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Designing immersive sports experiences: Multisensory stadium marketing, fan engagement and sponsor brand recall among young spectators in Ahmedabad

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Abstract

Stadiums are no longer only places where matches are played. Their sensory environment shapes how spectators feel about an event and how they remember the brands around it. This study examines how the multisensory stadium experience relates to fan engagement and sponsor brand recall among young sports fans in Ahmedabad, India. It considers five sensory dimensions: visual, audio, olfactory, tactile and interactive technology. A structured online questionnaire collected 91 responses, and 54 valid responses from spectators aged 15 to 30 who had attended a live event at an Ahmedabad stadium were analysed. The analysis used Pearson and Spearman correlations, multiple linear regression and independent samples t tests. Multisensory stadium experience was positively associated with fan engagement ($r = 0.611$) and with perceived sponsor brand recall ($r = 0.575$), and fan engagement was positively associated with perceived brand recall ($r = 0.573$). The five sensory dimensions together explained 49 percent of the variance in fan engagement, and audio experience was the only significant individual predictor ($\beta = 0.488$). Differences by gender were not significant. Differences between frequent and infrequent visitors were not significant for perceived brand recall, and the difference for fan engagement was borderline ($p = 0.055$). Because of the small, single city sample and cross sectional design, the results show associations, not causal effects. The findings suggest that stadium operators and sponsors should give particular attention to sound and to well timed interactive brand activities during breaks in play.

***Keywords*:** Multisensory Stadium Experience, Fan Engagement, Sponsor Brand Recall, Sensory Marketing, Sports Marketing, Youth Spectators, Ahmedabad, India

JEL Classification: L83, M31, M37

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1. Introduction

Sport is not just a physical activity or a game but a whole new culture in today's world. People are not just connected by geography, language or region, but also by sport. Sports fans today are like an online community. Sports stadiums are no longer just places where matches are played. The stadium itself has become part of the spectator's memorable experience. Visiting iconic stadiums like Levi's Stadium or Wembley Stadium has been a part of dream destination for many sports fans. The layout, environment, city or country, technology, and overall sensory elements affect the feelings and overall experience of the match. These factors influence how visitors remember the brands. This is especially true for younger audiences, and specifically males in India during cricket matches. In India, the Indian Premier League (IPL) is one of the most followed cricket leagues. Pro Kabaddi League and Indian Super League are also gaining popularity. They have also created much interest in watching sports live, particularly among young audiences. Given the growing opportunities to generate significant revenue for local and national economies, it is no surprise that cities have embraced a more professional and strategic approach to managing sports tourism. In this context, one has to look at Ahmedabad, home to the world's largest cricket stadium, named Narendra Modi Stadium. As more people choose to experience live sports in stadiums, more brands are interested in conducting marketing activities, as they can reach their target audiences in a captive environment. While interest in live sports is increasing, research on how sensory elements within a stadium affect brand recall and fan engagement among young spectators in Ahmedabad remains limited.

To understand the previous research on this subject, the literature review studies peer-reviewed research articles on stadium experiences, sports marketing, and spectator behaviour. This review aims to identify what existing studies have established and which areas require further review and attention. The review covers five main areas: sports consumer behaviour, stadium atmosphere and spectator experience, sports promotion and sponsorship, digital involvement among young audiences, and sensory or immersive marketing in live sports settings.

2. Theoretical Framework

The review relies on several theoretical models as follows:

2.1 Sport Consumer Behaviour Theory

Da Silva and Las Casas (2017) and Boško and Varmus (2021) found that sports fans are influenced by their emotional connection to a team, how easily they identify with it, and how involved they are in the sport. As a result, sports fans may behave differently than people do when buying everyday products. Furthermore, this indicates that the in-stadium sensory environment can evoke psychological and affective reactions distinct from those typically triggered in conventional retail environments.

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2.2 Atmospheric Theory (Kotler, 1973)

Khatibi et al. (2020) developed the Football Stadium Atmosphere Scale (FSAS) from Kotler's (1973) idea of atmospherics, which focuses on how physical surroundings can influence people's responses. In a stadium, elements such as sound, lighting, touch, and smell can affect satisfaction and emotional reactions. These factors may also influence how spectators notice and remember sponsors.

2.3 Experiential Marketing Theory (Pine & Gilmore, 1998)

The work of Panagopoulos et al. (2025) on smart venues and Mavroeidis et al. (2026) on stadium tourism can also be related to Pine and Gilmore's (1998) Experience Economy framework. The framework explains how consumers become involved in an experience through areas such as entertainment and aesthetics. In a stadium, multisensory activities can make the event more engaging even though spectators are not directly participating in the sport.

2.4 Social Identity Theory

Clarke et al. (2022) and Weng (2021) use Social Identity Theory to explain the connection between attending sporting events, identifying with a team and feeling attached to a place or group. This is useful when studying younger spectators because friends, social groups and a sense of belonging can influence their attitudes and consumption behaviour.

2.5 Literature Review

2.5.1 Sport Fan Consumer Behaviour

Sports spectators are often more emotionally involved than consumers in a regular retail setting. Da Silva and Las Casas (2017) described sports fans as highly involved consumers and linked their emotional attachment and loyalty with the commercial success of sports organisations. They viewed sports marketing as a relationship-building process rather than simply a series of individual transactions. However, their study was mainly based on the Brazilian context, so the same ideas need to be examined in other markets as well. Boško and Varmus (2021) studied spectators in Slovakia and found that emotional attachment can connect team identification with consumption-related outcomes such as stadium attendance, merchandise purchases, and watching broadcasts. Their study supports the idea that emotional attachment is important in sports consumption. At the same time, the use of secondary data limits the extent to which the findings can be applied to different settings. These two studies mainly reflect Latin American and European sports settings and do not fully represent the Indian context. Indian spectators may be influenced by regional identities, social backgrounds, and the strong cultural importance associated with cricket. In addition, the studies generally treat fan engagement as a broad concept and do not explain in detail how physical elements inside a stadium may create or strengthen engagement during a live event. This leaves an area for further investigation.

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2.5.2 Stadium Atmosphere, Experience, and Physical Environment

The physical environment of a stadium can affect how spectators perceive and respond to an event. Khatibi et al. (2020) contributed to this area by developing and testing the Football Stadium Atmosphere Scale (FSAS). Their study used Delphi expert panels, interviews, and spectator surveys in the Iranian Premier League and identified several dimensions of stadium atmosphere, including the following:

- Athletic performance of the club
- Perceived respect and security
- Facility quality and infrastructure
- Event management and logistics
- Architectural and stadium design
- Spectator crowd dynamics and conduct

The FSAS provides a useful way of examining the stadium environment. However, Khatibi et al. (2020) mainly focused on how spectators perceive the atmosphere and did not examine its possible commercial outcomes, such as sponsor recall, brand awareness or purchase intention. Weng (2021) interviewed 15 Chinese supporters who visited European football venues to study their stadium-visiting experience. The study found that stadium tours, heritage displays, and match-day atmosphere could strengthen team identification and attachment to the place. Physical features such as memorabilia, visual symbols, and stadium size also contributed to the overall experience. These findings suggest that sensory and physical features can shape how people connect with sports venues. Mavroeidis et al. (2026) studied online reviews of football stadiums in Greece and other parts of Europe. Their findings suggest that several factors influence satisfaction, including stadium atmosphere, service, team identity, and facility quality. However, because the study used online reviews, the results may be affected by self-selection, since people who choose to post reviews may not represent all visitors. Panagopoulos et al. (2025) proposed a framework for smart stadiums as part of smart tourism destinations. Their structural equation model showed that factors such as environmental sustainability, safety, service quality, entertainment, and commercial infrastructure were related to intentions to revisit or attend. The study is relevant to technology-supported stadium experiences, although it was conducted in Greece. Therefore, its findings may not directly reflect the conditions of Indian stadiums, particularly venues that handle very large crowds.

2.5.3 Sports Marketing, Sponsorship, and Brand Recall

Jin (2017) reviewed 282 articles published in the International Journal of Sports Marketing and Sponsorship between 1999 and 2015. The study found that sponsorship effectiveness and brand equity were major research areas. This highlights the commercial importance of branding at sports

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events. However, because the review focused on one journal, it may not cover findings from consumer psychology and other management research.

To evaluate how spectators process commercial messaging during competitions, sports marketing must draw directly on cognitive psychology and advertising frameworks:

- According to Attentional Capacity and Cognitive Load Theory (Sweller, 1988), people have a limited amount of working memory available at any one time. During an exciting part of a match, most attention is likely to be focused on the game itself, which can make surrounding sponsor messages less noticeable.
- The Encoding Specificity Principle (Tulving & Thomson, 1973) suggests that recall can be affected by the similarity between the conditions in which information was learned and the conditions in which it is later remembered. In a stadium, sounds, lights and crowd reactions may become part of the experience surrounding a sponsor message and may therefore be relevant to later recall.
- The Limited Capacity Model of Mediated Message Processing (Lang, 2000) also suggests that people have limited cognitive resources. During a sporting event, attention has to be divided between the match and other messages, including sponsor advertisements and in-stadium activities.

Leng (2017) studied sponsor recall in Singapore by involving 241 participants who watched videos of swimming events with different exposure times. The study found that when viewers have more visual exposure to sponsors, they generally remember them better. However, when viewers are more involved in the sporting action, their tendency to remember the brand decreases. This indicates that when spectators are highly focused on the game, they may pay less attention to sponsor messages. Therefore, breaks during a match, such as timeouts, innings breaks, and halftime, can help brands communicate with spectators.

Bizen and Tsuji (2024) conducted a survey of 365 corporate employees and found a relationship between athlete endorsements, organisational pride, and employee identification. However, the study mainly looked at employees and their connection with their organisation other than how spectators remember brands during a sporting event. Because of this difference, the findings have limited direct relevance to brand recall among stadium spectators.

Bragg et al. (2018) reviewed early studies on sports sponsorship and athlete endorsements aiming at younger consumers. Their findings showed that sports marketing positively affects how young people view a brand, remember it, and build an intention to buy the promoted product. The review also indicates that many products promoted through sports were energy-dense and low in nutritional value. While the study highlights the impact that sports marketing can have on young audiences, most of the research was based on North American media settings. It did not examine

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the multisensory experiences spectators have inside a physical stadium, suggesting a need for further research in this area.

2.5.4 Digital Fan Engagement and Emerging Technologies

Schlimm and Breuer (2023) surveyed 526 sports fans from different countries to assess their interest in new digital experiences in sports. The empirical analysis revealed that highly involved sports consumers exhibited a greater propensity to participate in Web3 initiatives, augmented reality applications, and virtual community environments. Furthermore, younger demographics demonstrated superior adaptability to these digital modalities, underscoring the growing integration of technology within fan engagement strategies.

However, that research predominantly examined digital participation mediated by screens and online platforms. It placed limited emphasis on integrating digital technologies into the physical stadium environment. Interactive technological features—such as mobile applications, digital displays, and in-venue engagement platforms—allow spectators to interact with technology while attending a match in person. This convergence of physical and digital dimensions warrants dedicated empirical investigation, particularly among younger cohorts who seamlessly navigate dual-engagement environments.

2.5.5 Youth Marketing and Sports: A Critical Gap

The studies reviewed recognise the importance of young sports fans, but youth is not always the main focus of the research. Da Silva and Las Casas (2017), Boško and Varmus (2021), and Clarke et al. (2022) largely consider spectators to be a single broad consumer group. Bragg et al. (2018) and Schlimm and Breuer (2023) focused on younger audiences, but they do not specifically examine how the in-stadium sensory features affect brand recall.

This is important because young consumers are a key audience for sports organisations and sponsors. The way they respond to sensory experiences, social influence, and digital technology may also be different from other groups. Existing models of spectator engagement do not fully explain how these factors might interact when young people are exposed to brands in a busy live-stadium environment.

2.5.6 Critical Analysis of the Reviewed Literature

Several of the reviewed studies are based on small or specific samples. For example, Weng (2021) studied Chinese football tourists, while Bizen and Tsuji (2024) focused on employees from one Japanese organisation. This made it difficult to apply their findings to other groups. Most of these studies are cross-sectional, and so they did not show how repeated stadium experiences may affect brand recall or loyalty over time. Although Khatibi et al. (2020) developed the FSAS, research that examines different sensory elements alongside brand recall remains limited. Findings from countries such as Iran, Singapore, and Greece also require careful consideration when applied to

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India, as their cultural and sporting contexts differ. Existing literature frequently draws upon frameworks such as Kotler's atmospherics, Social Identity Theory, and the Experience Economy. While foundational, these models do not fully account for the unique operational dynamics of sports stadia, where heightened emotional investment, team attachment, and live crowd interactions distinctively condition spectator responses to marketing stimuli. A further methodological limitation in current research is the aggregation of sensory elements into a singular atmospheric construct. This holistic treatment impedes the isolated assessment of visual, auditory, olfactory, and tactile stimuli regarding their distinct effects on sponsor brand recall. The present study considers this empirical gap by evaluating each sensory dimension independently within a multisensory stadium marketing framework. Geographically, empirical inquiries remain predominantly concentrated in North America, Europe, and East Asia, leaving the Indian sports landscape substantially under-researched — particularly concerning youth demographics in emerging sports hubs such as Ahmedabad.

Although Bragg et al. (2018) emphasised youth consumer behaviour, a critical gap persists regarding live venue environments within major sports markets like India, home to premier infrastructure such as the Narendra Modi Stadium in Ahmedabad. Indian sports consumption is also shaped by factors such as group viewing, regional team affiliations, the importance of cricket, and differences in spectators' socioeconomic backgrounds. Consequently, socio-cultural nuances specific to the Indian audience may not be adequately captured by Western-derived models, highlighting the necessity for localised empirical investigation to clarify how stadium environments govern spectator engagement and brand recall.

2.6 Research Gap

Most of the studies reviewed were conducted in Europe, North America, East Asia, and the Middle East, with comparatively little attention given to India's growing sports industry. Moreover, Research on multisensory stadium experiences related to fan engagement and brand recall remains limited. The present study addresses this gap by focusing on spectators in the Indian sports context, particularly Ahmedabad.

2.7 Positioning of the Present Research

Goel et al. (2026) examined visual, auditory, and emotional advertising stimuli and their effects on consumer perception, emotional engagement, purchase intention, brand recall, and brand preference. Building on this line of research, the present study examines multisensory stadium marketing through five areas:

- **Visual stimuli:** Strategic illumination, brand colour architecture, dynamic LED displays, and peripheral digital signage.
- **Auditory stimuli:** Curated acoustic tracks, public address messaging, and amplified crowd audio management.

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- **Olfactory stimuli:** Food aroma, Environmental scent branding and ambient concession-area aromas.
- **Tactile stimuli:** Physical merchandise touchpoints, promotional giveaways, seating ergonomics, and textured venue materials.
- **Interactive technology** can add another layer to the stadium experience. Features such as digital displays, interactive activities, and technology-based services can make the matchday experience more engaging and provide additional opportunities for brand interaction.

The study examines fan engagement and brand recall among youth spectators aged 15 to 30 who attend live sporting events at the Narendra Modi Stadium or other popular stadiums in Ahmedabad. By focusing on this local setting, the study aims to provide evidence on how different stadium experiences relate to fan engagement and sponsor brand recall among young sports consumers in Ahmedabad.

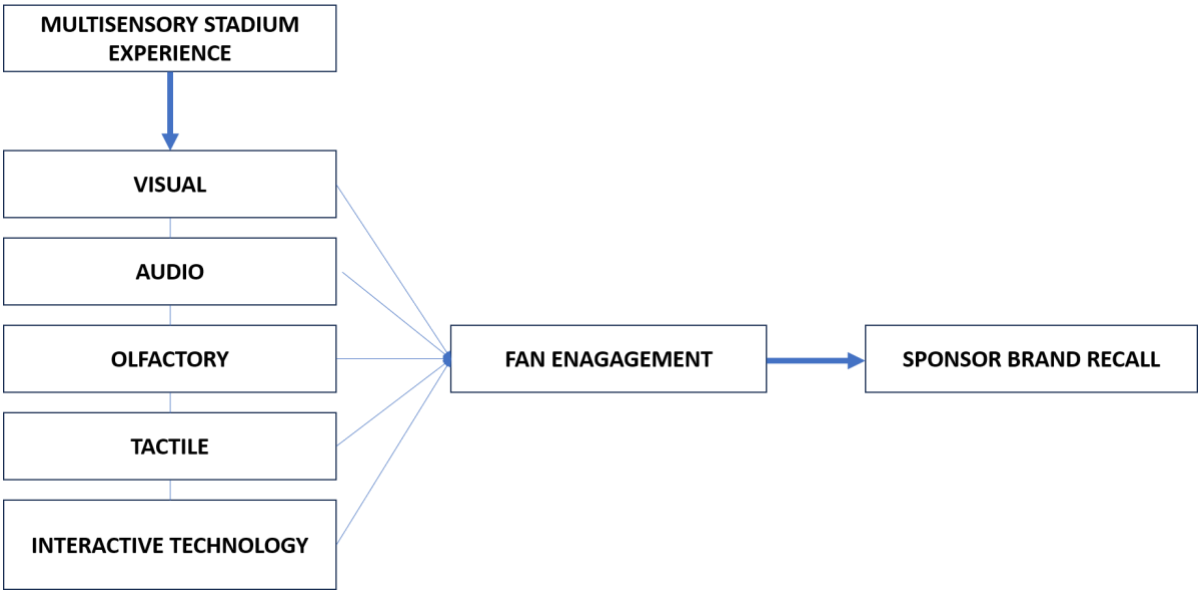
2.8 Conceptual Framework and Research Model

This research model proposes that Multisensory Stadium Experience—operationalized through five independent variables (Visual, Auditory, Olfactory, Tactile, and Interactive Technology stimuli)—influences Actual Sponsor Brand Recall, the dependent variable. However, this relationship is not direct; it is explained through Fan Engagement, which functions as the mediating variable, indicating that sensory stimuli enhance brand recall primarily by first increasing the level of engagement fans experience during the event. The strength of this mediated relationship is further influenced by three moderating variables—Gender, Frequency of Stadium Attendance, and Type of Sport Followed (Cricket, Football, Kabaddi)—which may alter how sensory stimuli translate into engagement and, subsequently, recall. Together, the model suggests a sequential pathway: sensory stimuli → fan engagement → sponsor brand recall, with demographic factors moderating this process at various points. (Figure 1). The study tests the relationships among the main measures and examines selected group differences by gender and frequency of stadium attendance. Fan engagement is treated as an outcome in the regression analysis, and perceived brand recall is examined as a separate outcome. Mediation and moderation are not claimed as tested effects because formal statistical tests for these effects were not reported.

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Figure 1. Proposed Research Model Depicting the Relationship between Multisensory Stadium Experience, Fan Engagement, and Sponsor Brand Recall



This study aims to achieve the following objectives:

1. To examine youth perceptions of multisensory stadium experiences in Ahmedabad.
2. To examine the relationship between multisensory stadium experiences and fan engagement among youth spectators.
3. To examine the relationship between multisensory stadium experiences and sponsor brand recall.
4. To examine the relationship between fan engagement and sponsor brand recall.
5. To determine the relative contribution of different sensory dimensions to fan engagement.
6. To examine whether fan engagement and sponsor brand recall differ across demographic and stadium-attendance groups.

$H_0$1: There is no significant relationship between multisensory stadium experience and fan engagement.

$H_0$2: There is no significant relationship between multisensory stadium experience and sponsor brand recall.

$H_0$3: There is no significant relationship between fan engagement and brand recall

$H_0$4: Visual, Auditory, Olfactory, Tactile, and Interactive Technology stimuli have no significant joint influence on Fan Engagement (i.e., all regression coefficients $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$).

$H_0$5: There is no significant difference in fan engagement across different gender groups.

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$H_0$6: There is no significant difference in fan engagement among frequent and infrequent stadium visitors.

$H_0$7: There is no significant difference in the brand recall among frequent and infrequent stadium visitors.

3. Research Design

The study uses a descriptive research design with quantitative data analysis. A structured questionnaire was used to collect respondents' views about their experiences in sports stadiums. The approach aligns with survey-based studies in sensory marketing and neuromarketing that use self-reported responses when physiological measures are not collected (e.g., Gogri et al., 2024; Rafijevas & Razbadauskaite-Venske, n.d.; Goel et al., 2026). The survey was taken online using Google Forms.

3.1 Population and Sampling

A total of 91 responses were received. Following application of the screening criterion requiring respondents to have attended at least one live sports event in a stadium in Ahmedabad during the previous five years, 54 valid responses were retained for the primary analysis. Tier-1 Ahmedabad city was chosen for the research survey because it has the world's largest cricket venue, the Narendra Modi Stadium, which is used for IPL, international matches, and international musical concerts like Coldplay. Ahmedabad plans to host the 2030 Centenary Commonwealth Games as part of a grand national strategy to transform the city into a global sports hub and lay the groundwork for an Olympic bid for 2036.

3.2 Data Analysis Techniques

Three statistical techniques were used to test the hypotheses. Pearson correlation was used to examine the relationship between continuous variables. Multiple linear regression assessed the contribution of the five sensory dimensions to fan engagement. Independent-samples t-tests compared fan engagement and brand recall between frequent and infrequent stadium visitors. The tests were assessed at the 0.05 significance level. Jamovi and the MS Excel Data Analysis ToolPak were used for the analysis, and Cronbach's alpha was used to assess the reliability of the multi-item scales.

3.3 Constructs, Questionnaire Items, and Their Role in the Study:

The following table lists the main constructs used in the study, the questionnaire items used to measure them, and each variable's role. The summated scales approach was used to calculate the constructs for data analysis from the questionnaire items.

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Table 1. Operationalization of Study Constructs and Questionnaire Items

Construct and Variables	Questionnaire items	Role
Visual Experience	Q10.1 to Q10.5	Independent variable
Auditory Experience	Q11.1 to Q11.5	Independent variable
Food & Olfactory Experience	Q12.1 to Q12.4	Independent variable
Tactile Experience	Q13.1 to Q13.4	Independent variable
Interactive Technology	Q14.1 to Q14.5	Independent variable
Overall multi-sensory stadium experience score	Visual + Auditory + Food + Tactile + Interactive	
Fan Engagement	Q15.1 to Q15.6	Dependent / mediator
Perceived Brand Recall	Q19.1 + Q19.2 + Q19.5	Dependent variable
Actual/Unaided Recall	Q16	Behavioural / cognitive recall measure
Aided Recall	Q17	Behavioural / cognitive recall measure
Most Clearly Recalled Brand	Q18	Categorical recall measure
Sensory Ranking	Q20	Ranking / descriptive analysis
Demographics	Q2 to Q9	Grouping / control variables

Table 2. Respondents' Demographic Profile

Age	Female	Male	Grand Total
15-18	5	14	19
19–22	3	17	20
23–26	4	3	7

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27-30	5	3	8
Grand Total	17	37	54

Occupation	Self-employed	Student	Working Professional	Grand Total
Doctoral			3	3
Higher Secondary		16		16
Postgraduate	3		8	11
Undergraduate		22	2	24
Grand Total	3	38	13	54

The survey includes 31.48% females and 68.52% males. Most respondents (72.22%) were in the 15 to 22 age group. Since the survey considers young respondents, 70.37% were students, as mentioned in the occupation.

Table 3. The regularly followed Sport(s) by the respondents

Sport	Frequency	Sport	Frequency
Cricket	41	Others	10
Football	20	Kabaddi	7
Tennis	10	Basketball	5

Cricket is the most followed sport, with 41 respondents (75.93%). (N=54). Others included sports like F1, horse riding, athletics, volleyball, table tennis, baseball, UFC, badminton, hockey, and taekwondo, among others.

Table 4. The most visited stadium in Ahmedabad City

Stadium name	Frequency
Narendra Modi Stadium	48
EKA Arena	9

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Others	4

The most visited stadium among respondents is Narendra Modi Stadium, with a frequency of 48. 88.89% of respondents have visited the Narendra Modi Stadium. 16.67% of respondents visited EKA Arena, and 7.4% of respondents visited other stadiums like Rajiv Gandhi Stadium and Veer Savarkar Sports Complex.

3.4 Reliability Analysis

Internal consistency of each multi-item construct (visual, auditory, olfactory, tactile, interactive technology, fan engagement and perceived brand recall) was reported using McDonald's omega and Cronbach's alpha, with values of .70 or above conventionally treated as acceptable for exploratory consumer behaviour research (Nunnally, 1978).

Table 5. Reliability Analysis

Scale	Mean	SD	Cronbach's α	McDonald's ω
Visual Experience (Items 10.1 to 10.5 from the questionnaire)	3.96	0.856	0.851	0.867
Auditory Experience (Items 11.1 to 11.5 from the questionnaire)	3.83	0.804	0.823	0.841
Food and Olfactory Experience (Items 12.1 to 12.4 from the questionnaire)	3.33	0.783	0.804	0.81
Tactile Experience (Items 13.1 to 13.4 from the questionnaire)	4	0.895	0.832	0.847
Interactive Technology (Items 14.1 to 14.5 from the questionnaire)	3.61	0.852	0.859	0.863
Fan Engagement (Items 15.1 to 15.6 from the questionnaire)	4.04	0.828	0.884	0.897

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Perceived Brand Recall (Items 19.1, 19.2, 19.5 from the questionnaire)	3.65	0.859	0.825	0.836

Table 6. Descriptive Statistics of the Seven Constructs

	Mean	Median	Mode	SD	Variance
Visual Mean	3.96	4	4	0.856	0.732
Auditory Mean	3.83	4	4	0.804	0.647
Food & Olfactory	3.33	3.25	4	0.783	0.613
Tactile	4	4.25	4.00[a]	0.895	0.801
Interactive Technology	3.61	3.8	4	0.852	0.727
Fan Engagement	4.04	4.17	4.17	0.828	0.685
Perceived Brand Recall	3.65	3.67	4	0.859	0.738

[a] More than one mode exists; only the first is reported

3.5 Statistical Analysis & Hypotheses Testing

The collected data were then analyzed using different statistical tests to understand the relationships between the variables studied and test the proposed hypotheses. Correlation, regression, and t-tests were used for the analysis.

$H_0$1: There is no significant relationship between multisensory stadium experience and fan engagement.

$H_1$1: There is a significant relationship between multisensory stadium experience and fan engagement.

Table 7. Correlation Matrix

		Multisensory Stadium Experience
Fan Engagement	Pearson's r	0.611***

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	df	52
	p-value	<.001
	Spearman's rho	0.407**
	df	52
	p-value	0.002
	N	54

Note. * p < .05, ** p < .01, *** p < .001

This shows a significant positive relationship between multisensory stadium experience and fan engagement (Pearson's r = 0.611, p < .001, N = 54). Spearman's rho was also positive and significant (rho = 0.407, p = .002), giving the same overall conclusion. The squared Pearson correlation is approximately 37.3%, which represents the proportion of shared variance between the two measures in this sample; it should not be taken as evidence of causation. Since the p-value is below 0.05, H01 is rejected in favour of H11. The results therefore indicate a significant positive association between multisensory stadium experience and fan engagement in this sample.

$H_0$2: There is no significant relationship between multisensory stadium experience and sponsor brand recall.

$H_1$2: There is a significant relationship between multisensory stadium experience and sponsor brand recall.

Table 8. Correlation Matrix

		Multisensory Stadium Experience Score
Perceived Brand Recall	Pearson's r	0.575***
	df	52
	p-value	<.001
	Spearman's rho	0.422**
	df	52

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	p-value	0.001
	N	54

Note. * p < .05, ** p < .01, *** p < .001

This shows a significant positive relationship between multisensory stadium experience and perceived sponsor brand recall (Pearson's r = 0.575, p < .001, N = 54). The Spearman correlation is also positive and significant (rho = 0.422, p = .001), so both measures point in the same direction. The squared Pearson coefficient is approximately 33.1%, representing shared variance rather than a causal effect. Respondents who reported stronger multisensory stadium experiences also tended to report stronger perceived sponsor brand recall. Therefore, H02 is rejected in favour of H12.

$H_0$3: There is no significant relationship between fan engagement and brand recall

$H_1$3: There is a significant relationship between fan engagement and brand recall.

Table 9. Correlation Matrix

		Perceived Brand Recall
Fan Engagement	Pearson's r	0.573***
	df	52
	p-value	<.001
	Spearman's rho	0.441***
	df	52
	p-value	<.001
	N	54

Note. * p < .05, ** p < .01, *** p < .001

This shows a significant positive relationship between fan engagement and perceived brand recall (Pearson's r = 0.573, p < .001, N = 54). Spearman's rho gives a similar result (rho = 0.441, p < .001). The squared Pearson coefficient is approximately 32.8%, indicating shared variance between the two measures in this sample. This result does not establish a causal relationship.

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Overall, respondents with higher fan-engagement scores also tended to report higher perceived sponsor brand recall. H03 is therefore rejected in favour of H13.

$H_0$4: Visual, Auditory, Olfactory, Tactile, and Interactive Technology stimuli have no significant joint influence on Fan Engagement (i.e., all regression coefficients $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$).

$H_1$4: Visual, Auditory, Olfactory, Tactile, and Interactive Technology stimuli has a significant joint influence on Fan Engagement (i.e., at least one $\beta_i \neq 0$).

The Linear Regression model determines the relative contribution of different sensory dimensions to fan engagement. (Five sensory dimensions → Fan Engagement)

Fan engagement = β0 + β1(Visual) + β2(Auditory) + β3(Olfactory) + β4(Tactile) + β5(Interactive technology) + Ɛ

Table 10. Model Fit Measures

				Overall Model Test			
Model	R	R^2	Adjusted R^2	F	df1	df2	p
1	0.7	0.49	0.435	9.2	5	48	<.001

Note. Models estimated using sample size of N=54

Omnibus ANOVA Test

	Sum of Squares	df	Mean Square	F	p
Visual Mean	0.112	1	0.112	0.289	0.59
Auditory Mean	4.473	1	4.473	11.57	0
Food & Olfactory	0.283	1	0.283	0.733	0.4
Tactile	0.458	1	0.458	1.185	0.28
Interactive Technology	0.624	1	0.624	1.612	0.21

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Residuals	18.567	48	0.387	

Note. Type 3 sum of squares

Model Coefficients - Fan Engagement

			95% Confidence Interval					95% Confidence Interval	
Predictor	Estimate	SE	Lower	Upper	t	p	Stand. Estimate	Lower	Upper
Intercept	1.2707	0.48	0.297	2.245	2.623	0.01			
Visual Mean	-0.0906	0.17	-0.43	0.249	-0.54	0.59	-0.0937	-0.44	0.257
Auditory Mean	0.5026	0.15	0.205	0.8	3.401	0	0.4883	0.2	0.777
Olfactory	-0.1224	0.14	-0.41	0.165	-0.86	0.4	-0.1157	-0.39	0.156
Tactile	0.203	0.19	-0.17	0.578	1.088	0.28	0.2194	-0.19	0.625
Interactive Technology	0.2208	0.17	-0.13	0.57	1.27	0.21	0.2273	-0.13	0.587

Please refer to Exhibit 1: Q-Q plot for assumption checks.

H04 was tested using multiple regression to see whether the five sensory factors—visual, auditory, olfactory, tactile, and interactive technology—together affect fan engagement. The results show that the overall model is significant ($R^2 = 0.490$, $p < .001$). This says that these five factors together explained about 49% of the variation in fan engagement.

When each factor was separately checked, auditory experience was the only factor that showed a significant effect on fan engagement ($\beta = 0.488$, $p < .001$). The other four factors were not significant individually, but together they were significant. Therefore, H04 is rejected, showing that the five factors together have a significant relationship with fan engagement, although auditory experience was the main individual factor.

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$H_0$5: There is no significant difference in the fan engagement across different gender groups.

$H_1$5: There is a significant difference in the fan engagement across different gender groups.

Table 11. Independent Samples T-Test

							95% Confidence Interval	
		Statistic	df	p		Effect Size	Lower	Upper
Fan Engagement	Student's t	0.777	52	0.441	Cohen's d	0.228	-0.35	0.803

Note. H_a $\mu_{Female} \neq \mu_{Male}$

Group Descriptives

	Group	N	Mean	Median	SD	SE
Fan Engagement	Female	17	4.17	4.17	0.645	0.157
	Male	37	3.98	4.17	0.901	0.148

The gender comparison was not statistically significant, t(52) = 0.777, p = .441. Female respondents had a mean fan-engagement score of 4.17 (n = 17), compared with 3.98 (n = 37) for male respondents. The mean difference was 0.19 points on the five-point scale. The corresponding values are 83.4% and 79.6% of the maximum possible score, respectively; these percentages describe the scale values and not the percentage of respondents. Cohen's d was 0.228, and the confidence interval included zero. Therefore, H05 is not rejected, as the sample does not provide sufficient evidence of a significant difference in fan engagement between the two gender groups.

$H_0$6: There is no significant difference in the fan engagement among frequent and infrequent stadium visitors

$H_1$6: There is significant difference in the fan engagement among frequent and infrequent stadium visitors

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Table 12. Independent Samples T-Test

		Statistic	df	p	Mean difference	SE difference
Fan Engagement	Student's t	-1.96[a]	52	0.055	-0.433	0.221

Note. H_a $\mu_{\text{Infrequent visitors}} \neq \mu_{\text{Frequent visitors}}$

[a] Levene's test is significant ($p < .05$), suggesting a violation of the assumption of equal variances

Group Descriptives

	Group	N	Mean	Median	SD	SE
Fan Engagement	Infrequent visitors	30	3.84	4.17	1.01	0.184
	Frequent visitors	24	4.28	4.17	0.439	0.0895

The comparison between infrequent and frequent stadium visitors showed a mean difference of -0.433, $t(52) = -1.96$, $p = .055$. The mean fan-engagement score was 3.84 for infrequent visitors ($n = 30$) and 4.28 for frequent visitors ($n = 24$). On the five-point scale, these correspond to 76.8% and 85.6% of the maximum score, respectively. However, the p-value is slightly above .05, and Levene's test was significant, indicating unequal variances. At the stated significance level, H06 is therefore not rejected, and the sample does not provide sufficient evidence of a significant difference in fan engagement between frequent and infrequent visitors.

$H_0$7: There is no significant difference in the brand recall among frequent and infrequent stadium visitors

$H_1$7: There is significant difference in the brand recall among frequent and infrequent stadium visitors

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Table 13. Independent Samples T-Test

		Statistic	df	p	Mean difference	SE difference
Perceived Brand Recall	Student's t	-1.38	52	0.173	-0.322	0.233

Note. H_a $\mu_{Infrequent\ visitors} \neq \mu_{Frequent\ visitors}$

Group Descriptives

	Group	N	Mean	Median	SD	SE
Perceived Brand Recall	Infrequent visitors	30	3.51	3.83	0.985	0.18
	Frequent visitors	24	3.83	3.67	0.645	0.132

The difference in perceived brand recall between infrequent and frequent visitors was not statistically significant, t(52) = -1.38, p = .173. Frequent visitors had a descriptive mean of 3.83 (n = 24), while infrequent visitors had a mean of 3.51 (n = 30). These values correspond to 76.6% and 70.2% of the maximum five-point scale, respectively. The descriptive difference should not be interpreted as statistically significant because the p-value is above 0.05. H07 is therefore not rejected, as the sample provides insufficient evidence of a significant difference in perceived brand recall between the two groups.

Table 14. Frequency of Respondents' Aided Brand Recall and Unaided Brand Recall

No. of brands remembered	**Unaided Brand Recall (Frequency of Respondents)**	**Unaided Brand Recall (No. of brands)**	**Aided Brand Recall (Frequency of Respondents)**	**Aided Brand Recall (No. of brands)**
1	32	32	5	5
2	6	12	3	6

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3	7	21	4	12
4	2	8	5	20
5	2	10	7	35
6	2	12	5	30
7	1	7	6	42
8	0	0	2	16
9	1	9	6	54
10	0	0	3	30
11	0	0	1	11
12	0	0	3	36
13	0	0	0	0
14	1	14	4	56
	N=54	**Average: 8.93**	**N=54**	**Average: 25.21**

Unaided brand recall means respondents mentioned the brand on their own, without any options given during the survey. On average, respondents mentioned 8.93 brands unaided. Aided brand recall means respondents remembered the sponsoring brands in the sports stadium when the survey showed a list of brands. On average, respondents mentioned 25.21 brands aided.

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Table 15. Specific brands clearly remembered by respondents

Brands	Count of Brand Recall	Brands	Count of Brand Recall
Adidas	3	Michael	1
Byjus	1	MRF	2
Campa	1	Nike	3
CEAT	5	Nita Ambani	1
Coca-Cola	2	Nothing	2
Dream 11	8	PanBahar	1
Emirates Airways	3	Punch	1
Etihad Airways	1	Qatar airways	3
IDFC First Bank	1	Royal challenges	1
Jio	3	Simpolo	1
Kia	1	Tata	14
		Torrent	5

Total of Brand Recall Count = 64 (N=54)

Tata was the most frequently recalled brand, with 25.93% of respondents mentioning it, followed by Dream11 at 14.82%. Eleven brands were recalled only once. This suggests recall was spread across multiple brands rather than concentrated in a small group.

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Table 16. Descriptive Statistics based on the Ranking of the Sensory Elements

	VISUAL	AUDITORY	FOOD & OLFACTORY	TACTILE	INTERACTIVE TECHNOLOGY
Mean	3.24	2.96	2.7	3.15	2.81
Standard Error	0.23	0.19	0.16	0.17	0.19
Median	3.5	3	3	3	2.5
Mode	5	4	3	4	2
Standard Deviation	1.71	1.41	1.18	1.27	1.43
Sample Variance	2.94	2	1.38	1.6	2.04
Kurtosis	-1.77	-1.29	-0.64	-0.96	-1.2
Skewness	-0.16	0.03	0.1	-0.23	0.34
Range	4	4	4	4	4
Minimum	1	1	1	1	1
Maximum	5	5	5	5	5
Sum	175	160	146	170	152
Count	54	54	54	54	54
Confidence Level(95.0%)	0.47	0.39	0.32	0.35	0.39

The descriptive statistics indicate that visual elements (3.25) have the highest mean, followed by tactile elements (3.15). Auditory elements, interactive technology, and olfactory elements received lower rankings. The standard deviation and skewness values suggest fewer variations and a broadly normal data distribution.

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Table 17. Correlation between brand trust and purchase intention

Correlation Matrix		
		Brand Trust: I trust brands promoted during sports events.
Purchase Intention: I am more likely to purchase brands promoted inside stadiums.	Pearson's r	0.755***
	df	52
	p-value	<.001
	95% CI Upper	0.851
	95% CI Lower	0.611
	Spearman's rho	0.704***
	df	52
	p-value	<.001
	N	54

Note. * p < .05, ** p < .01, *** p < .001

Table 17 shows the results that brand trust has a positive relationship with purchase intention, and this relationship is statistically significant for respondents. Pearson's correlation ($r = 0.755$, $p < .001$) revealed that the higher the trust in brands advertised at sporting events, the higher the intention to purchase brands advertised inside stadiums. Spearman's rho ($\rho = 0.704$, $p < .001$) also supports this association. Thus, the results provide empirical support for a significant relationship between brand trust and purchase intention when considering stadium-based sports marketing.

4. Findings

The study used 54 valid responses. Most respondents were aged 15–22 years (72.22%), and 70.37% were students. Cricket was the most followed sport, reported by 41 respondents (75.93%). Narendra Modi Stadium was the most visited stadium, with 48 respondents (88.89%). The results showed a positive relationship between multisensory stadium experience and fan engagement ($r = 0.611$, $p < .001$). A positive relationship was also found between multisensory stadium experience and sponsor brand recall ($r = 0.575$, $p < .001$). Fan engagement was also significantly related to brand recall ($r = 0.573$, $p < .001$). The regression model was significant ($R^2 = 0.490$, $p < .001$).

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Together, the five sensory dimensions explained 49% of the variation in fan engagement. Among the individual factors, auditory experience was significant ($\beta = 0.488$, $p < .001$), while visual, olfactory, tactile, and interactive technology were not significant on their own. The comparison between male and female participants did not show a major difference in fan engagement ($p = .441$). There was also no significant difference between frequent and infrequent visitors in fan engagement ($p = .055$) or perceived brand recall ($p = .173$). The questionnaire included one open-ended question wherein responses mainly suggest ways to improve the overall stadium experience. Participants called for better crowd and entry-exit management, cleaner washrooms, affordable food and water, comfortable seating, and improved lighting, sound, and ventilation. Few respondents also suggested better Wi-Fi, smart parking, and more interactive activities. Overall, the responses show that spectators consider not only the match itself but also the surrounding facilities and services when judging their stadium experience.

Respondents held generally favourable perceptions of the multisensory stadium experience in Ahmedabad. The multisensory experience was significantly and positively associated with fan engagement among youth spectators and was positively correlated with sponsor brand recall. Fan engagement was also positively related to brand recall, suggesting that engaged spectators are more likely to remember the brands they encounter at the venue. When each factor was examined separately, auditory experience was the only factor that showed a significant effect on fan engagement. The other four factors were not significant individually, but together they were. This indicates that sound plays a distinctive role in shaping how youth spectators engage with the event. Finally, for the sixth objective, neither fan engagement nor sponsor brand recall differed significantly by gender or by how often respondents visited the stadium.

Table 19. Hypothesis Summary

	Hypothesis	Result	Decision
H_01	There is no significant relationship between multisensory stadium experience and fan engagement.	A significant positive relationship was found between multisensory stadium experience and fan engagement ($r = 0.611$, $p < .001$).	H_01 Rejected
H_02	There is no significant relationship between multisensory stadium experience and sponsor brand recall	A significant positive relationship was found between multisensory stadium experience and perceived sponsor brand recall ($r = 0.575$, $p < .001$).	H_02 Rejected

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$H_0$3	There is no significant relationship between fan engagement and brand recall	Fan engagement was significantly and positively related to perceived sponsor brand recall ($r = 0.573$, $p < .001$).	$H_0$3 Rejected
$H_0$4	Visual, Auditory, Olfactory, Tactile, and Interactive Technology stimuli have no significant joint influence on Fan Engagement (i.e., all regression coefficients $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$).	Together, the five sensory factors explained 49% of the variation in fan engagement. Audio was the only factor that showed a significant individual effect ($\beta = 0.488$, $p < .001$).	$H_0$4 Rejected
$H_0$5	There is no significant difference in the fan engagement across different gender groups	No significant difference was found in fan engagement between male and female participants ($p = .441$).	Fail to reject the null hypothesis $H_0$5
$H_0$6	There is no significant difference in the fan engagement among frequent and infrequent stadium visitors	No significant difference was found in fan engagement between frequent and infrequent visitors ($p = .055$).	Fail to reject the null hypothesis $H_0$6
$H_0$7	There is no significant difference in the brand recall among frequent and infrequent stadium visitors	No significant difference was found in perceived brand recall between frequent and infrequent visitors ($p = .173$).	Fail to reject the null hypothesis $H_0$7

5. Conclusion

This shows that the stadium experience is related to fan engagement and sponsor brand recall among young sports fans in Ahmedabad. The results show that multisensory experiences were positively related to both fan engagement and brand recall, with audio experience showing a relationship with fan engagement. Overall, the study shows that a good stadium experience can make sports events more engaging and memorable for fans.

5.1 Managerial Recommendations

Based on the research findings, literature review and observation, the researchers recommend the following to the stadium owners, sports managers and the city governing bodies:

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Improve crowd and traffic management: Entry and exit points should be organised in a better way, especially during big matches. This must include clear routes, multiple exit options, and proper parking management to make it easier for spectators to enter and exit the stadium.

Focus on the in-stadium audio experience: According to this study, audio was one of the most important factors, showing a direct relationship with fan engagement. Hence, attention must be given to better sound quality, loud and clear announcements and music. Crowd interaction creates emotional and memorable experiences for the visitors; hence, that can be added too.

Improve basic facilities: Clean washrooms, comfortable seating, good lighting, and proper ventilation should be maintained throughout the event, as they play an important role in the overall experience.

Ensure affordable access to basic supplies: Many respondents mentioned the need for reasonable prices for food and water. Providing them with food and water at reasonable prices can make the experience more comfortable for spectators.

Incorporate dynamic digital tools and interactive technology: Integrate immersive fan-engagement technology throughout sports venues. Add Features such as Wi-Fi, smart parking, fan-cam activities, and other interactive options can give more interest to spectators to get engage with the event.

Make brand experiences more memorable: Sponsors can use visual, audio, and interactive activities during breaks. These can help spectators pay attention and remember the brand without taking attention away from the match.

Take spectator feedback seriously: Feedback should be collected after matches to understand the problems of the spectators that they commonly face. This actionable feedback enables stadium administrators to implement targeted operational enhancements aligned with actual spectator experiences during live events.

An Open and Dynamic Business-Sport Ecosystem: A “pro-business” and “pro-sport” political culture, where foreign investment and entry are welcomed. An institutional environment favourable to commercial enterprise and athletic development, characterised by openness to international capital and global market participants

5.2 Limitation and Directions for Further Research

This study has a few limitations that have to be considered. The study included only 54 valid responses, and all the respondents were from Ahmedabad. Therefore, the findings cannot be generalised to other cities or countries. Also, the study was conducted at a single point in time, so it does not show whether respondents' views may change after attending more matches or visiting stadiums more frequently.

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The study was based on a survey using a questionnaire, so the findings depend on what the participants reported about their own experience. The sample mainly included students and cricket followers, rather than people from other interest groups, so it may not represent the views of different types of sports fans. The study also focused on stadium experiences in Ahmedabad. Future research could include participants from different cities, age groups, and sports to better understand how spectators experience live sporting events.

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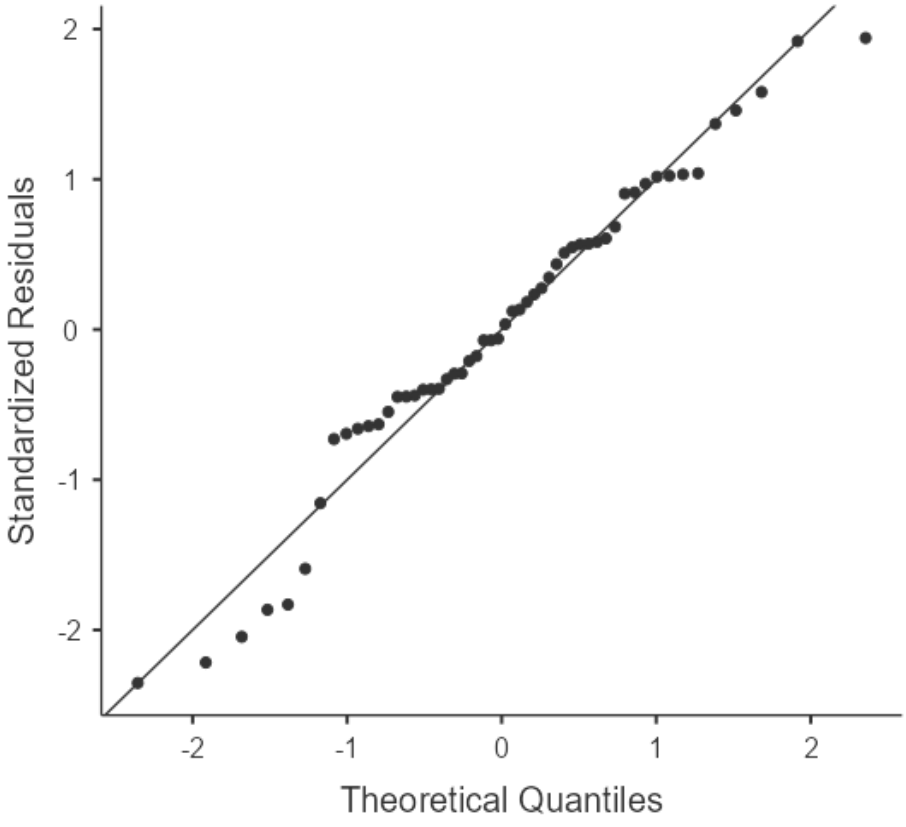
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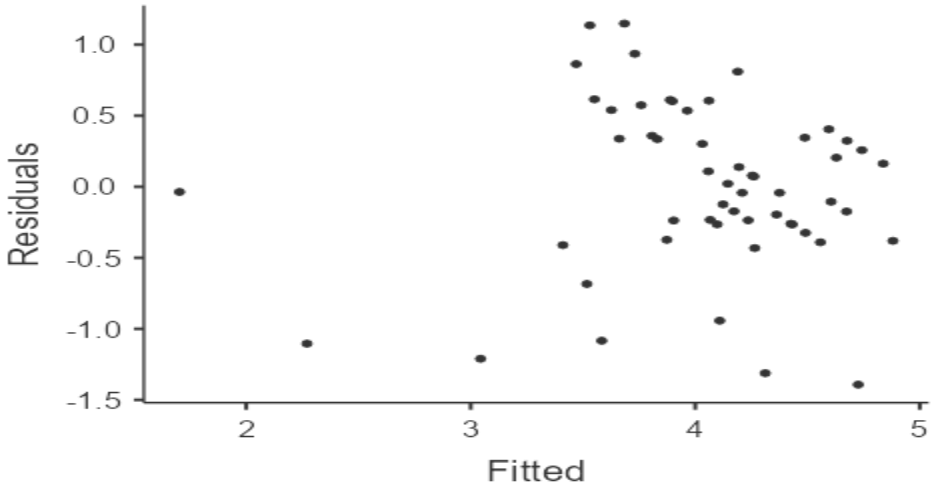
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Exhibit 1: Assumption Checks

Q-Q Plot

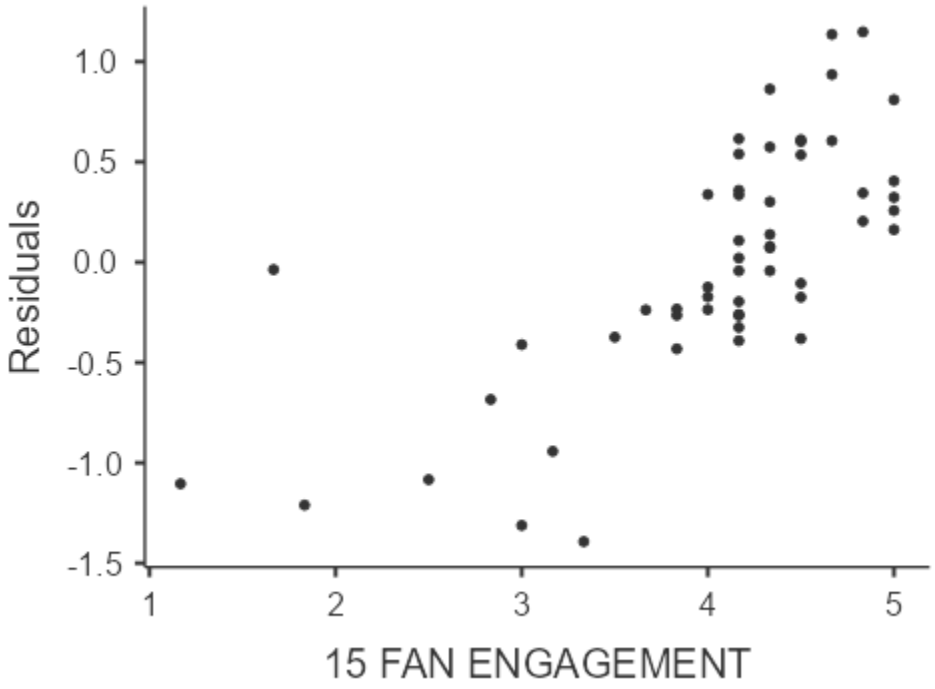


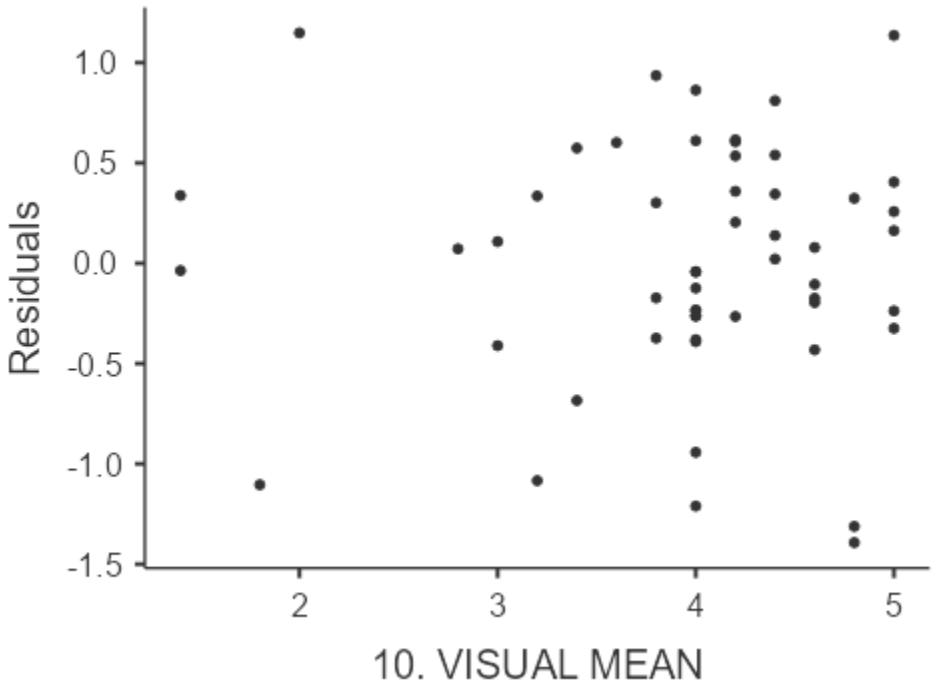
Residuals Plots



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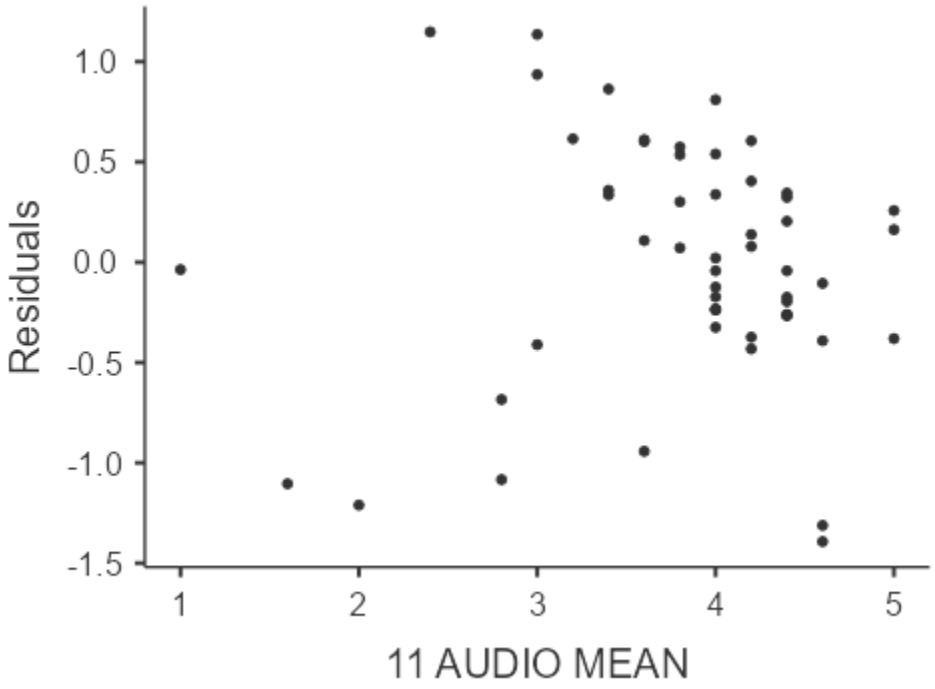
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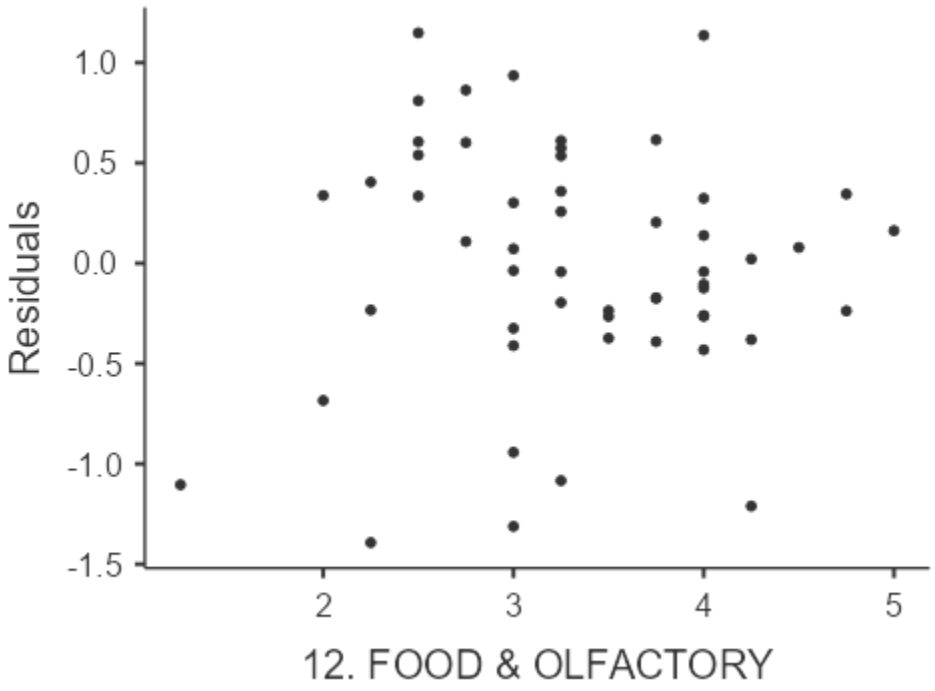




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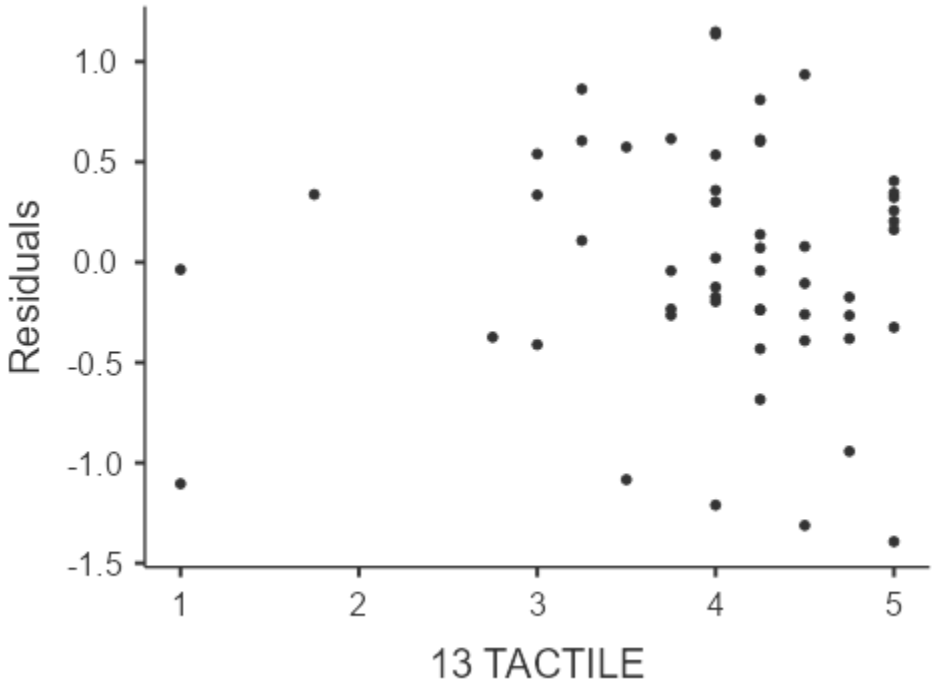
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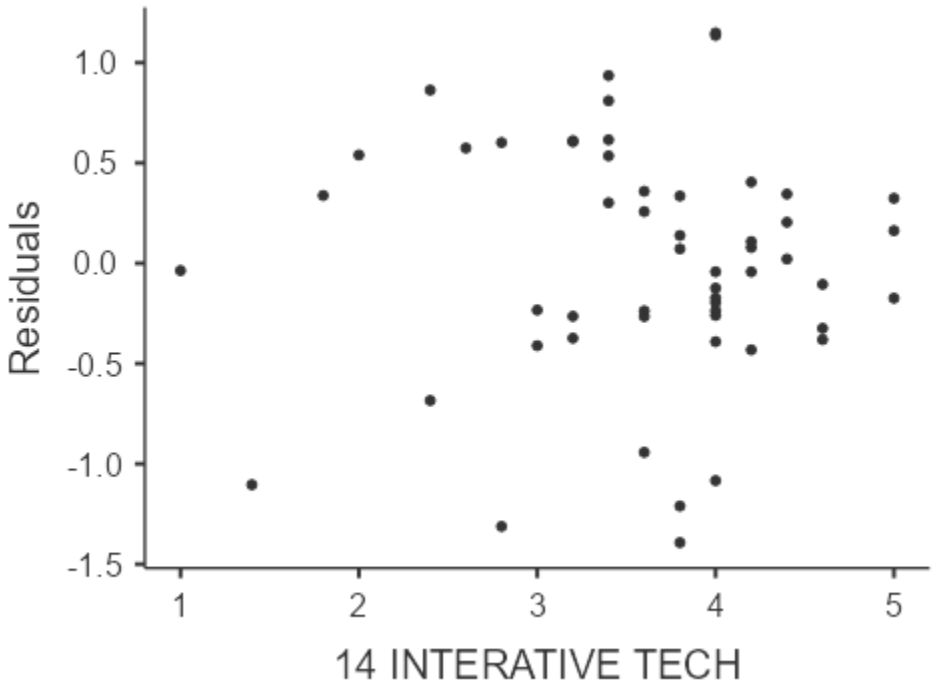




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