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EXPLORING JUST NOTICEABLE DIFFERENCE BETWEEN AI ENDORSERS AND HUMAN ENDORSERS IN ADVERTISING CAMPAIGNS

DENI ADHA AKBARI [1]*, UJANG SUMARWAN [2], NUR HASANAH [3] and RIZKI EDMI EDISON[4]

[1] Faculty of Economics and Business - Universitas Muhammadiyah Prof. Dr. Hamka (Uhamka), Jakarta, Indonesia. *Corresponding Author Email: deni@uhamka.ac.id
[2, 3] School of Business - IPB University, Bogor, Indonesia.
[4] Neuroscience Institute - Universitas Prima Indonesia, Medan, Indonesia.
[4] Institute of Leadership, Innovation, and Advancement - Universiti Brunei Darussalam, Bandar Seri Begawan, Brunei Darussalam.
[4] Research Center of Public Policy - National Research and Innovation Agency, Jakarta, Indonesia.

Abstract

This literature review explores the Just Noticeable Difference (JND) between AI and human endorsers in advertising campaigns, a growing area of inquiry in digital marketing. The study synthesizes existing research on applying JND principles in human and AI endorsers, examining how subtle changes in visual and auditory elements can significantly impact consumer perception and engagement. Ethical considerations, including transparency and avoidance of manipulation, are also analyzed. The findings offer valuable insights into crafting engaging and effective advertising strategies, emphasizing the responsible application of JND principles. Recommendations for future research and practical applications are provided, contributing to the academic discourse and technological advancements in the rapidly evolving landscape of digital advertising.

Keywords: Just Noticeable Difference, AI Endorsers, Human Endorsers, Advertising Campaigns, Digital Marketing

INTRODUCTION

The digital transformation of the 21st century has ushered in an era where artificial intelligence (AI) plays a pivotal role in various industries, including marketing and advertising (Varshney, 2020). The emergence of AI endorsers, virtual entities capable of promoting products and engaging with consumers, has added a new dimension to the advertising landscape (Wibawa et al., 2022). Moreover, human endorsers are indispensable to marketing strategies, which capitalize on their authenticity and emotional appeal (Liu et al., 2023). This literature review delves into the Just Noticeable Difference (JND) in visual attention between artificial intelligence (AI) and human endorsers, a burgeoning field of inquiry with far-reaching ramifications for the efficacy of advertising campaigns. Visual attention, defined as the selective focus consumers place on specific elements within an advertisement, is a vital determinant in the triumph of marketing strategies (Santoso et al., 2020). The notion of JND, representing the minimal alteration in a stimulus perceptible to a viewer, furnishes invaluable perspectives on how understated modifications in advertising design can sway consumer perceptions and actions (Mohd Suki, 2017). While human endorsers have long served as a

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foundational aspect of advertising, with extensive studies probing their sway over consumer conduct (Pelau et al., 2022), digital media has ushered in fresh intricacies. The role of visual attention has been magnified, becoming a pivotal factor in contemporary advertising (Espigares-Jurado et al., 2020). Concurrently, AI endorsers have emerged as a groundbreaking development, amalgamating uniformity, scalability, and customization in unprecedented ways (Schweidel et al., 2023). These virtual figures, crafted through advanced algorithms, are forging a distinct path in digital marketing, equipping brands with innovative avenues for consumer engagement (Thomas & Fowler, 2021). Despite the growing fascination with AI endorsers in the advertising industry, there is still much to discover, especially in how they affect consumer behavior in visual attention and JND. Investigating these areas could lead to the development of innovative advertising techniques and open new avenues in understanding consumer psychology.

LITERATURE REVIEW

The advent of AI in marketing and advertising has given rise to a novel category of endorsers: virtual figures known as AI endorsers. These digital creations, capable of endorsing products and engaging with consumers, signify a transformative moment in advertising. Alongside human endorsers, AI endorsers present unique advantages and encounter specific challenges. This literature review delves into the Just Noticeable Difference (JND) in visual attention between human and AI endorsers. JND, the minimal alteration in a stimulus that a viewer can discern, offers essential insights into how minor changes in advertising design can sway consumer perception and actions. By juxtaposing human and AI endorsers through the JND perspective, this review seeks to illuminate a vital facet of advertising efficacy at a time when technological advancements and human connections are becoming more and more interwoven.

The Concept of JND in Advertising

The Just Noticeable Difference (JND), or "Difference Threshold," holds significant importance in psychology and sensory perception. This term describes the minimal change in a stimulus that a person can perceive, signifying the smallest level of alteration necessary for an individual to notice that a change has occurred, even if they cannot pinpoint or articulate what that change is. The Just Noticeable Difference (JND), a foundational concept in psychophysics, is intricately linked with Weber's Law. This law emphasizes that the relationship between the increment threshold and the background intensity is relatively constant, signifying that the magnitude of the original stimulus prescribes the additional stimulus required for a change to be discernible (Hexley et al., 2023). Within the advertising industry, the understanding of JND is pivotal. It unveils how subtle modifications in design attributes such as color, size, and shape can profoundly influence consumer perception and behavior (Lesko & Nguyen, 2023; Jin et al., 2022). By leveraging JND principles, advertisers can formulate more potent design strategies, capitalizing on the delicate balance between stimuli and human perception. This knowledge extends to the exploration of visual attention variances between AI and human endorsers in advertising campaigns, allowing practitioners

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to pinpoint the exact degree of alteration in a visual element—such as the color, size, or shape of a "Buy Now" button—that will engage the viewer's attention. Understanding the JND can help designers and marketers make effective changes that consumers will notice without being overwhelming or distracting. Measuring JND can be complex, as it can vary between individuals and may be influenced by factors such as fatigue, age, or experience with the stimulus. It may also vary depending on the sensory modality (e.g., sight, sound, touch) being tested.

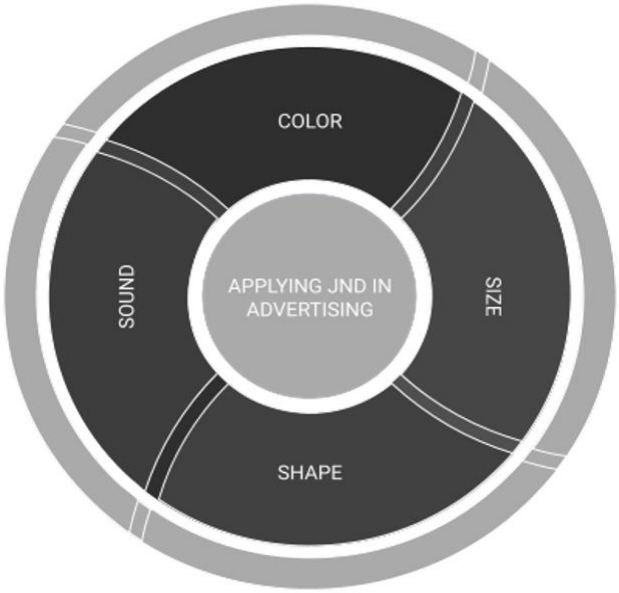

Fig 1: Application of JND in Advertising

As seen in Figure 1, the application of JND in advertising is multifaceted, encompassing various elements such as color, size, shape, and sound. In advertising design, discerning the minutiae that consumers perceive is paramount. Lin and Ghinea (2021) emphasize recognizing the threshold at which visual or auditory alterations become noticeable to consumers. For instance, color plays a pivotal role in shaping consumer perceptions. Rajkumar and Jain (2021) found that even a minor shift in a product's packaging shade can substantially influence its allure to potential buyers. The dimension of visual components, text or imagery, can be finetuned using JND principles to maximize impact. Sinno et al. (2019) highlighted that font size variations can markedly affect readability and user engagement. Products' geometry or packaging can be tailored based on JND insights to amplify visual appeal. Kim et al. (2023) illustrated that subtle shape modifications can precipitate notable shifts in consumer preferences. On the auditory front, Del Solar Dorrego & Vigeant (2022) defined sound as JND as the tiny change in an auditory stimulus discernible to a listener. These studies underscore the nuanced approach required in advertising to captivate and resonate with consumers effectively.

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Application of JND in Color

Applying JND in color represents a nuanced understanding of the smallest change in a color stimulus that an observer can detect (Shamoi et al., 2020). This concept has far-reaching implications across various domains, including product design, advertising, user interface design, data visualization, accessibility, and medical imaging. In product design, JND principles guide designers in selecting distinguishable color combinations, enhancing aesthetics and functionality (Salman, 2022). In advertising, marketers leverage JND to create visually appealing content that captures attention without overwhelming viewers (Lin et al., 2022). The principles of JND in color also inform user-friendly interface design, especially for individuals with color vision deficiencies (Richardson, 2019), and guide the choice of colors in data visualization (Shen, 2023). JND aids in developing accessible products for those with visual impairments (Huppert et al., 2021) and enhances the accuracy of diagnostic tools in medical imaging (Rao et al., 2023). The complexity of applying JND in color arises from individual differences in color perception, lighting conditions, and display technologies, all of which can influence the detection of color changes (Fan et al.m, 2021). Ethical considerations must also be addressed to ensure that color choices do not mislead or create biases (Levontin et al., 2020). The multifaceted application of JND in color offers a sophisticated approach to visual communication across diverse fields, with continued research promising to deepen understanding and practical applications

Application of JND in Size

Applying the JND in size represents a critical understanding of the smallest change in a size stimulus that an observer can detect (Lu et al., 2021). This concept has far-reaching implications across various fields, including design, marketing, ergonomics, human-computer interaction, and virtual reality. In product packaging, designers leverage JND to create visually appealing packages without being excessively large or small (Billi, 2020). In advertising, marketers apply JND principles to emphasize key elements such as logos or call-to-action buttons, enhancing visual impact (Jadeja, 2020). The principles of JND in size also inform user interface (UI) design, guiding the creation of easily clickable and readable elements (Heikkilä et al., 2023) and virtual reality, where JND ensures accurate perception of virtual objects (Stellmacher et al., 2022). JND aids in developing ergonomically designed products that fit comfortably in hand (Gao et al., 2021) and enhances accessibility for individuals with visual or motor impairments (Park & Chowdhury, 2022). Complex factors such as context, background, distance, and individual perception influence the application of JND in size (Buchmüller et al., 2021). The complexity of size perception necessitates thoroughly comprehending JND principles and their practical applications. From design and advertising to ergonomics and human-computer interaction, the concept of JND in size offers a nuanced approach to enhancing perception and usability in various fields; ongoing research and interdisciplinary collaboration promise to increase our understanding of JND in size and its practical applications.

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Application of JND in Shape

Applying the JND to shape necessitates a critical understanding of the smallest change in shape that an observer can detect, according to Van Baelen (2020). This concept has far-reaching implications in numerous disciplines, such as design, marketing, psychology, human-computer interaction, and therapeutic applications. JND principles guide the design of logos that are distinct yet consistent with brand identity (Hum et al., 2021). In product design, marketers use JND to create products that resonate with particular target audiences (Gielens et al., 2021). The principles of JND in shape also inform user interface (UI) design, guiding the creation of readily recognizable and distinguishable icons (Zubek et al., 2023), as well as gesture recognition systems, in which JND ensures accurate interpretation of hand shapes (Kocur et al., 2020). JND in shape is used in psychological research to investigate human perception and categorization of various shapes (de Tinguy et al., 2019) and in therapeutic applications for individuals with perceptual disorders (Bertonati, 2021). Smart and Szafir (2019) assert that applying JND to form is a complex procedure influenced by context, background, illumination, and individual perception. The multifaceted nature of shape perception requires a comprehensive understanding of JND principles and their real-world applications. From design and advertising to psychology and human-computer interaction, the concept of JND in shape offers a nuanced approach to enhancing perception and usability across diverse fields—continued research and interdisciplinary collaboration promise to deepen the understanding of JND in shape and its practical applications.

Application of JND in Sound

Applying the JND in sound refers to the smallest change in a sound parameter, such as pitch, loudness, or timbre, that a listener can detect (Zahorik, 2021). The principle of Just Noticeable Difference (JND) resonates deeply across diverse domains such as acoustics, music, psychology, technology, and healthcare. In music, composers utilize JND to weave complex compositions that captivate listeners, a practice highlighted by Nicholson and Sabat (2019). Sound engineers also draw on JND to refine audio quality in recordings and live performances (Ziemer, 2019). Within digital media, the principles of JND are harnessed to facilitate efficient audio compression, preserving quality without perceptible loss (Lin & Ghinea, 2021). The reach of JND extends even into the burgeoning field of virtual reality, guiding the development of rich auditory experiences (Werner, 2021), and into healthcare, where it shapes the tailoring of hearing aids to match individual auditory requirements (Bettarello, 2021). The multifaceted applications of JND underscore its significance and versatility in enhancing auditory perception and experience across various fields. JND in sound has been a valuable tool in auditory research, enriching our comprehension of how sound is perceived and processed cognitively (Werner et al., 2021). Applying JND to sound is a nuanced endeavor, influenced by many factors, such as the listener's hearing capabilities, ambient noise, and the context of the auditory experience (Werner et al., 2021). This intricate nature of sound perception necessitates a profound grasp of JND principles and a thoughtful approach to their practical implementation. Spanning fields such as music, acoustics, technology, and healthcare, JND in sound provides a refined method for augmenting auditory perception and experience;

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continued exploration and cross-disciplinary cooperation hold the potential further to deepen our understanding and utilization of JND in sound.

Human Endorsers and Visual Attention

The influence of human endorsers on consumer behavior has been studied extensively (Chopra et al., 2021). Silaban et al. (2022) state that applying the JND to human endorsers provides a nuanced comprehension of how subtle changes in the visual presentation can significantly impact consumer engagement. Attractiveness, credibility, and expertise are crucial factors that influence visual attention (Liu, 2022). The JND can be applied to various aspects of endorsement strategies, including physical appearance, where small changes in attire or facial expression can impact perception (Sun et al., 2021); visual elements, where adjustments in color, size, or shape related to the endorser can influence attention (Yuan et al.,2023); verbal communication, where the tone, pitch, or speed of speech can affect persuasiveness (Zoghaib, 2019); non-verbal cues, where subtle changes in body language or facial expressions influence trust (Gupta et al., 2023); and brand-endorser fit, where alignment between the endorser's image and brand values affects attitudes (Schimmelpfennig & Hunt, 2020). Employing the JND in advertising and marketing strategies, particularly with human endorsers, offers a powerful tool for understanding and influencing consumer perception and behavior. However, this approach must be handled with care and integrity. Multiplying visual or auditory elements to deceive or mislead consumers can cross ethical boundaries and raise serious concerns (van Velsen, 2022). While understanding JND allows advertisers and marketers to craft more effective and engaging endorsement strategies, these methods must adhere to ethical standards. The responsible application of JND principles ensures compliance with ethical norms and fosters consumer confidence and trust, reinforcing the credibility and authenticity of the advertising campaign.

AI Endorsers and Visual Attention

The advent of AI endorsers has marked a transformative shift in the advertising landscape, introducing a new dimension of consistency, scalability, and personalization that was previously unattainable (Jamshidi et al., 2023). These virtual figures, crafted through complex algorithms, are forging a unique space within digital marketing, enabling brands to engage with consumers innovatively (Haleem et al., 2022). Yet, the effects of AI endorsers on consumer behavior, especially in visual attention and the Just Noticeable Difference (JND), are still in the early stages of exploration. Delving into the JND with AI endorsers can reveal how nuanced alterations in appearance, such as changes in facial expressions or clothing, can profoundly influence consumer reactions (Sutherland, 2020). Similarly, subtle adjustments in visual elements like color, size, or shape can be strategically employed to capture consumer interest (Smart & Szafir, 2019), while careful modulation of voice characteristics such as pitch, tone, and speed can enhance the persuasiveness of a message (Brem & Niebuhr, 2021). Integrating these insights offers a promising avenue for developing more targeted and effective advertising strategies using AI endorsers. AI endorsers can also adapt messages based on JND principles to create personalized experiences (van Velsen et al., 2022) and respond to consumer interactions with subtle changes that enhance engagement (Niosi, 2021).

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However, applying JND with AI endorsers raises unique challenges and ethical considerations, such as ensuring transparency and avoiding manipulation that may deceive or mislead consumers. Integrating JND principles with AI endorsers offers a novel approach to crafting engaging and effective advertising strategies. This allows marketers to create content that resonates with audiences by understanding the subtleties that consumers can detect. As this field continues to evolve, ongoing research and ethical considerations will be vital to harnessing the full potential of AI endorsers in a responsible and impactful manner.

Psychologiphysical Testing

Psychophysical testing, a method that studies the relationship between physical stimuli and the sensations and perceptions they affect (Wang & Wan, 2020), has significant applications in understanding the JND in visual attention between AI and human endorsers in advertising campaigns. By defining specific objectives such as the color, size, or shape of a "Buy Now" button, researchers can apply various psychophysical methods, including the method of constant stimuli, method of limits, method of adjustment, and staircase method, to determine the smallest changes in visual elements detectable by consumers (Hexley et al., 2023). Creating stimuli that represent different levels of the visual element under study, selecting a representative sample of the target audience, and designing a carefully controlled experiment are essential steps in this process (Taylor J & Taylor G., 2021). Administering the test, analyzing the data using statistical methods, and interpreting the findings in the context of advertising campaign design can lead to effective changes that resonate with consumers without being overwhelming or distracting. Ethical considerations, including informed consent and risk assessment, must be integral to the testing process, and the findings should be documented and shared with relevant stakeholders or published in a relevant journal. The application of psychophysical testing to explore the nuanced differences in visual attention between AI and human endorsers presents a robust framework with significant potential for advertising and digital marketing. This approach uncovers critical insights that can be leveraged to enhance advertising campaigns by investigating the subtle distinctions in how consumers respond to AI and human endorsers. The understanding of these intricate differences not only contributes to the theoretical knowledge of consumer behavior and provides practical guidance for marketers seeking to optimize their strategies in an increasingly complex and technology-driven marketplace.

RESULTS AND DISCUSSION

Analyzing the results of psychophysical testing to investigate the JND in visual attention between AI and human endorsers in advertising campaigns necessitates a systematic approach. This process commences with the meticulous organization and preprocessing of data, including the elimination of inconsistencies and normalization if required. Subsequent interpretation employs statistical methods such as descriptive statistics, threshold analysis, ANOVA or t-tests, and regression analysis. Visualization techniques, such as plotting detection percentages against stimulus intensity, can elucidate the threshold or JND. Interpretation must align with the research question, considering the implications of the

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determined JND for designing advertisements featuring AI or human endorsers. Acknowledging limitations and contemplating the practical application of findings in advertising campaigns is vital. A detailed report or academic paper documenting the analysis ensures transparency and may be subject to peer review if intended for publication. This comprehensive methodology furnishes a solid framework for understanding the subtle differences in visual attention between AI and human endorsers, contributing valuable insights to advertising and digital marketing.

CONCLUSION

Investigating the JND between AI and human endorsers in advertising campaigns is a multifaceted and intricate field of study. According to a review of the relevant literature, human endorsers play a crucial role in advertising, utilizing authenticity and emotional appeal. Research demonstrates that subtle adjustments in visual presentation, such as appearance, message, or tone, can substantially impact consumer engagement. In contrast, AI endorsers, a recent innovation in advertising, offer a unique combination of consistency and personalization. Preliminary research suggests that AI endorsers can effectively engage consumers; however, the principles of JND and their application to AI endorsers require further investigation. The application of JND in this context has the potential to reveal how subtle variations in AI-generated content can influence the perception and behavior of consumers. The literature review highlighted the ethical considerations in implementing JND to human and artificial intelligence endorsers. Transparency and averting manipulation that may deceive or mislead consumers are paramount. JND in advertising is suitable for further investigation, particularly in the context of AI and human endorsers. Future research should concentrate on empirical studies to validate the identified theoretical constructs. For a deeper comprehension of JND and its practical applications in advertising, interdisciplinary collaboration and the incorporation of technological advances will be required. This literature review furthers our understanding of JND in advertising. It provides a foundation for future digital marketing research, policy development, and practical applications.

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