural design: A process for integrating behaviour change and design. *Design Studies*, *48*(1), 96–128. https://doi.org/10.1016/j.destud.2016.10.001

Chengalur, S. N., Rodgers, S. H., & Bernard, T. E. (2004). *Ergonomic Designfor People at Work (pp. 18-150). Hoboken*. NJ: John Wiley & Sons, Inc.

Christensen, E. (1987). Multivariate survival analysis using Cox's regression model. *Hepatology*, *7*(6), 1346–1358. https://doi.org/10.1002/hep.1840070628

Dul, J., & Weerdmeester, B. (2003). *Ergonomics For Beginners*. CRC Press. https://doi.org/10.4324/9780203212097

Foulsham, T., Walker, E., & Kingstone, A. (2011). The where, what and when of gaze allocation in the lab and the natural environment. *Vision Research*, *51*(17), 1920–1931. https://doi.org/10.1016/j.visres.2011.07.002

Frederick, E. C., Clarke, T. E., & Hamill, C. L. (1984). The effect of running shoe design on shock attenuation. In *Sport shoes and playing surfaces* (pp. 190–198). Human Kinetics Champaign.

Gallop, C. J. (2013). Knowing nothing: Understanding new critical social work practice. *Journal of Applied Hermeneutics*, *17*(7), 1–21.

Hardeman, W., Sutton, S., Griffin, S., Johnston, M., White, A., Wareham, N. J., & Kinmonth, A. L. (2005). A causal modelling approach to the development of theory-based behaviour change programmes for trial evaluation. *Health Education Research*, *20*(6), 676–687. https://doi.org/https://doi.org/10.1093/her/cyh022

Kaljun, J., & Dolšak, B. (2011). Artificial intelligence in aesthetic and ergonomic product design process. *2011 Proceedings of the 34th International Convention MIPRO*, 959–964.

Karlsson, N., Juliusson, Á., & Gärling, T. (2005). A conceptualisation of task dimensions affecting escalation of commitment. *European Journal of Cognitive Psychology*, *17*(6), 835–858. https://doi.org/10.1080/09541440540000004

Karwowski, W. (2006). The International Ergonomics Association (IEA). In *International Encyclopedia of Ergonomics and Human Factors-3 Volume Set* (pp. 170–173). CRC Press.

Lehman, P. K., & Geller, E. S. (2004). Behavior Analysis and Environmental Protection: Accomplishments and Potential for More. *Behavior and Social Issues*, *13*(1), 13–33. https://doi.org/10.5210/bsi.v13i1.33

Lehto, M. R., Landry, S. J., & Buck, J. (2007). Communication and display design. In *Introduction to human factors and ergonomics for engineers* (pp. 657–710). CRC Press.

MacLeod, D. (1994). *The ergonomics edge: improving safety, quality, and productivity*. John Wiley & Sons.

Martinez-Conde, S., Macknik, S. L., & Hubel, D. H. (2004). The role of fixational eye movements in visual perception. *Nature Reviews Neuroscience*, *5*(3), 229–240. https://doi.org/10.1038/nrn1348

Massaro, D., Savazzi, F., Di Dio, C., Freedberg, D., Gallese, V., Gilli, G., & Marchetti, A. (2012). When Art Moves the Eyes: A Behavioral and Eye-Tracking Study. *PLoS ONE*, *7*(5), 37–285. https://doi.org/10.1371/journal.pone.0037285

Michie, S., Johnston, M., Francis, J., Hardeman, W., & Eccles, M. (2008). From Theory to Intervention: Mapping Theoretically Derived Behavioural Determinants to Behaviour Change Techniques. *Applied Psychology*, *57*(4), 660–680. https://doi.org/10.1111/j.1464-0597.2008.00341.x

Openshaw, S., & Taylor, E. (2006). Ergonomics and design. In *A Reference Guide*.

Redford, G. D., & Redford, G. D. (1966). Aesthetic and Ergonomic Considerations. In *Mechanical Engineering Design: An Introduction* (pp. 109–124). Springer.

Rucci, M., & Victor, J. D. (2015). The unsteady eye: an information-processing stage, not a bug. *Trends in Neurosciences*, *38*(4), 195–206. https://doi.org/10.1016/j.tins.2015.01.005

Sagi, A., & Friedland, N. (2007). The cost of richness: the effect of the size and diversity of decision sets on post-decision regret. *Journal of Personality and Social Psychology*, *93*(4), 515–524.

Shah, A. K., & Oppenheimer, D. M. (2008). Heuristics made easy: An effort-reduction framework. *Psychological Bulletin*, *134*(2), 207–222. https://doi.org/10.1037/0033-2909.134.2.207

Simó-Pinatella, D., Font-Roura, J., Alomar-Kurz, E., Giné, C., Matson, J. L., & Cifre, I. (2013). Antecedent events as predictive variables for behavioral function. *Research in Developmental Disabilities*, *34*(12), 4582–4590. https://doi.org/10.1016/j.ridd.2013.09.040

Weintraub, D. J., & Gardner, G. T. (1970). Emmert's Laws: Size Constancy vs. Optical Geometry. *The American Journal of Psychology*, *83*(1), 40–54. https://doi.org/10.2307/1420854

Wolfe, R. A. (1994). Organisational Innovation: Review, Critique And Suggested Research Directions*. *Journal of Management Studies*, *31*(3), 405–431. https://doi.org/10.1111/j.1467-6486.1994.tb00624.x

Wood, G., & Newborough, M. (2003). Dynamic energy-consumption indicators for domestic appliances: environment, behaviour and design. *Energy and Buildings*, *35*(8), 821–841. https://doi.org/10.1016/S0378-7788(02)00241-4

Wright, W. D. (1984). The Perception of Light and Colour. In *Foundations of Sensory Science* (pp. 229–258). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-69425-7_7