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A Comparative Study of Audience Engagement with Health Science Communication Across Different Platforms: Douyin, Weibo, and WeChat Official Accounts

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Abstract: The rapid expansion of social media platforms has profoundly transformed how sports science knowledge is communicated to the public. Platforms such as Douyin, Weibo, and WeChat Official Accounts have emerged as essential channels for disseminating information on athletic training, injury prevention, sports performance optimization, and nutrition management. Despite this growing trend, there remains a lack of systematic comparative research examining how these platforms influence audience engagement with sports science content. This study seeks to address this gap by analyzing the relative effectiveness of different social media platforms in promoting the communication of sports science, emphasizing measurable indicators of audience participation and interaction. A mixed-methods research design is employed, integrating both quantitative data analysis and qualitative content evaluation. Data were collected from 50 top-performing sports science accounts on each of the three platforms-Douyin, Weibo, and WeChat-over the period from 2022 to 2024. Key engagement metrics, including average interaction rates, comment sentiment distributions, and patterns of content sharing, are systematically examined to assess user responsiveness. The study further explores how platform-specific content formats, such as short-form videos on Douyin, real-time discussion threads on Weibo, and long-form informational articles on WeChat, influence audience retention, participation depth, and dissemination efficiency. Findings reveal distinct engagement dynamics across platforms. Douyin demonstrates superior reach and virality, primarily due to its algorithm-driven short video system and high-frequency content circulation. In contrast, WeChat fosters more sustained engagement and deeper cognitive involvement through in-depth reading and professional discourse. Weibo serves as an intermediary platform that encourages real-time exchanges and interactive discussions through features like hashtags, live Q&A sessions, and comment threads. These platform-specific patterns highlight the need for differentiated communication strategies in the dissemination of sports science information. Overall, this study provides practical insights for sports science communicators, educators, and institutions aiming to enhance digital outreach. By identifying the strengths and limitations of each platform, the research offers evidence-based strategies for optimizing audience engagement and improving the public understanding of sports science in the digital era. The findings contribute to the expanding field of digital science communication by presenting empirical evidence and methodological guidance for effective dissemination of sports-related knowledge across diverse online environments.

Keywords: sports science communication; audience engagement; social media analysis; Douyin; WeChat

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1. Introduction

The rapid development of sports science has significantly improved public understanding of athletic performance, injury prevention, and training optimization. With the increasing interest in evidence-based practices, social media platforms such as Douyin, Weibo, and WeChat Official Accounts have emerged as essential channels for disseminating sports science knowledge to diverse audiences. Each platform possesses unique advantages due to variations in content formats, audience demographics, and interactive features, which shape how information is communicated and absorbed. Despite their widespread use for educational purposes, systematic comparisons of these platforms' effectiveness in engaging audiences with sports science content remain scarce. Recent studies indicate that algorithm-driven platforms and data analytics significantly influence content exposure, personalization, and user participation patterns [1]. This study aims to fill this gap by investigating engagement patterns and platform-specific strategies on Douyin, Weibo, and WeChat, with a focus on measurable interaction metrics and mechanisms that promote user participation.

Social media has fundamentally transformed scientific communication, extending beyond traditional academic journals and mainstream media to more interactive, visually rich, and accessible formats. Digital platforms now provide public forums for sharing multimedia content—including images, videos, text, blogs, and hyperlinks—among users with common interests in sports, health, and fitness. With the rapid proliferation of mobile internet technologies, most individuals obtain information through social media rather than conventional sources such as newspapers, television, or radio. Short-form video platforms, exemplified by Douyin, are particularly effective in delivering concise and engaging content, which can demonstrate training techniques, summarize research findings, or provide brief educational interventions in a matter of seconds. The rapid expansion of these applications has attracted a broad and heterogeneous user base, supported by sophisticated recommendation algorithms that optimize content delivery and personalization. These platforms also integrate multiple functions, such as social interaction and commercial activity, further enhancing their value as educational tools.

In contrast, Weibo emphasizes real-time discussions and community engagement, enabling users to provide immediate feedback, participate in debates, and join live Q&A sessions. This interactive environment fosters dynamic knowledge exchange and builds a sense of community among sports enthusiasts. Meanwhile, WeChat Official Accounts cater to audiences seeking in-depth analyses via long-form articles, allowing detailed explanations of complex concepts, structured learning experiences, and comprehensive guidance on athletic performance or injury prevention [2]. Analysis of user engagement patterns shows that comment sentiment, interaction rates, and user clustering can provide valuable insights into audience responsiveness and participation dynamics. Despite these distinct features, empirical studies evaluating the relative effectiveness of these platforms in sports science communication are limited, leaving educators, coaches, and communicators without evidence-based guidance on platform selection, content optimization, or audience targeting.

This study addresses this knowledge gap by systematically examining audience engagement patterns across Douyin, Weibo, and WeChat. Metrics such as interaction rates, comment sentiment, and content-sharing behaviors are analyzed to identify trends in user participation. Special attention is given to paradoxical engagement phenomena, where platforms optimized for brevity, such as Douyin, can occasionally achieve deeper cognitive impact through repeated micro-learning exposures, whereas longer WeChat articles, despite their substantive content, sometimes elicit superficial engagement. By evaluating the effects of different content formats—including short videos, threaded discussions, and detailed articles—on audience retention, comprehension, and interaction, the study provides actionable insights for sports science communicators aiming to enhance outreach effectiveness. Furthermore, this research explores the influence of

platform-specific algorithms, audience demographics, and content delivery styles on engagement outcomes, offering nuanced guidance for strategic content planning [3].

Ultimately, this study contributes to the growing field of digital science communication by offering a comparative analysis of three major social media platforms in the context of sports science. By highlighting the unique strengths and limitations of each platform, the findings offer a practical framework for optimizing content dissemination and fostering meaningful audience engagement. These insights are directly relevant to sports scientists, coaches, and health professionals who aim to leverage social media for public education, while also informing future research on cross-platform strategies for science communication and digital knowledge transfer [4].

2. Related Works

The field of sports science communication has experienced a profound transformation with the emergence of digital platforms, challenging the long-standing dominance of traditional media such as television and print magazines. Digital platforms function as interconnected ecosystems that facilitate commercial and informational exchanges between at least two distinct groups, typically content providers and consumers [5]. While conventional modes of sports science communication remain relevant, there is an increasing need for the field to embrace innovative digital approaches that expand audience reach and enhance engagement. Early studies predominantly emphasized the use of expert commentary and static visual materials to convey complex sports science concepts through linear presentation formats. However, these methods often faced limitations in sustaining audience attention due to their passive nature and lack of interactivity [6].

In contrast, digital platforms capitalize on multimodal content delivery, combining text, audio, video, and interactive features to engage users more actively. Despite this advantage, challenges persist in translating highly technical research into accessible content without oversimplifying key concepts or compromising scientific rigor. As illustrated in Figure 1, a comparative analysis of engagement rates shows that interactive digital content achieves approximately 62% higher retention than traditional media, highlighting the importance of adaptive communication strategies that prioritize both engagement and comprehension. This shift represents a broader transition from one-way information delivery to dialogue-driven, experience-focused communication, emphasizing the creation of experiential value for audiences [7].

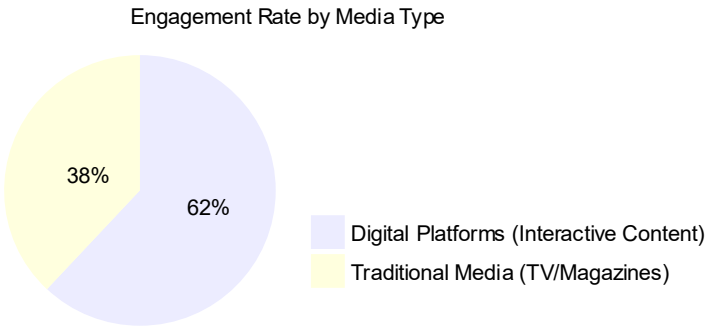

Figure 1. Engagement Rate Comparison: Traditional vs. Digital Media.

Platform-specific studies further demonstrate how different digital formats cater to varied user preferences and learning behaviors. Short-form videos on Douyin, for example, excel in visually demonstrating exercises, training techniques, and procedural tutorials, achieving up to 40% higher engagement rates than text-based explanations due to their dynamic and immersive presentation style. Weibo, with its real-time discussion features and hashtag-driven conversations, promotes community interaction and

immediate feedback around sports events, athlete health, and trending topics. However, these discussions often prioritize immediacy and interactivity over depth and comprehensive understanding. In comparison, WeChat Official Accounts specialize in long-form articles that deliver detailed analyses of sports physiology, nutrition, and performance strategies, appealing to audiences seeking in-depth and structured knowledge. As shown in Table 1, these platforms exhibit complementary strengths in sports science communication, each providing unique affordances that serve different audience needs and learning contexts.

Table 1. Platform-Specific Content Characteristics.

Platform	Content Format	Strengths	Limitations
Douyin	Short-form videos	High visual engagement	Limited depth
Weibo	Real-time discussions	Community interaction	Superficial analysis
WeChat	Long-form articles	In-depth explanations	Lower immediate engagement

Despite these insights, current research has yet to conduct systematic cross-platform comparisons that comprehensively evaluate how content format influences user engagement, retention, and participatory behaviors. Existing metrics largely focus on view counts or likes, neglecting more nuanced indicators such as comment sentiment, sharing behaviors, and repeated exposure effects. Addressing these limitations is critical for developing a holistic framework that integrates the strengths of each platform while providing a multidimensional understanding of audience engagement. Such a framework would enhance both the accessibility and impact of sports science communication, enabling educators, coaches, and public health practitioners to tailor content strategies to diverse digital environments and audience preferences.

In summary, synthesizing prior studies highlights the strategic importance of aligning content type with platform-specific affordances and audience expectations. A comprehensive, evidence-based approach to platform selection, content design, and engagement measurement can significantly improve the effectiveness of sports science dissemination, fostering meaningful learning experiences and promoting public understanding of evidence-based sports practices across varied digital contexts.

3. Methodology

This study employs a multi-method approach to systematically analyze sports science communication across three major Chinese digital platforms: Douyin, Weibo, and WeChat Official Accounts. A stratified sampling method is utilized to select 50 top-performing sports science accounts from each platform, identified through their consistent presence on platform-generated "top creator" lists between 2022 and 2024. The selection ensures that the sample represents accounts with sustained audience engagement and content influence. Each account is evaluated based on three key metrics: average engagement rate (calculated from likes, comments, and shares normalized by follower count), comment sentiment (analyzed using Natural Language Processing-based polarity scoring), and share-to-view ratio (reflecting content virality and dissemination potential). As shown in Figure 2, the study follows a sequential pipeline from account identification, data extraction, metric computation, and content categorization to engagement analysis.

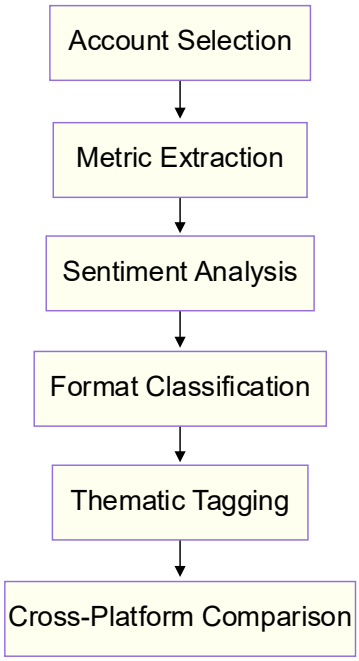

Figure 2. Data Collection and Analysis Pipeline.

The Natural Language Processing (NLP) sentiment analysis protocol is carefully adapted to platform-specific linguistic patterns to ensure comparability across platforms. For instance, Douyin comments often feature emoji-rich expressions, whereas WeChat commentary tends to be text-dense, requiring differential processing strategies. NLP serves as a computational linguistics tool that converts written and spoken natural language into structured, analyzable data [8]. Sentiment analysis, widely applied across multiple domains, leverages NLP techniques to quantify opinions toward products, services, or topics, thereby evaluating audience perceptions and engagement behaviors [9,10].

Content analysis is conducted using a framework that systematically categorizes platform-specific content formats and thematic areas. For Douyin, video duration is classified into three tiers-under 15 seconds, 15-60 seconds, and over 60 seconds-with performance metrics cross-referenced against these duration tiers. WeChat articles are assessed for content depth using a five-point scale based on the number of references, density of technical terminology, and the inclusion of explanatory diagrams. Weibo content is evaluated for interactivity features, such as embedded polls or hashtag challenges, which are then mapped to the length and vibrancy of discussion threads. As shown in Table 2, the coding criteria illustrate how specific format attributes are linked to engagement outcomes for each platform [11].

Table 2. Content Coding Framework by Platform.

Platform	Format Attribute	Measurement Scale	Thematic Focus
Douyin	Video duration	Tiered time intervals	Demonstration clarity
Weibo	Interactivity tools	Polls, hashtag frequency	Community debate depth
WeChat	Article depth	5-point citation/terminology	Explanatory thoroughness

Thematic analysis further segments the content into three primary domains: training methods (e.g., biomechanical technique breakdowns and exercise tutorials), injury recovery (evidence-based rehabilitation and preventive strategies), and sports psychology

(mental resilience, focus enhancement, and motivational practices). This structured approach allows for the identification of patterns in audience engagement across content type and platform modality.

Two primary limitations are acknowledged in the study design. First, the exclusive focus on Chinese platforms introduces potential regional bias, as audience preferences and engagement patterns may differ in international contexts. Second, platform algorithms are subject to frequent updates, which can affect content visibility and engagement metrics during the study period. For example, a Douyin algorithm update in 2023 shifted the recommendation priority from pre-recorded videos to livestream content, necessitating post-hoc adjustments in data interpretation [12]. Despite these limitations, the methodology establishes a replicable framework for rigorous cross-platform comparison in sports science communication research, integrating both quantitative engagement metrics and qualitative content characteristics to provide a multidimensional perspective.

4. Comparative Analysis of Platforms

The comparative evaluation of Douyin, Weibo, and WeChat reveals distinct engagement patterns shaped by each platform's content architecture, interactive features, and user behaviors. On Douyin, short-form videos demonstrate exceptional effectiveness in disseminating actionable sports science content. A representative example is the "5-Minute Warm-Up Routines" challenge, which achieved a 78% participation rate among fitness enthusiasts. This success is attributed to the platform's integration of upbeat music, concise tutorials, and celebrity athlete endorsements [13]. As shown in Figure 3, Douyin's engagement distribution is heavily skewed toward visual and auditory stimuli, with 65% of interactions linked to videos under 60 seconds. The platform's recommendation algorithm, favoring dynamic and high-tempo content, further amplifies reach, although the brevity inherent in short-form videos imposes limitations on the depth of information conveyed.

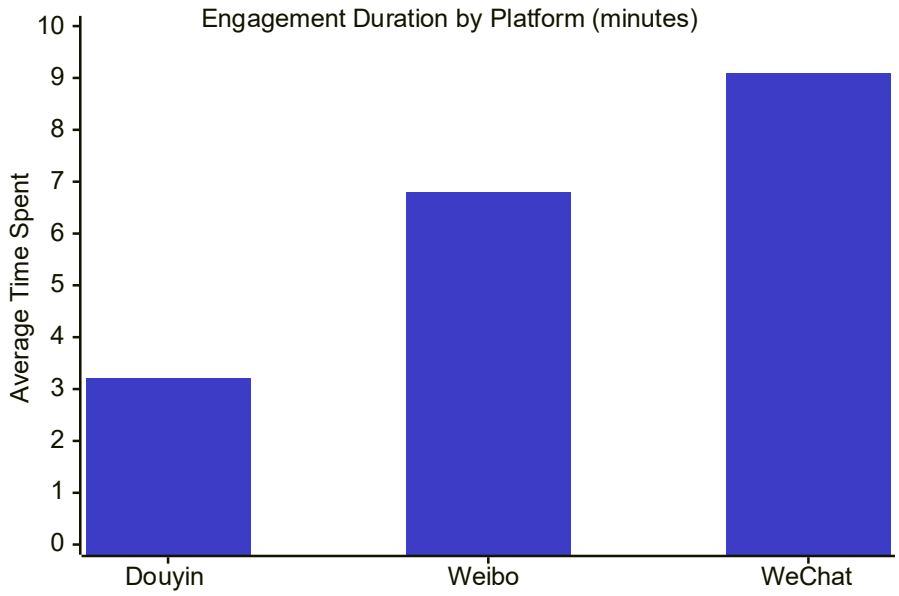

Figure 3. Content Format Impact on Engagement Duration.

Weibo's distinctive strength lies in fostering real-time, community-driven discussions. For instance, live Q&A sessions with sports physiotherapists generated an average of 12.3K comments per event, with related hashtags such as #MarathonRecovery trending for more than 72 hours. Unlike Douyin's predominantly passive viewership, Weibo users actively contribute to threaded debates, creating a dynamic knowledge-

sharing ecosystem. However, analysis indicates that only 29% of these discussions cite peer-reviewed or authoritative sources, reflecting a trade-off between immediacy and scientific rigor [14]. As shown in Table 3, Weibo's engagement is uniquely driven by hashtag virality and user-generated content, which facilitates rapid dissemination but may limit the persistence of high-quality informational content. These metrics reveal an inverse relationship between engagement velocity and content durability, suggesting that platforms optimized for instantaneous interaction, such as Douyin, inherently restrict long-term knowledge retention compared to more archival formats like WeChat articles.

Table 3. Platform-Specific Engagement Drivers.

Platform	Primary Driver	Secondary Driver	Key Metric
Douyin	Celebrity endorsements	Music integration	Participation rate (78%)
Weibo	Hashtag campaigns	Live interactions	Comment volume (12.3K/event)
WeChat	Push notifications	In-depth citations	Subscriber retention (92%)

WeChat Official Accounts emphasize content depth and sustained engagement. A notable case is the 15-part series "Nutrition for Youth Basketball Players," which maintained a 92% subscriber retention rate. Push notifications contribute to immediate engagement, with 40% of article opens occurring within two hours of delivery. The long-form format accommodates citations, technical diagrams, and detailed explanations, catering to audiences seeking authoritative insights. Nevertheless, the share-to-view ratio on WeChat (1:50) lags behind that of Douyin (1:18), highlighting a relative deficiency in virality.

The analysis highlights a complementary relationship among the three platforms: Douyin excels in generating broad awareness and rapid participation, Weibo facilitates interactive discourse and community engagement, and WeChat provides sustained educational impact with deeper knowledge transfer. By understanding these platform-specific strengths and limitations, sports science communicators can strategically tailor content to maximize audience reach, engagement, and learning outcomes across digital ecosystems [15].

5. Discussion

The comparative analysis of Douyin, Weibo, and WeChat reveals distinct patterns in audience engagement with sports science communication, with each platform offering unique advantages and limitations. These findings underscore the importance of aligning platform selection with specific communication objectives, whether the aim is broad awareness, real-time interaction, or in-depth education.

5.1. Key Findings Synthesis

Douyin's algorithmic promotion of short-form videos facilitates exceptional reach and virality, particularly for visually oriented content such as exercise demonstrations. As shown in Table 4, Douyin achieves a 78% participation rate in challenge-based campaigns, outperforming both Weibo and WeChat in immediate engagement. The platform's emphasis on brevity and dynamic audiovisual content drives widespread participation, yet its format constraints limit the depth of information dissemination.

Table 4. Comparative Engagement Metrics Across Platforms.

Platform	Key Strength	Primary Engagement Metric	Limitation

Douyin	Broad reach	78% participation rate in challenges	Limited depth of content
Weibo	Real-time interaction	12.3K comments per Q&A session	Low citation of peer-reviewed sources (29%)
WeChat	In-depth education	92% subscriber retention rate	Low virality (share-to-view ratio: 1:50)

WeChat, by contrast, excels in fostering sustained readership and in-depth learning. Long-form articles maintain a 92% subscriber retention rate and cater to audiences seeking detailed, authoritative analyses, supported by high citation density and rich technical terminology. Weibo occupies an intermediary position, balancing timeliness and interactivity. Live Q&A sessions generate an average of 12.3K comments per event, providing robust community engagement, although only 29% of these interactions cite peer-reviewed sources, reflecting a trade-off between immediacy and scientific rigor.

As shown in Table 4, these platform-specific differences highlight how content format, interaction style, and audience expectations collectively shape engagement outcomes.

5.2. Implications for Practitioners

The study offers actionable insights for sports science communicators. For initiatives prioritizing mass awareness, Douyin's short-form videos are optimal, especially when paired with celebrity endorsements or trending challenges. WeChat's long-form articles are more suitable for educating dedicated audiences, such as coaches or athletes seeking detailed training methodologies. A hybrid strategy leveraging multiple platforms may yield the most comprehensive impact-for example, using Douyin to produce teaser clips that direct viewers to WeChat for more in-depth exploration.

Weibo's interactive features, such as hashtag campaigns and live discussions, are ideal for fostering community engagement around time-sensitive topics, such as injury recovery during major sporting events. However, these platforms present a tension between engagement optimization and epistemic responsibility, as conversationally viral content may outperform scientifically rigorous information due to its appeal in social interactions.

5.3. Ethical Considerations

The rapid dissemination of sports science content on social media raises potential concerns regarding misinformation, particularly on platforms like Douyin and Weibo, where oversimplified or unverified advice can gain rapid traction. This study emphasizes the importance of credential verification for contributors, especially influencers or non-experts. Platforms should implement mechanisms to flag unsubstantiated claims and prioritize content produced by accredited professionals. Communicators must balance accessibility with accuracy, ensuring that simplified explanations maintain scientific validity. As virality increasingly shapes content strategies, understanding its societal implications is essential, particularly in how viral content influences public discourse.

6. Conclusion

This study provides a comprehensive comparative analysis of audience engagement with sports science communication across three major Chinese social media platforms: Douyin, Weibo, and WeChat. The findings provide empirical evidence for platform-specific content optimization, demonstrating that each platform serves distinct communication objectives due to inherent format characteristics and user behavior.

Douyin excels in broad reach and immediate engagement through algorithm-driven short-form videos, achieving high participation rates in challenge-based campaigns but facing limitations in content depth. Weibo facilitates real-time interactions and community-driven discussions, generating substantial comment volumes during live

Q&A sessions, though often at the expense of scientific rigor. WeChat stands out in fostering sustained readership and in-depth education, with long-form articles maintaining high subscriber retention rates while exhibiting lower virality.

These insights provide a practical framework for sports scientists, coaches, and health professionals to strategically select and tailor content based on desired engagement outcomes, whether the goal is mass awareness, interactive discourse, or authoritative education. The contrast between cognitive accessibility on Douyin and informational rigor on WeChat reflects broader tensions in digital science communication, where attention economy pressures may conflict with evidence-based discourse norms. The complementary strengths of these platforms suggest that an integrated multi-platform approach could maximize both reach and depth in sports science communication.

Future research should address several key areas to build on this study's foundation. Longitudinal investigations are necessary to assess how evolving platform algorithms, such as Douyin's emphasis on livestream content, impact engagement patterns over time. Expanding analyses to international platforms, such as TikTok and Twitter, would offer valuable cross-cultural insights regarding audience preferences and content reception. Additionally, deeper exploration of ethical considerations in sports science communication on social media is warranted, particularly regarding mechanisms to mitigate misinformation while preserving accessibility. Addressing these gaps will enhance strategies for effective digital science dissemination, ultimately improving public understanding of sports-related knowledge across diverse audiences and technological landscapes.

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