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THE IMPACT OF INTRUSIVE ADVERTISING ON BRAND RECALL, ATTENTION, AND
ATTITUDE WITHIN TELEVISED SPORT

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By DEVIN WILLIAMS

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THE IMPACT OF INTRUSIVE ADVERTISING ON BRAND RECALL, ATTENTION, AND
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BY THE COMMITTEE CONSISTING OF

Dr. Daniel Larson, Chair

Dr. Jeong Kyu Lee

Dr. Valerie Senkowski

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Abstract

With sports broadcasting becoming increasingly reliant on dynamic, intrusive advertising formats to capture viewer engagement, understanding the cognitive and effective trade-offs of these placements is vital for marketers and networks. This study investigated the impact of televised sport sponsorships intrusiveness of visual attention, brand recall, and Attitude Toward the Brand (Ab). Utilizing a within-subjects experimental design, eye-tracking methodology measured the visual fixations of 20 college-aged participants as they viewed naturalistic sport broadcasts featuring three advertisement formats: Static (baseline), Video with Audio, and Picture-in-Picture (PiP). Survey instruments, including the Ab scale, evaluated brand recall and sentiment across multiple time points. A repeated measures ANOVA revealed that dynamic formats (Video with Audio and PiP) significantly increased visual fixation duration compared to static placements. Generalized linear mixed-effects modeling supported the theoretical framework that forced visual attention significantly and positively predicted successful brand recall. However, linear mixed-effects modeling demonstrated that lower overall consumer Attitude Toward the Brand scores associated with the Picture-in-Picture format reflect pre-existing baseline brand differences rather than an active affective cost or decline over time. Additionally, participants whose primary sport consumption channel was streaming services demonstrated lower overall brand recall, highlighting the cognitive load of digital viewing environments. These findings establish a critical framework for modern sports sponsorship; while highly intrusive ad formats successfully capture visual attention and drive memory encoding without actively eroding long-term sentiment, sponsors must strategically deploy dynamic formats to build awareness for emerging brands rather than assuming uniform on-screen disruption.

Keywords: sports sponsorship, intrusive advertising, visual attention, brand recall

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Chapter 1: Introduction

Content creators and marketers continue to face challenges consistently grabbing the attention of consumers. Because of this, one way that advertisers have continued to find new ways of engaging viewers is by incorporating intrusive and possible distracting sponsorship within sport broadcasting. Industry data demonstrates the increasing adoption of these formats. During the 2022 AFC Championship game, Picture-in-Picture advertisements generated significantly higher consumer engagement metrics than traditional commercial breaks. The progressive ad showcased during the game made a TV viewer 56% more likely to search online for the brand Progressive after viewing the advertisement (Edo, 2022). While such performance metrics may appeal to advertisers seeking attention in an increasingly fragmented media landscape, the potential negative impact of such advertising on viewer experience and long-term brand perception remains an overlooked aspect of its implementation. Optimizing advertising placements not only enhances the viewing experience but also increases advertising effectiveness.

As the next generation of consumers have entered sport media consumption, traditional approaches to sport marketing may no longer be the optimal strategy for professional sport teams and leagues around the world. There is a large body of research targeted at college-aged students' attention span and looking at how the next generation has been affected by the usage of mobile phones (Siyami et al., 2023), social media (Shahzad et al., 2024), and the internet (Mark, 2023; Young, 2017). The advancement of technology has impacted the way that people consume media, and the sport sponsorship field will need to continue to adapt to fight against this change.

Sport sponsorship and marketing spending have continued to grow in importance within the field of sport business. The market will only continue to grow in coming years, as sport

sponsorship is projected to grow by 26.6 billion dollars before 2030 (PR Newswire, 2025).

Focusing on how to properly market to this new generation will be very important to the overall sport industry as the market continues to grow.

As investment in sport sponsorship grows, so too does the importance of understanding how these sponsorships are perceived and processed by consumers. One major element of the sport sponsorship mix is advertisements within television broadcasts. Media companies are increasingly exploring innovative ways to incorporate more advertising on screen. As advertising becomes more integrated into the sport product, understanding the relationship between viewer attention and brand attitude is becoming increasingly vital. Understanding this relationship is even more important due to the high emotional investment of sport viewers. There is a large amount of evidence related to the high level of emotional intensity that sport induces (Götz et al., 2020). An individual's attitude toward a brand is a strong predictor of consumer behavior (Mitchell & Olson, 1981). Because of this, marketers in many different fields have a high amount of interest in evaluating how people feel about particular brands.

This study investigated how intrusive advertisement affects attitude, attention and recall in the next generation of sport consumers, while also evaluating the trends and implications of increasingly intrusive advertising.

Purpose of the Study

With the continued importance of digital media, advancing the understanding of intrusive advertising is crucial to maximizing investment returns for companies within sport sponsorship. There continues to be a notable gap in the general understanding of how intrusiveness of sponsorship messages and advertisements during live sport broadcasts impact viewer attention,

recall, and attitude. Bauer & Greyser (1968) demonstrated that intrusiveness within advertising can result in consumer avoidance of advertising, something that would be a failure to any brand.

Previous research within sport has looked at how brand exposure time (Kwon & Shin, 2019), game related variables (Boronczyk et al., 2021; Herold & Breuer, 2023), and authenticity of sponsorship (Alonso-Dos-Santos et al., 2024) can impact sponsorship effectiveness on consumers. Placement, congruence, and volume of sponsorship within digital and printed sport media have also been explored (Alonso Dos Santos et al., 2019; Alonso Dos Santos et al., 2020).

Research outside of sport that has focused on intrusive advertising has examined online streaming services (Christy et al., 2023) and website advertising (Zha & Wu, 2014). Both studies demonstrated that intrusive and distracting advertising can be an irritant to consumers, with the latter demonstrating websites without disruptive advertising were perceived as being less intrusive by participants. Christy et al., 2023 also examined the effectiveness of such ads while evaluating consumer perception of the content and the advertising, concluding that more ‘disruptive’ ads perform worse than ‘non-disruptive’ ads.

Eye-tracking technology has begun to be explored within sport branding, marketing, and sponsorship. The technology provides an opportunity for companies to better understand consumer responses to brand and sponsorship activity (Nakagawa, 2011). Using eye-tracking to better understand how consumers are attracted to sport sponsorship can be very impactful to improving current sponsorship practices. Eye-tracking has been implemented within the sports sponsorship research field to continue to explore advances. Enhancing understanding of game related variables (Boronczyk et al., 2021; Herold & Breuer, 2023), color and animation (Breuer & Rumpf, 2015; Boronczyk et al., 2018), sponsor signage exposure and placements (Breuer & Rumpf, 2012; Boronczyk et al., 2018), and brand familiarity (Boronczyk et al., 2018) are all

elements of sport sponsorship that have been explored with the use of eye-tracking technology. This study evaluated the impact on consumer attention of intrusive advertising, using eye-tracking technology to evaluate a change in overall attention towards intrusive ad types.

Main Research Questions

1. How does the intrusiveness of sport sponsorship impact attention and recall of the brand?
2. How does the intrusiveness of advertisements impact the consumers attitude toward the brand?

Alternate Hypotheses

HR1: More intrusive advertising will have a positive impact on viewers' attention and ability to recall the brand.

HR2: More intrusive advertising will have a negative impact on viewers' attitude toward the brand.

Significance of the Research Problem

The examination of sport sponsorship within this context presents an opportunity to enhance research regarding eye-tracking, sport advertising, and consumer understanding. This research looks to advance the understanding of how modern sport advertising works and how the next generation of brands will have to consider new elements of advertising when catering to a new consumer base.

Additionally, the application of eye-tracking technology to this research topic provides a look into the relationship between brand placement, attention, recall, and attitude. Leveraging this technology will offer valuable insights to businesses, teams, leagues, and marketers alike. It provides opportunities for an enhancement of understanding related to ad placement

improvements on television and streaming broadcasts while contributing to research in both eye-tracking and sport sponsorship research.

This study will contribute to the continued research related to sponsorship placement within live sport broadcasts. Understanding how placement can impact consumers attention to sponsorship will continue ongoing research (Breuer & Rumpf, 2012; Boronczyk et al., 2018) related to sport broadcasting and attention. This research looks to advance this framework by considering variables related to contemporary and emerging sport consumers. While consumer attention and recall have been central to much of the existing sport sponsorship research, consumer attitudes toward sponsors, particularly in the context of invasive advertising, have received comparatively less focus and warrant further exploration.

Exploring consumer attitudes towards brands continues to be important within sport as more advertisements are becoming integrated within sport broadcasts. As technology advances to the point where we have the potential to adjust messages and sponsorships very quickly (Herold & Breuer, 2023) the importance of the sport product should not take a back seat to the potential for more effective but invasive sport sponsorship. This research evaluated the potential negative effect of the continued push for more consumer attention via audio and visual prominence. Previous research has focused on how product placement can impact consumer attitude within television and other digital media (d'Astous & Séguin, 1999), and bringing this idea to sport marketing is very beneficial for understanding the true return that a brand receives on their investment.

Delimitations of the Study

This study limited the population of the study to college students at The

University of Oklahoma. This allowed for questions to be answered related to a new generation of consumers while also allowing for general targeted analysis.

This research also limited the examination of sponsorship placement to that of commonly watched North American team sports. This provided participants with a familiar environment that allowed for a better collection process, as such this study included only English-language broadcasts.

Viewership was also limited to more established broadcasts such as streaming and television offerings. Excluding sponsorship from things such as social media, virtual reality, interactive experiences, or in-venue signage.

Additionally, participants' concurrent second-screen behavior (e.g., smartphone use) during the viewing sessions was not recorded. While second-screen usage has been established in the literature as a significant factor affecting sponsorship attention and recall (Lee, 2021; Jensen et al., 2015), the present study focused specifically on isolating the effects of advertisement placement intrusiveness under controlled viewing conditions. Measuring or allowing second-screen behavior would introduce an additional confounding variable that could obscure the direct relationship between placement condition and viewer response.

Finally, eye-tracking was limited to a laboratory setting to ensure equipment consistency as well as an experimental method, even though this could have created a notable limitation to ecological validity within the study. Research also focused on visual attention metrics using eye-tracking rather than EEG or emotional response physiological measures, such as its usage in García-Madariaga et al. (2020), which would have further strayed from authentic viewing experiences.

Limitations of the Study

As mentioned, this study took place within a laboratory setting. As such, this could have impacted the way that participants consumed the content provided, while potentially altering some natural behaviors of the people that took part in the study.

Additionally, with a study like this, there was always concern about data loss or corruption from eye-tracking equipment. Efforts were made to ensure as comfortable and relaxed viewing sessions as is possible, e.g. a comfortable chair and relaxed surroundings.

As much of the sampling was collected via a convenience sampling from OU students, it was difficult to recruit a truly diverse participant base. This did limit the studies overall population diversity. This study also relied on a questionnaire generating self-reported opinions. This could have been impacted by bias and further be affected by the laboratory setting.

Additionally, as this study focused on evaluating impact of emotional support towards brands connected to sport broadcasts, the impact of the Halo Effect could have had an impact on the results. If someone is a fan of the sport occurring during the broadcasts, that positive feeling could have made participants view the advertisements more favorably, impacting the overall effects of the intrusive nature of the advertisements.

Assumptions of the Study

There are multiple aspects of this study that rely on assumptions about the way that people consume their media, and sport by extension. As mentioned previously, the self-reported opinion questionnaire will be a large part of the analysis. This relied on the consumers' ability to accurately report their feelings towards a brand after consumption, while understanding that they are being tracked in a laboratory setting.

This also extends to the assumption of truth; it was assumed that participants answered these questions honestly throughout the questionnaire. This study also assumed that participants observed in a lab would still provide meaningful insights despite changes that don't properly match a natural environment. The clips shown were also assumed to represent a typical sport viewing experience.

Operational Definitions

Areas of Interest (AOIs) - Predefined regions within the visual stimulus where sponsorship messages appear. This will be coded into the videos beforehand.

Attitude Change - Measurable differences in the Attitude Toward the Brand (Ab) Scale across multiple time points (pre-test, between videos, and post-test), reflecting both immediate and cumulative effects of advertisement exposure.

Attitude Toward the Brand (Ab) - A construct measuring attitude toward a particular brand. This will be measured using the Attitude Toward the Brand (Ab) Scale as developed and validated by Spears & Singh (2004).

Brand Recall - Ability to retrieve brand information from memory after exposure to it. Questions about the brands shown will be administered after viewing sessions.

Eye-Tracking Technology - Measurement and analysis of visual attention patterns during the sport broadcast viewing. This will potentially involve using software or eye-tracking goggles to get noticeable insights.

Fixation Duration - Length of time that a participant's gaze remains relatively stable on an area of interest.

Intrusiveness – Referring to how much an ad forces itself into the viewers space of experience.

It refers to the idea that an ad may demand attention and interrupt what the participant is watching.

Multitasking – In this context, it refers to dividing attention between a primary task (watching a sport broadcast) and a secondary task like using a phone or other device.

Picture-in-Picture advertisements – Advertisements that overlay over the broadcast while game action continues in a reduced window. Used within this study as the most distracting level of ads.

Psychological Reactance - A motivational state that arises when an individual perceives their freedom or autonomy to be threatened or restricted. In the context of this study, it is collected using the Hong Psychological Reactance Scale (Hong & Faedda, 1996).

Return on Investment (ROI) - The effectiveness of sponsorship relative to the cost and time invested in it. This will be explored using eye-tracking statistics.

Root Mean Square (RMS) Precision: A measure of spatial variance representing the amount of high-frequency ‘jitter’ or noise in the eye-tracker’s signal while the eye is stationary. Lower RMS values indicate higher hardware stability and signal reliability.

Second-Screen Behavior – The use of an additional device (e.g., phone, tablet) while watching television content, which often leads to divided attention.

Semantic Differential Scale – A rating instrument in which respondents evaluate a concept by selecting a position between pairs of bipolar adjectives (e.g., *good–bad*, *strong–weak*) anchored at opposite ends of a numerical continuum which is 7 points within the Ab scale.

Sponsorship Effectiveness – The degree to which a sponsorship achieves intended outcomes, including viewer attention, brand recall, and positive attitude change. Within this study, effectiveness is evaluated using a combination of eye-tracking and pre/post attitude measures.

Spatial Accuracy – The degree of alignment between a participant's true point of gaze and the gaze position recorded by the hardware. It is calculated as the average angular offset between the measured fixation locations and the known physical coordinates of the calibration target.

Time of Interest (TOI): In eye-tracking methodology, a TOI refers to a designated temporal window within a continuous video stimulus used to isolate specific data for analysis. For the purpose of this study, a TOI represents the exact start and end timestamps during which a specific brand's advertisement (Static, Video with Audio, or Picture-in-Picture) was visibly present.

Visual Angle – Angle a viewed object subtends at the nodal point of the observer's eye. It is the standard metric used to quantify spatial distance and target size in eye-tracking research.

Chapter 2: Review of Literature

This chapter provides a review of literature relevant to the current study's exploration of viewer attention and brand perception in sport sponsorship. Specifically, it focuses on how the evolution of digital media consumption and advertising placement strategies impact viewer attention, recall, and attitude. The review is structured thematically, beginning with the evolution of attention in the digital era, followed by a focus on psychological reactance, multitasking and second-screen behavior, the role of social media, and the development of eye-tracking methods and brand attitude measurement. The chapter concludes by identifying gaps in the literature and establishing a rationale for the current study's methodological approach.

Literature Review Process

A systematic literature search was conducted using the University of Oklahoma's Library online database and resources. Databases including SPORTDiscus and PsycINFO were used. For attention research outside of sport, PsycINFO was used primarily to identify studies investigating the current state of consumer attention and technology use among college-aged populations. Literature related to psychological reactance was identified through manual reference list searching of key theoretical and empirical works, given the breadth of the reactance literature and the study's reliance on a specific established measurement instrument.

The following search terms and combination of words were used to find research related to the subject matter. "Attention span", "college students", "social media", "divided attention", "technology", "students", "second screen", "attention", "media multitasking", "digital distraction", "higher education", and "smartphone use" were all used. Inclusion criteria required peer-reviewed studies published from 2012 onward, a cutoff selected to reflect the modern era of smartphone and social media adoption. Exclusion criteria included studies not focused on

attention or technology use and populations outside of college-aged individuals. Of the 220 initial results, 5 duplicates were removed, yielding 215 unique articles. Following date screening, 34 articles published prior to 2012 were excluded, leaving 181 articles. After title and abstract screening for relevance, 35 articles were retained for full-text review, of which 14 were selected for in-depth review based on direct relevance to attention span and technology use in college-aged populations.

For the sport sponsorship focused section, SPORTDiscus was used as the primary database to identify peer-reviewed studies on televised sport sponsorship. Keywords included combinations of “sport sponsorship”, “eye-tracking”, “viewer attention”, “brand recall”, “intrusiveness”, “attention”, and “sponsorship placement.” Inclusion criteria focused on peer-reviewed studies published from 2012 onward that examined sponsorship in televised sport, with landmark foundational studies included regardless of publication date. Out of 8 initial results, 1 duplicated was removed, yielding 7 unique articles. 4 were included for in-depth review based direct relevance to sponsorship visibility and viewer attention. This database search was supplemented by manual reference list searching of key articles, through which foundational and landmark studies not captured by the primary search were identified. These supplemental studies were included regardless of publication date given their theoretical and historical significance to the field.

PsycINFO was used as the primary database to identify peer-reviewed studies on brand attitude measurement. Keywords included combinations of "attitude toward the brand," "sport sponsorship," "advertising intrusiveness," "eye tracking," "televised sport," and "second screen". Inclusion criteria required peer-reviewed studies published from 2012 onward. Of the 185 initial results, 19 articles were removed following date screening, yielding 166 articles. After duplicate

removal, 162 unique articles remained. Following title and abstract screening for relevance, 29 articles were retained for full-text review, of which 4 were selected for in-depth review. This database search was supplemented by manual reference list searching of key articles, through which foundational and landmark studies not captured by the primary search were identified, including seminal works on attitude theory and brand attitude measurement. These supplemental studies were included regardless of publication date given their theoretical significance to the field.

Evolving Viewer Characteristics

Evolution of Attention

The digital revolution has transformed media consumption, with sport media deeply affected. Increasingly, fans choose to watch events from home rather than attend in person (Larkin et al., 2015). As more consumers engage with sport content on screens rather than in venues, it becomes crucial to analyze these changing behaviors, especially in younger demographics who are key to future sponsorship strategies.

As this next generation becomes the target for advertising, understanding their challenges with providing attention is valuable to highlighting the need for evaluation. Modern students continue to face challenges maintaining attention, becoming clear with their inability to maintain their attention span within school environments (Jacildo et al., 2025). If students struggle to maintain attention within school environments, their ability to maintain attention during broadcasts could be heavily impacted. As traditional sponsorship approaches assume sustained viewer attention, the mismatch between advertiser expectations and actual viewer behavior creates a critical gap in understanding sponsorship effectiveness in sport broadcasting.

Attention and Technology

The rise of “second screen” behavior, simultaneously using smartphones while watching content, has garnered attention in marketing and sponsorship research. Simultaneous media use is now typical (Hassoun, 2012), significantly affecting sponsorship effectiveness. Lee (2021) found that multitasking reduced both brand recall and attitude toward the brand. Similarly, Jensen et al. (2015) reported that second-screen usage negatively influenced brand recognition and recall. Although not the focus of this research, previous findings demonstrate a continued trend of declining consumer attention.

Other research has examined technology's broader impact on attention. Siyami et al. (2023) found that excessive mobile phone use among students correlated with decreased attention and academic performance. Zheng et al. (2014) supported this by showing that adolescents with frequent phone use had lower attention capabilities. With 97% of people aged 18–29 owning a cellphone in the USA (Huey & Giguere, 2022), the potential impact on current sports sponsorship effectiveness is significant.

Impact of Social Media and the Internet

Social media has become nearly ubiquitous among young adults, fundamentally altering the advertising landscape in which brands must compete for consumer attention. As of 2015, 90% of this demographic used social media regularly (Barton et al., 2018). By 2021, 84% of adults had reported using social media (Auxier & Anderson, 2021). This widespread adoption has implications for how consumers process advertising messages. High social media usage has been associated with reduced attention spans, with Shahzad et al. (2024) finding a moderate negative correlation between social media addiction and attentiveness. When audiences already experience attention fatigue from constant social media stimulation, disruptive advertising tactics

like aggressive sports sponsorships may be perceived as particularly unwelcome, potentially triggering more negative brand attitudes than they would have in earlier, less saturated media contexts.

Psychological Reactance

Psychological reactance theory, first introduced by Brehm (1966), establishes the idea that individuals experience a motivational state of arousal when they perceive their freedom to be threatened or eliminated. This state causes people to reassert their freedom, often by increasing desire for restricted behavior, object, or choice. Since its creation, this theory has been applied across numerous fields including consumer behavior, health communication, and marketing, where it has proven particularly useful in explaining negative consumer responses to persuasive advertising (Rains & Turner, 2007).

Psychological reactance has been used to explain how individuals respond negatively to advertising they perceive as intrusive, manipulative, or freedom-limiting. Clee & Wicklund (1980) were among the first to connect reactance theory to consumer behavior, demonstrating that pressure in a purchasing context could trigger reactance and alter brand attitudes. Edwards et al. (2002) extended this to online advertising, finding that forced exposure to pop-up advertisements generated reactance responses that decreased brand attitudes. These findings suggest that the way advertising is presented, particularly when perceived as intrusive or unavoidable, can directly shape consumer attitudes toward associated brands.

To measure individual differences in the tendency to experience psychological reactance, Hong & Faedda (1996) developed the Hong Psychological Reactance Scale (HPRS), an 11-item instrument in which responses are recorded on a 5-point Likert scale. The HPRS measures reactance as a personality trait, capturing an individual's general predisposition to resist

perceived threats to their freedom rather than their response to a specific stimulus. This study uses this scale within the pre-study questionnaire.

The convergence of these attention-related challenges creates a critical context for understanding intrusive advertising effectiveness in sports. When viewers already experience attention fatigue from constant digital stimulation, advertising formats that demand additional cognitive resources may exceed current viewers' processing capacity. This mismatch between limited attentional resources and high-demand advertising formats could explain why intrusive placements might trigger more negative responses than they would among audiences with greater sustained attention capabilities. The following section examines how sponsorship placement strategies interact with these viewer attention patterns.

Televised Sport Sponsorship

This section explores research on televised sponsorship, focusing on advertising placement and the use of eye-tracking methodologies, as well as the history of brand attitude assessment. It synthesizes literature across sport management, consumer psychology, marketing, and attention research, with a specific aim to identify and address gaps, particularly regarding how advertising placement affects consumer attitudes.

Foundations of Sponsorship Attention

The relationship between advertising and attention has long been studied. Rudolph (1947) pioneered efforts to evaluate advertising effectiveness beyond sales data, setting the stage for future research. Jursek (1970) continued this work by critiquing TV ratings' influence on broadcasting decisions and advocating for more sophisticated audience measurement methods.

Current Trends and Innovations

Modern research has benefitted from advancements in eye-tracking technology. Breuer and Rumpf (2015) studied how color and animation influence viewer attention and perception during televised sports. Using 176 participants, they found that brightness and color contrast significantly boosted attention, while animation increased viewer confusion. These findings suggest that while visual enhancements can be effective, they must be used judiciously.

Boronczyk et al. (2018) further investigated how sponsorship effectiveness is shaped by visual and viewer-related factors. Their study, involving 92 participants, used manipulated sports imagery to show that high color contrast between sponsors improves attention, brand familiarity reduces it, and high sport involvement diminishes focus on sponsorship. These results indicate that sponsorship may be more effective for unfamiliar brands and casual viewers.

Herold and Breuer (2023) focused on how in-game events affect sponsor message visibility. Using over 100,000 eye-tracking data points from 42 avid soccer fans, they found that common game actions (e.g., throw-ins, fouls) reduced attention to sponsorship, while goals and lulls in gameplay increased it. These insights challenge traditional sponsorship valuation methods based on exposure duration and logo placement, advocating for more dynamic, data-driven strategies.

Placement of Sport Sponsorship

The strategic placement of sponsorship in sport media presents ongoing challenges. Digital advancements now enable more precise placement on broadcasts. Breuer and Rumpf (2012) explored this with a quasi-experimental study involving 85 participants who watched sport telecasts across four sports. Within this study, placement was coded through on-screen share, where the size of each sponsor signage was measured in terms of how many pixels the

signage took up on the screen. The study also used on-screen clutter, the amount of simultaneous exposed signage, and exposure time, the seconds the ad was on the screen, as additional evaluations for exposure. Their findings revealed that attention is significantly influenced by placement, size, as well as on-screen clutter. Importantly, exposure alone did not guarantee recall, with attention playing a mediating role.

Brand Attitude Measurement

There is a long history of brand attitude measurement within multiple fields. Fishbein & Ajzen (1975) established the theory of reasoned action, creating the idea that voluntary behavior is driven by someone's intention to perform it. This theory showed that an attitude toward a brand can directly predict someone's intention to buy a product, something that was re-validated by Mitchell & Olson (1981) while also providing the widely cited current definition of Attitude Toward a Brand (Ab). Lutz (1975) is regarded as one of the first papers to pose the idea of evaluating the idea of using advertising techniques to alter a consumer's attitude. The paper proved that someone could manipulate Attitude Toward the Brand in a laboratory setting by changing how a message is presented.

Spears & Singh (2004) directly cited Mitchell & Olson (1981) during their development of the Attitude Toward the Brand (Ab) Scale. The Ab Scale has been used to measure negative brand attitude reactions to intrusive advertising (Vogt, 2017) and to assess consumer attitudes while interacting with video formats (Diwanji & Lee, 2022). Within sports specifically, the scale was used to evaluate attitudes towards co-branding (Yu et al., 2020). The scale was also re-validated and utilized in Liao et al. (2025) to evaluate adults' attitude toward the application Microsoft Teams.

This research underscores the need for nuanced sponsorship strategies that consider where and how brands are shown on screen. As advertising becomes more embedded in the broadcast experience, companies must evaluate the trade-offs between visibility, viewer satisfaction, and consumer attitude toward the brand.

Intrusiveness of Media Impact on Emotion

The impact of intrusiveness on emotion has been explored outside of sport. Christy et al. (2023) evaluated the impact of disruptive advertising on consumers' perceptions of both the content and actual advertising. This research used 3 different ad placements (pre-roll, disruptive mid-roll, and non-disruptive mid-roll ads) with two different content types (narrative and non-narrative YouTube content). The study found that disruptive advertising produced higher levels of irritation and lower levels of product involvement, demonstrating the potential negative impact of advertisement that breaks up the viewing experience. Advertising that decreases the quality of the experience continues to be an issue within multiple different types of media.

Zha & Wu (2014) evaluated how online disruptive advertising affected users processing, feeling of content being intruded on, and on the overall news sites credibility as a site. The study created multiple versions of a fake website, including one website without any disruptive or intrusive advertising, one with disruptive advertising that was not related to the topic within the website, and one with disruptive advertising that was related to the content within the website. Participants were split between the three groups, with the first of the three being the control group. This study was able to confirm that advertisements that are deemed to be intrusive are perceived as more annoying while creating negativity within the viewer, demonstrating the negative impact of intrusiveness.

Sports Fans' Tolerance for Intrusive Advertising

However, research specific to sports contexts suggests that sports fans may respond differently to intrusive advertising than general consumers. Levin et al. (2013) developed the Sport Commercial Acceptance (SCA) scale to measure whether commercial messages during sports were intrusive, invasive, forced, distracting, disturbing, interfering, obtrusive, and annoying. Their findings revealed that sports fans demonstrated higher tolerance for commercial messages than consumers in non-sports contexts, with only 20% of fans believing advertisements were intrusive and 26% feeling ads were annoying. Interestingly, the study also found significant differences across sports, with NASCAR fans significantly more receptive to commercialization than American football fans. These findings suggest that the sport-fan relationship may create a unique context where fans are more willing to accept advertising intrusion, potentially buffering against the negative brand attitudes observed in other media environments.

However, Levin et al.'s reliance on self-reported acceptance measures may not fully capture the subconscious impact of intrusive advertising. The current study advances this research by incorporating eye tracking technology to objectively measure visual attention toward distracting advertisements during sports viewing, providing a more precise assessment of whether intrusive sponsorships capture attention and how this relates to brand attitudes. Additionally, it remains unclear whether the tolerance observed by Levin et al. extends to all forms of sports advertising or whether newer, more aggressive sponsorship formats may exceed even sports fans' acceptance thresholds, which is the target of this research.

Summary of Literature Findings

While the literature provides valuable insights into sponsorship visibility, eye-tracking outcomes, and the role of viewer behavior, few studies have empirically linked attention data to

viewer attitudes, a critical gap in understanding sponsorship effectiveness. Additionally, much of the existing research emphasizes exposure and recall, often overlooking the emotional or perceptual outcomes of brand placement and overall intrusiveness. Furthermore, while research suggests sports fans may be more tolerant of commercial messages than general consumers (Levin et al., 2013), this tolerance has been measured primarily through self-reported acceptance rather than objective attention metrics. It remains unclear whether this stated tolerance translates to actual visual engagement with intrusive advertisements or mitigates negative brand attitudes when attention is diverted from game action. Critically, despite research on advertising intrusiveness in other media contexts (Christy et al., 2023; Zha & Wu, 2014), no current research in sport has systematically examined how varying levels of advertisement intrusiveness impact the combined outcomes of attention, recall, and brand attitude using objective physiological measures. This study addresses these gaps by combining eye-tracking data with subjective attitude measures from college-aged viewers, thereby offering a more complete picture of sponsorship impact in a modern digital media context. The Ab scale developed by Spears and Singh (2004) provides a validated and reliable scale for assessing participant attitude toward brands and is used in this study to capture consumer attitude. Modern viewing behaviors continue to evolve, posing challenges for sports marketers, brands, and broadcasters. By refining sponsorship practices and integrating viewer feedback, stakeholders can optimize investment returns and create more meaningful, engaging partnerships between sports and commercial entities.

Chapter 3: Methods

This chapter outlines the methodology for this eye-tracking study examining the influence of sport sponsorship placement on attention, recall, and consumer attitudes. The study aimed to answer key research questions about how sponsorship visibility impacts consumer responses, specifically among college-aged participants. This chapter details sample selection, session protocol, instrumentation, research design, data collection procedures, data management protocols, and statistical analyses that were used in this study.

Sample

Participants within the study represented a diverse sample of a American university's population, including undergraduate students from various academic disciplines, years of study, and demographic backgrounds. Participants were recruited primarily using flyers placed throughout the campus. The flyer contained standardized recruitment language, including:

- Clear Eligibility criteria for participation
 - Undergraduate standing at the University of Oklahoma
 - Between 18 and 25 years of age
 - Normal or corrected vision
 - Interest in watching sport (casual or avid fans welcome)
- Time Commitment
- Expected Compensation
- Location
- The contact information of the research team to address questions or concerns
- IRB approval information and participation rights statement

Additional recruitment was done using the official mass email system at The University of Oklahoma. Due to the character limit within the system, a simple email was sent out to students at the school, containing information related to time commitment, compensation, researcher contact information, as well as a link to the previously mentioned flyer.

This recruitment strategy allowed participants from multiple different fields of study to participate, collecting a diverse range of student interactions with sport sponsorship. Exclusion criteria included individuals not enrolled as undergraduates at the University of Oklahoma, those unable to attend in-person testing sessions, those with no interest in sport or sport media consumption, and those with uncorrected vision impairments that may interfere with eye-tracking data accuracy.

Type of Sampling and Sampling Techniques

This study used a convenience sample of undergraduate students at the University of Oklahoma. This presented an opportunity for a cost-effective and time-efficient collection of data to occur, while collecting a sample among undergraduates at OU. Sample size determination was conducted using G*Power 3.1 software to ensure adequate statistical power for detecting placement effects. A priori power analysis for repeated measures ANOVA was conducted with $\alpha = 0.05$, desired power = 0.80, and three measurement conditions. For a medium effect size ($f = 0.25$), the analysis indicated a minimum sample size of 12 participants would be needed to detect main effects of placement condition.

Sampling on Campus and Convenience Sampling

Using university campus samples is common within this field of study. For instance, Otto and Rumpf (2018) recruited undergraduate and graduate students from the German Sport University Cologne for a lab experiment utilizing eye-tracking to measure how the animation

intensity of sponsorship signage impacted sport viewers' visual attention. Similarly, Behnam Abdolreza et al. (2023) utilized a university student sample in Iran to conduct an eye-tracking study assessing how game attractiveness and message color influence viewers' attention during sports broadcasts. Beyond sport-specific media contexts, Rosengrant et al. (2020) recruited an undergraduate sample in Georgia, employing portable Tobii eye-tracking glasses to track participants' gaze points and fixations to measure sustained visual attention and on-task vigilance. . While this study represents a convenience sample based on accessibility, this demographic is strategically relevant as college-aged consumers (18-25) represent a critical market for sports advertisers, comprising the most active sport consumer profile (Zhang et al., 2003).

Protocol and Visits

This study employed a single-session protocol lasting approximately 40-60 minutes. All participants completed their visit in one laboratory session, where eye-tracking equipment was calibrated to each participant before their viewing session began. This experimental design balanced experimental rigor and ecological validity by recreating a natural viewing environment. After participation, participants received a small gift, worth approximately \$15-25, as an incentive for participation.

Laboratory Setup

The testing environment was configured to simulate a typical sport viewing experience. A computer monitor was placed at a comfortable viewing distance from the participant who was sitting on a desk chair, with the Tobii Eye Tracker Pro X3 attached to the bottom of the screen (see Appendix A for an example). Following manufacturer specifications, participants were positioned approximately 50-95 cm (20-37 inches) from the screen to ensure optimal eye-tracking accuracy (*Positioning in Front of an Eye Tracker*, 2016). The room was

dimly lit to avoid glare on the screen, while being maintained across participants to ensure that results are consistent.

Session Protocol Timeline

Phase 1: Informed Consent and Pre-Session Instructions

Upon participant arrival, participants reviewed and digitally accepted an informed consent form and the general nature of the study was explained to them. Participants were instructed to watch video clips naturally, with half of the pre-session questions being focused on in-game rules rather than questions related to the advertising. The true purpose of the study regarding intrusiveness of sponsorship placement was intentionally obscured in these instructions to minimize testing effects.

Phase 2: Pre-Test Questionnaire

Participants were asked to complete a demographic questionnaire collecting information related to age, gender, and sport consumption frequency. Participants received the questionnaire before coming into lab for testing to lower total time commitment for the participants. After arriving at the testing lab, participants completed the Attitude toward the Brand (Ab) Scale for each of the twelve brands that were used within the videos while also answering general questions related to sports knowledge (see Appendix B). This test served as the baseline to measure the change in attitude after each stimulus, as well as after the entire study. Before participation, the researcher explained the semantic differential format, where participants were asked to answer on a 7-point scale measuring which word associates most with the participants' opinion of the brand. The questionnaire design is presented within Appendix B but will be further discussed in the instrumentation section.

Phase 3: Learning Period and Acclimation

To attempt to control instrumentation effects and allow participants to acclimate to the laboratory setting and the eye-tracking equipment an unrelated 2-minute video was shown of a non-sport related news broadcast. Participants were instructed to watch normally; this also allowed for any questions to be answered about procedure during this period.

Phase 4: Experimental Video Viewing

Participants were then asked to view a series of edited video clips from live sport broadcasts representing four different sports (basketball, football, baseball, and hockey). Each sport was represented with an approximately 8-minute video with three separate brand types within it. Each clip contained sponsorship placements that appeared according to a predetermined randomized schedule. Participants viewed all four videos, with questions related to sport content and brands within them appearing between each. There were four possible orders for the four videos, with each participant receiving a random order. The 12 brands were randomly ordered throughout the 4 videos, and each only appeared once throughout the entire viewing experience (see Table 1 for brands, sports, and order). Brand related questions included the full semantic differential Ab scale for all the brands within the video appeared between each video viewing.

Three advertisement conditions were presented in each of the video clips with a random brand in a random order (see Appendix C for examples of each ad type):

- Ad Type A, Control Condition: Brand was inserted in typical advertisement location (placed in the bottom corner of the screen).
- Ad Type B, Corner placement: Brand advertisement was placed in the bottom right of the screen with audio. Audio was changed from original broadcast to the advertisement

audio.

- Ad Type C, Picture-in-Picture format: Original broadcast was shrunk to the left side of the screen, with the brand now taking up an equal section of the screen.

The order of video clips was randomized across participants to prevent order effects as stated. Within each video, each sponsorship appeared approximately 1 minute 30 seconds between each other, some advertising appeared with a slightly smaller gap if it was illogical for an advertisement to appear (e.g. while a player attempted a shot). This allowed for sponsorship to appear at different games states (e.g. time-outs, active play, between-play) to reduce game-related factors on findings. Table 3.1 demonstrates brand order within videos.

Table 3.1: Brand Order

Brand	Ad Type	Sport
Chevrolet	A	Football
Puma	C	Football
Ford	B	Football
New Balance	B	Basketball
Toyota	A	Basketball
RAM	C	Basketball
Nissan	C	Baseball
Columbia	A	Baseball
Asics	B	Baseball
Honda	C	Hockey
Under Armor	B	Hockey
Reebok	A	Hockey

Note. Brand placements occurred in the order they appear within the table. Order and ad type were randomly chosen using a random number generator.

Stimuli

This study utilized four video clips, each representing a different sport commonly played within North America. Each video clip was between 7 - 9 minutes in duration, designed to provide sufficient viewing time for multiple advertisement exposures while having spaces in between to have periods of regular gameplay to represent a typical viewing experience. All videos featured standard broadcast qualities and contained natural game action, commentary, and production elements consistent with professional sport telecasts. Content was edited from official broadcasts with raw footage being obtained through licensed broadcast archives or official league/organization recordings to ensure video quality and legal compliance. Videos were also screened beforehand to ensure that manipulated brands do not appear elsewhere and remove any large brand placements.

Basketball, Baseball, Hockey, and Football were selected to represent North American sport and provide participants with a familiar viewing experience that represented diverse visual demands and viewer engagement patterns. The inclusion of multiple sports ensured that findings regarding advertisement effectiveness could be generalized across different viewing contexts and cognitive demands.

Phase 5: Post-Test Questionnaire

Immediately following video viewing, participants completed post-test measures while the video content and advertisements remained fresh within participant memory. Firstly, Participants were asked to list any brands or companies that they remembered seeing advertised during the video clips. This unaided recall measure assesses brand memory without providing

retrieval cues, making it a more rigorous test of sponsor effectiveness than aided recognition tasks (Lardinoit & Derbaix, 2001).

Secondly, participants were asked to complete an identical version of the Attitude Toward the Brand (Ab) Scale (see Appendix B) that was presented before and during the test. No ‘filler’ questions were included in this section. This scale was shown for each of the twelve test brands. Brand attitudes were assessed multiple times: before showing clips, after each video clip (to capture immediate effects of specific placement exposures) and again at the conclusion of all viewing (final post-test). This repeated measurement structure allowed for analysis of both immediate attitude shifts following each placement condition and cumulative attitude change across the entire viewing session.

Finally, participants were asked open-ended questions about their general impression of the video content and any comments about their viewing experience. They were also asked whether they noticed the eye-tracking equipment or any other aspects of the laboratory setup that may have influenced their viewing behavior.

After completing all questionnaires, the researcher provided a brief debrief explaining the true purpose of the study: examining how the intrusiveness of advertisement placement impacts attention, recall, and attitude toward brands. Participants were informed that this information was initially obscured to prevent biasing their natural viewing behavior. Participants were given the opportunity to ask questions and were thanked for their participation.

Instrumentation and Measurement Protocols

Eye-tracking Tools

This study utilized the Tobii Pro X3-120 eye tracker (firmware version 2.0.13) to evaluate participants’ gaze behavior. Gaze data was recorded at a sampling rate of 120 Hz and

eye positions were recorded for both eyes of all participants. Under ideal laboratory conditions, the Pro X3-120 achieves gaze-point accuracy of approximately 0.4° (binocular) with a precision (RMS) around 0.24° , indicating that it can reliably capture fine-grained eye-movements when properly calibrated and positioned (Tobii Technology AB, 2017). In this procedure, the eye tracker was calibrated for each participant using a standard 9-point calibration procedure. Participants were instructed to follow a sequence of dots appearing on the screen, allowing the system to establish individualized baseline measurements for subsequent gaze tracking during the experiment. Additionally, all participants were seated in a stationary chair while using the eye tracker.

Areas of Interest (AOIs)

Before data collection began, AOIs were programmed throughout the video clips for each advertisement placement condition. The eye-tracking software automatically tracked and recorded fixations, fixation duration, and gaze points relative to the pre-coded AOIs inserted.

Questionnaire Within Study

Questionnaires were given at different points throughout this study. Section 1 was given pre-study while section 2 was given pre-, during, and post study allowing a look at how the placement of the advertisements impacted the attitudes of the participants. Section 3 was given just post-study. The brands evaluated within the study were clouded by sport-related ‘filler’ questions, as utilized within Breuer, & Rumpf (2012) (see Appendix B for examples).

Section 1 – Demographics and Sport Viewing Habits (Pre-Test)

This section looked to collect information about the participants of the study, questions related to the age, sex, race, class standing, and vision correction (i.e. glasses, contact lenses, etc.). While also collecting information related to their sport consumption habits, including

questions related to viewing frequency, fan identification, favorite sport, and general primary viewing platform. Additionally, participant trait reactance was measured using the 11-item refined Hong Psychological Reactance Scale (HPRS; Hong & Faedda, 1996). Participants rated their agreement with each statement on a 5-point Likert-type scale, with higher scores indicating a greater general propensity to resist rules and influence (see Appendix D). This allowed participants to be categorized and analyzed after the study.

Section 2 – Brand Attitude Measurement (Pre, Between, and Post Test)

This section uses the Attitude Toward the Brand Scale (Ab Scale), originally developed by Spears and Singh (2004) and later applied extensively in branding and consumer research (e.g., Diwanji & Lee, 2022). The Ab scale contains 5 semantic differential questions (Unappealing/Appealing, Bad/Good, Unpleasant/Pleasant, Unfavorable/Favorable, Unlikable/Likable), these 5 questions are answered on a 7-point scale measuring which word associates most with the participants' opinion of the brand. Additionally, for the purpose of this study, the scale has been augmented with the addition of 12 'filler' questions as mentioned. These questions are general sport knowledge questions that are meant to make it less clear that sport sponsorship analysis is the overall goal of the study, especially as this scale was used multiple times in a single session. This scale featured no reverse coded items and featured a strong readability showcasing a Flesh Reading Ease of 81.2, a Flesh-Kincaid Grade Level of 4.4, with only 4.3% of sentences found to be passive.

In between each video, the Ab scale was presented to the participants with only the brands included within the video asked about. Sport 'filler' questions related to the video being watched (i.e. where the baseball game was taking place) were also included. The questions were presented in a random order, and scores collected at this step were compared to pre-test scores to

evaluate attitude change. After the video, each participant was presented with the Ab scale for all 12 brands. At this time, no additional questions were included to attempt to minimize viewer fatigue.

Section 3 – Sponsorship Recall (Post-Test)

This section looked to evaluate how sponsorship placement can impact recall right after the viewing period. As advertising was shown at random times for each participant, this allowed an understanding about how placement and timing impacted recall within sport sponsorship.

Research Design

This study utilized a within-subjects experimental design combining eye-tracking methods with a pre-during, and post measurement to investigate the impact of sport sponsorship placement. This study makes causal inferences while maintaining ecological validity using real-world sport broadcast clips. Eye-tracking was used to analyze the relationship between sponsorship placement, attention, recall, and attitude. There are multiple different variables found within eye-tracking that contribute to understanding these parts of the research. The gaze direction of participants has been shown to correlate with attention in the past (Henderson et al., 1999).

Threats to Internal Validity

There are multiple threats to internal validity that can be seen from within this study. Throughout the process of collecting data within this research, every effort was made to control internal threats. Below are a few examples of potential threats, as well as how this study looked to manage their presence.

Testing Effects

As this study had a repeated measures methodology, the presence of the pre-test

questionnaire could have caused the sponsorships being tested to artificially increase attention on them from participants. This could potentially have led to inflated metrics that did not represent real viewing behavior. This was controlled through the addition of filler non-brand-oriented questions that are meant to cloud the true nature of this study. Having questions that are not representative of the true purpose of the study cause participants to be unsure of what is being tested for. In future research, this could also be further prevented by adding a filler task between the pre-test and the actual videos, to make it more difficult to remember everything that was asked. Studies have done this in the past to avoid this phenomenon (Dixon et al., 2018).

Selection Bias

Selection bias was identified as a potential threat because of the convenience sample being used. The college students used in the study could have been a non-representative sample. By collecting demographic data and sport consumption data these controls were used in statistical analysis to better isolate the true effects of the videos and compare the sample characteristics to the overall population of interest.

Instrumentation Effects

The use of screen-based eye tracking (Tobii Pro X3-120) could have influenced how participants view content if the environment feels artificial. To reduce this threat, the testing room was arranged to resemble a natural sport-viewing environment (e.g., couch and TV setup or desk-and-monitor arrangement). Prior to data collection, participants viewed two minutes of unrelated content to acclimate to the eye-tracking setup. Because the Pro X3-120 is mounted below the screen and does not physically attach to the participant, this minimized obtrusiveness compared with glasses-based systems.

History

As people exist outside of the lab setting, it is possible that participants could have been influenced by recent exposure to sponsors before being involved in the test. This attempted to be controlled through the evaluation of a change in attitude rather than just collecting attitude after viewing.

Pre-Test Sensitivity

Finally, because this test has a pre-questionnaire related to brand consumption, it could have caused people to be more sensitive to these brands. This study utilized distractor questions as mentioned that attempted to minimize this threat to the study.

Threats to External Validity

There are also multiple external validity concerns that have been considered when creating and implementing this study. This study looked to take these into account during research collection.

Ecological Validity

As discussed, some eye-tracking studies have a difficult time recreating a real world setting through its use. When using eye-tracking glasses, it may cause the participant to not act as they would in their natural environment. This study looked to attack this issue through the re-creation of a natural sporting environment within the lab and by only using screen-based tracking.

Hawthorne Effect

Participants may act differently because they are being monitored in the lab. This was avoided through the language of the test, emphasizing that eye-tracking is just tracking general viewing patterns and not specifically sponsorship. It was also important to emphasize other

aspects of the pre-questionnaire that are not important to the study to cloud the true purpose of the recording. Participants were also partitioned off from the researchers within the lab space to be “out of view” of the lab personnel.

Data Collection Procedures

Prior to data collection, the study’s protocol was reviewed and approved by the University of Oklahoma Institutional Review Board (# 19435). All participants read and digitally signed informed consent forms before participation within this eye tracking study.

Time Frame and Personnel

This data collection took place over a period of several weeks, with the lead researcher being the only person responsible for data collection and procedures. Data analysis was also done through only the primary researcher. No additional staff took part in any step of this process, ensuring a smooth and consistent data collection period.

Type of Data being Collected

This research utilized the Tobii eye-tracking technology to track gaze position, and visual fixations to understand how the different positions of sponsorship impact the attention of participants. This information was compared to the results of questionnaires focused on the ability to recall sponsors while also evaluating how different ad placements impacted participant attitude. This also allowed for self-reported quantitative data to be collected.

Data Management and Analysis

Procedures for Data Management

Because of the large amount of data that was collected through this eye-tracking research, it was important to keep track of all data in a reliable way. The data from participants was exported to a single TSV, allowing data analysis to utilize a single file. This also helped to

protect any demographic information collected through the questionnaire. Gaze data was preprocessed to remove invalid samples like blinks or off-screen gazes. Before the participants arrived, areas of interest (AOIs) were coded into the video clips.

For Ab scale processing, responses from participants were recorded from an online survey. Data was not kept with clear participant identification. Through this process, data cleaning was documented with detailed comments within the R code to keep track of any errors in the analysis (see Appendix F). Throughout this process, all data was stored on password-protected servers and technology.

Data Cleaning and Preparation

Prior to final hypothesis testing, the raw dataset was screened to ensure validity and reliability of both survey responses and the eye-tracking metrics.

Eye-Tracking Data Processing.

Gaze position was sampled as a two-dimensional screen coordinate (x, y) mapped directly to the resolution of the stimulus display. Equipment calibration was verified for all participants prior to analysis to ensure the integrity of the overall gaze mapping. The average validation accuracy across the sample was 1.36 degrees of visual angle. While some highly controlled studies utilize a strict 0.5-degree threshold, measured accuracy values in applied visual research can routinely range from 0.3 to 2.0 degrees (Holmqvist et al., 2011). Ecological factors that are natural to this more naturalistic viewing, such as the use of no chin rest and individual participant physiologies, can introduce up to 1.5 degrees of spatial variance (Holmqvist et al., 2011). This study's average accuracy of 1.36 degrees falls well below the upper threshold accepted in other visual research (Komogortsev & Khan, 2008). Additionally, the tracker demonstrated high stability, with an average validation precision of 0.64 degrees

(RMS), indicating minimal spatial variance during these fixations (Holmqvist et al., 2011).

Raw gaze data was classified into fixations using the standard Tobii I-VT (Velocity-Threshold) fixation filter to distinguish conscious visual attention. Natural blinks and minor single drops (<75ms) were automatically interpolated via the filter's built-in gap-fill algorithm.

Given that this study features extended continuous tracking, a data quality threshold was established to account for natural participant movement, blinking, and visual fatigue. Data loss was evaluated using the Tobii Gaze Sample Percentage, which calculates the ratio of valid recorded gaze points to the maximum. Participants that were below a sample percentage below 70% (indicating a >30% loss) were excluded from the final analysis. This threshold aligns with established standards for extended visual attention tasks from other published papers (Yfantidou et al., 2025). Because of this threshold, two participants were removed from the final dataset.

Survey Data Processing.

Self-report survey data was exported from Qualtrics and screened for incomplete responses. Missing data analysis was conducted to determine the nature of any omissions. For the primary dependent variable, responses to the five-item Ab scale were evaluated for internal consistency reliability using Cronbach's alpha. As this scale is already previously established, no items were removed. Individual item scores were aggregated to compute a single composite mean score for each participant's attitude toward sponsors. Finally, the cleaned physiological fixation metrics and the survey responses were merged using unique participant identifiers to construct the final dataset for mixed-effects modeling.

Statistical Tests

During this study, there were multiple different statistical tests used to allow individual sections to show different results. The demographics, sport viewing, and psychological reactance

scores were analyzed using descriptive statistics displaying frequencies, means, standard deviations, and percentages related to the participants of the study.

For the sponsorship recall section, a generalized linear mixed-effects model (GLME) with a binomial distribution was used to analyze the binary outcome of brand recall (recalled vs. not recalled), accounting for repeated measures within participants across multiple sponsorship placements. Similar approaches have been used in sport-sponsorship research to model recall or awareness over time. For example, Walraven et al. (2014) applied a longitudinal logit model to predict sponsorship awareness across multiple years in the UEFA Champions League, demonstrating the logistic regression for repeated measures recall data. Breuer & Rumpf (2012) also used a logistic regression within their eye-tracking study to analyze sponsor recall.

Eye-tracking outcomes (fixations, fixation duration, and total gaze time) were analyzed using one-way repeated measures ANOVA to compare mean visual attention across the three advertisement placement conditions (static, video with audio, and Picture-in-Picture). This analysis directly tests whether different types of advertisement intrusiveness produce significantly different levels of visual attention. As the omnibus ANOVA revealed significant differences ($p < .05$), post-hoc pairwise comparisons with Bonferroni correction were conducted to identify which specific conditions differ from one another.

Attitude Toward the Brand was assessed at multiple time points throughout the study: pre-test (baseline), after each of the four video clips (interim assessments), and post-test (final assessment). Linear mixed-effects (LME) regression models were used to analyze brand attitude scores, with placement condition as the primary predictor of interest. The static ad was used as the reference category for this analysis, allowing for direct comparison of how each intrusive placement format impacts brand attitudes relative to traditional sponsorship placement. The

model also controlled for individual differences by including psychological reactance, sport fan identification, and sports media consumption habits as covariates. Additionally, fixation duration was added to this model to control for visual attention. Participants and brand were both included as a random effect to account for the repeated-measures design and inherent baseline differences in brand perception.

Finally, prior to hypothesis testing, statistical assumptions were evaluated for all models. For the repeated measures ANOVA, assumptions of normality and sphericity were tested, with Greenhouse-Geisser corrections applied if sphericity was violated. For the mixed-effects models, potential multicollinearity among predictors was assessed using Variance Inflation Factors (VIF). Additionally, assumptions of homoscedasticity and normality of residuals were verified via visual inspection of residual-versus-fitted and quantile-quantile (Q-Q) plots.

This approach allowed for an examination of how different types of advertisement intrusiveness influence brand attitudes while controlling for individual variation. Prior sport-sponsorship research has successfully used mixed-effects models and regression-based approaches to analyze outcomes across conditions, including Herold and Breuer (2023) who used generalized linear mixed models and Breuer and Rumpf (2015) who used linear regression to predict sponsorship outcomes.

Chapter 4: Results

This chapter will present the results of the statistical analyses conducted to address the research questions regarding sport sponsorship intrusiveness. This section will include factor analysis done on the two main incorporated scales, assumption testing, analysis of descriptive statistics, and information related to hypothesis testing.

Descriptive Statistics

Sample

Initial recruitment resulted in 22 participants. However, due to the cut-off for gaze sample data ($< 70\%$), two participants were removed from the final data set leaving a population of 20. The ages of the retained sample ranged from 18 to 22 ($M = 20$, $SD = 1.08$). Looking at gender composition, the sample identified as 55% ($n = 11$) female and 45% male ($n = 9$). The majority of the sample identified as White/Caucasian (65%, $n = 13$), followed by Asian (20%, $n = 4$).

Psychological and Fandom Covariates

As the stimuli within this study consisted of specific televised sporting events, participant sport fandom and consumption habits were measured to serve as control covariates. The sample showed strong engagement with sport media, demonstrating a mean Sport Fan Identity Score of 3.55 ($SD = 0.94$) on a 5 point-scale (see Appendix D for scale). Furthermore, 55% of participants reported watching sports at least once a week ($n = 11$). The primary sport consumption channel found within this sample was streaming services (45%, $n = 9$), followed by social media highlights (35%, $n = 7$), and traditional television (20%, $n = 4$). Additionally, participants demonstrated moderate baseline levels of psychological reactance ($M = 23.85$, $SD = 5.81$) on the trimmed 45-point scale. Table 4.1 demonstrates the descriptive statistics for

continuous variables whereas Table 4.2 demonstrates frequencies and percentages for categorical variables.

Baseline Brand Recall and Attitude Metrics

Raw baseline metrics regarding brand recall were also evaluated. Frequencies and percentages for successful brand recall were calculated across all three advertisement formats. As shown in Table 4.3, overall unprompted recall was generally robust, with nine of the twelve specific brands being successfully recalled by at least half of the participants. The highest recall rates were observed for Chevy in the static format and Ram in the Picture-in-Picture format. Both brands were recalled by 70% of the sample ($n = 14$). Columbia, which was presented in the static format, yielded the lowest recall rate at 35% ($n = 7$). A similar aggregation was performed for brand attitude scores across the three timepoints (pre-test, mid-test, and post-test), the complete descriptive statistics for which are presented in Table 4.4.

Table 4.1: Continuous Variables

Variable	<i>N</i>	<i>M</i>	<i>SD</i>	Max	Min
Age	20	20.00	1.08	22	18
Sport Identity	20	3.55	0.94	5	2
Psychological Reactance	20	23.85	5.81	36	14

Table 4.2: Categorical Variables

Variable	Category	<i>N</i>	%
Gender	Female	11	55.0
	Male	9	45.0

	Male	9	45.0
Race			
	White/Caucasian	13	65.0
	Asian	4	20.0
	Other	2	10.0
	Native American/Alaska Native	1	5.0
Class Standing			
	Sophomore	8	40.0
	Senior	6	30.0
	Junior	3	15.0
	Freshman	3	15.0
Vision Correction			
	No Correction	10	50.0
	Contact Lenses	6	30.0
	Glasses	4	20.0
Sport Watch Frequency			
	Twice to Three Times a Week	6	30.0
	Three to Five Times a Week	5	25.0
	Once to Twice a Week	4	20.0
	Once a Month	3	15.0
	About Once a Day	2	10.0
Consumption Channel			
	Streaming Service	9	45.0
	Social Media Highlights	7	35.0
	Traditional TV	4	20.0

Table 4.3: Brand Recall Frequencies and Percentages by Format

Sport	Brand	Ad Format	Times Recalled (<i>N</i>)	Recall Percentage (%)
Football	Chevy	A (Static)	14	70
Basketball	Ram	C (Picture-in-Picture)	14	70
Football	Puma	C (Picture-in-Picture)	13	65
Hockey	Honda	C (Picture-in-Picture)	12	60
Basketball	New Balance	B (Video w/ Audio)	12	60
Basketball	Toyota	A (Static)	12	60
Football	Ford	B (Video w/ Audio)	11	55
Baseball	Nissan	C (Picture-in-Picture)	10	50
Hockey	UnderArmor	B (Video w/ Audio)	10	50
Baseball	Asics	B (Video w/ Audio)	9	45

Hockey	Reebok	A (Static)	9	45
Baseball	Columbia	A (Static)	7	35

Table 4.4: Average Brand Attitude Scores by Specific Brand and Format

Sport	Brand	Ad Format	Pre Test M (<i>SD</i>)	Mid Test M (<i>SD</i>)	Post Test M (<i>SD</i>)
Baseball	Columbia	A (Static)	5.50 (1.01)	5.40 (1.09)	5.31 (1.03)
Baseball	Asics	B (Corner Video w/ Audio)	4.81 (1.30)	5.08 (1.49)	4.88 (1.33)
Baseball	Nissan	C (Picture-in- Picture)	4.39 (1.18)	5.06 (0.92)	4.56 (1.28)
Basketball	Toyota	A (Static)	5.93 (0.97)	5.49 (1.13)	5.84 (0.89)
Basketball	NewBalance	B (Corner Video w/ Audio)	5.39 (1.05)	5.49 (0.91)	5.53 (0.99)
Basketball	Ram	C (Picture-in- Picture)	4.42 (0.74)	4.03 (1.40)	4.02 (1.34)
Football	Chevy	A (Static)	5.40 (1.09)	5.15 (1.08)	5.14 (0.98)

Football	Ford	B (Corner Video w/ Audio)	5.57 (1.12)	5.00 (1.17)	5.16 (1.21)
Football	Puma	C (Picture-in- Picture)	4.77 (1.38)	4.87 (1.60)	5.08 (1.60)
Hockey	Reebok	A (Static)	4.50 (1.37)	5.26 (1.17)	4.71 (1.26)
Hockey	UnderArmor	B (Corner Video w/ Audio)	5.42 (1.18)	4.49 (1.29)	5.16 (1.37)
Hockey	Honda	C (Picture-in- Picture)	5.12 (1.42)	5.26 (1.46)	5.28 (1.01)

Factor Analysis

Attitude Toward the Brand

As there are two full scales being adapted into this study at different points, factor analyses were run on both Attitude Toward the Brand (Ab) Scale developed by Spears and Singh (2004) and the Psychological Reactance scale developed by Hong & Faedda (1996). For the five-item Ab scale, the factor analysis demonstrated a single dominant factor, which confirmed the scales unidimensional construct report during the original development. All five items demonstrated excellent factor loadings ranging from 0.88 to 0.96. This single factor was able to demonstrate 83.08% of the total variance in Attitude toward the brand.

The internal consistency of this scale was also evaluated. Inter-item correlation matrix showed strong positive relationships among all Ab scale items (.78 to .90). Reliability analysis

yielded excellent internal consistency as well, with Cronbach's alpha demonstrating exceptional reliability at the pre-test baseline ($\alpha = .96$). While these alphas may indicate item redundancy, this high degree of overlap was included in the original semantic differential framework. Table 4.5 demonstrates the factor analysis for the Ab scale.

Table 4.5: Unidimensional Factor Loadings for Brand Attitude (Pre-Test)

Scale Item	Standardized Factor Loadings
Unappealing/Appealing	0.92
Bad/Good	0.89
Unpleasant/Pleasant	0.96
Unfavorable/Favorable	0.90
Unlikable/Likable	0.88

Note. Cronbach's Alpha at first collection = .96. The single extracted factor accounts for 83.08 % of the total variance.

Psychological Reactance Scale

The 11-item Hong Psychological Reactance Scale was originally conceptualized with a four-factor structure: Emotional Response Toward Restricted Choice, Reactance to Compliance, Resisting Influence From Others, and Reactance Toward Advice and Recommendations. Despite this foundation, a unidimensional maximum likelihood factor analysis was initially conducted on the 11-item Psychological Reactance Scale to evaluate it was a singular, global construct for the current study. However, two items demonstrated inadequate standardized factor loadings ($<.40$). To ensure strict construct validity and maintain model simplicity for the subsequent covariate analyses, these two items were removed. A subsequent factor analysis on the remaining nine items within the scale extracted a single dominant factor, with all factor loadings exceeding .40 (ranging from .44 to .94). While this single global factor

accounted for 38.29% of the total variance, reflecting the multifaceted nature of the original scale, the unidimensional structure was deemed acceptable given the robust factor loadings. Following this confirmation reliability analysis yielded a strong internal consistency when collected ($\alpha = .86$). The nine retained items were summed to create a singular composite reactance score for each participant. Table 4.6 demonstrates the modified reactance table with the unidimensional factor loadings.

Table 4.6: Unidimensional Factor Loadings for the Trimmed Psychological Reactance Scale

Scale Item	Standardized Factor Loadings
Regulations (Rules) trigger a sense of resistance in me.	0.49
I find contradicting others stimulating.	0.17
When something is prohibited, I usually think "that's exactly what I am going to do."	0.45
I consider advice from others to be an intrusion.	0.44
It irritates me when someone points out things which are obvious to me.	0.48
I become frustrated when I am unable to make free and independent decisions.	0.94
I become angry when my freedom of choice is restricted.	0.92
Advice and recommendations induce me to do just the opposite.	0.44

I resist the attempts of others to influence me.	0.58
It makes me angry when another person is held up as a model for me to follow.	0.57
When someone forces me to do something, I feel like doing the opposite.	0.22

Note. Cronbach's Alpha= .86. The single global trait factor accounts for 38.29% of the total variance. Factor loadings were derived using maximum likelihood estimation. Items 2 and 11 were trimmed due to insufficient loadings ($< .40$) in the initial full-scale extraction.

Assumption Testing

After data preparation, all mixed effects models were evaluated to ensure statistical assumptions were met. To satisfy the assumption of independence violated by the repeated-measures design, participant and brand/time-of-interest were successfully modeled as random intercepts. Following the removal of redundant demographic covariates, all main effect across both the linear and generalized linear mixed-effects models yielded Variance Inflation Factors (VIF) well below the conservative threshold of 5.0 (ranging from 1.01 to 1.62), indicating no problematic multicollinearity. As expected in moderation analysis, multicollinearity was observed strictly between the interaction term and its main effects, which does not compromise the validity of the parameter estimates. Furthermore, visual inspection of residual-versus-fitted and Q-Q plots confirmed that the assumptions of homoscedasticity and normality of residuals were adequately met, alongside the normality of the random effects. For the generalized linear mixed-effects model predicting brand recall, standard logistic regression assumptions were satisfied without issues (see Appendix E for diagnostic plots).

Hypothesis Testing

Visual Attention by Advertisement Format

To understand if the format of the sponsorship significantly manipulated participant visual attention, a repeated measures analysis of variance (ANOVA) was conducted (see Table 4.7). The dependent variable was the mean fixation duration (formatted in seconds), and the within-subjects factor was the advertisement format (Static, Video with Audio, and Picture-in-Picture). The results showed a statistically significant main effect of advertisement format on visual attention, $F(2, 38) = 4.33, p = .020$.

To determine the specific nature of these differences found, post-hoc pairwise t-test with Bonferroni corrections were conducted. Participants showed significantly different visual attention when exposed to the Video with Audio format ($M = 8.01, SD = 4.75$) compared to the baseline Static format ($M = 6.06, SD = 2.88$), $p = .040$. Similarly, fixation durations for the Picture-in-Picture format ($M = 7.73, SD = 4.52$) differed significantly from the Static format, $p = .040$. There were no significant differences in visual attention between the Video with Audio and Picture-in-Picture formats ($p = .490$). Table 4.8 contains the post-hoc pairwise t-test data. These findings confirm that the inclusion of dynamic, intrusive elements significantly altered the baseline visual engagement patterns of the participants within the study. The significant differences in mean visual fixation duration across the three ad formats are visually illustrated in Figure 4.1.

Table 4.7: Repeated Measures ANOVA Results for Visual Attention

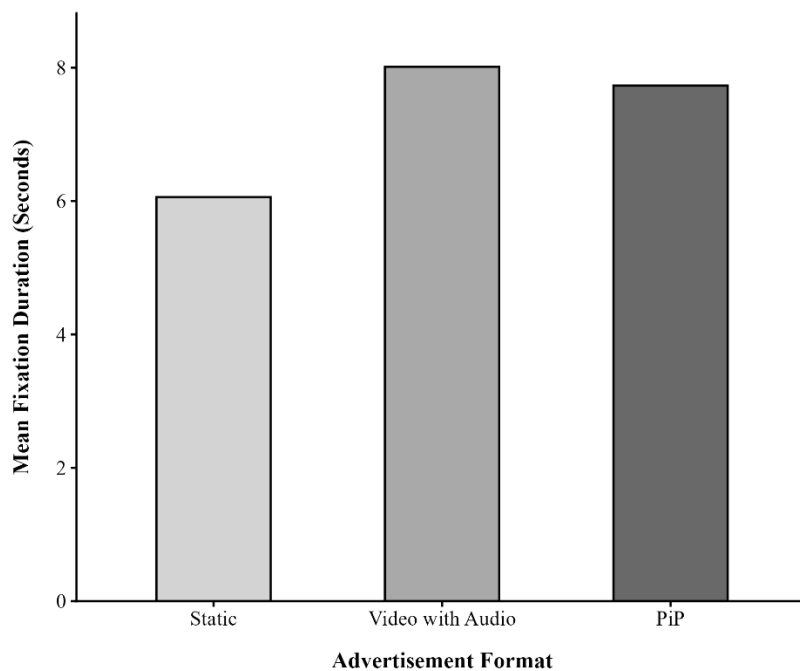
Source	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>p</i>
Advertisement Format	2	44.63	22.32	4.33	0.020

Error (Within-Subjects) 38 195.99 5.16

Table 4.8: Post-Hoc Pairwise t-tests for Visual Attention

Video Type Comparison	p	Significance
Static (A) vs. Video (B)	0.04	Significant (*)
Static (A) vs. PiP (C)	0.04	Significant (*)
Video (B) vs. PiP (C)	0.49	Not Significant

Figure 4.1: Mean Visual Fixation Duration by Ad Format



Predicting Brand Recall

To examine the factors that influence successful brand recall in this study, a generalized linear mixed-effects model (GLME) was estimated using a binomial distribution.

The binary dependent variable was successful brand recall (0 = not recalled, 1 = successfully recalled). Fixed effects included fixation duration (transformed to be in seconds), advertisement format, sport fan identity, and primary consumption channel. To account for the repeated-measures design and natural baseline differences, random intercepts were included for both participant and time of interest (TOI).

The results of the GLME, shown in Table 4.9, indicated that visual attention was a significant, positive predictor of brand recall. Specifically, for every one second increase in visual fixation, the odds of a participant successfully recalling the associated brand increased by 5% ($OR = 1.05$, 95% CI [1.00, 1.09], $p = 0.038$). While the previous analysis established that advertisement format significantly altered visual attention, the specific advertisement format itself was not a direct predictor of recall when visual attention was controlled for ($p > .05$).

Additionally, participants primary sports consumption channel significantly predicted recall likelihood. Participants who identified streaming services as their primary methods of consumption showed lower odds of successful brand recall compared to the baseline group that consumed via social media highlights ($OR = 0.33$, 95% CI [0.13, 0.79], $p = .013$). Sport fan identity did not significantly predict recall ($p = .439$).

Table 4.9: Generalized Linear Mixed-Effects Model Predicting Brand Recall

Predictor	<i>OR</i>	<i>SE</i>	95% <i>CI</i>	<i>z</i>	<i>p</i>
(Intercept)	3.12	2.64	0.59 – 16.36	1.34	0.179
Fixation Sec	1.05	0.02	1.00 – 1.09	2.08	0.038
Ad Type [B]	0.91	0.32	0.47 – 1.80	-0.26	0.796

Ad Type [C]	1.40	0.48	0.71 – 2.76	0.96	0.335
Sport Fan Identity	0.85	0.18	0.56 – 1.29	-0.77	0.439
Consumption Channel [Streaming Service]	0.33	0.15	0.13 – 0.79	-2.48	0.013
Consumption Channel [Traditional TV]	0.38	0.21	0.13 – 1.11	-1.78	0.076
Random Effects					
τ_{00} Participant	0.35				
τ_{00} TOI	0.07				
ICC	0.11				
N Participant	20				
N TOI	4				
Observations	240				
Marginal R ² / Conditional R ²	0.094 / 0.197				

Note. *OR* = Odds Ratio; *SE* = Standard Error; *CI*; Confidence Interval. The reference category for Ad format is the static ad type. The reference category for consumption channels is social media highlights. Significant p-values are bold for clarity.

Predicting Brand Attitude

To evaluate the impact of advertisement format, visual attention, and psychological reactance on consumer brand attitude over time, a linear mixed-effects model (LME) was

conducted. The continuous dependent variable was Attitude Toward the Brand (Ab) score. Fixed effects included advertisement format (static, video with audio, and Picture-in-Picture), timepoint (before, during, after), the interaction between format and timepoint, fixation duration (in seconds), trimmed psychological reactance, sport fan identity, and primary sport consumption channel. To account for the repeated-measures design and natural variation among specific brands, random intercepts were included for participant and for brand.

The results, detailed in Table 4.10, revealed that visual attention significantly and positively predicted Ab. Specifically, a one-second increase in visual fixation was associated with a 0.04-point increase in Ab score ($t = 5.33, p < .001$). Conversely, the format of the advertisement demonstrated a significant negative relationship. Across all measured time points, participants exposed to the Picture-in-Picture format reported significantly lower overall Ab scores compared to the static baseline (Estimate = -0.73, $t = -2.69, p = .007$). The video with audio format did not significantly differ from the baseline static ad type ($p = .659$). Figure 4.2 visualizes this overall attitude associated with the Picture-in-Picture format compared to the static baseline.

Table 4.10: Linear Mixed-Effects Model Predicting Brand Attitude

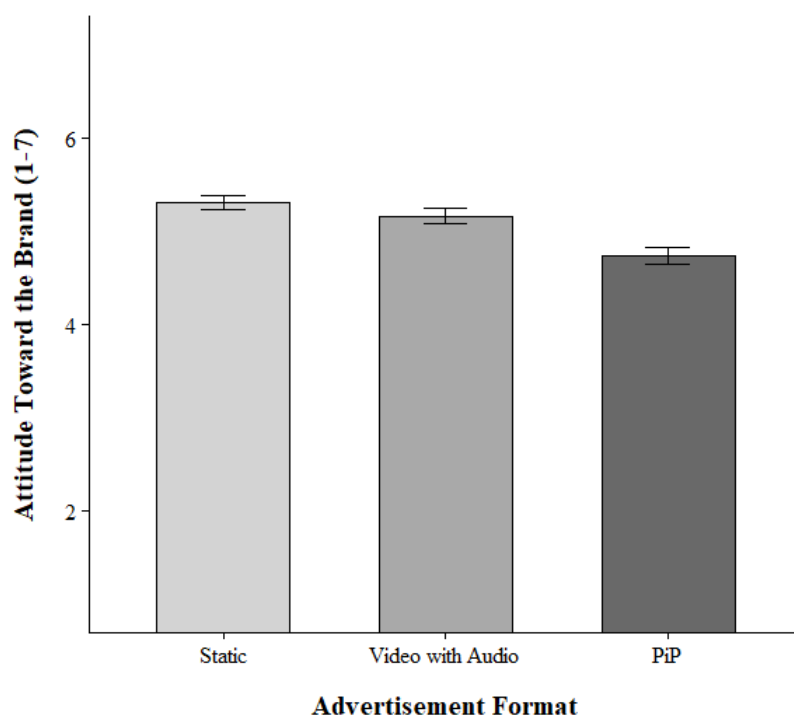
Predictor	Estimate	SE	95% CI	<i>t</i>	<i>p</i>
(Intercept)	4.66	0.65	3.38 – 5.94	7.16	<0.001
Ad Format: Video with Audio	-0.12	0.27	-0.65 – 0.41	-0.44	0.659
Ad Format: Picture-in-Picture	-0.73	0.27	-1.26 – -0.20	-2.69	0.007
Timepoint: During	-0.01	0.17	-0.34 – 0.32	-0.04	0.964

Timepoint: After	-0.08	0.17	-0.41 – 0.25	-0.49	0.623
Fixation Duration (Seconds)	0.04	0.01	0.03 – 0.06	5.33	<0.001
Psychological Reactance	0.01	0.02	-0.03 – 0.05	0.40	0.688
Sport Fan Identity	0.02	0.13	-0.22 – 0.27	0.20	0.845
Channel: Streaming Service	-0.10	0.26	-0.60 – 0.41	-0.37	0.708
Channel: Traditional TV	0.83	0.32	0.20 – 1.46	2.60	0.009
Video with Audio X During	-0.27	0.24	-0.74 – 0.19	-1.16	0.247
Picture-in-Picture X During	0.14	0.24	-0.33 – 0.60	0.58	0.562
Video with Audio X After	-0.03	0.24	-0.50 – 0.43	-0.14	0.891
Picture-in-Picture X After	0.14	0.24	-0.32 – 0.61	0.60	0.548
Random Effects					
τ_{00} Participant	0.22				
τ_{00} Brand	0.09				
ICC	0.21				
$N_{\text{Participant}}$	20				
N_{Brand}	12				
Observations	720				

Marginal R^2 / Conditional R^2 0.178 / 0.354

Note. SE = Standard Error; CI = Confidence Interval. The reference category for ad format was the static ad type. The reference category for timepoint is before (pre-test). The reference category for consumption channel is social media highlights. Significant p -values are bold for clarity.

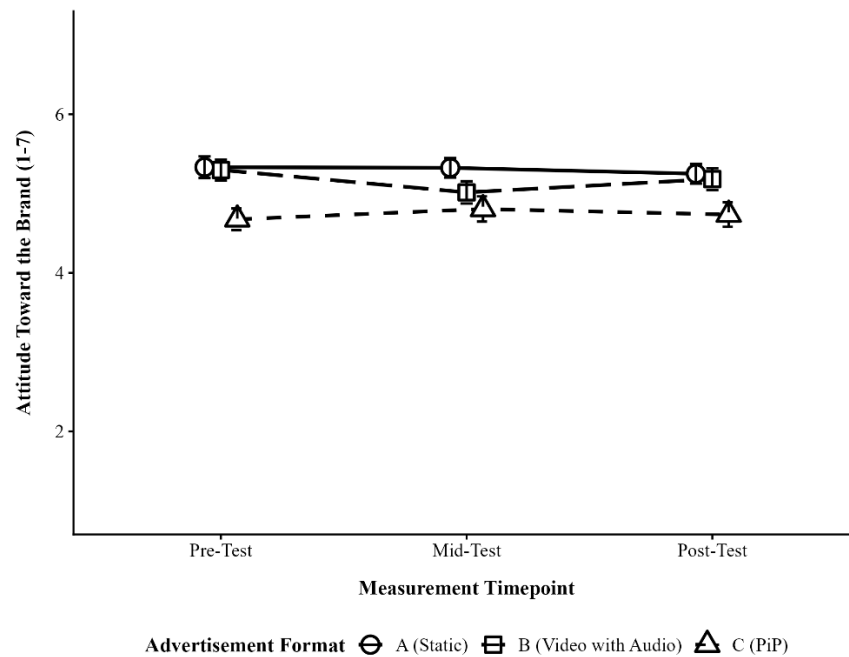
Figure 4.2: Mean Brand Attitude by Measurement Type



Furthermore, primary sports consumption habits also were shown to influence attitude. Participants who reported to consume sports via traditional TV showed significantly higher baseline brand attitudes compared to those who primarily consumed via social media highlights ($Estimate = 0.83$, $t = 2.60$, $p = .009$). Neither psychological reactance ($p = .688$) nor sport fan identity ($p = .845$) emerged as significant predictors. Finally, there was no significant interaction between advertising format and time point ($p > .05$), indicating that the relative impact of the ad formats on attitude remained consistent across the pre-, mid-, and post-test measurements As

participants were not shown the different advertisement types before the test, the lower baseline attitude is attributed to the random groups created, rather than from any impact of the PiP format. The longitudinal trends in attitude across all three time points for each advertisement format are further depicted in Figure 4.3.

Figure 4.3: Longitudinal Changes in Brand Attitude by Advertisement Format



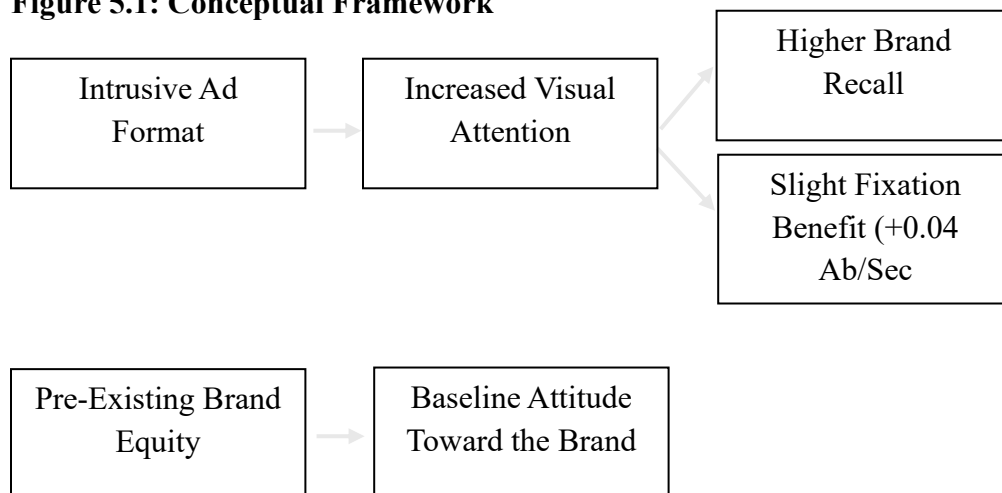
Note. *SE* = Standard Error; *CI* = Confidence Interval. The reference category for ad format was the static ad type. The reference category for timepoint is before (pre-test). The reference category for consumption channel is social media highlights. Significant *p*-values are bold for clarity.

The results demonstrated in this chapter outline a clear relationship between sponsorship intrusiveness, visual attention, and consumer memory. The repeated measures ANOVA confirmed that dynamic, intrusive advertisement formats (video with audio and Picture-in-Picture) successfully forced significantly longer visual fixation compared to the static baseline format. Furthermore, generalized linear mixed-effects modeling revealed that this captured

attention directly predicted successful brand recall. Additionally, higher attention also produced a positive overall impact on Ab, with every additional second of attention increasing attitude by 0.04. However, there was no significant interaction between the advertisement format and the measurement time point. This indicates that the lower scores reflect a baseline difference in the randomly assigned brands rather than a degradation caused by the viewing experience itself. The brands were presented in the pre-test without stimuli, so this difference is entirely due to randomization. Ultimately, these findings highlight the reality for sponsors. Showing the importance of visual attention and its connection to increased attitude and brand recall.

Chapter 5: Discussion and Conclusions

The primary objective of this experimental eye-tracking study was to examine the impact of televised sport sponsorship intrusiveness on consumer visual attention, brand recall, and Attitude Toward the Brand. As sports broadcasts continue to rely on more dynamic advertising formats to capture viewer engagement, understanding the cognitive and effective trade-offs of these placements continues to be vital for both networks and sponsors. Through the execution of repeated-measures experimental design and mixed-effects modeling, this study was able to successfully isolate the relationship between ad format, visual fixation, memory retention, and consumer sentiment. The findings present a clear strategic framework for sports teams, broadcasters, and sponsors: while highly intrusive formats successfully capture visual attention and drive memory encoding, consumer brand sentiment remains stably anchored in pre-existing equity and is resilient against active longitudinal erosion. This chapter will contextualize these findings within existing consumer psychology frameworks, explore practical implications, and outline potential boundaries for future visual attention research. The theoretical progression from is mapped in Figure 5.1.

Figure 5.1: Conceptual Framework**Brand Recall: The Role of Visual Attention**

While the intrusive advertisement formats were able to capture viewer attention within this study, the findings regarding memory present the true reality for sport marketers. The generalized linear mixed-effects model revealed that the format of the advertisement (Video or PiP) did not predict successful brand recall. Instead, the only significant predictor for recall was the duration of visual fixation, or the overall attention given to the sponsor.

This finding supports and modernizes assertions made by Breuer and Rumpf (2012), who theorized that just exposing a consumer to sports sponsorship does not guarantee memory retention, and that visual attention must act as a mediator to retention. This current study's data provides proof of this; a more intrusive ad format only aids recall when it can force participant or consumers eyes to stop and process the logo or sponsorship presented.

Furthermore, the data revealed an environmental challenge that could be significant regarding memory retention in this more modern era. Participants who reported consuming sports primarily through full-length broadcasts (both streaming services and traditional television) exhibited lower odds of successful brand recall compared to those consuming via short-form social media highlights. This aligns with previous literature on digital media

consumption, which suggests that long form broadcasts that are often accompanied by higher levels of interactive clutter, buffering, and simultaneous multi-device use, foster environments of divided attention (Jensen et al., 2015; Lee, 2021). While an advertisement might be physically visible, the cognitive load imposed by streaming platforms could inhibit the successful encoding of the brand in the consumer's memory.

Intrusion and Threshold

While dynamic sponsorship formats successfully captured visual attention and aided recall, the linear mixed-effects model revealed that consumer sentiment remained remarkably stable over time. Specifically, while the Picture-in-Picture (PiP) condition exhibited lower overall attitude scores, the absence of a significant format-by-time interaction indicates that this variance reflects pre-existing baseline brand assignments rather than an active erosion of sentiment caused by the layout. Furthermore, actual visual engagement served as an affective buffer, with increased visual fixation duration significantly and positively predicting Attitude Toward the Brand (Ab).

Building on previous research by Levin et al. (2013) which suggests that sports fans possess a uniquely high tolerance for commercial messages within broadcast environments, these findings demonstrate that consumer sentiment is robustly anchored in prior brand equity. Rather than functioning as a disruptive obstruction that actively breaches tolerance thresholds or degrades ongoing perception, initial layout differences simply establish baseline sentiment levels without undermining the fundamental affective stability of the sports consumer.

Instead of eliciting an immediate affective backlash, the data suggests that pre-existing brand evaluations remain remarkably stable during short-form exposure. While the Picture-in-Picture format successfully captured visual attention, this added engagement did not translate

into a significant shift, positive or negative, in consumer sentiment over the course of the viewing session. This indicates that consumer Attitude Toward the Brand is anchored more strongly in prior brand equity and established affinities than in the immediate structural format of temporary televised sponsorship. Rather than triggering acute situational reactance or annoyances, dynamic overlays appear to function primarily as an attentional mechanism without immediately disrupting the underlying equity a brand holds with the consumer.

Managerial Implications

The findings of this study offer direct, data-driven applications for sports marketing professionals, media buyers, and broadcast directors. The industry will continue to seek new ways to monetize live sports through things like digital overlays and embedded sponsorships. Because of this, stakeholders need to be able to recognize the balance between visibility and viewer satisfaction when it comes to advertising.

Awareness vs Affinity

For brand sponsors, the decision to utilize intrusive formats like the Picture-in-Picture (PiP) ad type should be dictated by the overall strategic goals of the campaign. The data demonstrates that PiP successfully increases visual attention and drives brand recall within a sports-interested college demographic, making it an exceptionally powerful tool for new, emerging, or unfamiliar brands whose primary strategic objective is rapid baseline awareness.

Crucially, for established brands, these findings completely de-risk the use of high-visibility, screen-dominant advertising. Because the lower overall scores associated with the PiP condition reflect pre-existing baseline equity differences rather than active sentiment degradation over time, established brands can confidently deploy highly disruptive formats to maximize memory encoding without fearing an ongoing erosion of consumer affinity or brand loyalty. The

foundations of pre-existing brand equity act as a highly resilient anchor, giving marketers a clear green light to prioritize attentional dominance during live broadcasts without risking long-term relational damage.

Timing and Broadcast Integration

Because broadcast formatting choices do not actively degrade consumer sentiment, media networks and broadcast directors possess unprecedented flexibility in how they allocate and monetize screen real estate. Rather than restricting dynamic ads out of an unbacked fear of a fan backlash, networks should optimize broadcast layouts based purely on attention capture and memory encoding efficiency. Because this model was able to prove that physical on-screen exposure alone does not guarantee retention and that visual fixation duration is the true statistical engine driving brand recall ($p = 0.038$), broadcast inventory should be priced and deployed based on its "fixation potential".

Instead of hiding intrusive ads to protect fans from situational annoyance, networks should strategically deploy Picture-in-Picture (PiP) and dynamic video overlays during natural broadcast lulls. These moments represent periods of low visual and cognitive competition from the game itself, allowing the eye to fully fixate on the sponsor message and capitalize on the +0.04 affective buffer per second of direct tracking. Conversely, during active, high-intensity gameplay, networks should utilize static placements to capture baseline peripheral attention, thereby preserving high-conversion, attention-forcing dynamic layouts for temporal windows where they can maximize their direct attentional return on investment.

Platform Valuation

Finally, the finding that consumers who watch primarily full-length broadcasts exhibited lower overall brand recall compared to highlight viewers has immediate implications

for sport media valuation. As live sports broadcast rights continue to migrate to streaming platforms, media buyers must recognize that this digital viewing environment inherently diminishes memory encoding compared to bite-sized social media consumption. Streaming platforms must work actively to reduce digital clutter during broadcasts to maintain the value of their advertising, and sponsors should utilize this data within their valuation models when negotiating rates for long-form digital advertising.

Limitations

While this study provides valuable insight into visual attention and sponsorship intrusiveness, there are several limitations that must be acknowledged when interpreting the results.

First, the findings are constrained by the overall sample size and the demographic homogeneity of the participants. The sample consisted of a limited number of college-aged individuals drawn from a university. While this demographic represents a highly coveted target market, it does not perfectly reflect broader, multi-generational sport viewers. The baseline attitudes and technological familiarity observed within this study may differ from different fan demographics. Furthermore, this limited sample size precluded the use of formal mediation analysis (such as structural equation modeling) to statistically test the indirect pathway between ad format, attention, and recall, though the individual models strongly support this sequential relationship.

Second, the study is limited by the overall ecological validity inherent to physiological laboratory research. While the Tobii eye-tracking software provides highly precise and objective data regarding visual fixation, the data was collected in a controlled lab environment. Participants were explicitly aware their eye movements would be tracked, which may have

subtly altered their natural viewing behaviors compared to watching a sports broadcast in a living room at home.

Thirdly, the nature of the repeated-measures design and the structure of the semantic differential provides some measurement considerations. The administration of the same five-item Attitude Toward the Brand scale across multiple brands at three distinct timepoints increases the risk of survey fatigue. Participants may have become less engaged during the mid- and post-test measurements, which could have led to ‘straight-lining’. This outcome is when participants provide identical answers across all five semantic items to quicken their completion. While the scale demonstrates exceptional internal reliability, this high degree of overlap may partially reflect this response set bias. Additionally, the strict 1-5 bounds of the scale present a potential floor and ceiling effect. If a participant entered the study holding an extremely negative pre-existing attitude toward a sponsor, the scale lacks the capacity to capture any further drop in attitude caused by the ad types.

Finally, as established in Spears and Singh (2004), true Attitude Toward the Brand is defined as a relatively enduring, summary evaluation. Because this study measured post-test attitude immediately following the viewing experience, it is possible that the survey captures a *feeling* rather than a permanent change in attitude. Without a delayed longitudinal assessment, it remains unclear whether the observed negative sentiment persists over time or disappears once the viewer is removed from the intrusive viewing environment.

Future Research

The findings within this study establish a link between sponsorship intrusiveness, visual attention, and brand sentiment, but they also highlight several potential pathways for future research.

First, future researchers should expand the use of metrics beyond just strictly utilizing visual fixation duration. While fixations measure conscious attention and memory encoding, future research could analyze saccadic movements that could provide deeper insights into consumer visual behaviors. Evaluating these metrics during the Picture-in-Picture format could determine whether viewers attempt to visually avoid sponsorship, or if the format creates cognitive confusion that prevents them from being able to follow the sport broadcast.

Second, future studies must address limitations of brand attitude measurement. To determine if the damage caused by intrusive formats is permanent, future experiments should incorporate a delayed post-test. Measuring Attitude Toward the Brand 24 to 48 hours after initial exposure would clarify whether the negative sentiment observed in this study represents an enduring shift (Spears & Singh, 2004) or merely a temporary state of reactance that disappears when the broadcasts end.

Additionally, evaluating second-screen behavior and its interaction with intrusive advertising should grow in importance in future research. As Jensen et al., (2015) demonstrated, second-screen usage can have a negative impact on brand recall and recognition. Augmenting this methodology with additional metrics for second-screen usage could be impactful within future research. It is possible that this further evaluation of this intrusive and second-screen relationship could reveal additional impacts on consumers.

Future research should also look to replicate this experimental design with a substantially larger sample size to improve overall statistical power. While the current study found a significant degradation in brand attitude caused by the Picture-in-Picture format compared to the baseline, the affective difference between the two dynamic formats (Video with Audio versus PiP) did not reach statistical significance. However, longitudinal visual trends in

the data suggest a potential divergence in consumer sentiment between these two specific formats over time. It is probable that the current sample lacked the statistical power necessary to detect a smaller effect size between the two dynamic overlays. A larger-scale replication would reduce the risk of a Type II error and definitively determine if viewers hold distinctly different tolerance thresholds

Finally, future research should explore the moderating effects of brand familiarity and sport-specific contexts. This study looked to utilize specific brands within a controlled viewing environment. Replicating this methodology with a mix of established sport sponsors versus unknown brands could determine if existing brand equity buffers against the reactance caused by intrusion. Comparing high-action sports with continuous play against slower paced sports could also reveal whether tolerance for intrusion is dependent on rhythm of the game being shown.

Conclusion

The evolution of digital broadcasting continues to provide sports marketers with tools to embed commercial messages directly into the live viewing experience. As this experimental eye-tracking study has shown, while dynamic, intrusive formats successfully hijack consumer attention and drive brand memory encoding, pre-existing brand equity remains a stubbornly dominant force. The data demonstrated that while actual visual engagement provides a slight affective benefit, merely placing a brand in a highly prominent Picture-in-Picture format does not inherently degrade or elevate its baseline standing with consumers. Ultimately, this research proves that while visual attention can be forced, deeply held brand sentiment cannot be easily manipulated by broadcast formatting alone. As the sports media landscape continues to fracture across traditional and streaming platforms, brands and broadcasters must prioritize strategic, context-aware sponsorship placements rather than relying solely on-screen dominance.

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Appendix A: Example of Eye Tracking Setup



Eye tracking configuration and setting utility. (2023). Tobii.com.

<https://www.tobii.com/products/software/applications-and-developer-kits/tobii-pro-eye-tracker-manager>

Appendix B: Attitude Toward the Brand Scale (Spears and Singh, 2004)

Please describe your feelings towards [Brand] (Spears & Singh, 2004).

1. Unappealing [1] [2] [3] [4] [5] [6] [7] Appealing
2. Bad [1] [2] [3] [4] [5] [6] [7] Good
3. Unpleasant [1] [2] [3] [4] [5] [6] [7] Pleasant
4. Unfavorable [1] [2] [3] [4] [5] [6] [7] Favorable
5. Unlikable [1] [2] [3] [4] [5] [6] [7] Likable

6. In baseball, how many strikes until a batter is 'out'?
 1. 1
 2. 2
 3. 3
 4. 5

7. In baseball, how many bases must a runner touch to score a run?
 1. 4
 2. 1
 3. 3
 4. 6

8. In baseball, can a runner steal 1st base?
 1. Yes
 2. No

9. In football, how many points is a touchdown worth?
 1. 6

2. 7

3. 5

4. 3

10. In football, does the clock stop when a player steps out of bounds?

1. Yes

2. No

11. In football, what happens when a team fails to gain 10 yards in four downs?

1. They get to try one more time.

2. They lose possession of the football.

3. They have to punt the ball away.

12. In hockey, what is it called when a player scores three goals in a single game?

1. Special Day

2. Hat Trick

3. Triple Double

4. All-Star

13. In hockey, does the clock run continuously or does it stop for certain events?

1. Continuously

2. Stops for certain events

14. In hockey, can a team 'pull' their goalie and add an extra skater onto the ice?

1. Yes

2. No

15. In basketball, what line must the shooter be behind to score three points?

1. Free Throw

2. Three-Point
3. Half Court
4. Out of Bounds

16. In basketball, what happens when a player commits six personal fouls?

1. They get suspended.
2. Nothing, they are allowed to continue.
3. The player is removed from the game, and no longer allowed to return
4. The player must never play against that team again all year.

17. In basketball, is a player allowed to take steps without dribbling the ball?

1. Yes, but only in certain situations.
2. Yes, as long as their team has called a time out.
3. Yes, but only if it is Lebron.
4. No, under no circumstances can a player take steps without dribbling.

This appendix demonstrates the format of the scale given to participants pre-test. The Ab scale is repeated 12 times within the questionnaire. Those 12 Ab scales and the 12 ‘filler’ sport related questions appear in a random order for each participant. Mid-test version only includes the three brands shown in that video, with additional sport ‘filler’ questions related to the sport viewed. Post-test version only includes the 12 Ab scales.

Appendix C: Ad Types

Ad Type A – Static Image:



Ad Type B – Corner with Audio:



Ad Type C – Picture in Picture:



Appendix D: Pre-Test Questionnaire

1. Age: __

2. Gender: [Male] [Female] [Non-Binary] [Prefer Not to Say]
3. Race/Ethnicity: [Select all that apply] (Added to describe sample diversity)
 - White/Caucasian
 - Black/African American
 - Hispanic/Latino
 - Asian/Pacific Islander
 - Native American/Alaska Native
 - Middle Eastern/North African
 - Other (please specify): _____
 - Prefer Not to Say
4. Class Standing: [Freshman] [Sophomore] [Junior] [Senior]
5. Vision Correction: [No Correction] [Glasses] [Contact Lenses]
6. How frequently do you watch Sport Events through media channels such as TV, Internet, cell phone, computer, or tablet?
 - This question is adapted from Zhong, Guo, and Xue (2025).
 - Once a Month
 - Twice to Three times a month
 - Once to Twice a Week
 - Three to Five Times a Week
 - About Once a Day
7. Being a Sport Fan is very important to me (5 Point Likert Scale, Strongly Disagree to Strongly Agree).
 - This question is adapted from Wann (2002) who developed a measure of sport fan identification to assess levels of fan involvement.
8. Through which channels do you primarily consume broadcasted sport?
 - Traditional TV
 - Steaming Service
 - Only in Person
 - Social media highlights
 - Other (please specify)
9. Please indicate the extent to which you agree or disagree with the following statements using the scale below (5 Point Likert Scale, Strongly Disagree to Strongly Agree):
 - Regulations (Rules) trigger a sense of resistance in me.
 - ~~○ I find contradicting others stimulating.~~
 - When something is prohibited, I usually think "that's exactly what I am going to do."
 - I consider advice from others to be an intrusion.
 - It irritates me when someone points out things which are obvious to me.
 - I become frustrated when I am unable to make free and independent decisions.
 - I become angry when my freedom of choice is restricted.
 - Advice and recommendations induce me to do just the opposite.
 - I resist the attempts of others to influence me.
 - It makes me angry when another person is held up as a model for me to follow.
 - ~~○ When someone forces me to do something, I feel like doing the opposite.~~
 - The above scale is the Hong Psychological Reactance Scale. For this study the scores within the scale were summed (Hong & Faedda, 1996).

Appendix E: Assumptions

Figure E1: Normality of Residuals

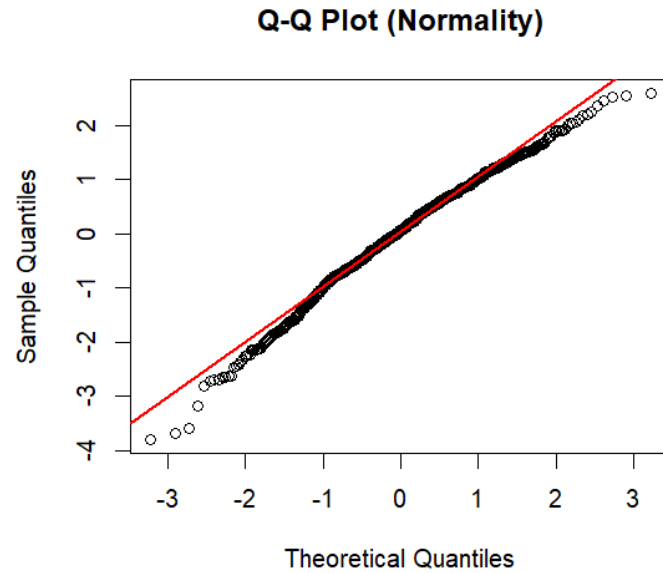


Figure E2: Homogeneity of Variance

Homogeneity of Variance

Reference line should be flat and horizontal

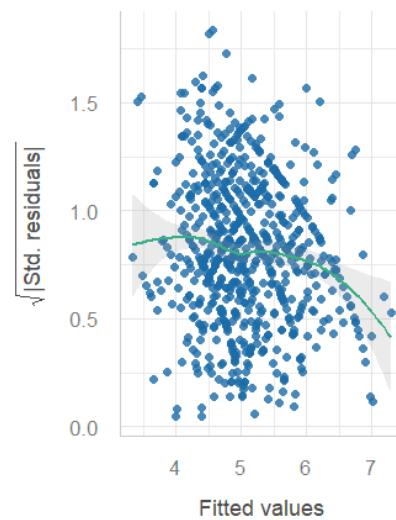
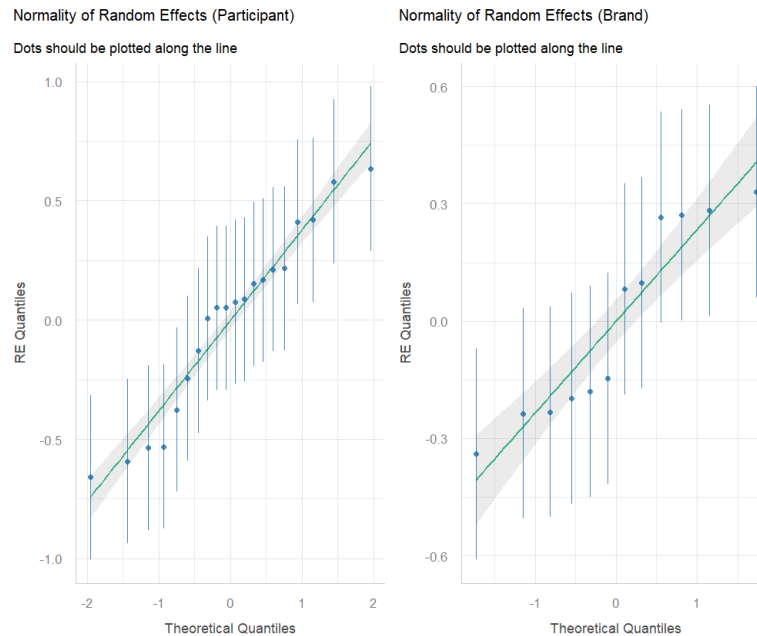


Figure E3: Normality of Random Effects



Note. Figure E1 demonstrates that the model's residuals are approximately normally distributed. Figure E2 shows that the variance remains stable across the primary distribution of fitted values; the minor downward deviation the upper extreme is a recognized artifact of data sparsity. Finally, Figure E3 verifies the assumption specific to mixed-effects modeling, confirming that the random intercepts for both participant and brand do not meaningfully deviate from the normality.

Appendix F: Full R Code

```
#
=====
# APPENDIX: COMPLETE ANALYSIS SCRIPT
# Intrusive Advertising and Eye Tracking Thesis
#
=====

# --- Load Required Packages ---
library(tidyverse)
library(readxl)
library(lme4)
library(stringr)
library(lmerTest)
library(sjPlot)
library(broom)
library(see)
library(performance)
library(psych)
library(corrplot)
library(ggplot2)

#
=====
# SECTION 1: DATA IMPORT
#
=====

cleaned_data_long <- read_tsv('test-1_Metrics_cleaned.tsv')

recall_attitude_data <- read_csv('Intrusive Advertising Thesis - During and
Post Test_May 14, 2026_09.20.csv') %>%
  rename(Participant = 1) %>%
  mutate(Participant = parse_number(Participant)) %>%
  distinct(Participant, .keep_all = TRUE)

demo_data <- read_csv('demodata.csv') %>%
  mutate(Participant = parse_number(Participant)) %>%
  rename(
    Age    = Q1,
    Gender = Q2
  ) %>%
  mutate(
    Age    = as.numeric(Age),
    Gender = as.factor(Gender)
  ) %>%
  distinct(Participant, .keep_all = TRUE)

order_prizes <- read_xlsx('video_order_prizes.xlsx') %>%
```

```

mutate(Participant = parse_number(Participant)) %>%
distinct(Participant, .keep_all = TRUE)

#
=====
# SECTION 2: DATA QUALITY EXCLUSIONS
#
=====
# Participants 13 and 20 were excluded for failing the 70% valid gaze
# sample threshold required for reliable eye tracking data.

excluded_participants <- c(13, 20)

cleaned_data_long <- cleaned_data_long %>% filter(!Participant %in%
excluded_participants)
recall_attitude_data <- recall_attitude_data %>% filter(!Participant %in%
excluded_participants)
demo_data <- demo_data %>% filter(!Participant %in%
excluded_participants)
order_prizes <- order_prizes %>% filter(!Participant %in%
excluded_participants)

#
=====
# SECTION 3: SCALE SCORING
#
=====
# --- Psychological Reactance (9-Item Trimmed Scale) ---
reactance_data <- demo_data %>%
  mutate(Participant = as.numeric(Participant)) %>%
  select(Participant, Q9_1, Q9_3, Q9_4, Q9_5, Q9_6, Q9_7, Q9_8, Q9_9, Q9_10)
  %>%
  mutate(across(starts_with("Q9_"), ~ case_when(
    . == "Strongly Disagree" ~ 1,
    . == "Disagree" ~ 2,
    . == "Neither Agree or Disagree" ~ 3,
    . == "Agree" ~ 4,
    . == "Strongly Agree" ~ 5,
    TRUE ~ NA_real_
  ))) %>%
  mutate(Reactance_Score = rowSums(across(starts_with("Q9_")), na.rm = TRUE))
  %>%
  select(Participant, Reactance_Score)

# --- Sports Fan Identity and Viewing Behavior ---
sports_interest_data <- demo_data %>%
  mutate(Participant = as.numeric(Participant)) %>%

```

```

select(Participant, Q6, Q7_1, Q8) %>%
  rename(
    Watch_Frequency      = Q6,
    Sport_Fan_Identity    = Q7_1,
    Consumption_Channel    = Q8
  ) %>%
  mutate(
    Sport_Fan_Identity = case_when(
      Sport_Fan_Identity == "Strongly Disagree" ~ 1,
      Sport_Fan_Identity == "Disagree" ~ 2,
      Sport_Fan_Identity == "Neither Agree or Disagree" ~ 3,
      Sport_Fan_Identity == "Agree" ~ 4,
      Sport_Fan_Identity == "Strongly Agree" ~ 5,
      TRUE ~ NA_real_
    ),
    Watch_Frequency      = as.factor(Watch_Frequency),
    Consumption_Channel = as.factor(Consumption_Channel)
  )

#
=====
# SECTION 4: DATASET MERGING
#
=====

comparison_dataset <- cleaned_data_long %>%
  left_join(recall_attitude_data, by = "Participant") %>%
  left_join(demo_data, by = "Participant") %>%
  left_join(order_prizes, by = "Participant")

#
=====
# SECTION 5: AD TYPE CLASSIFICATION
#
=====
# Each brand was assigned to one video context (TOI) and one of three ad
# formats: A = Static overlay, B = Corner video with audio,
# C = Picture-in-Picture.

valid_ads <- tribble(
  ~TOI,          ~Brand,          ~Ad_Type,
  "Football_Post_Proposal", "Chevy", "A",
  "Football_Post_Proposal", "Puma", "C",
  "Football_Post_Proposal", "Ford", "B",
  "Basketball_Post_Proposal", "NewBalance", "B",
  "Basketball_Post_Proposal", "Toyota", "A",
  "Basketball_Post_Proposal", "Ram", "C",
  "Baseball_Post_Proposal", "Nissan", "C",

```

```

"Baseball_Post_Proposal", "Columbia", "A",
"Baseball_Post_Proposal", "Asics", "B",
"Hockey_Post_Proposal", "Honda", "C",
"Hockey_Post_Proposal", "UnderArmor", "B",
"Hockey_Post_Proposal", "Reebok", "A"
)

#
=====
# SECTION 6: FINAL PANEL DATASET CONSTRUCTION
#
=====

final_panel_data <- comparison_dataset %>%
  filter(TOI != "Entire_Recording") %>%

  mutate(
    clean_recall = tolower(Q64),
    clean_recall = replace_na(clean_recall, "")
  ) %>%

  # --- Binary Brand Recall Indicators ---
  mutate(
    Recall_Asics = if_else(str_detect(clean_recall, "asics|asic|oasis"),
1, 0),
    Recall_Chevy = if_else(str_detect(clean_recall, "chevy|chevrolet"),
1, 0),
    Recall_Columbia = if_else(str_detect(clean_recall,
"columbia|colombia"), 1, 0),
    Recall_Ford = if_else(str_detect(clean_recall, "ford"),
1, 0),
    Recall_Honda = if_else(str_detect(clean_recall, "honda"),
1, 0),
    Recall_NewBalance = if_else(str_detect(clean_recall, "new
balance|newbalance|new blanche"), 1, 0),
    Recall_Nissan = if_else(str_detect(clean_recall, "nissan"),
1, 0),
    Recall_Puma = if_else(str_detect(clean_recall, "puma"),
1, 0),
    Recall_Ram = if_else(str_detect(clean_recall, "ram"),
1, 0),
    Recall_Reebok = if_else(str_detect(clean_recall,
"reebok|rebock|rebok|reebock|rebrook"), 1, 0),
    Recall_Toyota = if_else(str_detect(clean_recall, "toyota"),
1, 0),
    Recall_UnderArmor = if_else(str_detect(clean_recall, "under armor|under
armour|underarmor|underarmour"), 1, 0)
  ) %>%

```

```

# --- Aggregate Fixation Durations Per Brand (milliseconds) ---
mutate(
  Fixation_Asics      = Total_duration_of_fixations.Asics,
  Fixation_Chevy      = Total_duration_of_fixations.Chevy_Logo +
Total_duration_of_fixations.Chevy_Truck,
  Fixation_Columbia   = Total_duration_of_fixations.Columbia,
  Fixation_Ford       = Total_duration_of_fixations.Ford_Logo,
  Fixation_Honda      = `Total_duration_of_fixations.Honda-Ad` +
`Total_duration_of_fixations.Honda-Logo`,
  Fixation_NewBalance = Total_duration_of_fixations.New_Balance,
  Fixation_Nissan     = Total_duration_of_fixations.Nissan +
`Total_duration_of_fixations.Nissan-logo`,
  Fixation_Puma       = Total_duration_of_fixations.Puma_Vid,
  Fixation_Ram        = Total_duration_of_fixations.Ram_Logo,
  Fixation_Reebok     = Total_duration_of_fixations.Reebok,
  Fixation_Toyota     = `Total_duration_of_fixations.Toyota-Logo` +
`Total_duration_of_fixations.Toyota-Vid`,
  Fixation_UnderArmor = Total_duration_of_fixations.UnderArmor
) %>%

select(-starts_with("Total_duration_of_fixations.")) %>%

# --- Reshape to Long Format ---
pivot_longer(
  cols      = starts_with("Recall_") | starts_with("Fixation_"),
  names_to  = c(".value", "Brand"),
  names_sep = "_"
) %>%

inner_join(valid_ads, by = c("TOI", "Brand")) %>%
mutate(Ad_Type = factor(Ad_Type, levels = c("A", "B", "C")))

#
=====
# SECTION 7: PRELIMINARY ANALYSES – RELIABILITY AND VALIDITY
#
=====

# --- Internal Consistency (Cronbach's Alpha) ---

pre_test_items <- comparison_dataset %>%
  select(starts_with("Q10_")) %>% drop_na() %>% mutate(across(everything(),
as.numeric))
alpha_pre <- psych::alpha(pre_test_items)
print(alpha_pre$total$raw_alpha)

during_test_items <- comparison_dataset %>%
  select(starts_with("Q50_")) %>% drop_na() %>% mutate(across(everything(),
as.numeric))

```

```

alpha_during <- psych::alpha(during_test_items)
print(alpha_during$total$raw_alpha)

post_test_items <- comparison_dataset %>%
  select(starts_with("Q72_")) %>% drop_na() %>% mutate(across(everything(),
as.numeric))
alpha_post <- psych::alpha(post_test_items)
print(alpha_post$total$raw_alpha)

# --- Inter-Item Correlation Matrix (Brand Attitude) ---
scale_items_chevy <- comparison_dataset %>%
  select(starts_with("Q10_")) %>% drop_na() %>% mutate(across(everything(),
as.numeric))

brand_correlations <- cor(scale_items_chevy, use = "pairwise.complete.obs")
print(round(brand_correlations, 3))

corrplot(brand_correlations,
  method = "number",
  type = "lower",
  tl.col = "black",
  tl.srt = 45,
  title = "Inter-Item Correlations (Brand Attitude)",
  mar = c(0, 0, 1, 0))

# --- Internal Consistency: Psychological Reactance ---
reactance_items <- demo_data %>%
  select(Q9_1, Q9_3, Q9_4, Q9_5, Q9_6, Q9_7, Q9_8, Q9_9, Q9_10) %>%
  drop_na() %>%
  mutate(across(everything(), ~ case_when(
    . == "Strongly Disagree" ~ 1,
    . == "Disagree" ~ 2,
    . == "Neither Agree or Disagree" ~ 3,
    . == "Agree" ~ 4,
    . == "Strongly Agree" ~ 5,
    TRUE ~ NA_real_
  )))

reactance_alpha <- psych::alpha(reactance_items)
print(reactance_alpha$total$raw_alpha)

reactance_correlations <- cor(reactance_items, use = "pairwise.complete.obs")
print(round(reactance_correlations, 2))

# --- Export Correlation Matrices to Word ---
tab_corr(
  scale_items_chevy,
  triangle = "lower",
  title = "Table X: Inter-Item Correlations for Brand Attitude (Pre-
Test)",

```

```

    file      = "Brand_Attitude_Correlations_Table.doc"
  )

  tab_corr(
    reactance_items,
    triangle = "lower",
    title    = "Table X: Inter-Item Correlations for Psychological Reactance",
    file     = "Reactance_Correlations_Table.doc"
  )

  # --- Confirmatory Factor Analysis (Unidimensionality) ---
  attitude_fa <- fa(scale_items_chevy, nfactors = 1, fm = "ml")
  reactance_fa <- fa(reactance_items,   nfactors = 1, fm = "ml")

  att_var <- round(attitude_fa$Vaccounted[2, 1] * 100, 2)
  reac_var <- round(reactance_fa$Vaccounted[2, 1] * 100, 2)

  # Export Brand Attitude Factor Loadings
  attitude_loadings_df <- data.frame(
    `Scale Item`          = colnames(scale_items_chevy),
    `Standardized Factor Loading` = round(as.numeric(attitude_fa$loadings), 3)
  )

  tab_df(
    attitude_loadings_df,
    title      = "Table 1: Unidimensional Factor Loadings for Brand
Attitude",
    footnote   = paste("Note. Cronbach's a = .96. The single extracted factor
accounts for", att_var, "% of the total variance."),
    show.footnote = TRUE,
    file       = "Attitude_Factor_Loadings_Table.doc"
  )

  # Export Psychological Reactance Factor Loadings
  reactance_loadings_df <- data.frame(
    `Scale Item`          = colnames(reactance_items),
    `Standardized Factor Loading` = round(as.numeric(reactance_fa$loadings), 3)
  )

  tab_df(
    reactance_loadings_df,
    title      = "Table 2: Unidimensional Factor Loadings for the Trimmed
Psychological Reactance Scale",
    footnote   = paste("Note. Cronbach's a = .86. The single extracted factor
accounts for", reac_var, "% of the total variance. Items Q9_2 and Q9_11 were
trimmed due to insufficient loadings in the initial full-scale extraction."),
    show.footnote = TRUE,
    file       = "Reactance_Factor_Loadings_Table.doc"
  )

```

```

#
=====
# SECTION 8: HYPOTHESIS TESTING – DATA PREPARATION
#
=====

final_panel_data <- as.data.frame(final_panel_data)
final_panel_data$Participant <- as.factor(final_panel_data$Participant)
final_panel_data$TOI <- as.factor(final_panel_data$TOI)
final_panel_data$Ad_Type <- as.factor(final_panel_data$Ad_Type)

# Convert fixation duration from milliseconds to seconds
final_panel_data <- final_panel_data %>%
  mutate(Fixation_Sec = Fixation / 1000)

model_data <- final_panel_data %>%
  drop_na(Recall, Fixation_Sec, Ad_Type, Participant, TOI, Age, Gender)

model_data_sports <- model_data %>%
  left_join(
    sports_interest_data %>% mutate(Participant = as.factor(Participant)),
    by = "Participant"
  ) %>%
  drop_na(Sport_Fan_Identity, Consumption_Channel)

#
=====
# SECTION 9: HYPOTHESIS TESTING – INFERENCEAL MODELS
#
=====

# --- H1/H3: Brand Recall (Generalized Linear Mixed-Effects Model) ---
recall_model_full_updated <- glmer(
  Recall ~ Fixation_Sec + Ad_Type + Sport_Fan_Identity + Consumption_Channel
+
  (1 | Participant) + (1 | TOI),
  data = model_data_sports,
  family = binomial(link = "logit"),
  control = glmerControl(optimizer = "bobyqa")
)

summary(recall_model_full_updated)

# --- H2: Visual Attention (Repeated Measures ANOVA) ---
attention_anova_data <- final_panel_data %>%
  drop_na(Fixation_Sec, Ad_Type, Participant) %>%
  group_by(Participant, Ad_Type) %>%
  summarise(Mean_Fixation = mean(Fixation_Sec, na.rm = TRUE), .groups =

```

```

"drop")

attention_anova <- aov(
  Mean_Fixation ~ Ad_Type + Error(Participant / Ad_Type),
  data = attention_anova_data
)

summary(attention_anova)

# --- Post-Hoc Pairwise Comparisons (Bonferroni-Corrected) ---
post_hoc_attention <- pairwise.t.test(
  x = attention_anova_data$Mean_Fixation,
  g = attention_anova_data$Ad_Type,
  paired = TRUE,
  p.adjust.method = "bonferroni"
)

print(post_hoc_attention)

# --- H4/H5: Brand Attitude Panel Construction ---
attitude_panel <- comparison_dataset %>%
  distinct(Participant, .keep_all = TRUE) %>%
  left_join(reactance_data, by = "Participant") %>%
  mutate(across(matches("^Q[0-9]+_"), as.numeric)) %>%
  rowwise() %>%
  mutate(
    # FootballL brands
    Attitude_Chevy_Before = mean(c_across(starts_with("Q10_")), na.rm =
TRUE),
    Attitude_Chevy_During = mean(c_across(starts_with("Q50_")), na.rm =
TRUE),
    Attitude_Chevy_After = mean(c_across(starts_with("Q72_")), na.rm =
TRUE),
    Attitude_Puma_Before = mean(c_across(starts_with("Q5_")), na.rm =
TRUE),
    Attitude_Puma_During = mean(c_across(starts_with("Q48_")), na.rm =
TRUE),
    Attitude_Puma_After = mean(c_across(starts_with("Q67_")), na.rm =
TRUE),
    Attitude_Ford_Before = mean(c_across(starts_with("Q9_")), na.rm =
TRUE),
    Attitude_Ford_During = mean(c_across(starts_with("Q49_")), na.rm =
TRUE),
    Attitude_Ford_After = mean(c_across(starts_with("Q71_")), na.rm =
TRUE),
    # BaseballL brands
    Attitude_Nissan_Before = mean(c_across(starts_with("Q14_")), na.rm =
TRUE),
    Attitude_Nissan_During = mean(c_across(starts_with("Q30_")), na.rm =
TRUE),

```

```

    Attitude_Nissan_After      = mean(c_across(starts_with("Q76_")), na.rm =
TRUE),
    Attitude_Columbia_Before = mean(c_across(starts_with("Q8_")),  na.rm =
TRUE),
    Attitude_Columbia_During = mean(c_across(starts_with("Q31_")), na.rm =
TRUE),
    Attitude_Columbia_After  = mean(c_across(starts_with("Q70_")), na.rm =
TRUE),
    Attitude_Asics_Before    = mean(c_across(starts_with("Q7_")),  na.rm =
TRUE),
    Attitude_Asics_During    = mean(c_across(starts_with("Q32_")), na.rm =
TRUE),
    Attitude_Asics_After     = mean(c_across(starts_with("Q69_")), na.rm =
TRUE),
    # Basketball brands
    Attitude_NewBalance_Before = mean(c_across(starts_with("Q4_")),  na.rm =
TRUE),
    Attitude_NewBalance_During = mean(c_across(starts_with("Q40_")), na.rm =
TRUE),
    Attitude_NewBalance_After  = mean(c_across(starts_with("Q66_")), na.rm =
TRUE),
    Attitude_Toyota_Before     = mean(c_across(starts_with("Q11_")), na.rm =
TRUE),
    Attitude_Toyota_During     = mean(c_across(starts_with("Q41_")), na.rm =
TRUE),
    Attitude_Toyota_After      = mean(c_across(starts_with("Q73_")), na.rm =
TRUE),
    Attitude_Ram_Before        = mean(c_across(starts_with("Q13_")), na.rm =
TRUE),
    Attitude_Ram_During        = mean(c_across(starts_with("Q42_")), na.rm =
TRUE),
    Attitude_Ram_After         = mean(c_across(starts_with("Q75_")), na.rm =
TRUE),
    # Hockey brands
    Attitude_Honda_Before      = mean(c_across(starts_with("Q12_")), na.rm =
TRUE),
    Attitude_Honda_During      = mean(c_across(starts_with("Q56_")), na.rm =
TRUE),
    Attitude_Honda_After       = mean(c_across(starts_with("Q74_")), na.rm =
TRUE),
    Attitude_UnderArmor_Before = mean(c_across(starts_with("Q3_")),  na.rm =
TRUE),
    Attitude_UnderArmor_During = mean(c_across(starts_with("Q57_")), na.rm =
TRUE),
    Attitude_UnderArmor_After  = mean(c_across(starts_with("Q65_")), na.rm =
TRUE),
    Attitude_Reebok_Before     = mean(c_across(starts_with("Q6_")),  na.rm =
TRUE),
    Attitude_Reebok_During     = mean(c_across(starts_with("Q58_")), na.rm =
TRUE),

```

```

    Attitude_Reebok_After      = mean(c_across(starts_with("Q68_")), na.rm =
TRUE)
  ) %>%
  ungroup() %>%
  select(Participant, Reactance_Score, starts_with("Attitude_")) %>%
  pivot_longer(
    cols      = starts_with("Attitude_"),
    names_to   = c("Brand", "Timepoint"),
    names_pattern = "Attitude_(.*)_(.*)",
    values_to   = "Attitude_Score"
  ) %>%
  drop_na(Attitude_Score) %>%
  inner_join(valid_ads, by = "Brand") %>%
  mutate(
    Ad_Type      = factor(Ad_Type,      levels = c("A", "B", "C")),
    Timepoint     = factor(Timepoint,    levels = c("Before", "During",
"After")),
    Participant   = as.factor(Participant)
  )

# --- Merge Sports Data Into Attitude Panel ---
attitude_panel_sports <- attitude_panel %>%
  left_join(
    sports_interest_data %>% mutate(Participant = as.factor(Participant)),
    by = "Participant"
  ) %>%
  drop_na(Sport_Fan_Identity)

# --- H4/H5: Brand Attitude Model (with Visual Attention Covariate) ---
fixation_merge_data <- final_panel_data %>%
  select(Participant, Brand, Fixation_Sec) %>%
  distinct()

attitude_panel_sports_final <- attitude_panel_sports %>%
  left_join(fixation_merge_data, by = c("Participant", "Brand"))

attitude_model_sports_final <- lmer(
  Attitude_Score ~ Ad_Type * Timepoint + Fixation_Sec +
    Reactance_Score + Sport_Fan_Identity + Consumption_Channel +
    (1 | Participant) + (1 | Brand),
  data = attitude_panel_sports_final
)

summary(attitude_model_sports_final)

#
=====
# SECTION 10: RESULTS TABLE EXPORTS
#

```

```

=====

tab_model(
  attitude_model_sports_final,
  title = "Table 3: Linear Mixed-Effects Model Predicting Brand
Attitude (Controlling for Visual Attention)",
  show.se = TRUE,
  show.stat = TRUE,
  string.stat = "t",
  string.p = "p-value",
  file = "Attitude_Model_Results_with_Attention.doc"
)

tab_model(
  recall_model_full_updated,
  title = "Table 4: Generalized Linear Mixed-Effects Model Predicting
Brand Recall",
  show.se = TRUE,
  show.stat = TRUE,
  string.stat = "z",
  string.p = "p-value",
  file = "Recall_Model_Results_Final.doc"
)

anova_results_table <- tidy(attention_anova)

tab_df(
  anova_results_table,
  title = "Table 5: Repeated Measures ANOVA Results for Visual Attention",
  digits = 3,
  file = "ANOVA_Formal_Results2.doc"
)

post_hoc_results <- data.frame(
  Comparison = c("Static (A) vs. Video (B)", "Static (A) vs. PiP (C)",
"Video (B) vs. PiP (C)"),
  p_value = c(0.044, 0.040, 0.490),
  Significance = c("Significant (*)", "Significant (*)", "Not Significant")
)

tab_df(
  post_hoc_results,
  title = "Table 6: Post-Hoc Pairwise t-tests for Visual Attention",
  file = "PostHoc_Attention_Results.doc"
)

attitude_brand_summary <- attitude_panel %>%
  group_by(Brand, Ad_Type, Timepoint) %>%
  summarise(
    M = mean(Attitude_Score, na.rm = TRUE),

```

```

SD = sd(Attitude_Score, na.rm = TRUE),
.groups = "drop"
) %>%
mutate(Formatted_Score = sprintf("%.2f (%.2f)", M, SD)) %>%
select(Brand, Ad_Type, Timepoint, Formatted_Score) %>%
pivot_wider(names_from = Timepoint, values_from = Formatted_Score) %>%
mutate(
  Sport = case_when(
    Brand %in% c("Chevy", "Puma", "Ford") ~ "Football",
    Brand %in% c("NewBalance", "Toyota", "Ram") ~ "Basketball",
    Brand %in% c("Nissan", "Columbia", "Asics") ~ "Baseball",
    Brand %in% c("Honda", "UnderArmor", "Reebok") ~ "Hockey"
  ),
  Ad_Format = case_when(
    Ad_Type == "A" ~ "A (Static)",
    Ad_Type == "B" ~ "B (Corner Video w/ Audio)",
    Ad_Type == "C" ~ "C (Picture-in-Picture)"
  )
) %>%
arrange(Sport, Ad_Type) %>%
select(
  Sport,
  Brand,
  `Ad Format` = Ad_Format,
  `Pre-Test M (SD)` = Before,
  `Mid-Test M (SD)` = During,
  `Post-Test M (SD)` = After
)

tab_df(
  attitude_brand_summary,
  title = "Table 7: Average Brand Attitude Scores by Specific Brand and
Format",
  file = "Attitude_Brand_Averages_Table.doc"
)

recall_summary_table <- final_panel_data %>%
group_by(Brand, Ad_Type) %>%
summarise(
  `Times Recalled (N)` = sum(Recall, na.rm = TRUE),
  Total_Participants = n(),
  .groups = "drop"
) %>%
mutate(
  `Recall Percentage (%)` = round((`Times Recalled (N)` /
Total_Participants) * 100, 1),
  Sport = case_when(
    Brand %in% c("Chevy", "Puma", "Ford") ~ "Football",
    Brand %in% c("NewBalance", "Toyota", "Ram") ~ "Basketball",
    Brand %in% c("Nissan", "Columbia", "Asics") ~ "Baseball",

```

```

      Brand %in% c("Honda", "UnderArmor", "Reebok") ~ "Hockey"
    ),
    `Ad Format` = case_when(
      Ad_Type == "A" ~ "A (Static)",
      Ad_Type == "B" ~ "B (Video w/ Audio)",
      Ad_Type == "C" ~ "C (Picture-in-Picture)"
    )
  ) %>%
  arrange(desc(`Recall Percentage (%)`)) %>%
  select(Sport, Brand, `Ad Format`, `Times Recalled (N)`, `Recall Percentage (%)`)

tab_df(
  recall_summary_table,
  title = "Table 8: Brand Recall Frequencies and Percentages by Format",
  file = "Descriptive_Recall_Table.doc"
)

#
=====
# SECTION 11: ASSUMPTION CHECKS
#
=====

check_collinearity(attitude_model_sports_final)
check_collinearity(recall_model_full_updated)

# Residual diagnostics for the attitude model
check_model(attitude_model_sports_final)

plot(fitted(attitude_model_sports_final), resid(attitude_model_sports_final),
     main = "Residuals vs. Fitted",
     xlab = "Fitted Values",
     ylab = "Residuals")
abline(h = 0, col = "red", lwd = 2)

qqnorm(resid(attitude_model_sports_final), main = "Normal Q-Q Plot of
Residuals")
qqline(resid(attitude_model_sports_final), col = "red", lwd = 2)

#
=====
# SECTION 12: DESCRIPTIVE STATISTICS FOR DEMOGRAPHIC TABLES
#
=====

table1_updated <- demo_data %>%
  summarise(

```

```

Variable = "Age",
N = n(),
M = round(mean(Age, na.rm = TRUE), 2),
SD = round(sd(Age, na.rm = TRUE), 2),
Min = min(Age, na.rm = TRUE),
Max = max(Age, na.rm = TRUE)
) %>%
bind_rows(
  sports_interest_data %>%
    summarise(
      Variable = "Sport Fan Identity",
      N = n(),
      M = round(mean(as.numeric(Sport_Fan_Identity), na.rm = TRUE), 2),
      SD = round(sd(as.numeric(Sport_Fan_Identity), na.rm = TRUE), 2),
      Min = min(as.numeric(Sport_Fan_Identity), na.rm = TRUE),
      Max = max(as.numeric(Sport_Fan_Identity), na.rm = TRUE)
    )
) %>%
bind_rows(
  reactance_data %>%
    summarise(
      Variable = "Psychological Reactance",
      N = n(),
      M = round(mean(Reactance_Score, na.rm = TRUE), 2),
      SD = round(sd(Reactance_Score, na.rm = TRUE), 2),
      Min = min(Reactance_Score, na.rm = TRUE),
      Max = max(Reactance_Score, na.rm = TRUE)
    )
)

print(as.data.frame(table1_updated))

# Categorical breakdowns
demo_data %>%
  count(Gender) %>%
  mutate(Percentage = round((n / sum(n)) * 100, 1)) %>%
  print()

sports_interest_data %>%
  count(Watch_Frequency) %>%
  mutate(Percentage = round((n / sum(n)) * 100, 1)) %>%
  print()

sports_interest_data %>%
  count(Consumption_Channel) %>%
  mutate(Percentage = round((n / sum(n)) * 100, 1)) %>%
  print()

#

```

```
=====
# SECTION 13: FIGURES
#
=====
```

```
# --- Figure 4.1: Mean Brand Attitude by Ad Format (Bar Chart) ---
```

```
attitude_summary <- attitude_panel %>%
  mutate(Ad_Format = case_when(
    Ad_Type == "A" ~ "Static",
    Ad_Type == "B" ~ "Video with Audio",
    Ad_Type == "C" ~ "PiP"
  )) %>%
  group_by(Ad_Format) %>%
  summarise(
    Mean_Attitude = mean(Attitude_Score, na.rm = TRUE),
    SE              = sd(Attitude_Score, na.rm = TRUE) / sqrt(n())
  )

attitude_summary$Ad_Format <- factor(attitude_summary$Ad_Format,
                                     levels = c("Static", "Video with Audio",
                                     "PiP"))

ggplot(attitude_summary, aes(x = Ad_Format, y = Mean_Attitude, fill =
Ad_Format)) +
  geom_bar(stat = "identity", position = "dodge", width = 0.6, color =
"black") +
  geom_errorbar(aes(ymin = Mean_Attitude - SE, ymax = Mean_Attitude + SE),
               width = 0.2, position = position_dodge(0.9)) +
  scale_fill_manual(values = c("Static"           = "#D3D3D3",
                              "Video with Audio" = "#A9A9A9",
                              "PiP"              = "#696969")) +
  labs(x = "Advertisement Format", y = "Attitude Toward the Brand (1-7)") +
  theme_classic(base_size = 12, base_family = "serif") +
  theme(
    legend.position = "none",
    axis.title.x    = element_text(face = "bold", margin = margin(t = 12)),
    axis.title.y    = element_text(face = "bold", margin = margin(r = 12)),
    axis.text       = element_text(color = "black")
  ) +
  coord_cartesian(ylim = c(1, 7))
```

```
# --- Figure 4.2: Brand Attitude Over Time by Ad Format (Line Graph) ---
```

```
line_summary <- attitude_panel %>%
  mutate(Ad_Format = case_when(
    Ad_Type == "A" ~ "A (Static)",
    Ad_Type == "B" ~ "B (Video with Audio)",
    Ad_Type == "C" ~ "C (PiP)"
  )) %>%
  group_by(Ad_Format, Timepoint) %>%
```

```

summarise(
  Mean_Attitude = mean(Attitude_Score, na.rm = TRUE),
  SE             = sd(Attitude_Score, na.rm = TRUE) / sqrt(n()),
  .groups       = "drop"
)

line_summary$Ad_Format <- factor(line_summary$Ad_Format,
                                levels = c("A (Static)", "B (Video with
Audio)", "C (PiP)"))
line_summary$Timepoint <- factor(line_summary$Timepoint,
                                levels = c("Before", "During", "After"))
levels(line_summary$Timepoint) <- c("Pre-Test", "Mid-Test", "Post-Test")

pd <- position_dodge(width = 0.2)

attitude_plot <- ggplot(line_summary, aes(x = Timepoint, y = Mean_Attitude,
                                           group = Ad_Format,
                                           linetype = Ad_Format,
                                           shape     = Ad_Format)) +
  geom_line(position = pd, size = 1, color = "black") +
  geom_point(position = pd, size = 4, color = "black", fill = "white", stroke
= 1.2) +
  geom_errorbar(position = pd,
               aes(ymin = Mean_Attitude - SE, ymax = Mean_Attitude + SE),
               width = 0.15, size = 0.7, color = "black") +
  scale_linetype_manual(values = c("solid", "longdash", "dashed")) +
  scale_shape_manual(values = c(21, 22, 24)) +
  labs(
    x       = "Measurement Timepoint",
    y       = "Attitude Toward the Brand (1-7)",
    linetype = "Advertisement Format",
    shape    = "Advertisement Format"
  ) +
  theme_classic(base_size = 12, base_family = "serif") +
  theme(
    legend.position = "bottom",
    legend.title    = element_text(face = "bold"),
    legend.text     = element_text(size = 11),
    axis.title.x    = element_text(face = "bold", margin = margin(t = 12)),
    axis.title.y    = element_text(face = "bold", margin = margin(r = 12)),
    axis.text       = element_text(color = "black", size = 11)
  ) +
  coord_cartesian(ylim = c(1, 7))

print(attitude_plot)

ggsave(filename = "Figure_4_2_Attitude_Lines.png",
        plot      = attitude_plot,
        width     = 7,
        height    = 5.5,

```

```

    units    = "in",
    dpi      = 300)

# --- Figure 4.3: Mean Visual Fixation Duration by Ad Format (Bar Chart) ---
fixation_summary <- attention_anova_data %>%
  mutate(Ad_Format = case_when(
    Ad_Type == "A" ~ "Static",
    Ad_Type == "B" ~ "Video with Audio",
    Ad_Type == "C" ~ "PiP"
  )) %>%
  group_by(Ad_Format) %>%
  summarise(
    Mean_Fixation = mean(Mean_Fixation, na.rm = TRUE),
    SE            = sd(Mean_Fixation, na.rm = TRUE) / sqrt(n())
  )

fixation_summary$Ad_Format <- factor(fixation_summary$Ad_Format,
                                   levels = c("Static", "Video with Audio",
                                   "PiP"))

fixation_plot <- ggplot(fixation_summary, aes(x = Ad_Format, y =
Mean_Fixation, fill = Ad_Format)) +
  geom_bar(stat = "identity", position = "dodge", width = 0.5, color =
"black") +
  geom_errorbar(aes(ymin = Mean_Fixation - SE, ymax = Mean_Fixation + SE),
               width = 0.15, size = 0.7, position = position_dodge(0.9)) +
  scale_fill_manual(values = c("Static"           = "#D3D3D3",
                              "Video with Audio" = "#A9A9A9",
                              "PiP"             = "#696969")) +
  labs(x = "Advertisement Format", y = "Mean Fixation Duration (Seconds)") +
  theme_classic(base_size = 12, base_family = "serif") +
  theme(
    legend.position = "none",
    axis.title.x    = element_text(face = "bold", margin = margin(t = 12)),
    axis.title.y    = element_text(face = "bold", margin = margin(r = 12)),
    axis.text       = element_text(color = "black", size = 11)
  ) +
  scale_y_continuous(expand = expansion(mult = c(0, 0.1)))

print(fixation_plot)

ggsave(filename = "Figure_4_3_Fixation_Bars.png",
        plot      = fixation_plot,
        width     = 6,
        height    = 5,
        units     = "in",
        dpi       = 300)

#

```

```
=====
# END OF SCRIPT
```

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#
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