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How Recommendation Algorithms Drive Beauty Product Consumption: An Analysis Based on Data of University Students on TikTok

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Abstract. With the widespread use of social media platforms among college students, recommendation algorithms have gradually become an important mechanism influencing their consumption behavior. This paper takes the TikTok platform as the research scenario to explore the impact of recommendation algorithms on college students' willingness to purchase beauty products. The study employs quantitative research methods, collecting 97 valid samples from a questionnaire survey. The survey content covers aspects such as usage behavior, recommendation perception, purchase history, and influencing factors. The data results are presented through methods such as proportion analysis and descriptive statistical analysis. The study found that respondents generally recognized the relevance and professionalism of TikTok's recommended content. Among them, 73.19% believed that the recommended content matched their own interests, and about 70% of respondents would make a purchase decision within 30 minutes of seeing the recommended content, showing that algorithm recommendations play a significant role in stimulating instant purchases and emotional consumption. Overall, recommendation algorithms significantly improve the purchase intention of beauty products through precise exposure and emotion enhancement mechanisms, providing a reference for social e-commerce platforms to optimize algorithm design and promote rational consumption.

Keywords: Recommendation algorithms, beauty product purchase intentions, college students, questionnaire survey, emotional consumption

1. Introduction

This study focuses on the reshaping of retail and marketing models brought about by the rapid development of social media platforms, especially the phenomenon of how the TikTok (Douyin) platform influences college students' beauty product consumption behavior through its recommendation algorithms. In recent years, the rapid growth of social media platforms has profoundly reshaped China's retail and marketing models [1]. As one of China's most influential short-video platforms, TikTok, with its highly intelligent recommendation algorithms and content

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distribution mechanisms, has not only changed the paths and models of brand communication and marketing but also reshaped consumers' purchasing decision-making processes [2]. Driven by recommendation algorithms, users' interests, interactive behaviors, and consumption preferences are continuously collected and analyzed in detail, leading to highly personalized and precise trends in the content users browse on social media and the product recommendations they receive [3].

This study is of importance for understanding the dissemination channels of beauty-related content in modern social media, and how algorithms affect college students' consumption behavior and aesthetic perception. Beauty consumption is a major consumption territory in daily expenditure of college student crowds, and individuals' purchase conversion of the beauty brand is closely related to their frequency of dissemination and recommendation on social media. For college students, beauty information dissemination not only relies on social media but is more an important medium for aesthetic perception formation and decision-making for consumption [4]. This is a consumer group with high interaction power, strong initiative, and great response to new brands, and they are more easily affected by algorithm-recommended beauty consumptions [5]. Plus, this study can help brands optimize their online marketing and communication strategies, but while algorithm recommendations stimulate the desire for consumption from beauty consumption, they may also have risks of information cocoons and aesthetic convergence, and consequently lead users to make impulse decisions without full rational cognition [6]. Hence, research on the influence paths and mechanisms of recommendation algorithms on college students' consumption behavior in the beauty ecosystem of the platform has important theoretical and realistic value.

In terms of research methods, we mainly follow the study path of "algorithm recommendation, beauty information dissemination, consumption behavior generation", focusing on how algorithm recommendation affects college students' desire for beauty products, beauty judgment and beauty consumption decision. In the research, we employ the literature review research method to search and read existing domestic and foreign research theories and researches, which enables us to comparatively sort out the theoretical framework of recommendation algorithm, social media dissemination and consumption decision; This way, it can lay a solid theoretical basis for extending research. Also, this study uses online questionnaire survey method to grasp first-hand data, which is conducive to summarize more comprehensively the relationship between recommendation algorithm and college students' beauty consumption behavior and promote the development of this study.

Finally, the goal of this study is to reveal how social media recommendation algorithms influence college students' consumption decisions on beauty products layer by layer, from information exposure and emotional triggers to purchasing behavior. To achieve this goal, this study systematically analyzed and discussed variables such as push frequency, user engagement on social media, consumer preferences, and actual purchasing behavior.

2. Literature review

In recent years, research on the relationship between short video platform recommendation algorithms and consumer behavior has narrowed its scope from the broad concept of "social media influence" to a more focused discussion on the specific mechanisms by which algorithms stimulate users' impulsive and immediate purchasing behavior. In the context of short videos, many users passively receive a lot of recommended content through personalized information streams. This process is based on the platform's deep analysis of user data and accurate capture of preferences. Related research shows that the quality of recommended content and the matching degree of personalized recommendations can greatly improve user satisfaction and participation, and users' willingness to buy will also be higher. However, with the rapid development of personalized

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recommendations, users are paying more and more attention to the protection of personal privacy and are very concerned, which to some extent affects their trust in the platform [7]. Similarly, empirical research on the Douyin platform has also found that the quality of algorithm recommendations can indirectly promote consumption decisions by strengthening user trust [8]. In addition, personalized push of short videos generally improves users' impulsive consumption behavior of "wanting to buy when they see it" by stimulating user emotions, flow experience and active interaction [9]. Taking Generation Z and college students as examples of beauty consumers, many studies at home and abroad have pointed out that short video marketing on TikTok and Douyin can increase college students' willingness to buy beauty products. In general, the authenticity of the content, brainwashing marketing and trust in internet celebrities or celebrities are the main influencing factors [10,11]. Regarding the current network environment in China, some researchers have pointed out that the functional experience and content quality of the Douyin platform can not only enhance college students' sense of immersion and trust, but also further deepen the sense of immersion by improving interactivity, thus enabling users to make purchases [12]. Secondly, when users realize that "the algorithm can accurately understand and match their own needs and ideas", they are more likely to develop a certain liking for the recommendations or the platform and may become loyal customers. Therefore, "algorithm matching degree" is an important reason affecting beauty consumption behavior [13].

Regarding live streaming and Douyin simulated small shops, many studies have shown that the platform algorithm plus the interaction with users can further promote users' impulsive consumption. For example, on platforms such as TikTok Shop, users are often worried about missing out on discounts, limited products, and entertainment, which can stimulate users' personal emotions and flow experience to a certain extent, significantly increasing the probability of users' impulsive purchases [14,15]. In addition, domestic scholars have also found that Douyin's "planting grass" type short videos play a connecting role between stimulating consumers' shopping desire and the impulsive purchase intention of Generation Z by improving users' flow experience. In particular, the pleasant and relaxed live broadcast atmosphere will further strengthen this connecting role [12]. It is worth mentioning that users will also actively adjust their browsing and interaction behavior to make the recommendation algorithm form muscle memory. This behavior, in turn, strengthens the influence of the platform algorithm on consumer behavior [7].

However, there are still many shortcomings in the current research. Most of the literature focuses on users' purchase intentions and rarely tracks actual purchase behaviors such as adding to cart or placing an order immediately. In addition, the evaluation criteria for the exposure of recommendation algorithms are generally based on users' subjective perceptions, which leads to the platform sometimes lacking objective, quantifiable experimental design and credible data. Future research needs to do more research on objective indicators and design some more scientific experimental methods to improve the effectiveness of judging the factors affecting actual purchase behavior and the persuasiveness of research conclusions [12].

3. Research methods

3.1. Questionnaire survey

This study takes how TikTok's recommendation algorithms influence college students' beauty consumption behavior as its core issue. The questionnaire was designed from four dimensions: demographic characteristics, platform usage behavior, algorithm perception, and beauty consumption behavior, with a total of 20 questions (including 17 single-choice questions and 3

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multiple-choice questions). The overall structure aims to systematically capture college students' usage of the TikTok platform, their interactive experiences with recommendation algorithms, and their actual beauty purchasing behavior, providing reliable first-hand data for subsequent research.

Firstly, demographic variables. This section intends to show the basic background of the respondents, so as to construct a respondent sample characteristic profile and serve the later group difference analysis. Mainly involving respondents' gender, grade, monthly disposable income, etc. These are indicators that reflect differences among the college students in terms of economic conditions and growth stages, and are likely to be important factors that elaborate their beauty consumption ability and preference.

Secondly, usage behavior variables. This part investigates respondents' daily habit on the TikTok platform, the measure of frequency of touch and interaction with recommendation algorithm, including daily duration on TikTok, how many beauty bloggers are followed, how often the beauty content is seen in a week, etc. The distribution of social media usage frequency and content interest, which are important factors to analyze people's easy to be influenced by the recommended content, are fairly examined by these variables.

Algorithmic perception variables refers to the subjective perception and cognition of respondents on recommendation algorithms, including the degree of matching between recommended content and personal preferences, algorithmic components that affect their purchase intention, and reasons for abandoning purchase, which are used to unveil users' cognitive judgments and emotional responses under the algorithm push notification, and facilitate the understanding of the mechanism of how recommendation algorithm stimulates consumption decision generation.

The study evaluate the variable of consumption behavior of beauty by using specific purchase behavior data to measure the impact of recommendation algorithm on consumption behavior, that is, the number of beauty purchases made by interviewees in the past three months, the actual consumption amount that is generated due to temporary or impulsive purchases caused by recommendations, the time taken from recommendation to order placement, the degree of reliance on heat indicators such as the number of likes and comments, etc. In addition, question items were also set up to assess whether brand selection is increasingly convergent, and overall impression of purchasing, to further see whether recommendation algorithm triggers aesthetic convergence or brand concentration tendency consumption process.

3.2. Data collection

This study collected data via an online questionnaire, which was distributed to college students retrieved on the questionnaire websites. A self-administered questionnaire can allow respondents to provide authentic data about their usage and consumption experiences. Seventy valid questionnaires were ultimately obtained, the sample of which were college students from different regions of China. Data from the questionnaires has good authenticity, universality and completeness, sufficient to facilitate a relatively accurate portrayal of beauty-related exposure and usage behavior consumption among college students.

3.3. Data analysis tool

3.3.1. Selection and reasons for analytical tools

This study uses Python and Octoparse (a web crawler) to collect data on the browsing and transaction volume of beauty-related content among university students on the platform. This data

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can provide support for understanding the relationship between the depth of exposure to beauty content and the purchase rate. Secondly, SPSS analysis is used to analyze the obtained crawled data to demonstrate the relationship between beauty content recommendations and purchases.

3.3.2. Expected results

Based on the collected data and analysis results, this study aims to prove the research hypothesis that beauty recommendation algorithms have a direct impact on university students' beauty shopping, promoting impulsive fashion consumption and accelerating the consumer decision-making process. Simultaneously, the study aims to identify current limitations based on data results, such as online questionnaires.

4. Data analysis results

Based on data from 97 valid samples, a systematic analysis was conducted on college students' usage behaviors, perceptions of algorithm recommendations, and beauty consumption behaviors on the TikTok platform, aiming to reveal the mechanism of action of recommendation algorithms in beauty consumption on social media platforms. The analysis mainly includes five parts: demographic characteristic analysis, usage behavior analysis, algorithm perception analysis, beauty consumption behavior analysis, and comparative analysis.

4.1. Demographic characteristic analysis

Among all samples in this study, female respondents accounted for a higher proportion. The accounts were 71.13% females and 28.86% males. The overall trend of this gender structure is generally consistent with the trend in the beauty consumption market. This indicates that this part of the sample is highly rational in its gender structure, laying the realistic foundation for our subsequent analysis. From the point of view of grade composition, senior students (fourth-year undergraduates) accounted for the highest proportion (39.18%), and those for younger students are sophomores and freshmen, accounting for almost 20% of each. The sample covers students of different grades, with some degree of maturity difference. Looking again from the perspective of life quality and consumption capacity, most students have a monthly disposable income concentrated in the range of 1000–1999 yuan (36.08%), followed by those with more than 3000 yuan (30.93%). It can be judged that most of the world of college students have light to moderate consumption capacity and remain a torchbearer of stable capacity in our consumption campaign, at the same time, beauty products seem to be one of their fixed consumption categories.

Overall, the structure of the sample in terms of gender, grade and consumption capacity is in line with the characteristics of the college student beauty consumer group and is highly representative.

4.2. Analysis of TikTok usage behavior

The data indicates that college students use TikTok with relatively high frequency. Among the respondents, 37.11% spend 30 to 60 minutes on the platform per day, 27.84% use it for 1 to 2 hours, and another 16.49% spend over two hours daily. This shows that TikTok is a social media platform favored and frequently used by most college students over an extended period, providing a foundational condition for the recommendation algorithm to continuously push beauty-related content. As for attention to beauty content, 74.23% of the respondents follow more than six beauty bloggers or brand accounts, with 10.31% following over 15. This demonstrates that college students

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not only frequently encounter beauty content on the platform but also exhibit strong proactive content subscription behavior. Regarding the beauty-related recommended content seen within a week, 64.95% of the respondents reported seeing "a moderate or considerable amount," while another 11.34% indicated seeing "a great deal." This result implies that the algorithm has a wide coverage and high frequency in pushing beauty content to college students, creating a continuous information exposure environment.

A comprehensive analysis reveals that college students' TikTok usage habits, the types of content they follow, and their frequency of information exposure all indicate a high level of interaction with the recommendation algorithm, making their beauty consumption behavior more susceptible to algorithm-driven recommendations.

4.3. Analysis of perception of recommendation algorithms

Data shows that 25.77% of college students believe that the beauty content recommended by TikTok "perfectly matches" their consumption preferences, while 47.42% consider it "fairly matching." This indicates that most college students highly recognize the accuracy of algorithm-based recommendations. The precision of the algorithm also provides a necessary condition for subsequent consumption behavior. In terms of factors influencing purchase intention, 49.48% of college students regard "the professionalism and credibility of bloggers" as the most critical factor, followed by precise matching between content and their own needs (47.42%), and the authenticity of video content (36.08%).

4.4. Analysis of beauty consumption behavior

For specific consumption behavior, the largest proportion of surveyed college students (43.3%) reported purchasing beauty products 2 to 3 times in the past three months, while 20.62% purchased 4 to 6 times, and 8.25% made over 6 purchases during this period, indicating that some college students have developed a relatively high purchase frequency and stable consumption habits. Regarding impulsive consumption, 42.27% of college students reported making "impromptu purchases" 2 to 3 times in the past three months due to encountering recommended content, while approximately 24% reported making more than 4 such purchases. The high proportion of impulsive purchases suggests that recommendation algorithms have a significant influence in triggering immediate emotions. For purchase amount, 71% of college students spent between 100 and 300 yuan (40.21%) or less than 100 yuan (30.93%) on beauty products purchased via TikTok in the past three months. This indicates that college students tend to purchase moderately priced or low-cost beauty products and are more easily influenced by the rapid "grass-planting" content primarily presented in short videos on the TikTok platform. Regarding purchase speed, 35.05% of college students completed their purchases within 5 minutes of seeing a recommendation, while 34.02% made their decisions within 5 to 30 minutes. Such rapid conversions indicate that algorithm-based recommendations not only influence consumption intention but also significantly accelerate the purchasing process. Notably, 67.02% of college students agreed that "the brands they purchase are gradually concentrated among a few," reflecting a certain degree of information cocooning and brand convergence. This suggests that algorithm-driven recommendations may lead users to focus increasingly on brands repeatedly recommended by the platform, reducing their exploration of new or niche brands.

Finally, in the evaluation of the overall impression, it is gratifying to see that disposable students more than 75% of students said they had a good impression of the beauty products purchased on

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TikTok. The above circumstance seems to indicate that the effect of the algorithm on the beauty consumption ecosystem overshadow its adverse effect, and also indicate the overall high satisfaction, preference and trust degree of TikTok in the beauty whole e-commerce field.

4.5. Comparative analysis

Based on the comparative results across different variables, there is a clear correlation between TikTok's recommendation algorithm and the beauty product consumption of college students. For example, taking platform usage intensity into consideration, among students who use TikTok for more than 1 hour/day (44.33%), 43.3% had purchased 2-3 beauty products within three months and 35.05% of students quickly placed their orders within 5 minutes; however, the proportion of students engaging in 'impulse buying' was relatively lower among students who use TikTok for less than half an hour each week. This shows more frequent usage makes students more vulnerable to stimuli presented by the recommendation algorithm. Taking content exposure into account, among students who reported seeing a "relatively large amount" or "a great deal" of beauty content in a week (35.05%), 20.62% reported making 4-6 purchases, which was much higher than those lower exposure (i.e., around 14%). This shows that repeated content recommendations cumulatively persuade users and strengthen their intention to consume. In addition, there is a link between matching degree of the recommended content and impulse purchases. Students who considered TikTok's recommendations as "highly relevant" when they saw them (35.05% of respondents), placed their orders within 5 minutes, while only about 8% respondents states that they quickly ordered within 5 minutes when "the recommendations have nothing to do with my preference at all". Therefore, users are likely to find it easier to quickly place their orders with an algorithm that has higher recommendation precision.

Overall, through high exposure, high matching degree, and rapid emotional stimulation, TikTok's recommendation algorithm can stimulate college students' beauty consumption behavior and greatly increase their frequency of consumption and speed of which they consume.

5. Discussion

The research results show that college students are a high-frequency user of beauty recommendations on TikTok, and algorithmic recommendations have a significant impact on their purchasing decisions. 64.95% of respondents use TikTok for 30 minutes to 2 hours daily, and over 60% follow more than 6 beauty bloggers. Such a high intensity of use creates the circumstances of the possibility of accurate algorithmic targeting. 73.19% of the respondents consider that the suggested content is relevant to their interests, which implies that the personalization mechanism of the algorithm is effective and decreases the search costs of users and increases the interest and confidence by matching information. It is important to note that 69.07% of the respondents order the product within 30 minutes after reading the recommended content, and 35.05% of the customers decide on making a purchase within 5 minutes, which means that emotional arousal and stimulating information are critical factors to influence impulse buying. This implies that the algorithm does not merely present the content to the user, but also manipulates the short-term emotional intensity of the user by being exposed to it continuously, through visual effects, and indirectly by influencers, which leads to impulsive consumption behavior.

Meanwhile, the research also reveals key variables influencing users' purchase intentions—trust mechanisms and content quality. The survey shows that 49.48% of users consider the professionalism and credibility of influencers as the main driving force, and 47.42% believe that

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accurate content matching promotes purchases. Trust is greatly compromised by false advertising (46.39%), and suspected sponsored content (43.3%). It means that college students do not blindly follow the recommendations provided by the algorithm but make their judgment according to the authenticity of the information and the credibility of the bloggers. Thus, trust is a significant prerequisite to enhance the performance of algorithms and the limit of its effects. Once trust is damaged, the conversion efficiency brought by the algorithm will rapidly decline.

Based on the above findings, this study proposes three recommendations: First, platforms need to enhance their content review and authenticity verification functions so that they reduce exaggerated statements and over-sell to ensure users remain believer in the recommendation mechanism. Second, bloggers and companies ought to make their content more professional and transparent and improve the way they present the product efficacy, use cases, and real-life experiences to minimize risks in user decision-making. Third, media literacy among users should also be improved, which is to be rational about consuming the recommended content and not to consume it on a whim when exposed periodically, but rather to be guided by the emotions. Furthermore, platforms can appropriately increase the diversity of content in their recommendations to mitigate the trend of aesthetic convergence and concentrated consumption.

Overall, this study shows that TikTok's recommendation algorithm significantly increases college students' willingness to purchase beauty products through the combined effects of precise exposure, emotional reinforcement, and trust mechanisms. However, the positive impact of the algorithm depends on the quality of content and the stability of the trust environment. Once false advertising or excessive exposure occurs, the resulting negative experiences may weaken the algorithm's long-term influence. Therefore, the balance between platform design, content ecosystem, and user behavior will determine the sustained effectiveness of the recommendation algorithm in the beauty product consumption field.

6. Conclusion

This study analyzed the impact of TikTok's recommendation algorithm on college students' willingness to purchase beauty products through a questionnaire survey. The results showed that the algorithm significantly enhanced purchase intention through content matching, influencer credibility, and emotional arousal, especially demonstrating a clear tendency towards immediate decision-making. However, false advertising and suspected soft advertising weakened trust and limited the algorithm's positive effects. Based on this, this study argues that the influence path of recommendation algorithms consists of precise exposure, trust building, and emotional reinforcement, playing a crucial role in beauty product consumption. This research provides valuable theoretical and practical references for understanding social media consumption behavior under the background of recommendation algorithms, supplementing empirical evidence on the mechanism by which algorithms influence purchasing, and highlighting the key roles of trust and emotion in the consumption path. Future research could further expand the sample size, introduce more objective behavioral data or experimental methods, and focus on changes in consumption preferences and aesthetic convergence under the long-term effects of algorithms, to more comprehensively reveal the continuous impact of algorithms on user decisions.

Authors contribution

All the authors contributed equally and their names were listed in alphabetical order.

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