[Original Article]

Awareness, attitude, and behavior of global and Korean consumers towards vegan fashion consumption - A social big data analysis -

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Abstract

This study utilizes social big data to investigate the factors influencing the awareness, attitude, and behavior toward vegan fashion consumption among global and Korean consumers. Social media posts containing the keyword "vegan fashion" were gathered, and meaningful discourse patterns were identified using semantic network analysis and sentiment analysis. The study revealed that diverse factors guide the purchase of vegan fashion products within global consumer groups, while among Korean consumers, the predominant discourse involved the concepts of veganism and ethics, indicating a heightened awareness of vegan fashion. The research then delved into the factors underpinning awareness (comprehension of animal exploitation, environmental concerns, and alternative materials), attitudes (both positive and negative), and behaviors (exploration, rejection, advocacy, purchase decisions, recommendations, utilization, and disposal). Global consumers placed great significance on product-related information, whereas Korean consumers prioritized ethical integrity and reasonable pricing. In addition, environmental issues stemming from synthetic fibers emerged as a significant factor influencing the awareness, attitude, and behavior regarding vegan fashion consumption. Further, this study confirmed the potential presence of cultural disparities influencing overall awareness, attitude, and behavior concerning the acceptance of vegan fashion, and offers insights into vegan fashion marketing strategies tailored to specific cultures, aiming to provide vegan fashion companies and brands with a deeper understanding of their consumer base.

Keywords: vegan fashion, ethical consumption, social big data, semantic network analysis, sentiment analysis

I. Introduction

In the past, the main ethical issues discussed in the fashion industry were environmental issues. Nowadays, the scope has expanded to include questions about fair trade, animal testing, and the use of animal skins and furs (Reimers, Magnuson, & Chao, 2016). In particular, the slaughter of animals for fur and leather products

in fashion has always been raised as an ethical problem in the fashion industry (Styles, 2014). Some conscious consumers began to turn away from animal-based fashion materials due to the increased awareness of animals as companions and the spread of animal protection campaigns, animal welfare policies, and ethical consumption culture (Kim & Park, 2018).

Vegan fashion incorporates synthetic or environmentally conscious materials while refraining from using animal-derived materials such as leather, fur, silk, and wool (Gottfried, 2017). The ethical motives for vegan fashion consumption are the fundamental values of veganism, which are against animal cruelty and advocating for animal rights (Choi & Lee, 2019). Studies on vegan fashion have been more passive than those on sustainable and eco-friendly consumption, which are other areas of ethical fashion. Some studies were conducted on vegan fashion consumption using ground theory (S. Y. Choi, 2019; Y. J. Choi, 2019) and big data analysis (Choi, 2021; Choi & Lee, 2019).

This study used big data to conceptualize the discourse on vegan fashion consumption and increase the applicability of the research results. Social big data identifies the emotions of the times and is used to understand people's reactions to governments, public institutions, and companies (Li & Xu, 2020). Social big data is more practical than the traditional survey method for understanding consumer needs by identifying their diverse and honest opinions. Multiple algorithms and AI language models were utilized to enhance the reliability and validity of qualitative interpretation. Park (2020) conceived a conceptual structure for sustainable fashion consumption based on eco-friendly consumption (Brounen, Kok, & Quigley, 2013; DeWaters & Powers, 2011; Roth, 1992). In the structure, the four types of sustainable consumption are consumer restraint, abstinence from consumption, purchase of eco-friendly/ethical products, and recycling at the disposal stage. This study's conceptual structure of sustainable consumption was appropriately modi-

fied, supplemented, and applied to vegan fashion consumption.

This study aims to analyze and compare sub-factors of vegan fashion awareness, attitudes, and behaviors among global and Korean consumers (particularly Korean consumers). First, through social network analysis, we analyzed and compared the macroscopic awareness of vegan fashion between global and Korean consumers. Second, we analyzed the sub-factors of vegan fashion awareness, attitude, and behavior using a YouTube comment and sentiment analysis using Bidirectional Encoder Representations from Transformers (BERT). By confirming the ethical applicability of vegan fashion consumption through this mixed method, we intend to contribute to improving animal rights in modern fashion.

Ⅱ. Theoretical Background

1. Vegan fashion

Vegan fashion is produced in a way that neither uses animal materials (i.e., leather, fur, silk, wool) (Gottfried, 2017) nor harms animals (Jeong & Kwon, 2018). Vegan fashion is an ethical fashion that considers animals as valuable beings due to their coexistence with humans and protects and respects the rights of animals instead of fostering animal cruelty (Kim & Park, 2018). In addition, vegan fashion is a responsible industry that protects the Earth, the ecosystem, and humans from various harmful substances generated in the production, manufacturing, and processing of clothing (Bae, 2020). The consumption of vegan fashion applies a vegetarian concept to fashion consumption, which is rising due to increased environmental and animal protection awareness (Choi & Lee, 2019).

Studies on vegan fashion have regarded vegan fashion as a concept similar to eco-friendly and ethical fashion (Bae, 2020; Reimers et al., 2016). In studies by Kim and Park (2018) and Wi and Kim (2019), vegan fashion is a movement toward animal protec-

tion in fashion due to the spread of ethical consumption culture. In addition, after comparing past and present social perceptions of vegan fashion, Choi and Lee (2019) found that animal and environmental ethics were factors in the consumers' perception of vegan fashion. These results suggest that although vegan fashion started from animal ethics, it has become an ethical concept that also considers environmental responsibility.

2. Prior research on vegan fashion consumption behavior

While it has been proven through various studies that vegan fashion falls within the category of ethical fashion (Reimers et al., 2016), the exploration of vegan fashion as an independent concept has only recently begun. Since the 2010s, Korean scholars have focused on "vegan fashion" as an independent concept (Bae, 2020; Choi, 2021; Yoh, 2018). This concept, at times, is referred to as "faux fur consumption" or "ethical consumption" rather than explicitly as "vegan fashion consumption" (Kim & Kwon, 2016; Shin & Jin, 2021).

In the initial phase of conceptualizing vegan fashion, researchers conducted grounded theory-based studies to explore consumer behavior (S. Y. Choi, 2019; Y. J. Choi, 2019). This focus becomes especially relevant considering the recent emergence of the vegan fashion concept, particularly in Asia. As the concept of vegan fashion spreads, recent studies conducted in the field of vegan fashion reveal three main areas of focus: consumer behavior in vegan fashion (Kim & Kwon, 2016; Yoh, 2018), ethical dilemmas arising within vegan fashion (Choi & Han, 2022; Jeong & Kwon, 2018), and reviews on vegan fashion collections (Lee & Lee, 2022).

In the theoretical framework of vegan fashion studies, insights from S. Y. Choi (2019)'s research contribute to a comprehensive understanding of the purchase decision-making process. S. Y. Choi (2019) classified the elements affecting the decision-making process when buying vegan fashion items into speci-

fic phases: recognizing the need, conducting information searches, evaluating alternatives, making a purchase, assessing the post-purchase experience, taking post-purchase actions, and disposition. Y. J. Choi (2019)'s study explores the purchasing processes of vegan fashion consumers and introduces contextual factors. Motivations driven by vegan trends and animal protection awareness emerge, and the factors influencing vegan fashion consumption encompass minority groups' consciousness, ethical consumption consciousness, and active engagement with fashion trends.

Several studies that investigated the relationship between psychological variables in earnest are as follows. Yoh (2018) proved that attitudes toward vegan fashion products, subjective norms, ethical responsibility, and ethical self-identity determine the purchase intention of vegan fashion products. Choi (2020) analyzed moderating variables that affect the discrepancy between consumers' attitudes and behaviors toward artificial fur; only consumers with ethical beliefs such as animal protection strengthened their intention to purchase artificial fur. In Kim (2023)'s study, the investigation of differences before and after the presentation of vegan certification marks among fashion product consumers revealed disparities in perceived benefits, risks, product trust levels, and behavioral intentions. The study emphasized the significance of attaching vegan certification marks and underscored the afterglow effect of vegan certification on eco-friendly fashion products.

As another exploratory attempt, studies were conducted to identify consumers' psychological drivers for vegan fashion consumption through big data analysis. As the inaugural study on this subject, Choi and Lee (2019)'s research investigated the perceptual shifts among Korean consumers toward vegan fashion using textual data from social media. They confirmed that consumers' awareness of vegan fashion is gradually transitioning from a derivative concept associated with food to becoming an integral part of fashion culture. Since then, some studies on vegan fashion

have been conducted using consumer-based social media data (Jung & Bae, 2022; Kang, Jang, & Jang, 2023).

Recent big data analysis studies on vegan fashion have commonly explored societal perceptions of vegan fashion based on text data generated by online users (Jeong & Yun, 2023; Jung & Bae, 2022, 2023). However, the utilized analysis techniques are relatively uniform, with most studies primarily relying on text mining or network cluster analysis, such as CONCOR, to derive factors. Thus, while there may be differences in qualitative interpretation, the overall research framework remains similar. Given that big data analysis is inherently exploratory, there is a need for more diverse and advanced techniques to obtain more nuanced and comprehensive research outcomes compared to previous approaches. Therefore, this study presented diverse methodologies and outcomes using various semantic network clustering techniques and sentiment analysis based on a deep learning model.

Ⅲ. Methodology

1. Target analysis

Prior studies needed to be more robust due to their focus on a limited pool of vegan fashion buyers, constraining the in-depth analysis of authentic consumer consumption behaviors. These studies overlooked the inclusion of numerous consumers potentially interested in vegan fashion, which could have enriched the analysis. Thus, this study opted to leverage social big data to meticulously select and analyze a more extensive spectrum of consumers as research subjects. This approach addressed these gaps by encompassing a broader range of consumer perspectives. For cultural comparison, the study targeted both global and Korean consumers. Data sourced in English represented the global consumer segment, while data in Korean represented Korean consumers, ensuring a comprehensive examination across diverse cultural contexts.

2. Research questions and methodologies

The research employed multiple algorithms such as Wakita-Tsurumi, Clauset-Newman-Moore, and CONCOR, commonly used in social sciences, to categorize core themes in global and Korean consumer behaviors. These algorithms were applied to extract discourse topics. Centrality analysis was conducted on vegan fashion consumption discourse to gauge keyword importance, employing social network analysis (SNA) techniques using graph theory and statistical probability. Centrality measures quantitatively demonstrated entities' structural significance within the network, drawing from the work of Freeman (1978).

Additionally, a microscopic approach derived awareness, attitude, and behavior sub-factors from studies on sustainable consumption scales and in-depth interviews regarding vegan fashion consumption by S. Y. Choi (2019), and Y. J. Choi (2019), Park (2020). Sentiment analysis was executed via BERT, a leading language model in natural language processing (Lee & Hsiang, 2020), to classify consumer attitudes. Lastly, the final analysis underwent review by five doctoral researchers specializing in clothing and textiles. The multilingual capability of Google's BERT model was utilized for incorporating Korean language elements through training across 104 languages.

3. Collection period and channel

The research conducted data collection during December 2013, a period marked by higher search volumes for "artificial fur" compared to natural fur in Google trends analysis. This timeframe was bifurcated, considering the period before December 1, 2013, as the past and after as the present. Notably, the first article explicitly mentioning "vegan fashion" on the South Korean news platform Naver was published on December 1, 2013, supporting the validity of the collection period (Choi, 2013).

To comprehensively explore consumer perception and behavior, web documents featuring "vegan fashion" were collected, encompassing global data from

Google and Twitter, and Korean data from Naver, Daum, and Twitter. Subsequently, for a detailed analysis of consumer awareness, attitude, and behavior, along with sentiment classification, YouTube videos and comments with the "vegan fashion" keyword were gathered. YouTube was chosen for its succinct and direct comments, enhancing the accuracy of sentiment analysis outcomes. The specifics of data collection are presented in ⟨Table 1⟩.

4. Analysis procedure

The analysis procedure involved Python 3.7 modules, NLTK for English and KoNLPy for Korean text processing. The initial steps encompassed removing stopwords, suffixes, and advertisement content from the collected text data, followed by merging synonymous terms. Notably, in the primary Korean data collection, "Secretary of State," "Steven Vegan," and "Food" were identified as irrelevant for analysis, prompting their exclusion. Further refinement during secondary data collection aimed to eliminate noise by excluding corresponding words.

For enhanced visibility in network analysis, a matrix was constructed using the top 100 keywords based on co-occurrence. Evaluation of the network size for two groups demonstrated comparable density (AA: 0.576, AS: 0.515) and average geodesic distance (AA: 1.403, AS: 1.466), affirming their suitability for content analysis. NodeXL 1.0.1 measured centralities (degree, betweenness, closeness, eigenvector), enabling visualization of node size based on degree centrality and edge thickness based on edge weight.

The accuracy of the sentiment analysis model was validated using sample data, indicating reliability scores ranging from 0.68 (average for Korean) to 0.99 (average for English). This pre-analysis verification ensured the model's reliability. ⟨Fig. 1⟩ provides an illustrative example of analysis conducted using the sentiment analysis model.

Ⅳ. Results

1. Awareness and behavior regarding vegan fashion consumption

This study structured the macroscopic and microscopic search processes into distinct phases. Initially, a clustering analysis organized primary themes associated with consumer awareness and behaviors in vegan fashion consumption from a macroscopic standpoint.

1) Clustering analysis

(1) Main topics of global consumers

Through clustering keywords using the Wakita-

⟨Table 1⟩ Information on data collection

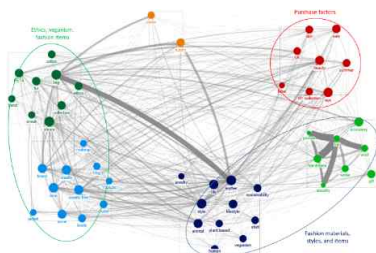| Sort		Context	
Channel		- Global: Google (blog, web), Twitter (tweets), YouTube - Korea: Naver (blog, café), Daum (blog, café), YouTube	
Period		2013. 12. 1−2020. 7. 31	
Program		Python 3.7 (NLTK, KoNLPy, BERT), NodeXL 1.0.1, Ucinet 6.0 (NetDraw)	
Keyword		vegan fashion (English and Korean)	
Data volume	Network analysis	ENG.	4,758 − Google (1,844), Twitter (2,914)
		KOR.	5,655 − Naver (2,023), Daum (2,221), Twitter (1,411)
	Sentiment analysis	ENG.	YouTube comments (6,003)
		KOR.	YouTube comments (7,275)

<Fig. 1> Part of sentiment analysis

Tsurumi (WT) algorithm, three semantic factors emerged: group 1 (ethical and vegan fashion products), group 2 (purchase-related factors), and group 3 (vegan fashion materials and style) (Fig. 2). Meanwhile, employing the Clauset−Newman−Moore (CNM) algorithm revealed more apparent factors than the WT algorithm, delineating group 1 (pre-purchase information search), group 2 (significance of vegan fashion and ethical considerations), and group 3 (vegan fashion style, materials, and items) (Fig. 3).

CONCOR analysis yielded four factors: group 1 (conceptual aspects of veganism), group 2 (vegan trends and lifestyle), group 3 (vegan fashion style), and group 4 (vegan fashion products) (Fig. 4). Notably,

ethical dimensions of veganism and the prominence of vegan fashion styles and items mirrored outcomes from clustering using the WT and CNM algorithms. However, the CONCOR analysis additionally unearthed factors linked to consumer lifestyles (e.g., YouTube, life, lifestyle, trends).

The clustering analysis unveiled the elements influencing global consumers' attitudes and actions in vegan fashion consumption. These elements encompass ethical concerns (such as animal welfare, environmental impact, and labor practices), external features of vegan fashion products (including materials, styles, and items), internal aspects of vegan fashion (covering diverse purchasing factors), information sources

<Fig. 2> WT algorithm

<Fig. 3> CNM algorithm

<Fig. 4> CONCOR

and shopping avenues, alongside aspects linked to consumer lifestyles.

(2) Main topics of Korean consumers

The clustering analysis, using the WT algorithm, revealed four semantic factors: group 1 (concept of vegan fashion), group 2 (purchasing behavior and vegan fashion products), group 3 (ethical considerations), and group 4 (domestic vegan fashion brands) (Fig. 5). Meanwhile, employing the CNM algorithm categorized Korean consumers' discourse into group 1 (meaning and ethical aspects of vegan fashion) and group 2 (vegan fashion brands and products) (Fig. 6). This outcome suggests an association between the meaning and practice of vegan fashion in purchase behavior. In the CONCOR analysis, three factors emerged: group 1 (purchasing), group 2 (ethical considerations), and group 3 (vegan fashion brands and products) (Fig. 7). Broadly, these topics align with the synthesis of clustering results from the WT and CNM algorithms.

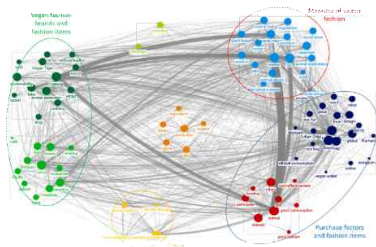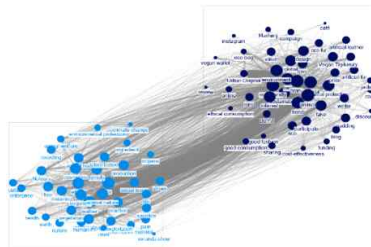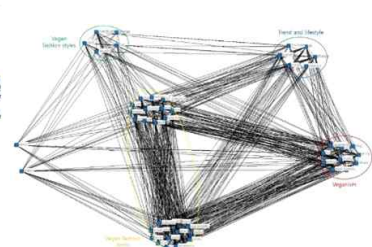Regarding Korean consumers' awareness and behavior in vegan fashion consumption, clustering analysis identified components such as the meaning of veganism, ethical factors (environmental and labor-related), internal attributes of vegan fashion products (purchasing determinants), purchasing behavior, and involvement with Korean or global vegan fashion brands. Notably, for Korean consumers engaging in vegan fashion purchases, the ethical significance of veganism emerged as a significant motivational factor.

2) Centrality analysis

Centrality analysis assessed keyword significance, seeking the most discussed topics in the discourse on vegan fashion consumption. However, the differences in closeness and eigenvector centrality values among keywords were minimal. Thus, all centrality metrics were included in the results, emphasizing degree and betweenness centrality for interpretation.

From the top 100 keywords extracted from both Global and Korean consumer discussions, around 30% overlapped. These 28 keywords predominantly covered aspects related to vegan fashion products (like bags, shoes, boots, jackets, coats, and beauty items), pre-purchase information search (involving brand, enterprise, online, store, sale, trend, and design), and environmental responsibility (touching upon animal welfare, human impact, love, sustainability, ethics, nature, and environment). Despite differing cultural priorities, numerous consumer perceptions and behaviors in vegan fashion consumption were commonly shared between these two cultures.

(1) The main keywords of global consumers

Upon scrutinizing the primary keywords in customers' engagement with vegan fashion consumption, the following factors emerged: vegan fashion items (20%), ethical considerations (16%), vegan fashion materials and styles (16%), information sources and shopping channels (12%), purchasing determinants (9%), and other purchasing motives (6%) (Table 2 and 3). Furthermore, alongside the original tenets of veganism—focusing on cruelty-free practices, animal

<Fig. 5> WT algorithm   <Fig. 6> Applied CNM algorithm   <Fig. 7> CONCOR

<Table 2> Top 20 words on vegan fashion for global consumers by word frequency

No.	Word	Frequency	TF-IDF	C_d [a]	C_b [b]	C_c [c]	C_e [d]
1	Bag	446	1,121.46	0.78	166.10	0.009	0.021
2	Love	432	1,125.62	0.71	190.88	0.008	0.019
3	Leather	390	964.59	0.77	143.49	0.009	0.021
4	Style	362	891.19	0.84	191.94	0.009	0.022
5	Brand	337	883.68	0.66	82.15	0.008	0.018
6	Shoes	291	828.24	0.70	90.69	0.008	0.020
7	Hat	230	918.14	0.25	11.95	0.006	0.007
8	Animal	220	675.48	0.60	79.39	0.008	0.017
9	Beauty	220	654.62	0.66	86.69	0.008	0.018
10	Store	201	631.31	0.67	89.79	0.008	0.019
11	Eco	189	589.42	0.68	100.28	0.008	0.019
12	Cruelty	178	570.43	0.69	116.79	0.008	0.019
13	Life	178	564.14	0.60	70.46	0.008	0.018
14	Cruelty-free	175	559.77	0.66	100.41	0.008	0.018
15	Handmade	136	483.07	0.51	70.18	0.007	0.014
16	PETA	135	492.72	0.45	23.22	0.007	0.014
17	Fur	124	449.15	0.51	46.51	0.007	0.015
18	Intimacy	122	429.27	0.01	0.00	0.005	0.000
19	Sustainability	109	408.52	0.51	52.12	0.007	0.015
20	Sale	97	374.10	0.51	42.85	0.007	0.015

a: degree centrality, b: betweenness centrality, c: closeness centrality, d: eigenvector centrality

rights, and plant-based ideals—ethical keywords like eco, sustainability, green, slow, and fair trade were notably discussed within the realm of vegan fashion.

In the realm of global consumer awareness concerning vegan fashion consumption, a significant number of keywords were associated with vegan fashion items. Notably, plant-based materials such as cotton, hemp, and denim, alongside artificial materials like faux fur, were highlighted as representative elements of vegan fashion. Moreover, specific styles such as streetwear, slouchy, and grunge were discussed as emblematic of vegan fashion. Among various vegan fashion items, bags, shoes, and accessories garnered the most attention. Similar to previous studies (Choi & Lee, 2019), discussions on vegan beauty products were intertwined with discourse on vegan fashion items.

For global consumers, brand emerged as a pivotal factor influencing the purchase of vegan fashion, indicating the crucial role of brand value. Subsequently, factors such as price, luxury, size, color, label, trend, quality, and design displayed significant connection centrality, affirming their importance in discussions. Information was sourced from channels like shopping avenues, stores, collections, blogs, YouTube, and Instagram.

<Table 3> Global consumers' awareness and behavior of vegan fashion by degree centrality

Sort		Keywords (C_d)
Awareness	Ethics	Cruelty(.69), eco(.68), cruelty-free(.66), animal(.60), sustainability(.51), ethics(.49), PETA(.45), veganism(.39), plant-based(.34), environment(.32), bio(.29), nature(.28), fair trade(.23), slow(.20), green(.18), animal rights(.16)
Behavior	Purchase factors	Brand(.66), sale(.51), luxury(.46), size(.33), color(.33), label(.25), trend(.31), quality(.30), design(.20)
	Information sources and shopping channel	Store(.67), collection(.46), New York collection(.45), blog(.40), model(.39), blogger(.32), London Fashion Week(.29), online(.29), fashion week(.27), YouTube(.24), Instagood(.22), eBay(.18)
	Purchase motivation	Love(.71), handmade(.66), life(.60), lifestyle(.48), baby(.29), friend(.27)
Vegan fashion styles and materials		Style(.84), leather(.77), fur(.51), skin(.46), cotton(.46), material(.44), streetwear(.32), wool(.29), hair(.28), suede(.25), hemp(.24), faux fur(.14), slouchy(.12), denim(.12), grunge(.10)
Fashion products		Accessories: bag(.78), shoes(.70), accessory(.60), boots(.40), purse/wallet(.33), sneakers(.32), jewelry(.26), hat(.25), backpack(.23), necklace(.20), scarf(.18) Clothes: shirts(.46), jacket(.39), coat(.32), T-shirts(.20), skirt(.19) Others: beauty products(.66), make up(.35), skincare(.29), cosmetic(.23)

Keywords like love, lifestyle, handmade, baby, and friend were identified as motivating factors for purchase. Love correlated strongly with pivotal keywords like animal, human, and environment. Based on betweenness centrality analysis, love (190.88) stood as the second most influential keyword after style (191.94). This implies that the love for the ecosystem plays a substantial mediating role in shaping essential discussions surrounding vegan fashion consumption.

(2) The main keywords of Korean consumers

Following an analysis of primary keywords associated with Korean consumers' engagement in vegan fashion consumption, several vital factors emerged: the concept of vegan fashion and materials (19%), environmental and social ethics (15%), vegan fashion items (8%), purchasing determinants (7%), and consumer behavior (6%) (Table 4 and 5). Predominantly, discussions revolved around vegan fashion (including topics like animal protection, abuse, exploitation, and welfare) and materials used (such as leather, fur, fake fur, artificial fur, and plant-based materials).

Like global consumers, Korean consumers showcased awareness regarding various aspects of vegan fashion consumption, encompassing eco-friendly practices, sustainability, environmental protection, climate change, and social ethics (about societal concerns and conscientious consumption). Keywords with notable betweenness centrality were primarily associated with environmental and ethical fashion, such as eco-friendly (124.95), environment (79.52), sustainable (73.11), ethical (65.68), and animal protection (53.62). This finding suggests expanding the original notion of vegan fashion to encompass broader ethical fashion concerns.

Factors influencing Korean consumers' engagement in vegan fashion consumption included interest, love, participation, practice, sharing, and funding. Active consumer behaviors encompassed online participation (crowdfunding) and information sharing. Funding sustainable design products often stems from emotional connections and attachment between brands and con-

<Table 4> Top 20 words on vegan fashion for Korean consumers

No.	Word	Frequency	TF-IDF	$C_d{}^a$	$C_b{}^b$	$C_c{}^c$	$C_e{}^d$
1	Animal	821	1,851.67	0.95	153.71	0.010	0.018
2	Brand	726	1,695.27	0.94	150.84	0.010	0.018
3	Leather	572	1,512.35	0.88	120.31	0.009	0.017
4	Fur	552	1,514.05	0.86	104.60	0.009	0.017
5	Bag	517	1,450.07	0.81	101.86	0.008	0.016
6	Material	447	1,282.07	0.89	113.03	0.009	0.017
7	Eco-friendly	354	1,059.70	0.89	124.95	0.009	0.017
8	Cosmetics	339	1,035.54	0.71	69.21	0.008	0.014
9	Trend	330	1,016.48	0.82	94.57	0.009	0.016
10	Beauty	280	914.06	0.62	49.50	0.007	0.013
11	Animal nature	214	749.08	0.73	55.04	0.008	0.015
12	Veganism	211	751.44	0.70	57.15	0.008	0.014
13	Environment	209	731.58	0.79	79.52	0.008	0.016
14	Sustainability	203	720.83	0.73	73.11	0.008	0.015
15	Vegetarian	188	690.32	0.58	18.56	0.007	0.013
16	Interest	174	652.67	0.77	72.71	0.008	0.015
17	Global	166	619.54	0.66	44.84	0.008	0.014
18	Animal abuse	166	620.58	0.64	41.96	0.007	0.013
19	Ethics	153	579.83	0.77	65.68	0.008	0.016
20	Animal test	143	556.79	0.54	22.17	0.007	0.012

a: degree centrality, b: betweenness centrality, c: closeness centrality, d: eigenvector centrality

sumers (Chon, 2017). In discussions on Korean consumers' behavior related to vegan fashion consumption, the association between "funding," "love," and "participation" aligns with prior study findings.

Brand, material, trend, design, price, discount, and cost-effectiveness were crucial purchasing factors for Korean consumers. Unlike global consumers, where the brand stood out as the most critical factor, Korean consumers prioritized economic benefits. Degree centrality analysis highlighted discussions predominantly focused on vegan bags, eco-bags, vegan shoes, and vegan beauty products as critical components of vegan fashion items.

2. Sub-factors of vegan fashion consumers' awareness, attitudes, and behaviors

In this study, the framework established by Park (2020) for the components of sustainable consumption, also applicable in ethical fashion consumption classification, structured the results. Comments sharing similar keywords or content were categorized, assigning them respective classification codes. Consequently, approximately 41 comments from Global consumers and about 33 comments from Korean consumers were identified. To avoid subjective biases that could lead to measurement errors in assessing positive/negative attitudes within comments, a machine-learning

<Table 5> Korean consumers' awareness and behavior of vegan fashion by degree centrality

Sort		Keywords (C_d)
Awareness	Vegan fashion conception and materials	Animal(.95), leather(.88), fur(.86), animal nature(.73), animal protection(.72), fake(.71), veganism(.70), animal abuse(.64), vegetarian(.58), animal test(.54), animal exploitation(.52), plant based(.49), pain(.49), padding(.49), artificial fur(.44), artificial leather(.39), goose fur(.38), animal welfare(.36), sacrifice(.18)
	Environmental and social ethics	Eco-friendly(.89), environment(.79), ethics(.77), sustainable(.73), free(.53), social issue(.51), value(.45), nature(.40), earth(.39), environment protection(.31), good consumption(.28), organic(.28), ethical consumption(.22), good fashion(.21), climate change(.18)
Behavior	Activation	Interest(.77), love(.54), participate(.54), practice(.56), sharing(.38), funding(.28)
	Purchase factors	Brand(.94), material(.89), trend(.82), design(.64), price(.47), discount(.22), cost-effectiveness(.21)
Vegan fashion products		Vegan bag(.81), vegan cosmetics(.71), vegan beauty product(.62), eco bag(.27), shoes(.43), vegan coat(.36), vegan padding(.24), vegan wallet(.20)

classification technique was utilized. The accuracy of sentiment analysis results using BERT ranged between 0.77 and 0.96 in both groups (Table 6).

Upon scrutiny of YouTube comments, it was found that 61.06% of comments from Global consumers conveyed a positive sentiment, while 38.93% expressed negativity. Conversely, among Korean consumers, 70.29% conveyed a positive sentiment, and 29.70% conveyed negativity (Fig. 8 and 9). Notably, in both groups, positive attitudes toward vegan fashion outweighed negative sentiments.

1) Awareness

(1) Knowledge of the effects of exploitation on animals and alternative materials
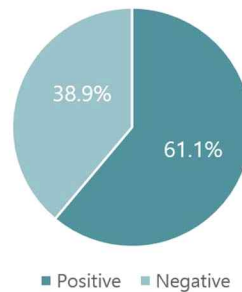
Both global and Korean consumers sought and disseminated information regarding animal exploitation

<Table 6> The average accuracy of the BERT model

	Korean	English
Accuracy	0.77	0.96

*Accuracy=sum of accuracy/volume of data

in the production of animal-derived materials and the advantages of alternative materials for the ecosystem. Both consumer segments actively sought knowledge about alternative materials employed in vegan fashion as ethical substitutes for traditionally produced animal-derived materials. Furthermore, they engaged in information dissemination and demonstrated awareness regarding vegan fashion brands and products. Compassion towards animals and indignation over animal cruelty spurred heightened interest in seeking out alternative materials. Additionally, Korean consumers expressed dissatisfaction with the scarcity of

<Fig. 8> Sentiments of global consumers

<Fig. 9> Sentiments of Korean consumers

information on alternative materials, emphasizing their search for eco-friendly vegan materials in the context of industrial alternatives and environmental concerns.

"I honestly have never owned/worn anything made from silk, but it's great to see that there are alternatives that are vegan and sustainable!!"

"Now that I know about vegan fashion and animal rights, I feel disgusted with the fur clothes I wore without thinking. I liked the feeling of richness and luxury in the past, but now it hurts so much to think about how many animals must have been sacrificed and suffered just to wear those clothes."

"I am vegan and avoid animal skin products as much as possible. However, there is a lack of information on how to replace them."

(2) Knowledge of environmental and social impacts

Global and Korean consumers wanted to understand the implications of producing and disposing of vegan fashion products on the environment and the ecosystem. Specifically, Korean consumers exhibited awareness of multifaceted issues, encompassing social influences like labor rights. Echoing findings from earlier studies (Choi & Lee, 2019; S. Y. Choi, 2019), Korean consumers highlighted the importance of considering animal protection, environmental impact, resource wastage, and labor rights within the domain of vegan fashion, aligning it with the principles of ethical fashion.

"While new vegan footwear is a welcome relief from wearing cotton shoes, I would like to know the environmental impact of the production and disposal of them."

"I would like to avoid materials made from plastic while also avoiding materials made from animals. It

is difficult to recycle these clothes while throwing them away, and the soil can be polluted if done incorrectly. In addition, I think the composition of the material is also important. For example, choosing organic fiber over regular ones would be nice."

"I think it's good not to use animal products. But, fashion companies must reduce the number of clothes and raise their meager prices to pay the correct labor cost. 20,000 won for a t-shirt isn't normal."

2) Attitude

(1) Positive attitudes

For global consumers, positive attitudes toward products were shaped by quality, economic advantages (discounts and promotions), ethical considerations, and functionality (convenience, practicality, warmth, and aesthetics). Some consumers offered positive feedback about vegan fashion brands and content, sharing purchasing recommendations.

Conversely, numerous positive comments among Korean consumers highlighted the moral dimension of vegan fashion. Videos introducing vegan fashion brands or products highlighted the concept of "fashion consumption with a good purpose." This observation highlights that, for Korean consumers, the ethical dimension of vegan fashion significantly influences their perceptions and attitudes toward it.

"I bought my first pair of shoes from K** (thanks to you haha) and I received them yesterday, I was so excited! The quality is incredible and they are just so comfy! Totally worth it."

"Vau***** is amazing − it's expensive, but there are sales often, which is when I buy their stuff (they always have a pre-orders at 50% for one day and 30−40% for a couple weeks − at 50% off, I think it is a really good price for vegan, eco (they use lots of recycled materials) and ethical clothing."

*"G****, Mic****, H**, and G** are good companies, saying they will never produce fur in the future. But, I wish more fashion-leading brands would participate."*

*"I love what St***a has brought to the fashion industry. She is among the leaders in sustainable fashion, putting things in place to show the world how you can still be a luxury brand and incorporate sustainable practices saving the planet and its inhabitants in the process."*

(2) Negative attitudes

Both global and Korean consumers exhibited an ethical conflict concerning the materials used in vegan fashion, contributing to a negative attitude. The crux of this issue lies in the environmental impact of artificial materials despite avoiding animal-derived components in a vegan fashion. Furthermore, dissatisfaction with price and quality emerged as common grievances for both consumer groups. Consumers voiced concerns that vegan fashion products, crafted from artificial materials, often come with a higher price tag than genuine leather or fur alternatives. Dissatisfaction also stemmed from the perceived inferior performance of vegan leather products compared to genuine leather.

Among Korean consumers, there were numerous instances of extreme criticism and mockery regarding vegan fashion consumption. Examples of such comments include statements like: "Vegan fashion consumers should adhere to vegetarianism," "Supporters of vegan fashion criticize meat eaters," "They lack empathy for plants," and "They are hypocritical." These comments reflect heightened criticism and ridicule towards the ethical stances and behaviors associated with vegan fashion consumption within the Korean consumer segment.

"That's really expensive⋯sure it'll last a long time, but fashion taste and trends change a lot

quicker."

"If you are trying to save nature, why are you wearing clothes made of chemical fibers?"

"Faux fur is, in other words, fake. If you don't have money, don't buy a coat."

"Plants do not feel pain! Depending on the music you listen to, the shape of the plants growing will change. Plants are living creatures, and of course, they feel pain."

3) Behavior

(1) Explore before purchase

For global consumers, various factors influence pre-purchase considerations for vegan fashion products, including size, quality, brand, purchase location, ethics, and texture. Discussions actively revolved around inquiries regarding the purchase location, brand, and size directly linked to the product purchase. Moreover, YouTubers sharing information about vegan fashion products and confirming whether the desired style aligns with veganism contributed to information exchange.

Conversely, among Korean consumers, the number of vegan materials they intended to buy in clothing, shoes, and bedding emerged as a critical search criterion. They actively sought and exchanged information about materials, including certifications for vegan or cruelty-free standards, such as the Responsible Down Standard (RDS).

"Can you elaborate on the fit of them all a little bit? Can you also say what size you are and if you have a regular, wide or narrow foot?"

"Does anyone know of other ethical Youtubers (or brands) who do fashion videos for more professional clothing?"

"I will definitely check the RDS certification mark before buying. I'm sorry, goose."

"I was only thinking about vegetarianism and only fur, but it was wider, and there were more killings. So I need to check the material of the clothes, shoes, and textiles."

(2) Refrain from buying

Global and Korean consumers were inclined to avoid buying fashion items crafted from animal-derived materials like fur and silk. They demonstrated an inclination toward searching for artificial alternatives to animal-based materials. The prevalent rationale behind avoiding such purchases was ethical concerns regarding the inhumane treatment of animals. Additionally, dietary and health considerations also emerged. Interestingly, some Korean consumers abstained from purchasing animal-based fashion products due to vegetarianism, extending their lifestyle choices to fashion consumption. While specific non-vegetarian consumers consume meat, they display a willingness to embrace veganism in their fashion choices.

"We need to ban all leather; the live export industry of castle will be impacted."

"I am allergic to wool and feathers. I have been on a hunt for nice non-leather bags!"

"I am vegan, so I try to avoid using genuine leather products as much as possible in fashion."

"I don't think I'm going to be vegan, so I'm going to cut down on meat consumption and use fewer leather products instead."

(3) Consumption lead

Both global and Korean consumers advocated for greater involvement in vegan fashion consumption, emphasizing a shift in their perception of fashion consumption or expressing support for the vegan fashion industry. In contrast, Korean consumers notably advocated for boycotting fashion products derived from animals. They exhibited behaviors that underscored the ethical expansion of vegan fashion, particularly concerning environmental and labor-related aspects.

"Natural fur also contributes to environmental pollution and inhumanly slaughters lives. The fur industry is doing things humans can't do, such as skinning animals alive and cutting off both front and hind feet for easy skinning. Let's use vegan fashion considering both the environment and animal rights."

"Wake up world, it's time to evolve! Go vegan! More people need to start vegan businesses!"

"With a little effort from you, fewer animals will suffer. Please join us in vegan fashion consumption for poor and weak animals. I will do my best to ban cruelty to animals as much as I can."

"Everyone, let's boycott Angora! Great opportunity for rescue animals!"

(4) Purchase intention and evaluation

Both global and Korean consumers expressed a willingness to buy vegan fashion products. Global consumers assessed the price and quality of the products and willingly endorsed various vegan fashion brands or products. After conducting sentiment analysis on comments mentioning 'price,' it was found that a high price was associated with negative sentiment (non-recommendation). In contrast, an affordable and reasonable price received positive feedback (recommendation). This suggests that the price perception among global consumers is relative rather than an absolute determinant of satisfaction or dissatisfaction.

*"I have vegan D****tens and I love them. Also,*

good price. I got the grey canvas ones − not so great for muddy walks, but still ok for everyday wear."

"Consumers are not stupid. If it's actually cheaper, warmer, and doesn't harm animals, I'd definitely buy it. How can I wear more expensive padding, less warm and cruel to animals?"

"I am hesitant to purchase artificial leather products because they cannot be worn for a long time. I remember feeling embarrassed when the faux leather products were cracked and peeled off."

"I think it's good not to use animal products, but it's necessary to cut down on fast fashion, reduce the number of clothes, and raise ridiculously low prices. 20,000 won for a T-shirt is not normal."

(5) Use and disposal

Global and Korean consumers voiced their views regarding the continued use and disposal of animal-based products purchased before their awareness of vegan fashion. Both consumer groups expressed concerns about the adverse environmental effects of discarding synthetic fiber-based vegan fashion products. Additionally, Korean consumers actively shared and sought information about laundering and maintaining vegan fashion items, such as artificial leather and faux fur.

"It's only been a month since I started veganism··· I have a problem. Is it right to dispose of the expensive goose sleeping bags and paddings I bought when I was not vegan? It's a must-have item for camping in winter, but I don't feel comfortable after starting veganism."

"Synthetic fibers such as poly and nylon are made from petroleum, so is that not related to environmental pollution? If we think about the production of synthetic fibers and their decomposition after disposal,

wouldn't that also lead to polluting the environment?"

"Tell me how to care for eco-leather. For example, wrinkle care or laundry."

Ⅴ. Discussion

Through Social Network Analysis (SNA), the study unveiled the constituent factors influencing the awareness and behaviors of both Global and Korean consumers regarding vegan fashion consumption. Notably, in both consumer groups, the original concept of vegan fashion has expanded into broader ethical fashion domains, encompassing concerns related to environmental and labor issues. These findings align with prior research, wherein terms like 'vegan,' 'eco,' 'ethical,' 'fair,' 'green,' 'organic,' 'recycling,' and 'sustainability' have been identified within the realm of ethical and sustainable fashion (Reimers et al., 2016; Shen, Wang, Lo, & Shum, 2012).

Global consumers tended to seek and discuss detailed information regarding their purchases, focusing on product specifics, brand details, and purchase locations. On the contrary, Korean consumers preferred information relating to the ethical implications and materials of vegan fashion. These findings can be inferred to stem from cultural differences in primary vegan motivations. In the West, veganism has predominantly been motivated by ethical and moral reasons. It begins with the Greek philosopher Pythagoras; the word vegetarianism was previously called the Pythagorean diet (Ferguson, 2011). Eating meat was considered a moral shame, and his students wore white vegetable cloaks and did not hunt animals or use clothing made of wool (Zhmud, 2012).

While in the East, it is rooted in religious beliefs such as Buddhism and Jainism (Lim & Song, 2016). When this veganism trend extends to the fashion industry, ethical considerations predominantly drive the adoption of vegan fashion because animal materials can be used as clothing materials without killing them.

Therefore, the spread of vegan fashion and the launch of vegan fashion brands could be adopted earlier in the West. When examining the number of vegan fashion brands, there are more brands in Western countries such as the UK, the US, and Canada than in Asian countries like Korea and Japan (Choi & Han, 2022). This phenomenon signifies a greater diversity of consumer choices regarding vegan fashion products in Western countries.

The results of deriving sub-factors of awareness, attitude, and behavior through YouTube comments and sentiment analysis revealed distinct patterns. Firstly, global consumers actively shared brands and products as an awareness factor, while Korean consumers expressed discontent due to insufficient information on alternative materials. Secondly, various elements encompassing quality, economic benefits, ethics, functionality, aesthetics, information sources, and brands contributed to the positive attitudes of global consumers. Korean consumers predominantly emphasized the ethical values of vegan fashion, shaping their positive perceptions of vegan fashion products. For both consumer groups, factors leading to negative attitudes included the conflict between environmental and animal ethics and dissatisfaction with price and quality.

Regarding behavioral factors, global consumers considered multiple pre-purchase aspects, such as size, quality, brand, place of purchase, and ethical considerations. In contrast, Korean consumers focused more on vegan certifications and alternative materials. Notably, while the price was a relative awareness factor for global consumers, it represented a dissatisfaction factor for Korean consumers. Ethics, health, and dietary habits emerged as primary motivations for avoiding purchasing animal materials.

The desire to adopt vegan fashion was apparent in both groups. However, Korean consumers exhibited group-level actions through crowdfunding and boycotts, distinguishing their engagement. Moreover, discussions across both groups highlighted deliberations

on the continued use of already-owned animal-based fashion products and concerns about environmental pollution arising from the disposal of synthetic fibers. ⟨Table 7⟩ summarizes the constituent factors and sub-factors of global and Korean consumers' awareness, attitudes, and behaviors on vegan fashion consumption derived from research questions 1 and 2.

VI. Conclusion

Culture is inherent in people's thinking and causes differences in cognition, emotion, and motivation (Markus & Kitayama, 1991). National culture has consistently and significantly influenced individual values and attitudes (Soyez, 2012). Accordingly, culture is a major influencing factor on consumer behavior, reinforcing the manifestations of culture (Peter & Olson, 1998). This study showed that consumers in each culture (global and Korean) have different acceptance methods regarding vegan fashion consumption.

This study underlines how cultural disparities shape consumers' inclinations in their awareness, attitudes, and behaviors concerning vegan fashion consumption. Global consumers prioritize factors directly tied to purchases: fashion products, brands, purchase locations, and sizing. Conversely, for Korean consumers, socially assigned ethical symbols emerge as pivotal factors, while for Global consumers, personal preferences and product-centric lifestyles take precedence. Moreover, collective behaviors like crowdfunding and boycotts are distinctly manifest among Korean consumers.

Regarding marketing implications, companies and brands should prioritize an integrated ethical fashion approach, irrespective of cultural backgrounds. This entails considering animals, the environment, and humanity, aligning with the expanding ethical scope of vegan fashion. Additionally, addressing environmental concerns linked to synthetic fiber use throughout the entire lifecycle of vegan fashion products is pivotal. Collaborating with influential figures such as

<Table 7> Awareness, attitudes, and behaviors of global and Korean consumers

Category	Variable	Attribute	
		Global consumers	Korean consumers
Awareness	Knowledge of cruelty	- Animal exploitation - Cruelty process in the fashion production	
	Environmental knowledge	Negative impacts on the ecosystem	
		None	Labor rights and fair trade
	Knowledge of alternatives	- Searching for alternatives - Sharing information about vegan fashion brands and products	- Lack of information on alternatives - Exploring alternative industrial materials and eco-friendly materials
Attitude	Positive attitude	- Quality, economic benefits, ethics, functionality, aesthetics - Brand's attitude, informants' attitude	The ethical value of vegan fashion
	Negative attitude	- Ethical conflicts: environmental issues in using synthetic materials - Dissatisfaction with price and quality	
		None	Criticism and ridicule
Behavior	Explore before purchase	Size, quality, brand, place of purchase, ethics, texture, style, informants	Vegan certification, use of alternative materials
	Refrain to buy	Refrain from purchasing animal products (ethical motives, health reasons, influence of eating habits)	
	Consumption lead	Participation in vegan fashion consumption	
		- Shifting awareness of consumption - Vegan fashion business	- Boycott or cloud funding - Extension of eco and labor
	Purchase intention and evaluation	Expression of purchase intention for vegan fashion products	
		- Evaluation of quality and price - Recommendation of vegan fashion brands and product	- Evaluation of cost-effectiveness - Dissatisfaction with price, durability, and ventilation - Pay for a premium price for environmental and labor aspects
	Use and disposal	- Concerns about the use of existing animal-based products - Negative impact of disposal on the environment	
		None	Washing and wrinkling

YouTubers and bloggers enhances global marketing efforts. Moreover, when entering the Korean market, transparently presenting certifications and material information while highlighting the ethical significance of vegan fashion can resonate effectively with consu-mers. This strategy needs to accommodate the price emphasis of Korean consumers by potentially inte-grating extra costs into premium prices while striving for the lowest feasible price through reduced adver-tising and other expenses.

From an academic perspective, this study holds significance in introducing novel methodologies, such as sentiment analysis, into existing big data research on vegan fashion consumption, and it presents a more sophisticated approach by applying various semantic network clustering techniques for comparison and analysis. Moreover, the study is notable for addressing the limitations of qualitative and quantitative research by combining diverse information science methodologies with qualitative analysis. This study compares vegan fashion consumers from a cultural perspective and demonstrates differences in consumption perceptions. It suggests that future follow-up research could incorporate variables such as gender, identity, generational influences, and market economics.

This study encounters several limitations and challenges. The data collection focused exclusively on the keyword "vegan fashion," warranting the inclusion of alternative terms such as "cruelty-free fashion," "animal-friendly fashion," and "fashion not tested on animals" to achieve more diverse research outcomes. In the period when the data for this study was collected, the concept of vegan fashion and beauty had already proliferated. However, there needs to be a discussion regarding the post-COVID-19 period in 2020. Since the pandemic, there has been an increased interest in ethical consumption, as indicated by several studies (Hasbullah, Sulaiman, & Mas'od, 2020; Kim & Lee, 2022). Therefore, it is necessary to examine the evolving patterns of consumer perception towards vegan fashion since the pandemic.

Additionally, while the study distinguished between global and Korean consumers using both English and Korean, it was difficult to exclude the possibility that some Korean consumers might be included in the global consumer sample. Subsequent studies may explore differentiating consumers through internet communities or channels specific to certain countries rather than relying solely on language. Lastly, using YouTube comments for sentiment analysis may intro-duce biases due to highly engaged participants. Future research necessitates sophisticated data collection methods to address these concerns and enhance the accuracy of Korean language processing while also considering expansion to various languages for a more comprehensive interpretation.

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