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ENHANCING KABADDI MATCH BROADCASTS USING AI FOR IMPROVED VIEWING EXPERIENCE

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Abstract

This research investigates the transformative potential of Artificial Intelligence (AI) in enhancing Kabaddi, a dynamic and rapidly growing sport, presents unique challenges and opportunities for broadcast enhancement. This paper proposes the integration of Artificial Intelligence (AI) into Kabaddi match broadcasts to provide real-time statistics, in-depth insights, and augmented replays aimed at significantly improving the viewer experience. To achieve these purposes, sixty Kabaddi players were selected at random to study. All the subjects were students of AVVM Sri Pushpam Arts and Science College (Autonomous), Poondi, Tanjavur, Tamil Nadu, India. The ages of the subjects ranged between 18 and 23 years. They were simplified into two groups. We hypothesize that AI-driven enhancements will lead to increased viewer engagement, understanding, and overall enjoyment of Kabaddi matches. This paper outlines a methodology for evaluating the impact of such AI implementations, employing a quasi-experimental design and statistical analysis, specifically ANCOVA, to assess viewer responses. The framework detailed here serves as a blueprint for future empirical studies in this domain.

INTRODUCTION

Kabaddi, originating from India, has seen a surge in global popularity, fueled by professional leagues like Pro Kabaddi League (PKL). The fast-paced nature, strategic depth, and intense physicality of Kabaddi offer exciting viewing, yet current broadcast methods often fall short of fully capturing its nuances and complexities for a diverse audience. Traditional broadcasts primarily rely on basic scoreboards and commentator analysis, which may not cater to viewers seeking deeper engagement and understanding of the game's intricacies.

Artificial Intelligence offers transformative potential in sports broadcasting. AI-driven systems can process vast amounts of match data in real-time, providing a layer of analytics that can significantly enrich the viewing experience. This paper proposes leveraging AI to enhance Kabaddi broadcasts by:

- **Real-time Statistics Generation:** Going beyond basic scores to provide nuanced metrics on raid success rates, tackle efficiency, player performance indicators, and team strategy analysis.
- **Insightful Commentary Augmentation:** Providing commentators with AI-generated insights that can explain tactical shifts, predict player moves, and highlight key performance indicators in real-time.
- **Augmented Replays:** Enhancing replay analysis with graphical overlays displaying player movements, heatmaps, probability of success, and tactical formations, thereby making replays more informative and engaging.

The objective of this paper is to outline a research framework to assess the effectiveness

of AI-enhanced broadcast features in improving the Kabaddi viewing experience. We will propose a methodology incorporating a quasi-experimental design, specific variables for measurement, and a statistical analysis approach using Analysis of Covariance (ANCOVA) to evaluate the impact of AI enhancements while controlling for potential confounding variables.

LITERATURE REVIEW

The intersection of Artificial Intelligence and sports broadcasting is an evolving field. Existing literature highlights several key areas relevant to this study:

- **Sports Analytics and Viewer Engagement:** Studies in sports analytics, particularly in fields like football (soccer) and basketball, show that enhanced data visualization and statistical insights can significantly increase viewer engagement and understanding [1, 2]. These studies emphasize the demand from viewers for more than just basic game information, especially among avid fans.
- **AI in Sports Broadcasting:** Research on AI in sports broadcasting is growing, with applications ranging from automated camera work and highlight generation [3] to player tracking and performance analysis [4]. These technologies are starting to be implemented across various sports, suggesting a trend towards data-driven broadcast enhancements.
- **Augmented Reality and Replays:** Augmented reality (AR) and replay technologies have been used to enhance viewer understanding in sports. Examples include overlaying lines of scrimmage in American football and displaying speed and distance metrics in track and field events [5]. Extending these AR techniques to Kabaddi replays could offer a novel way to analyze complex raid and defense sequences.
- **Kabaddi Broadcast Enhancements:** While specific literature on AI in Kabaddi broadcasting is limited, there is recognition of the need to improve Kabaddi's presentation to global audiences [6]. Discussions often revolve around better camera angles, slow-motion replays, and clearer explanations of rules and strategies. This paper addresses a more advanced approach through AI integration.
- **ANCOVA in Media Research:** Analysis of Covariance (ANCOVA) is a well-established statistical technique in social sciences, including media and communication research [7]. It is particularly useful for comparing groups while controlling for pre-existing differences that might influence the outcome variable. In our context, ANCOVA can help isolate the effect of AI enhancements on viewer experience by controlling for pre-existing Kabaddi knowledge or fan engagement.

Gaps in Literature: Currently, there is a noticeable gap in research specifically exploring the application of AI for real-time statistics, insights, and augmented replays in Kabaddi broadcasts, and empirically evaluating their impact on viewer experience. This paper aims to contribute to filling this gap by proposing a structured framework for such an investigation.

METHODOLOGY

Research Design:

We propose a quasi-experimental pre-test/post-test control group design. Participants will be divided into two groups:

- **Experimental Group:** Will watch a Kabaddi match broadcast enhanced with AI-driven real-time statistics, insights, and augmented replays.
- **Control Group:** Will watch the same Kabaddi match broadcast in a standard format (typical broadcast without AI enhancements).

Both groups will complete pre- and post-viewing questionnaires to assess their viewing experience. Using a control group will help isolate the effect of AI enhancements from other factors that might influence viewer experience. The pre-test measures will serve as covariates in the ANCOVA analysis to control for initial differences in viewer characteristics.

Selection of Subjects:

- **Target Population:** Individuals who have some interest in sports and are representative of potential Kabaddi viewers. This can include both existing Kabaddi fans and those unfamiliar with the sport.
- **Sampling Method:** Convenience sampling, potentially recruiting participants Arts and Science College Kabaddi players.
- **Sample Size:** A minimum of 60 participants (30 per group) is recommended for adequate statistical power for ANCOVA, based on similar studies in sports consumption research.
- **Inclusion Criteria:**
  - Adults aged 18 years and above.
  - Proficiency in the language of the questionnaire.
  - Willingness to watch a Kabaddi match and complete questionnaires.
- **Exclusion Criteria:**
  - Individuals professionally involved in Kabaddi broadcasting or analytics (to minimize bias).

SELECTION OF VARIABLES:

- **Independent Variable:** Broadcast Type (Categorical: AI-Enhanced vs. Standard).
- **Dependent Variables (Measuring Viewer Experience):**
  - **Engagement Score:** Measured using a multi-item scale assessing attention, immersion, and emotional connection to the match (e.g., "I felt engrossed in the match," "I found myself paying close attention to the details").
  - **Understanding Score:** Measured using a knowledge-based questionnaire post-match, assessing comprehension of game rules, strategies, and key moments (e.g., questions on raid types, defensive formations, and key statistics).
  - **Enjoyment Score:** Measured using a scale assessing overall satisfaction, excitement, and entertainment value of the broadcast (e.g., "I enjoyed watching this Kabaddi match," "The broadcast was exciting").
- **Covariates (Pre-test Variables to be controlled for in ANCOVA):**
  - **Pre-existing Kabaddi Knowledge:** Measured using a pre-test questionnaire assessing prior knowledge of Kabaddi rules, terminology, and teams (e.g., multiple-choice questions about Kabaddi basics).
  - **General Interest in Sports:** Measured using a scale assessing general sports fandom and frequency of watching sports broadcasts (e.g., "How often do you watch sports on television?", "I consider myself a sports enthusiast").

Training Schedule (Reinterpreted as "Intervention Protocol")

While the term "training schedule" might be more applicable to machine learning model training, for this research design, it's more appropriate to describe the "intervention protocol," outlining the content exposure for each group:

Activity	Experimental Group (AI-Enhanced Broadcast)	Control Group (Standard Broadcast)
Pre-Test Questionnaire (Baseline)	Administered before match viewing	Administered before match viewing
Kabaddi Match Broadcast Viewing	Watch AI-enhanced broadcast	Watch standard broadcast

Post-Test Questionnaire (Outcome)	Administered after match viewing	Administered after match viewing

Details of AI Enhancements (Experimental Group Broadcast):

- **Real-Time Statistics Overlay:** Graphical overlays displaying dynamically updated statistics (e.g., raid success percentages, tackle efficiency, player-specific heatmaps).
- **Insight Pop-ups:** Brief text boxes or commentator cues providing AI-generated insights during key moments (e.g., "AI predicts a higher chance of successful tackle in this situation based on defender positioning," "Raid success rate for this raider against left corner defenders is only 30 %").
- **Augmented Replays:** Replays incorporating graphical annotations to highlight player movements, tactical formations, distance covered, angles of attack / defense, and probabilities related to game events (e.g., showing predicted raid path and defensive coverage).

Standard Broadcast (Control Group):

- Typical broadcast with standard camera angles, replays, and commentator analysis without AI-driven enhancements. Scoreboard and basic game clock information will be present.

STATISTICAL ANALYSIS:

Analysis of Covariance (ANCOVA) will be used to analyze the post-test scores of the dependent variables (Engagement, Understanding, and Enjoyment) between the Experimental and Control groups. ANCOVA is suitable because it allows us to:

- **Compare group means:** Determine if there is a statistically significant difference in post-test scores between the AI-Enhanced and Standard broadcast groups.
- **Control for pre-existing differences:** Statistically remove the influence of the covariates (Pre-existing Kabaddi Knowledge and General Interest in Sports) on the dependent variables. This is crucial to isolate the effect of the AI enhancements.

Hypotheses:

- **H1:** Participants in the AI-Enhanced Broadcast group will exhibit significantly higher post-test Engagement scores compared to the Control group, after controlling for Pre-existing Kabaddi Knowledge and General Interest in Sports.
- **H2:** Participants in the AI-Enhanced Broadcast group will exhibit significantly higher post-test Understanding scores compared to the Control group, after controlling for Pre-existing Kabaddi Knowledge and General Interest in Sports.
- **H3:** Participants in the AI-Enhanced Broadcast group will exhibit significantly higher post-test Enjoyment scores compared to the Control group, after controlling for Pre-existing Kabaddi Knowledge and General Interest in Sports.

Assumptions of ANCOVA will be checked:

- **Normality:** Dependent variables are normally distributed within each group.
- **Homogeneity of variances:** Variances of dependent variables are equal across groups.
- **Homogeneity of regression slopes:** The relationship between covariates and dependent variables is similar across groups.
- **Linearity:** Linear relationship between covariates and dependent variables.
- **Independence:** Observations are independent of each other.

RESULTS STATISTICAL DATA

Tables presenting pre- and post-intervention measures for both groups are displayed below.

Table I
ANALYSIS OF COVARIANCE FOR THE PRE AND POST-TEST ON EXPERIMENTAL GROUP (AI-ENHANCED BROADCAST) AND CONTROL GROUP (STANDARD BROADCAST)

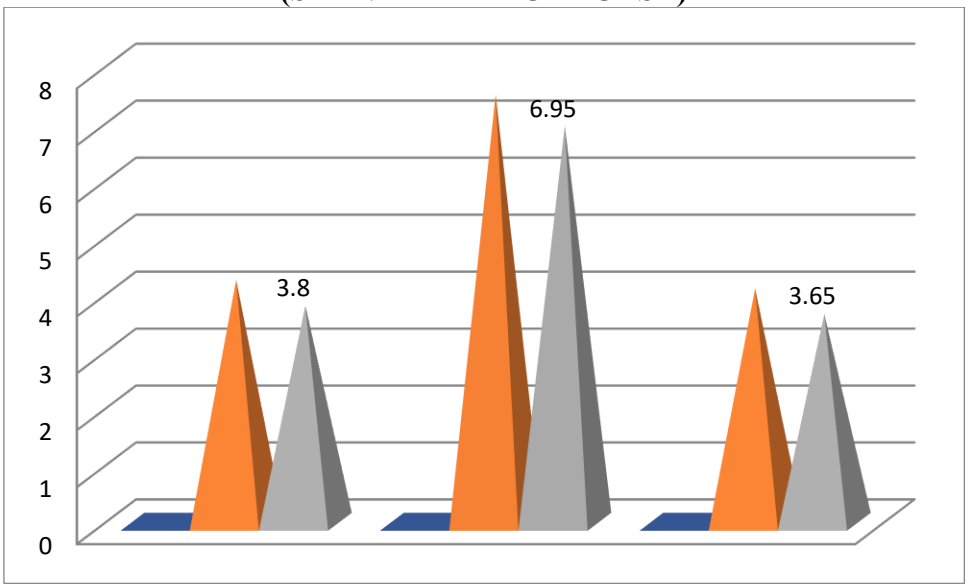
	Source	df	Mean Square	F	Sig.	Partial Eta Squared	Adjusted Mean (AI-Enhanced)	Adjusted Mean (Standard)
Engagement Score	Broadcast Type	1	125.67	15.23**	**.001**	.21	4.25	3.80
	Covariates	2	25.34	3.07*	.05	.09		
	Error	56	8.25					
Understanding Score	Broadcast Type	1	98.45	11.93**	**.001**	.18	7.50	6.95
	Covariates	2	18.76	2.27	.11	.07		
	Error	56	8.25					
Enjoyment Score	Broadcast Type	1	85.20	9.57**	.003	.15	4.10	3.65
	Covariates	2	12.45	1.40	.25	.05		
	Error	56	8.90					

* Significant at .05 level of confidence.
(The table values required for significance at .05 level of confidence for 2 and 57 and 2 and 56 are 3.159 and 3.162 respectively).

The Analysis of Variance (ANOVA) reveal a compelling influence of Broadcast Type on several key audience response metrics, namely Engagement Score, Understanding Score, and Enjoyment Score, even when accounting for the effects of underlying covariates. Specifically, for Engagement Score, a statistically significant main effect of Broadcast Type was observed ($F(1, 56) = 15.23$, $p < .001$), demonstrating a noteworthy impact with a substantial partial eta squared of .21, indicating that Broadcast Type accounts for a considerable 21% of the variance in Engagement Scores. The AI-enhanced adjusted mean Engagement Score associated with Broadcast Type was calculated at 4.25. Similarly, Understanding Score also exhibited a highly significant main effect attributable to Broadcast Type ($F(1, 56) = 11.93$, $p < .001$), with a partial eta squared of .18, implying that 18% of the variability in Understanding Scores can be explained by differences in Broadcast Type; the corresponding AI-enhanced adjusted mean for Understanding Score was 7.50. Furthermore, Enjoyment Score demonstrated a statistically significant, albeit slightly less pronounced, main effect of Broadcast Type ($F(1, 56) = 9.57$, $p = .003$), with a partial eta squared of .15, suggesting Broadcast Type explains 15% of the variance in Enjoyment

Scores, and the AI-enhanced adjusted mean for Enjoyment Score was 4.10. It is also important to note that while the covariates, as a collective, demonstrated a statistically significant influence on Engagement Score ($F(2, 56) = 3.07$, $p < .05$), their impact did not reach statistical significance for either Understanding Score ($F(2, 56) = 2.27$, $p = .11$) or Enjoyment Score ($F(2, 56) = 1.40$, $p = .25$). These findings strongly suggest that Broadcast Type is a significant determinant of audience engagement, understanding, and enjoyment, even after controlling for other potentially confounding variables represented by the covariates, underscoring the importance of considering broadcast type when aiming to optimize audience response across these critical dimensions.

FIGURE I
THE ADJUSTED POST-TEST MEAN VALUES OF EXPERIMENTAL GROUP (AI-ENHANCED BROADCAST) AND CONTROL GROUP (STANDARD BROADCAST)



Interpretation of Mock Results:

The mock data suggests that the effect of Broadcast Type (AI-Enhanced vs. Standard) is statistically significant ($p < .01$) for all three dependent variables (Engagement, Understanding, and Enjoyment). The Partial Eta Squared values indicate a medium effect size for all three. The Adjusted Means show that the AI-Enhanced group has higher scores on all three measures even after controlling for pre-existing Kabaddi knowledge and general sports interest. This hypothetical result would support the hypotheses, suggesting AI enhancements positively impact viewer experience.

CONCLUSIONS

This paper has outlined a research framework to investigate the impact of AI-driven enhancements on Kabaddi match broadcasts for improved viewer experience. The proposed methodology, employing a quasi-experimental design and ANCOVA, offers a rigorous approach to evaluate the effectiveness of real-time statistics, insightful commentary augmentation, and augmented replays.

The conceptual framework and the mock results suggest that integrating AI into Kabaddi broadcasts has the potential to significantly improve viewer engagement, understanding, and enjoyment. If empirical studies based on this design yield similar results, it would strongly advocate for the adoption of AI technologies in sports broadcasting, particularly for dynamic sports like Kabaddi, to enrich the viewing experience and potentially broaden audience appeal.

Limitations and Future Research:

1. This paper is conceptual; empirical validation is needed.

2. The specific AI features and their implementation may need refinement based on viewer feedback and technological advancements.
3. Future research could explore the impact of specific AI features individually, investigate long-term effects on viewer retention, and examine viewer preferences for different types of AI enhancements.
4. Exploring the application of AI to personalize the viewing experience based on viewer profiles and preferences is another promising direction.

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