

## Article

# A Study on the Impact of Linguistic Persuasive Styles on the Sales Volume of Live Streaming Products in Social E-Commerce Environment

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**Abstract:** Live-stream shopping is developing rapidly, but the sales levels of live streaming products vary by different hosts. How to increase the sales volume of live streaming products has become a problem. Consumers' purchase behavior in live streaming is determined by some subjective factors, and the persuasiveness of linguistic style affects this subjective judgment to a certain extent. Therefore, the persuasiveness of the hosts' linguistic style will lead to changes in consumers' purchase intentions, which will affect the sales volume of products sold in the live streaming. Based on Hovland's persuasion model, Aristotle's rhetoric skills, text analysis, Latent Dirichlet Allocation (LDA) topic extraction model and grounded theory, this study divides the host's linguistic persuasive style in the social e-commerce environment into five types: appealing to personality, appealing to logic, appealing to emotion, appealing to reward, and appealing to exaggeration. Combined with the sales volume of the product, we establish a regression model, and obtain the influence results of the host's various linguistic persuasive styles on the sales of live streaming products. The results show that: the linguistic persuasive style of appealing to personality has the greatest positive impact on the sales volume of live broadcast products, but the linguistic style of appealing to logic has a negative impact. Interestingly, the same linguistic style has different effects for different types of products: the linguistic style of appealing to exaggeration has a negative effect on the sales volume of apparel products, but it has a positive influence on the sales volume of digital electrical products. Therefore, different linguistic styles should be used for different product types.

**Keywords:** social e-commerce; live-stream shopping; grounded theory; linguistic persuasive style; product sales volume; product categories



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## 1. Introduction

Recently, with the popularization of the Internet, China has witnessed a sharp increase in the number of Internet users. At the same time, as China's economy grows by leaps and bounds over the past two decades, people's demand for diversified and personalized lifestyles and consumption patterns has become stronger. In this context, new business models such as social e-commerce and live-stream shopping continue to emerge. Major e-commerce platforms are also rushing to launch live streaming models that combine hosts and content to quickly seize the consumer market. At present, the overall development of live-stream shopping is still in the exploratory stage. How to expand live-stream shopping consumer groups, how to cater to consumer psychology, how to design live streaming mode and content, and how to promote the sales of live-stream shopping are common issues faced by brand suppliers and live streaming store owners.

Live-stream shopping is a new sales model in which consumers watch real-time broadcast videos and purchase goods through the Internet. The products sold in the live

broadcast are called live streaming products, the person selling the goods is the host, and the platform on which the host conducts the live broadcast is called the live streaming platforms. The sales of live streaming products are partially responsible for the rise and fall of the host and the live broadcast platform. In addition to product quality, the sales volume of a product in the live broadcast is also largely determined by the host's ability to guide shopping, which is mainly reflected in the persuasiveness of her words. Specifically, different linguistic styles used by the hosts may bring different viewing experiences to consumers, thereby stimulating or inhibiting consumers' willingness to buy, which directly leads to huge changes in the sales volume of products promoted by the hosts. There is a large volume of published studies describing the role of persuasive linguistic styles in the success rate of crowdfunding financing projects, whereas few have examined its impact on product sales from the perspective of text analysis in the context of live-stream shopping.

In order to study the influence of the persuasiveness of different linguistic styles on product sales, this study combines Hovland's persuasion model with the basic theory of Aristotelian rhetoric skills, using text analysis, LDA topic extraction model and grounded theory. We then sum up the persuasive linguistic style classification of the hosts in live-stream shopping. At the same time, we establish a mathematical model of linguistic style categories and product sales to determine the relationship between them, and use empirical and statistical methods to test the model to obtain the degree of influence of persuasive linguistic styles on product sales. Accordingly, live broadcast platforms, hosts, and suppliers can make scientific decisions on product sales to promote further construction and development of live-stream shopping.

In summary, in this paper, we analyze the influence of the persuasiveness of different linguistic styles on product sales, and strive to improve the marketing focus of the host when selling products through data analysis. Our results can not only enrich the categories of persuasive linguistic style models in the live streaming environment, but also broaden the application range of persuasive linguistic models. Mining and analyzing valuable information in the host's language text, can assist the live streaming platform, hosts, and suppliers, etc., to improve the scientificity of decision-making and provide a reliable reference for the development of live-stream shopping in the social e-commerce environment. It is therefore expected to make important theoretical and practical contributions.

## 2. Literature Review

Traditional word-of-mouth marketing believes that word-of-mouth has both a perception effect and persuasive effect [1–3]. The perception effect of Internet word-of-mouth on product sales comes from the description and transmission of basic product information in the text, and there have been more studies involving the perception effect [3]. However, few literature systematically study the persuasive effect, especially the persuasiveness of language and its effects from the perspective of text analysis. Persuasion is a kind of behavior that can guide the recipient's attitude and behavior towards the persuader's intended direction. Persuasive style refers to the skills and strategies used in language expression [4].

In Hovland's persuasion model, the persuader, the persuasive information, the persuasive context and the object of persuasion constitute the four basic elements of attitude change. Among them, the first three are the external stimulus of attitude change [5,6]. The persuasive influence of text language is multifaceted. Even for the description of the same content, the use of different text language expression techniques can lead to different persuasive effects. Typical examples include: in the description of the facts, compared with "the number of casualties", "the number of survivors" has a much better persuasive effect due to the positive information transmission method [7]. In Aristotle's work [8], the term "rhetoric" is described as "an ability to find persuasive methods in every feasible case". He pays attention to the influence of morality and emotion on the audience, and divides persuasion into three modes, namely: appeal to personality, appeal to logic, and appeal to emotion. The influence of persuasive language can sometimes be negative. Petty

and Cacioppo [9] believe that the more persuasive a piece of information is, the harder people will try to find loopholes in the information to avoid being persuaded by the information. For example, the use of exaggerated techniques in advertising is not conducive to forming consumer brand perception, and even has a negative impact on users' purchase intentions [10].

There are many studies on the application of persuasion theory in marketing. For example, Zhang [11] used the persuasion model to study the impact of source credibility on consumer acceptance of genetically modified foods. Berger and Cunningham [12], in the article *Consumer Persuasion of Public Service Related Advertising*, conducted two experimental studies on how to influence the persuasiveness of print advertisements. The results of the study showed that women generally have a more positive attitude towards public welfare and related products. Scholars [13] study the relationship between online social influence, information dissemination, and viral marketing from the perspective of social persuasion. Zboja [14] studied the relationship between persuasive knowledge and sales pressure. Isaac [15] demonstrated that persuasion knowledge access can lead to greater credibility and increase trust and belief in a persuasive message. Yang [16] focused on the e-commerce environment and used the theory of persuasion to investigate the impact of consumer personality characteristics based on motivation or ability and external stimuli (such as promotional information and interface design) on consumers' information processing and purchasing decisions. However, little attention has been paid to the application of persuasion theory in online live-stream shopping. Existing studies also ignore the influence of host language text on consumers' purchase intention and the consequent influence of product sales.

Grounded theory is a qualitative research method developed by sociologists Glaser of the University of Chicago and Strauss of Columbia University in 1967. The theory discovers problems in life, integrates and builds theoretical models by summing up experiences and concepts, which is a bottom-up induction method. Matteucci [17] addressed the issue on the variety of grounded theory in tourism studies. Mittring-Junghans [18] used grounded theory to conduct inductive research on disease. Iyer [19] used grounded theory to research in-depth interviews with marketers, and help marketers of radical software innovations to formulate the appropriate marketing response. This article is a research on the results of consumer purchase behavior and online marketing of live-stream shopping, which also belongs to the matching degree of consumer behavior and online marketing. Therefore, it is feasible to use grounded theory to study language text information in this article.

E-commerce live streaming is a new model of social e-commerce, which has developed rapidly due to its unique advantages of interactivity, intuition, and entertainment [20,21]. Given a major challenge online retailers face in stimulating consumers' purchase intention [22], Sun [23] et al. proposed that, from the perspective of IT support, the three aspects of technical support, including guided shopping, voice comments, and visualization in live streaming, can positively affect consumers' product purchase intention. The rapid development of e-commerce live streaming has not only led to growth of information technologies (e.g., real-time interaction), but its unique immersive and perceptual shopping experience has also contributed to the development of live streaming marketing, a new marketing method. Live marketing uses online platforms to introduce and display products to be sold in real time, and businesses can interact with consumers. Therefore, more and more consumers are drawn to live-stream shopping and are willing to purchase products through the introduction of products by the host [24,25]. In the context of e-commerce live streaming, consumers enjoy a more intuitive and interesting shopping experience while also acquiring more complex and diverse product information. Reliable sources of information are therefore increasingly valued by customers who suffer from information overload. At present, a large number of papers focus on online store sales or the research of consumers' purchase intention in live streaming, but the study of using specific data to explore the factors influencing the sales volume of goods in live streaming and the research of host language persuasion style on consumers' purchase intention still remain relatively

rare. Against this backdrop, our study takes social e-commerce as the background to study the influence of the host's linguistic persuasive style on the sales of live streaming products.

Hovland's persuasion model believes that the disseminator is the first element of persuasion, and the disseminator's objectivity and credibility are the basic conditions for persuasion. Credibility depends on expert qualification and reliability. People with expertise in certain areas are more effective in persuading others [26]. Therefore, people new to a certain field will subconsciously trust the opinions of experts and authoritative organizations. When the persuader is a domain expert, people are more likely to be persuaded by this expert status [27]. In a market with asymmetric information, "signal display" helps to resolve the information asymmetry of both parties [28], and reputation strategy is one of the effective means to reduce information asymmetry. One purpose of reputation strategy is to highlight credibility [29]. Authoritative figures, institutions and even some academic terms have enhanced consumers' trust in products. User experiences of products will also enhance credibility. Sometimes, the host is also one of the authority figures, because most hosts obtain fan dividends by expanding the number of fan groups and groups that follow in the live streaming room. The host itself is also one of the Internet celebrities or celebrities. Their own reputation affects consumers' willingness to buy. Therefore, the product experience of some hosts will also have a greater impact on consumers.

During live streaming, the linguistic persuasive style most frequently used by the host is to appeal to personality. The host will constantly use language expressions such as "experts", "teams", proper nouns, and personal experience to convey information about product reliability to consumers and build their trust. In a survey on the language style of fundraising letters, it was found that the use of personality strategies has a greater impact on fundraising letters than any other persuasive style [30]. In the research of consumers' purchasing intention, trust is also one of the important factors to enhance consumers' purchasing intention. Therefore, this paper proposes the following hypothesis:

**Hypothesis 1 (H1).** *The persuasive style of appealing to personality will help increase the sales of live streaming products.*

In Hovland's persuasion model, reward belongs to the content of persuading information. For live-stream shopping, the rewards of the merchants and the products themselves to consumers will inevitably affect consumers' purchase intention, thus affecting the sales of live streaming products. In live-stream shopping, hosts will make promises of spiritual and material rewards to consumers when selling products. For example, they issue coupons, send the products to lucky viewers, or temporarily reduce the price of products during live broadcasting.

The persuasive style of appealing to rewards will affect consumers' willingness to buy, but the seller may not fulfill the promised return. In other words, the goods received are not worth the money, and the number of gifts given does not match the expectations of consumers. Despite the concern, the persuasiveness of the linguistic style of resorting to rewards cannot be ignored. Therefore, in general considerations, the linguistic persuasion style of resorting to returns has an impact on consumers' purchase intentions, and thus affects the number of products consumers purchase in the live streaming room. Therefore, this paper proposes the following hypothesis:

**Hypothesis 2 (H2).** *The persuasive style of appealing to reward will help increase the sales of live streaming products.*

Studies have shown [31] that the process of persuasion effect includes not only the cognitive response of the information recipient, but also the emotional response to the persuasive information. An experiment showed [11] that in order to highlight the authority of the information source, the persuader should add emotional information to the persuasive information. In practice, emotional text will affect users' consumption behavior, and the



emotional opinions in online reviews will form Internet word of mouth, which in turn will have a significant impact on product sales [32,33].

In live-stream shopping, hosts usually use language such as asking the audience to pay attention to the live-stream number and forwarding the live-stream room to get more attention by describing their feelings of live broadcast. Some hosts also use phrases such as “quick grab” and “quick hand” repeatedly to stimulate the tension and excitement of the live audience, hoping to enhance their purchase intention of consumers. There is little research on the emotional style analysis of host language in live streaming. However, in a study, it was found that emotional expressions are used more frequently than logical expressions, but compared with logical linguistic styles, emotional linguistic styles have a limited impact on consumers [34]. After analyzing a charity fundraising project, it is concluded that emotional appeals have little effect on the financing effect. Investors are more concerned about the content of the text. The content of the text is more likely to stimulate investors’ sentiment than the emotional rhetoric. Therefore, the emotional linguistic style of the host in the live streaming is not enough to stimulate consumers’ purchase intention. That is, it cannot bring more product sales. Therefore, this article proposes the following hypothesis:

**Hypothesis 3 (H3).** *The persuasive style of appealing to emotion has a negative impact on the sales of live streaming products.*

The style of logic mainly reflects the sense of logic in the language, and general logical expression is an effective way to deal with false information. The expression of appeal to logic means that the speaker obtains a conclusion by a logical deduction method, which is an effective means to crush rumors [35]. In a study on the communication effects of advertisements [36], researchers found that in addition to the aesthetic effects of advertisements, the logical system of advertisement display also has a significant impact on advertisement effects.

In live streaming shopping, hosts use logical language such as causality to promote products. This sense of logic will eliminate consumers’ doubts about the authenticity of the product, thus influencing their purchase intention and increasing product sales. Therefore, this paper proposes the following hypothesis:

**Hypothesis 4 (H4).** *The persuasive style of appealing to logic will help increase the sales of live streaming products.*

Exaggerated expressions, which belong to the way of information dissemination in Hovland’s persuasion model, will affect the attitude of the information receiver towards the product. Exaggeration often means “excessive reputation” [37], which may affect the authenticity of information dissemination from the perspective of information recipients. Exaggerated expressions are interactive. In the process of communication, exaggerated language will arouse some consumers’ interest in the product. However, the persuasiveness depends on to what extent the consumers accept the exaggerated language. That is, exaggerated linguistic style acts on the object of persuasion.

A study found [38] that when consumers evaluate the quality of products based on online texts, they tend to discount the value of online texts to a certain extent. The same is true for language content. When consumers watch live streaming, some language expressions of the host, such as “very”, “first”, and other words with absolute meaning, will cause consumers to regard the host’s description of the product as an intentional exaggeration of the product-related performance, making consumers feel unreal, which thereby reduces their willingness to buy. Studies have shown [10] that exaggerated techniques will reduce users’ perception of product image. Exaggerated descriptions of characters may reduce the audience’s evaluation of the characters. This phenomenon is particularly obvious when the object of description is a celebrity or politician. In addition, the effect of exaggeration is also affected by the intensity of exaggeration. When the host uses more exaggerated language

to describe the product, it may further stimulate consumers' uncertainty about the product, reduce their purchase intention, and lead to changes in the sales of the product. Therefore, this paper proposes the following hypothesis:

**Hypothesis 5 (H5).** *The persuasive style of appealing to exaggeration has a negative impact on the sales of live streaming products.*

Figure 1 shows our research model. Different linguistic styles will persuade live-stream viewers from different angles, affect their willingness to buy, and thus have an impact on the sales of live streaming products.

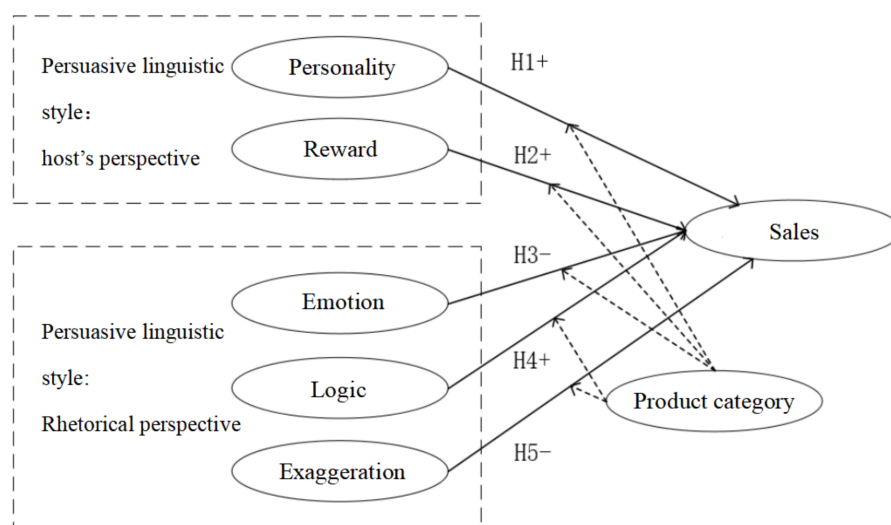


Figure 1. Research Model.

### 3. Materials and Methods

In order to solve the problem of the degree of influence of the persuasiveness of different linguistic styles on the sales volume of products, (1) we obtain keywords by processing the general summary text; (2) we collect text data from the live streaming platform and the live streaming room; (3) then we integrate Hovland's persuasion model, the basic theory of Aristotle's rhetoric skills and grounded theory; and finally (4) we summarize the host's language persuasion style classification in the live stream shopping context.

Meanwhile, to establish the relationship between the language persuasion style category and the product sales, a corresponding model is established and tested empirically. Accordingly, live streaming platforms, hosts and suppliers make scientific decisions on product sales to promote the further construction and development of live-stream shopping. The research procedure based on grounded theory is shown in Figure 2.

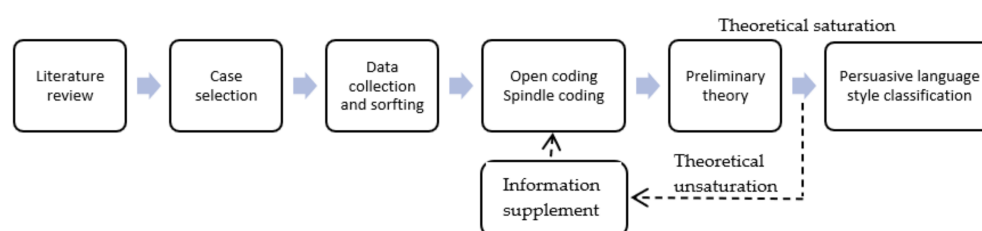


Figure 2. Research procedure based on grounded theory.

Based on the visitor volume and management maturity, Taobao's live stream shopping platform was selected as our data source. Popular hosts such as Wei Ya and Li Jiaqi have all settled in Taobao and carry out live streaming on Taobao. In addition, this article obtains the sales volume and sales price of each commodity sold by Taobao hosts on the Zhigua

Data Platform. The Zhigua Data Platform ranks the hosts by calculating the total scores of the number of fans of each host, the number of live streams, the number of sales, and the total sales. The top-ranked hosts have a strong ability to bring goods and have a certain reputation in society, so it is more valuable to study the linguistic style of these hosts. In addition, the rankings of live streaming hosts show an inverted pyramid structure. Although some hosts rank at the top of the comprehensive ranking, there is still a large gap between the number of live streams and the first- and second-ranked hosts. Therefore, the voice materials of these hosts are comparable. This paper selects a total of 587 products from the top 20 hosts in the ranking, such as Li Jiaqi, Wei Ya, Li Jing, and Lie Er, as voice samples for this research. The data collection time is from early June 2020 to the end of August 2020. The data collection period spans between early June 2020 to the end of August 2020 during the COVID-19 epidemic, the time when competition in the live delivery industry intensified and the bubble gradually dissipated. The professionalization of the live broadcast team led to higher efficient information conversion. Therefore, selecting this time period is helpful for language extraction and analysis.

We adopted the above-selected hosts voice material, and translated the audio into text through multiple voice translation software such as iFLYTEK, and then manually reviewed the translated text to ensure its accuracy. Before applying grounded theory to analyze the acquired speech and text, in order to ensure the universality and persuasiveness of the research results, the repetitive texts were deleted, and the speech materials that lacked the number of merchandise sales and in which the live streaming language was too extreme were eliminated. Finally, 452 speech texts were obtained. In addition, 20 valid speech texts were randomly selected to test the theoretical saturation, and the remaining speech texts were used as a linguistic style framework model.

This section randomly selected 200 speech texts from 452 valid speech texts for analysis. We marked the product categories of these 200 voice texts and saved them as CSV files. Next, we used Python for text preprocessing. Word segmentation and stop word removal are very critical in this step. The effect of word segmentation and stop word removal directly affect the results of text analysis. We used Jieba to process word segmentation. Stop words refer to some function words, symbols, and unimportant words that need to be deleted after word segmentation, such as “?”, “me”, “us”, “in”, “of”, “based on”, etc. These words do not have much practical meaning, but their higher frequency will affect the results of text analysis. We selected four stop words list of Harbin Institute of Technology, Chinese stop word list, Baidu stop word list, and Sichuan University Machine Intelligence Laboratory stop word list for stop word processing.

After text preprocessing, a custom dictionary setting is required. A custom dictionary refers to adding some vocabulary to the word segmentation lexicon. These vocabularies are often added based on the characteristics of text data in a special field. In live-stream shopping, words such as “seckill”, “plus” that contain informative contents were manually added to our custom dictionary so as to hope to get our results more reliable for the specific context.

After the above-mentioned text data processing, word frequency statistical analysis was then performed on the text. According to statistics, the top 30 vocabulary words are shown in Table 1 below. It can be seen that the most frequently used vocabulary by the host in the live streaming room is “color”, which indicates that consumers are most concerned about the basic information of the product in the live broadcast, and color is one of the most intuitive product information. Among the top 30 vocabularies, in addition to product description vocabulary such as “color” and “size”, there are also words such as “rest assured” that reflect the reliability of the host; we can also find “coupons” and “cost-effectiveness” that reflect spiritual and material rewards; “seckill”, “increase” and “addition” reflect the emotional interaction between the anchor and consumers; while the frequently used words such as “good-looking” and “super” are manifestations of the exaggeration of the host language.

Table 1. Text word frequency statistics table.

Words	Frequency	Words	Frequency	Words	Frequency
Color	803	Plus	160	Details	104
Good-looking	398	Blue	149	Suitable for	102
Get it	214	Fabric	143	Rest assured	101
Coupon	205	Comfortable	138	Seckill	97
Black	199	Popular	136	Quantity	94
Fans	193	Increase	132	Cost-effective	89
White	177	Ingredient	128	Super	87
Effect	173	Pink	113	Spot goods	81
Cheap	168	Taste	108	Cost-performance ratio	80
Pretty	168	Hurriedly	107	Size	77

Clustering is an unsupervised learning method. In 2003, Blei et al. [39] proposed the Latent Dirichlet Allocation (LDA) topic model which is mainly used for semantic analysis of text data. As a generative statistical model, LDA extracts latent topics by summarizing keywords of a document, and these topics represent the main content of the entire document. The structure of the LDA model is shown in Figure 3, where  $\theta$  is the topic distribution of document  $i$ ,  $Z_{ij}$  is the  $j$ th word in document  $i$ ,  $w$  is a specific word,  $M$  is the number of documents,  $N$  is the number of words in the document, and  $\alpha$  represents the distribution parameter of the topic on the word,  $\beta$  represents the distribution parameter of the word, and  $\theta$  represents the polynomial distribution function of the word.  $\phi$  is the parameter of the multinomial distribution of words in the topic.

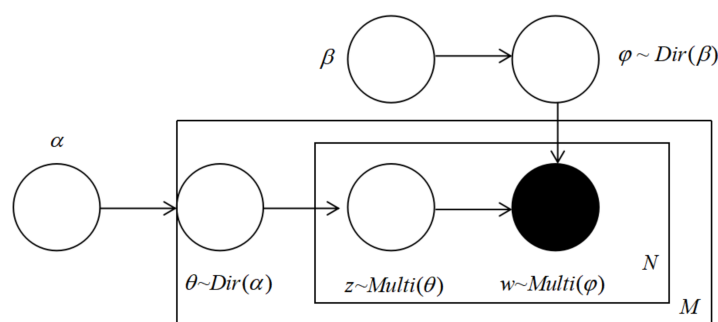


Figure 3. Schematic diagram of LDA model structure.

The LDA model assumes that each speech text is composed of a proportional combination of each topic, and the combination ratio obeys a multinomial distribution, denoted as:

$$Z|\theta = \text{Multinomial}(\theta) \quad (1)$$

Each topic is composed of words in the dictionary according to a certain ratio, and the combination ratio also obeys multiple distributions, denoted as:

$$W|Z, \phi = \text{Multinomial}(\phi) \quad (2)$$

The probability of generating word  $w_i$  under the condition of comment  $d_j$  is expressed as:

$$P(d_j|w_i) = \sum_{s=1}^K P(w_i|z=s) * P(z=s|d_j) \quad (3)$$

where,  $P(w_i|z=s)$  represents the probability that the word  $w_i$  belongs to the  $s$ th topic;  $P(z=s|d_j)$  represents the probability of the  $s$ th topic in the comment  $d_j$ .

Based on the above research results, the TF-IDF matrix was built using the segmented text, and the machine learning package Sklearn that comes with Python was used for LDA

training. Then, the training value with the smallest perplexity was selected as the number of clustering categories, and finally five topics were obtained. The main keywords of each topic are shown in Table 2.

**Table 2.** Subject classification of host language text.

Topic 1	Topic 2	Topic 3	Topic 4	Topic 5
Western style	Pure gold	Color	Ingredient	Coupon
Original price	Give to	Black	Effect	Get it
Quality	Gift	White	New product	Cheap
Cost	Lottery	Fabric	Sensitive	Quantity
Official	Pretty	Good-looking	Experience	Plus

It can be seen from the results that Topic 1 focuses on the quality and source of the product, reflecting the host's overview of the product, allowing consumers to have an overall perception of the live streaming product. The main content of Topic 2 is the lottery and gifts in the live streaming room. This is the embodiment of the interaction between the host and the audience in the live streaming room, reflecting that the host and consumers pay more attention to the interactive session. The keywords in topic 3 focus on the attributes of the product and detailed product information. Generally, the basic information of the product is a concern for consumers. The words "effect", "sensitivity", and "experience" in Topic 4 all reflect the host's explanation of the product's experience after use, which is another key issue that attracts consumers' attention. Topic 5 mainly reflects the preferential situation of the product in the live streaming room. Most consumers make purchases in the live streaming room because of the large preferential strength. Therefore, the host will emphasize the preferential situation of the product many times during the explanation.

Although LDA extracted the above five topics, it is not difficult to find that because live-stream shopping is unique in terms of sales language and environment, the above-mentioned subject classification is not very detailed. For example, in topic 5, "coupons" and "cheap" can be divided into discounts and rewards, but the words "plus" and "quantity" are the host's rendering of consumers' emotions, which are used to stimulate consumers' excitement in purchasing, and are manifestation of emotional interaction, so they can be classified as emotional interaction. Therefore, we intend to use the grounded theory, combine with the high-frequency vocabulary results obtained in text analysis, and then further study the language style classification and the characteristics of each linguistic style of the host in the live stream.

Open coding consists of three steps: labeling, conceptualization, and categorization. Firstly, we analyzed and refined all the collected text data, and labeled some sentences or phenomena; secondly, we integrated related sentences, phenomena, and labels to form some specific concepts; finally, we integrated concepts with similar meanings into categories. The purpose of open coding is to identify phenomena, define concepts, and discover categories, that is, to deal with convergence problems. For example, the text data in the voice text of a product showed: "We have all natural, preservative-free and non-genetically modified test reports", "during the day, I have eaten one, which is individually packaged, and is more convenient", "We should eat more corn, because it is rich in dietary fiber, and help us to solve our constipation problem", respectively paste "quality inspection report", "experience of the host using the product", "host's years of sales experience or basic common sense" label. Secondly, the labels that reflect the same type of phenomenon were aggregated into specific concepts, which were identified by "authoritative institutions", "use experience" and "past experience". Finally, these concepts were summarized and integrated into corresponding categories, and they were uniformly labeled with "reliability". After excluding personal presuppositions and prejudices as much as possible, eight categories were finally abstracted from the language text, namely, professionalism, reliability, logic, hard work, emotional interaction, spiritual reward, material reward, and exaggeration. Among them, professionalism is the categorization of the two concepts of



professional terms and content output; reliability is the categorization of the three concepts of authority, use experience, and past experience; logic is the categorization of the two concepts of logical derivation and causality; hard work is the categorization of the concept of making a hard effort; emotional interaction is the categorization of the two concepts of emotional shock and request for gratitude; spiritual reward is the categorization of the concept of value for money; material return is the categorization of the two concepts of limited time second kill and welfare release; and exaggeration is the categorization of the two concepts of exaggerated description and exaggerated tone. The categories summarized in this article and the corresponding language text data sentences are shown in Table 3.

**Table 3.** Open coding process.

Examples of Data	Conceptualization	Categorization
“Nicotinamide”, “Hyafactor-NAG”, etc.	Proper nouns	Professional
The host can tell the basic information and advantages and disadvantages of the product in a short time.	Content output	
“team”, “expert”, “quality inspection report”, etc.	Authoritative institutions	Reliability
Experience of the host using the product.	Use experience	
Host’s years of sales experience or basic common sense.	Past experience	
Logical derivation from phenomenon to essence through experiments.	Logical deduction	Logic
Logical description of causality.	Causal relationship	
The host described himself as spending a long time on live broadcasts or processing products, striving for good product quality.	Making hard effort	Hard work
After the product link is issued, the anchor utters “quick grab” and other emotion-stimulating phrases to the audience, as well as real-time feedback on the stock of the product.	Emotional shock	Emotional interaction
Requests or thanks sent by the host to the audience to follow the live streaming room, forward the live streaming room, etc.	Request thanks	
The purchase of this product in the live streaming room will make consumers feel value for money, even if the price is not very cheap.	Value for money	Spiritual reward
The product is sold at a very low price in the live streaming room.	Limited time seckill	Material reward
The host distributes coupons to consumers, draws to send and sell goods, etc.	Send benefits	
The host’s extreme description words such as “first” and “most” on commodities.	Exaggerated description	Exaggeration
The exclamation of the host introducing the product, such as “OMG, this is too good to watch, etc.	Exaggerated tone	

After open coding, the original language text materials were classified into eight categories. This paper summarizes and refines the eight categories of open coding according to the “conditions, actions, and results” of the canonical model. Among them, the condition is the situation in which a phenomenon is located, and the action is the routine response of the research object in this situation, and the result is a series of consequences of the action. For example, the two initial categories of “professionalism” and “reliability” formed by open coding can be integrated under the canonical model: in the process of live broadcast by the host, the professional words in the host language are the basic factors to obtain consumers’ trust, and the reliable information transmitted in the host language is the key factor to gain their trust. Therefore, professionalism and reliability can be combined into a credible language style. As a result, we developed five main categories, namely, “appealing to credibility”, “appealing to logic”, “appealing to emotion”, “appealing to reward” and “appealing to exaggeration”, and eight corresponding sub-categories, they are shown in Table 4.

**Table 4.** Correspondence between main category and sub-category.

Main Category	Subcategory	Relationship between the Main Category and the Subcategory
Appealing to credibility	Professionalism	The professional words in the host language are the basic factors to obtain consumers' trust.
	Reliability	The reliable information conveyed in the host language is the key factor to build consumers' trust.
Appealing to logic	Logic	The logic of language is the basic content of the language style of appealing to logic.
Appealing to emotion	Hard work	The hard work of the persuader can inspire consumers to identify with the persuader.
	Emotional interaction	Emotional interaction is the most direct way to express emotion.
Appealing to reward	Spiritual reward	Spiritual return is the manifestation of the language style of appealing to return to influence consumers on the spiritual level.
	Material reward	The return in kind is the manifestation of the language style of appealing to the return to affect consumers at the material level.
Appealing to exaggeration	Exaggeration	The exaggeration of language is the basic content of the language style of appealing to exaggeration.

Theoretical saturation test specifically refers to continuing to explore the categorical features without obtaining data, and then using it as a basis for whether to stop sampling [40]. If the newly acquired data fails to generate new theories and new categories when analyzing these data, the theory is considered to be saturated. The role of theoretical saturation test is to expand research data and revise and perfect theoretical construction. The test method of theoretical saturation is generally self-checking within the researcher team, combining multiple times, and judging whether there is something to be improved. Some researchers also consulted experts in related fields, hoping to obtain some valuable suggestions on the theoretical framework constructed by them, and make amendments [36]. This paper intends to use theoretical saturation to test whether the data category tends to be saturated. We analyzed the reserved 20 effective language text materials. These content and materials still reflect the causality and persuasive style characteristics of the host language in the social e-commerce environment. The results show that for the five main categories of the host language persuasive style model in the social e-commerce environment, no new categories and new relationships have been found. Therefore, it can be considered that the language style model constructed in this study is saturated.

Based on Hovland's persuasion model and grounded theory, this article establishes a host linguistic persuasive style model in a social business environment, which includes five linguistic persuasive styles of appealing to credibility, appealing to logic, appealing to emotion, appealing to reward, and appealing to exaggeration. Based on the persuasive model of the host linguistic style, this paper further studies the influencing factors of the persuasiveness of the host linguistic style on the sales volume of live products in the social e-commerce environment.

We follow the insights in existing research studying the linguistic style and corresponding product sales in livestreaming and establish a multiple linear regression model for analyzing the host linguistic persuasive style and the sales volume of different live streaming products in a social e-commerce environment.

According to the coding of language text materials in grounded theory, the more times the language text material of each product is coded by a certain persuasive style, the more the product tends to a certain linguistic style. This article selects the number of codes of appealing to credibility, the number of codes of appealing to logic, the number of codes of appealing to emotion, the number of codes of appealing to reward, the number of codes of appealing to exaggeration in the product language text, and the number of live sales of the product. The above main factors are used to analyze the influence of the linguistic

persuasive style of the host on the sales volume of live streaming products in the social e-commerce environment.

We took the number of live broadcast sales of the product  $Y$  as the response variable, initially selecting the number of codes of appealing to reward  $X_1$ , the number of codes of appealing to exaggeration  $X_2$ , the number of codes of appealing to logic  $X_3$ , the number of codes of appealing to emotion  $X_4$ , and the number of codes of appealing to personality  $X_5$  as explanatory variables. This preliminarily established a multiple linear regression model between the sales volume of live broadcast products  $Y$  and factor variables  $X_i$ , ( $i = 1, 2, 3, 4, 5$ ):

This is example 1 of an equation:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \mu \quad (4)$$

where there is a random disturbance term.

Under the premise of ensuring the integrity and correctness of the data, this paper chose to adopt more complete coding materials, that is, to construct the regression model using materials in which the speech and text are encoded in five language styles. From the selection from early June 2020 to the end of August 2020, 196 pieces of coded commodity language text materials were used as data samples.

#### 4. Results

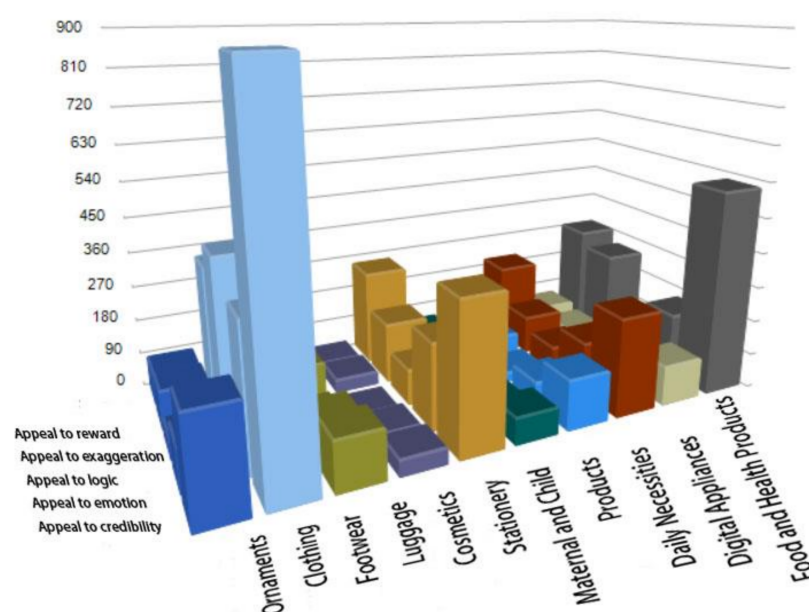
According to the classification of commodity categories on Taobao live streaming platform, this paper divides the collected 452 valid commodity language text materials into 10 categories: accessories, clothing, shoes, luggage, beauty, stationery, maternal and child, household goods, digital appliances, and food and health products. This paper initially selected 196 product voice materials for coding analysis, and a summary of the coding frequency of various types of commodities is shown in Table 5. Bar graphs are presented to observe the relationship between the data more clearly.

**Table 5.** Table of usage times of language styles of various commodities.

	Appeal to Reward	Appeal to Exaggeration	Appeal to Emotion	Appeal to Logic	Appeal to Credibility
Ornaments	84	102	51	113	259
Clothing	334	405	111	358	882
Footwear	69	91	25	93	127
Luggage	22	36	7	27	44
Cosmetics	252	159	94	222	379
Stationery	52	34	6	35	71
Maternal and Child Products	91	62	27	61	131
Daily Necessities	203	102	68	136	255
Digital Appliances	58	44	19	40	104
Food and Health Products	277	239	88	160	526

It can be found from Figure 4 that among all the products, the linguistic persuasive style of appealing to personality is the most frequently used, with a total of 2778 coding records. After that, the order of frequency is linguistic persuasive style of appealing to reward, appealing to exaggeration, and appealing to emotion. The least used linguistic style is appealing to logic, with only 496 coding records. This phenomenon confirms that the linguistic style of appealing to personality has the greatest impact on the listener among all linguistic style models, and it also proves that the linguistic style of appealing to personality is the most persuasive. In the context of social e-commerce, the use of personality-based linguistic styles for product promotion and sales has become the focus of most hosts' live streaming. One of the most important reasons for more consumers to pay attention to the social commerce form of live streaming is that the prices of the products in live streaming are cheap. Activities such as time limited second killing, lucky draw gift

giving, full gift giving and the corresponding language with related activities stimulate consumers' purchase intentions, so the linguistic style of appealing to reward is also used by live broadcast anchor. The persuasive style of appealing to emotion is also used in the delivery of hosts, and the number of uses is significantly greater than that of appealing to logical persuasion. This also confirms that in general situations, emotional expressions are more frequently used than logical expressions. The persuasion style of appealing to exaggeration is often used in live broadcasts. Although previous studies have shown that excessive exaggeration is not conducive to stimulating consumers' willingness to purchase, the linguistic style of appealing to exaggeration in live-stream shopping is still a very necessary persuasive method. This article believes that in a commodity sales environment with a fast pace and a short period of time such as live streaming, few consumers will consider using logical language to deal with false information, and people may pay more attention to basic commodity information, commodity prices, and other practical and effective information. In live streaming, the logical language is instead used by the hosts. The hosts make consumers believe in the functions and effects of the products through causality and deduction, and then generate purchase intentions, make purchase decisions, and increase product sales.



**Figure 4.** The number of times the linguistic style is used for various types of goods.

From a horizontal perspective, that is, to analyze the frequency of linguistic style usage from the perspective of various commodity categories, it is not difficult to find that, for all ten categories of commodity, the linguistic persuasive style of appealing to personality is used for the largest proportion. For product categories of cosmetics, stationery, maternal and child, household goods, digital appliances, and food and health products, the frequency of linguistic persuasive style of appealing to reward ranks the second; for product categories of clothing and luggage and bags, the use of the linguistic style of appealing to exaggeration ranks second. However, the linguistic persuasive style of appealing to reward is used more frequently in the product categories of shoes and accessories, which shows that for these two categories, consumers pay more attention to the actual benefits of the products, that is, spiritual returns and physical returns. For different product categories, the use of logical persuasion style is the least. The five linguistic persuasive styles are subdivided into tags, as shown in Table A1 in the Appendix A.

It can be seen that for the linguistic style of appealing to rewards, there are more coding times for welfare sending out (sending goods by means of lottery, etc.) and limited-time second killing. This shows that the anchor is more focused on providing richer material

returns to the live streaming viewers, which also reflects that most consumers who watch the live streaming and purchase goods in the live streaming room pay more attention to the preferential prices of the goods. Exaggerated expressions are used more often than exaggerated tones in the linguistic style appealing to exaggeration. Although Li Jiaqi's exaggerated tone words such as "OMG" are popular all over the Internet, in the entire live broadcast market, the hosts use exaggerated tone cautiously. In the linguistic style of appealing to emotion, emotional interaction is more used by hosts. This is because the purpose of live streaming is to increase product sales. After the product links are on the shelves, the hosts hope to stimulate consumers' excitement to enhance their willingness to buy, thereby increasing the number of products sold. In the linguistic style of appealing to personality, it can be found that the two labels of content output and user experience are more mentioned, which shows that the hosts believe that the product content and the buyer's or the host's after-use experience is the consumers' most concerned content.

The Eviews software was used to test the correlation between the data samples of the independent variables  $X_1$  to  $X_5$ , and the results are shown in Table 6. The correlation coefficients between every two variables are both within 0.8. The least square method was used to estimate the parameters of the preliminary linear regression model (4), and the regression coefficient estimated value of the model (4) is obtained by using Eviews. Thus the prediction Equation (5) of model (4) is obtained:

$$\hat{Y} = 0.0013 - 0.1007X_1 + 0.0208X_2 - 0.5598X_3 + 0.6074X_4 + 1.0061X_5 \quad (5)$$

**Table 6.** Correlation analysis.

	$X_1$	$X_2$	$X_3$	$X_4$	$X_5$
$X_1$	1.0000				
$X_2$	0.0059	1.0000			
$X_3$	0.1457	−0.0314	1.0000		
$X_4$	0.0343	0.2302	0.0441	1.0000	
$X_5$	0.2096	0.2773	0.1903	0.1268	1.0000

The statistical test result of regression equation using Eviews software is shown in Figure 5. In the chart, variable  $c$  is a constant, and coefficient is the size of the coefficient corresponding to each variable. If the coefficient is positive, the parameter positively affects the  $y$  value. When the coefficient is negative, the parameter negatively affects the  $y$  value,  $t$ -Statistic and Prob. represent whether each parameter is significant, and  $F$ -Statistic and Prob ( $F$ -Statistic) represent whether the model is significant. The  $p$  value is a decreasing index of the reliability of the outcome. The larger the  $p$  value, the less it can be considered that the correlation of the variables in the sample is a reliable indicator of the correlation of the variables in the population. The absolute value of the  $t$  value corresponding to nearly half of the regression coefficients is less than 2. The original hypothesis cannot be rejected, which shows that these variables have no significant effect on the sales volume of goods.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001335	0.008529	0.156492	0.8758
$X_1$	−0.100696	0.171370	−0.587592	0.5575
$X_2$	0.020831	0.201753	0.103250	0.9179
$X_3$	−0.559760	0.189826	−2.948796	0.0036
$X_4$	0.607399	0.151127	4.019140	0.0001
$X_5$	1.006065	0.292604	3.438313	0.0007
R-squared	0.426750	Mean dependent var	0.051020	
Adjusted R-squared	0.411665	S.D. dependent var	0.115055	
S.E. of regression	0.088251	Akaike info criterion	−1.987135	
Sum squared resid	1.479758	Schwarz criterion	−1.886784	
Log likelihood	200.7392	Hannan-Quinn criter.	−1.946508	
F-statistic	28.28874	Durbin-Watson stat	1.707782	
Prob(F-statistic)	0.000000			

**Figure 5.** Predictive Model (5) first test result.



In view of the problem of insignificant variables in the statistical inference test of the above model, the stepwise regression method was used to quantitatively screen the variables. The VIF test was performed on the variables, the centered VIF results are all within 10, and the results are shown in Figure 6a. Therefore, it can be considered that there is no problem of multiple collinearity among data samples, and regression analysis can be performed.

Variable	Coefficient	Uncentered VIF	Centered VIF
C	6.84E-05	1.735923	NA
X <sub>3</sub>	0.033671	5.563523	3.338640
X <sub>4</sub>	0.021298	4.527962	3.120639
X <sub>5</sub>	0.057461	9.344314	5.547472

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000652	0.008270	0.078858	0.9372
X <sub>3</sub>	-0.581205	0.183497	-3.167385	0.0018
X <sub>4</sub>	0.620220	0.145939	4.249852	0.0000
X <sub>5</sub>	0.948204	0.239710	3.955627	0.0001

R-squared	0.425687	Mean dependent var	0.051020
Adjusted R-squared	0.416714	S.D. dependent var	0.115055
S.E. of regression	0.087871	Akaike info criterion	-2.005690
Sum squared resid	1.482502	Schwarz criterion	-1.938790
Log likelihood	200.5576	Hannan-Quinn criter.	-1.978606
F-statistic	47.43757	Durbin-Watson stat	1.704859
Prob(F-statistic)	0.000000		

(a)

(b)

**Figure 6.** Predictive model (5) second test results. (a) VIF test results of Model 6.; (b) model (5) second test result.

The variables X<sub>3</sub>, X<sub>4</sub>, and X<sub>5</sub> were screened to establish an optimized linear regression model:

$$\hat{Y} = 0.0007 - 0.5812X_3 + 0.6202X_4 + 0.9482X_5 \quad (6)$$

The same statistical test was performed on the model, and the results showed that the  $p$  values were all less than 0.05. At this time, when the significance level is  $\alpha = 0.05$ , the value of the F statistic =  $47.44 > F_{0.05}(2,193) = 3.00$ , indicating that the regression equation is significant. The  $t$  values of  $\beta_3, \beta_4$ , and  $\beta_5$  are all greater than  $t_{0.25}(193) = 1.960$ , indicating that the parameter  $t$  test in the model is significant, that is, X<sub>3</sub>, X<sub>4</sub>, and X<sub>5</sub> have significant effect on Y. The test results are shown in Figure 6b.

The results of the regression model show that the linguistic style of appealing to personality positively affects the sales volume, and the impact is the greatest; the linguistic style of appealing to emotion positively affects the sales volume of goods in the live streaming; on the whole, the linguistic style of appealing to logic negatively affects the sales of goods during live streaming.

The results of the above models are consistent with the results in Figure 4 that is, in the live streaming environment, the host should use the linguistic style of appealing to personality and emotion more for product promotion, and the linguistic style of appealing to personality is the most important factor influencing product sales volume. The linguistic style of appealing to emotion more directly mobilizes consumer emotions and thus has a positive impact on product sales.

In order to further understand the influence of different language styles on different types of goods, 196 samples were divided into commodity categories, and the coding data of six categories of goods, including clothing, ornament, beauty, daily necessities, digital and food, were modeled. After data normalization and correlation test, we performed the VIF test on six types of commodity data. The results are shown in the Figure 7 below. The test values are all less than 10, and there is no multilinearity; therefore, regression analysis can be performed. The following six regression models were obtained:

$$Y_1 = -0.0165 - 0.8041X_2 + 1.0516X_3 + 1.6436X_5 \quad (7)$$

$$Y_2 = 7.4957 + 4.5910\text{LN}X_5 \quad (8)$$

$$Y_3 = -0.0309 + 2.2671X_1 \quad (9)$$

$$Y_4 = 5.8945 + 1.5075\text{LN}X_1 + 1.8316\text{LN}X_5 \quad (10)$$

$$Y_5 = 10.7701 + 7.7626LN X_2 \quad (11)$$

$$Y_6 = 0.0510 + 1.3075LN X_1 \quad (12)$$

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.000127	9.602729	NA
X <sub>2</sub>	0.124023	4.395684	1.189361
X <sub>3</sub>	0.131105	4.422796	1.033397
X <sub>5</sub>	0.285486	8.606291	1.225730

(a)

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.000332	4.818633	NA
X <sub>1</sub>	0.442886	4.818633	1.000000

(c)

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	25.37721	44.65876	NA
LN X <sub>2</sub>	6.283616	44.65876	1.000000

(e)

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	22.98796	57.72155	NA
LN X <sub>5</sub>	3.094859	57.72155	1.000000

(b)

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	11.32756	91.39887	NA
LN X <sub>1</sub>	0.376319	35.95506	1.001081
LN X <sub>5</sub>	0.646477	59.41546	1.001081

(d)

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	4.431769	38.58104	NA
LN X <sub>1</sub>	0.384421	38.58104	1.000000

(f)

**Figure 7.** VIF test results of Models. (a) VIF test results of Model 7; (b) VIF test results of Model 8; (c) VIF test results of Model 9; (d) VIF test results of Model 10; (e) VIF test results of Model 11; (f) VIF test results of Model 12.

The data information in Figure 8 is consistent with that in Figure 6, that is, the significance of each parameter is judged by observing t-Statistic and *p* value, and the significance of the model is judged by F-Statistic and Prob (F-Statistic). In the result values of several equations, the *p* values of the above equations are all less than 0.05, and the *t* and *F* values are both significant. The results are shown in Figure 8. From the results of the above model, it is concluded that the linguistic style of appealing to personality (X<sub>5</sub>) has a positive effect on the sales volume of clothing, accessories, and household goods, which is consistent with previous research and previous hypotheses. The linguistic style of appealing to reward (X<sub>1</sub>) has a positive impact on the sales volume of beauty, food, and household goods. Consumers who purchase these types of goods pay more attention to rewards, so they are more affected by the linguistic style of reward. It can be found in the model results of the clothing product type that the linguistic style of appealing to logic (X<sub>3</sub>) has a positive effect on the sales volume of clothing, while the linguistic style of appealing to exaggeration (X<sub>2</sub>) has a negative impact on the sales volume clothing. It is worth noting that for the digital appliance type products, the linguistic style of appealing to exaggeration has a great positive influence on the sales volume of this type of product.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.016502	0.011286	-1.462101	0.1500
X <sub>2</sub>	-0.804139	0.352169	-2.283387	0.0267
X <sub>3</sub>	1.051625	0.362084	2.904369	0.0055
X <sub>5</sub>	1.643606	0.534309	3.076134	0.0034
R-squared	0.313321	Mean dependent var		0.018519
Adjusted R-squared	0.272120	S.D. dependent var		0.031370
S.E. of regression	0.026764	Akaike info criterion		-4.332332
Sum squared resid	0.035816	Schwarz criterion		-4.185000
Log likelihood	120.9730	Hannan-Quinn criter.		-4.275512
F-statistic	7.604743	Durbin-Watson stat		1.733982
Prob(F-statistic)	0.000277			

(a)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.495726	4.794576	1.563376	0.1439
LN X <sub>5</sub>	4.591027	1.759221	2.609693	0.0228
R-squared	0.362058	Mean dependent var		-4.907787
Adjusted R-squared	0.308896	S.D. dependent var		2.840362
S.E. of regression	2.361268	Akaike info criterion		4.687838
Sum squared resid	66.90704	Schwarz criterion		4.779132
Log likelihood	-30.81487	Hannan-Quinn criter.		4.679387
F-statistic	6.810496	Durbin-Watson stat		1.161955
Prob(F-statistic)	0.022815			

(b)

**Figure 8.** Cont.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.030905	0.018234	-1.694931	0.0981
X <sub>1</sub>	2.267086	0.665497	3.406606	0.0015
R-squared	0.229325	Mean dependent var	0.024390	
Adjusted R-squared	0.209564	S.D. dependent var	0.059823	
S.E. of regression	0.053186	Akaike info criterion	-2.982479	
Sum squared resid	0.110323	Schwarz criterion	-2.898890	
Log likelihood	63.14082	Hannan-Quinn criter.	-2.952041	
F-statistic	11.60496	Durbin-Watson stat	1.967987	
Prob(F-statistic)	0.001538			

(c)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.77008	5.037580	2.137947	0.0855
LNx <sub>s</sub>	7.762585	2.506714	3.096717	0.0270
R-squared	0.657292	Mean dependent var	-4.654235	
Adjusted R-squared	0.588750	S.D. dependent var	3.110030	
S.E. of regression	1.994425	Akaike info criterion	4.453545	
Sum squared resid	19.88865	Schwarz criterion	4.438090	
Log likelihood	-13.58741	Hannan-Quinn criter.	4.262533	
F-statistic	9.589659	Durbin-Watson stat	2.268165	
Prob(F-statistic)	0.026953			

(e)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.894471	3.365644	1.751365	0.0932
LNx <sub>1</sub>	1.507496	0.613449	2.457411	0.0220
LNx <sub>s</sub>	1.831574	0.804038	2.277969	0.0323
R-squared	0.335422	Mean dependent var	-5.349498	
Adjusted R-squared	0.277632	S.D. dependent var	2.112056	
S.E. of regression	1.795083	Akaike info criterion	4.116146	
Sum squared resid	74.11342	Schwarz criterion	4.261311	
Log likelihood	-50.50990	Hannan-Quinn criter.	4.157949	
F-statistic	5.804210	Durbin-Watson stat	1.461227	
Prob(F-statistic)	0.009105			

(d)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.051022	2.105177	0.024237	0.9809
LNx <sub>1</sub>	1.307490	0.620017	2.108796	0.0461
R-squared	0.162022	Mean dependent var	-4.330455	
Adjusted R-squared	0.125588	S.D. dependent var	1.812231	
S.E. of regression	1.694617	Akaike info criterion	3.969409	
Sum squared resid	66.04973	Schwarz criterion	4.068919	
Log likelihood	-47.61762	Hannan-Quinn criter.	3.996454	
F-statistic	4.447021	Durbin-Watson stat	1.974316	
Prob(F-statistic)	0.046058			

(f)

**Figure 8.** Model test results. (a) Model (7) test result; (b) Model (8) test result; (c) Model (9) test result; (d) Model (10) test result; (e) Model (11) test result; (f) Model (12) test result.

## 5. Discussion

During the live streaming process, consumers are more inclined to learn more product information in a short time. Therefore, the host should arrange as much time as possible to use the linguistic style of appealing to personality to promote products to consumers. Generally, more attention should be paid to the number of uses of the two labels of product content output and user experience. Through the introduction of product efficacy, price, etc., consumers can quickly grasp the basic information of the product. If the user experience is matched with the live demonstration, it can deepen the consumer's impression and make them trust the information generated by the content more, so as to make the decision to buy the product.

Hosts should appropriately use the persuasive style of appealing to rewards. When using this persuasive style, more attention should be paid to material rewards, such as the use of time-limited second killing, welfare sending, and other material returns that consumers can truly feel. In the current live streaming market, it is the original intention of live-stream shopping consumers to buy their favorite products at a more favorable price or to buy more products at the same price. In the limited live streaming time, compared with the spiritual return, the physical return is more direct and effective to stimulate consumers to make impulsive purchase decisions. However, the use of the linguistic style of appealing to reward also requires the host to have a stronger ability to negotiate. The preferential price will attract more consumers to buy goods and promote the increase in sales. The increased sales will enhance the host's live streaming level and influence, and increase the probability of getting more favorable commodity prices from suppliers.

The host should appropriately use the persuasive style of appealing to emotion. "Hands fast" and "remaining number of products" are positive feedback to consumers. They are channels for the host and consumers in the live streaming room to communicate about products, allowing consumers to understand the sales of products in real time. The transmission of this tension has mobilized consumers' desire to buy goods. Appropriate use of emotional linguistic style can stimulate consumers to place orders as soon as possible. Requesting to forward the language of the live streaming room is also a way to spread the live streaming room.

The advantage of the linguistic style of appealing to logic in live streaming is not obvious. Therefore, when the live streaming time is limited, the persuasive linguistic style of appealing to logic can be less considered. When the live streaming time allows, the logic

linguistic style can be used to correct the misconceptions of consumers and smash some false propaganda. The host can also use logical language such as establishing causality and telling the deduction process to make consumers more convinced of the purchasing value of goods.

Although the linguistic style of appealing to exaggeration is frequently used in live streaming, hosts must control the number of uses of the linguistic style to prevent the true effect of the product from being compromised in the hearts of consumers. Attention should also be paid to the use of exaggerated language. For some practical products, such as clothing, exaggerated language style is often used, but it will have a negative impact on sales. This is because consumers are more concerned about the quality and user experience of such products. Exaggerated language style takes up the limited time, and consumers cannot receive the information they want, which has a negative impact on consumers' purchasing decisions.

## 6. Conclusions

In this paper, we analyze the host language text in the social e-commerce environment with the reference to grounded theory, and finally obtain five linguistic persuasive styles, namely, appealing to personality, appealing to emotion, appealing to logic, appealing to reward, and appealing to exaggeration. In live streaming, hosts use the linguistic style of appealing to personality the most frequently, followed by appealing to reward, appealing to exaggeration, and appealing to emotion, and use the linguistic style of appealing to logic the least. By constructing a regression equation of the five linguistic styles and the number of product sales, it is concluded that the linguistic style of appealing to personality has the greatest positive impact on the number of product sales; the linguistic style of appealing to emotion has a relatively great degree of positive influence on the number of merchandise sales; the linguistic style of appealing to logic has a negative impact on the number of merchandise sales. For product categories such as beauty and cosmetics, household goods and food, the linguistic style of appealing to reward has a positive impact on product sales. In addition, this research has found that the same linguistic style has different effects of different types of goods. For example, the linguistic style of appealing to exaggeration has a negative impact on the sales volume of apparel products, but it has a positive effect on the sales volume of digital electrical products. Therefore, different linguistic styles should be used for different commodity types.

Previous research on the influence factors of consumer purchase intention or product sales in live streams was conducted from the perspective of consumers or the personal characteristics of the host. In the study of language persuasive style, research mainly focused on text reading and crowdfunding projects. Based on the persuasion model and grounded theory, the study of the linguistic style classification of the host language text in the live streaming environment is an innovative fusion and a new perspective in the field of live streaming research. Combining the existing research results of language persuasion style, this research is based on the Hovland persuasion model and the basic theory of Aristotle's rhetoric skills. In the live-stream shopping environment, the classification of the host's language persuasion style is not only a supplement of the existing persuasion model, but also an innovation in the study of linguistic style classification in live streaming. Our work has several limitations that can be explored in future research.

First, we encode the language of 452 effective live broadcast products and extracts keywords, and then accordingly builds an association model between linguistic styles and product sales. However, we do not extend the semantics of these keywords, such as synonyms and antonyms, which limits the scope of application. Therefore, in future research, some programming languages can be used to expand keywords to ensure the universal applicability of the regression model constructed in this study. Second, this paper only considers the linguistic style of the head hosts and related data collection, and only collects the host data of the Taobao platform, which may cause self-selection effects. Future research can expand the scope of the platform and the number of hosts, such as selecting

major live shopping platforms such as Taobao, TikTok, and Kwai, selecting relevant data of different levels of hosts, and further analyze the influence of the host's linguistic style on the sales volume of live streaming products. In addition, in view of the issue of live shopping impulse, it will be valuable for future research to investigate how different incentives in the same live broadcast room stimulate consumers' impulsive consumption.

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## Appendix A

**Table A1.** The number of uses of language labels for various types of goods.

	Ornaments	Clothing	Footwear	Luggage	Cosmetics	Stationery	Maternal and Child Products	Daily Necessities	Digital Appliances	Food and Health Products
Appealing to reward	84	334	69	22	252	52	91	203	58	277
Sending benefits	35	43	19	2	127	29	54	114	37	113
Value for money	9	48	5	3	12	4	3	9	1	6
Time-limited second killing	41	247	46	17	130	26	42	99	28	175
Appealing to exaggeration	102	405	91	36	159	34	62	102	44	239
Exaggerated description	96	379	87	35	155	34	61	102	44	236
Exaggerated tone	7	26	4	1	4	0	1	0	0	3
Appealing to logic	51	111	25	7	94	6	27	68	19	88
Logical deduction	33	49	6	2	46	3	9	42	12	21
Causal relationship	18	64	20	5	48	3	18	26	7	67
Appealing to emotion	113	358	93	27	222	35	61	136	40	160
Emotional shock	77	275	61	19	154	31	56	97	26	120
Request thanks	26	58	28	7	63	1	5	38	10	33
Devote effort	12	36	6	2	7	3	0	4	4	8
Appealing to credibility	259	882	127	44	379	71	131	255	104	526
Past Experience	13	32	8	1	20	2	3	9	5	39
Content output	194	560	82	30	242	46	84	172	65	317



Table A1. Cont.

	Ornaments	Clothing	Footwear	Luggage	Cosmetics	Stationery	Maternal and Child Products	Daily Necessities	Digital Appliances	Food and Health Products
Authoritative Institutions	5	21	1	3	5	7	10	11	5	45
Used Experience	46	321	32	16	126	17	37	75	32	136
Proper Nouns	11	19	10	0	19	0	5	1	3	34

## References

- Pang, B.; Lee, L. Opinion mining and sentiment analysis. Foundation. *Trends Inf. Retr.* **2008**, *2*, 1–135. [\[CrossRef\]](#)
- Li, S.G.; Zhang, Y.Q.; Liu, F. Economical user-generated content (UGC) marketing for online stores based on a fine-grained joint model of the consumer purchase decision process. *Electron. Commer. Res.* **2020**, *30*. [\[CrossRef\]](#)
- Feng, N.; Feng, H.; Li, D.; Li, M. Online media coverage, consumer engagement and movie sales: A PVAR approach. *Decis. Support Syst.* **2020**, *11*, 113267. [\[CrossRef\]](#)
- Burgers, C.F.; Graaf, A.M.D. Language intensity as a sensationalistic news feature: The influence of style on sensationalism perceptions and effects. *Communications* **2013**, *38*, 167–188. [\[CrossRef\]](#)
- Hovland, C.I.; Weiss, W. The influence of source credibility on communication effectiveness. *Public Opin. Q.* **1951**, *15*, 635–650. [\[CrossRef\]](#)
- Janis, I.L.; Hovland, C.I.; Field, P.B. *Personality and Persuasibility*; Yale University Press: New Haven, CT, USA, 1959.
- Tversky, A.; Kahneman, D. The framing of decisions and the psychology of choice. *Science* **1981**, *211*, 453–458. [\[CrossRef\]](#)
- Aristotle; Roberts, W.R. *Rhetoric*; Modern Library: New York, NY, USA, 1954.
- Petty, R.E.; Cacioppo, J.T. Issue involvement can increase or decrease persuasion by enhancing message-relevant cognitive responses. *J. Personal. Soc. Psychol.* **1979**, *37*, 1915–1926. [\[CrossRef\]](#)
- Krishnan, B.C.; Dutta, S.; Jhac, S. Effectiveness of exaggerated advertised reference prices: The role of decision time pressure. *J. Retail.* **2013**, *89*, 105–113. [\[CrossRef\]](#)
- Zhang, M.; Chen, C.; Hu, W.; Chen, L.; Zhan, J. Influence of source credibility on consumer acceptance of genetically modified foods in China. *Sustainability* **2016**, *8*, 899. [\[CrossRef\]](#)
- Berger, I.E.; Cunningham, P.H.; Kozinets, R.V. Consumer persuasion through cause-related advertising. *Adv. Consum. Res.* **1999**, *26*, 491–497.
- Yi, X.; Shen, X.; Lu, W.; Chan, T.S.; Chung, F.L.K. Persuasion driven influence analysis in online social networks. *Int. J. Conf. Neural Net.* **2016**, *10*, 4451–4456.
- Zboja, J.J.; Brudvig, S.; Laird, M.D.; Clark, R.A. The roles of consumer entitlement, persuasion knowledge, and perceived product knowledge on perceptions of sales pressure. *J. Mark. Theory Pract.* **2021**, 1–13. [\[CrossRef\]](#)
- Isaac, M.S.; Grayson, K. Beyond skepticism: Can accessing persuasion knowledge bolster credibility? *J. Consum. Res.* **2017**, *43*, 895–912. [\[CrossRef\]](#)
- Yang, S.-F. An eye-tracking study of the Elaboration Likelihood Model in online shopping. *Electron. Commer. Res. Appl.* **2015**, *14*, 233–240. [\[CrossRef\]](#)
- Matteucci, X.; Gnoth, J. Elaborating on grounded theory in tourism research. *Ann. Tour. Res.* **2017**, *65*, 49–59. [\[CrossRef\]](#)
- Junghans, N.M.; Holmberg, C.; Witt, C.M.; Teut, M. Thoughts, beliefs and concepts concerning infectious childhood diseases of physicians practicing homeopathic, anthroposophic and conventional medicine—A qualitative study. *BMC Complement. Med. Ther.* **2021**, *46*, 21.
- Iyer, K.; Jayasimha, K.R. Buying behaviour model of early adopting organizations of radical software innovations. *J. Bus. Ind. Mark.* **2021**, *36*, 1010–1026. [\[CrossRef\]](#)
- Hu, M.; Zhang, M.; Wang, Y. Why do audiences choose to keep watching on live video streaming platforms? An explanation of dual identification framework. *Comput. Hum. Behav.* **2017**, *75*, 594–606. [\[CrossRef\]](#)
- Lu, Z.; Xia, H.; Heo, S.; Wigdor, D. You watch, you give, and you engage: A study of live streaming practices in China. In Proceedings of the 2018 Chi Conference on Human Factors in Computing Systems, Montreal, QC, Canada, 21–26 April 2018.
- Ma, L.; Zhang, X.; Ding, X.; Wang, G. How Social Ties Influence Customers' Involvement and Online Purchase Intentions. *J. Theor. Appl. Electron. Commer. Res.* **2021**, *16*, 395–408. [\[CrossRef\]](#)
- Sun, Y.; Shao, X.; Li, X.T.; Nie, G.K. How live streaming influences purchase intentions in social commerce: An IT affordance perspective. *Electron. Commer. Res. Appl.* **2019**, *37*, 12. [\[CrossRef\]](#)
- Cai, J.; Wohn, D.Y.; Sureshababu, D. Utilitarian and Hedonic Motivations for Live Streaming Shopping. In Proceedings of the 2018 ACM International Conference on Interactive Experiences for TV and Online Video, Seoul, Korea, 26–28 June 2018; pp. 81–88.
- Wongkitrungrueng, A.; Dehouche, N.; Assarut, N. Live streaming commerce from the sellers' perspective: Implications for online relationship marketing. *J. Mark. Manag.* **2020**, *36*, 488–518. [\[CrossRef\]](#)
- Smith, C.T.; Houwer, J.D.; Nosek, B.A. Consider the source: Persuasion of implicit evaluations is moderated by source credibility. *Pers. Soc. Psychol. Bull.* **2013**, *39*, 193–205. [\[CrossRef\]](#)

27. Geiger, N. Do people actually “listen to the experts”? A cautionary note on assuming expert credibility and persuasiveness on public health policy advocacy. *Health Commun.* **2020**. [[CrossRef](#)] [[PubMed](#)]
28. Kirmani, A.; Rao, A.R. No pain, no gain: A critical review of the literature on signaling unobservable product quality. *J. Mark.* **2000**, *64*, 66–79. [[CrossRef](#)]
29. Chen, H.H. Managing e-channel profits: Signaling quality by selling through a reputable retailer. Business Management and Electronic Information. In Proceedings of the 2011 International Conference on Business Management and Electronic Information, Guangzhou, China, 13–15 May 2011; pp. 336–338.
30. Goering, E.; Connor, U.M.; Nagelhout, E.; Steinberg, R. Persuasion in fundraising letters: An interdisciplinary study. *Nonprofit Volunt. Sect. Q.* **2011**, *40*, 228–246. [[CrossRef](#)]
31. Vakratsas, D.; Tim, A. How advertising works: What do we really know? *J. Mark.* **1999**, *63*, 26–43. [[CrossRef](#)]
32. Archak, N.; Ghose, A.; Ipeirotis, P.G. Deriving the pricing power of product features by mining consumer reviews. *Manag. Sci.* **2011**, *57*, 1485–1509. [[CrossRef](#)]
33. Webber, P.; Wirth, W. When and how narratives persuade: The role of suspension of disbelief in didactic versus hedonic processing of a Candidate film. *J. Commun.* **2014**, *64*, 125–144. [[CrossRef](#)]
34. Tenorio, E.H.; Castro, M.A.B. Trump’s populist discourse and affective politics, or on how to move ‘the People’ through emotion. *Global Soc. Educ.* **2021**. [[CrossRef](#)]
35. Gentes, A.; Selker, T. Beyond Rhetoric to Poetics in IT Invention. *Hum. Comput. Interact.* **2013**, *8119*, 267–279.
36. Jeon, G.S. The study of ‘entanglement system’ according to the positioning of AD’s expression. *J. Basic Des. Art* **2011**, *12*, 461–476.
37. Choo, J.W. The current state and directions of advertising ethics in Korea. *J. Ethics* **2019**, *1*, 109–133.
38. Lee, Y.; Jo, Y.J.; Gim, H.Y. The effects of country image, attitudes toward a country, and purchase emotion on purchase intention of fashion products with a Korean images—Focusing on Korean female consumers. *J. Korean Soc. Cos.* **2009**, *59*, 111–123.
39. Blei, D.M.; Ng, A.Y.; Jordan, M.I. Latent Dirichlet allocation. *J. Mach. Learn. Res.* **2003**, *3*, 993–1022.
40. Fassinger, R.E. Paradigms, praxis, problems, and promise: Grounded theory in counseling psychology research. *J. Couns. Psychol.* **2005**, *52*, 156–166. [[CrossRef](#)]