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Embodied Emotion at Scale: Sport as the Collective Emotion Laboratory for Human Development in the Age of AI

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Abstract

Sport represents humanity's largest-scale emotion laboratory where intense competitive emotions are practiced within safe boundaries through collective participation. As artificial intelligence evolves to systematize virtual and digital experiences, sport's irreplaceable embodied practice of collective participation becomes more apparent, not less. This conceptual paper demonstrates how artificial intelligence can optimize emotional learning from large-scale sport experiences while highlighting, rather than replacing, their unique human development value. Authors propose a four-level framework positioning sport organizations as comprehensive emotional development centers that leverage AI-powered technologies, including video analytics capturing facial expressions, body movements, and collective synchrony, to systematize emotional intelligence development. The framework creates measurable competitive advantages through enhanced fan loyalty, operational efficiency, risk mitigation, and new revenue streams. Sport's role as a cornerstone of human capital development through embodied participation will strengthen with artificial intelligence, positioning sport management as a leader in leveraging technology to enrich, not replace, authentic human experiences.

Keywords: Artificial Intelligence, Embodied Emotion, Emotion Laboratory, Human Capital, Emotional Intelligence, Sport Management

Embodied Emotion at Scale: Sport as the Collective Emotion Laboratory for Human Development in the Age of AI

Sport represents one of the world's most extensive shared emotional experiences. At the FIFA World Cup Qatar 2022 final, 88,966 spectators filled the stadium while more than 1.5 billion watched, creating a rare moment of synchronized emotion across physical and mediated spaces (FIFA, 2024). Sporting events function as ecological laboratories of emotion, where the embodiment of physical co-presence enables individuals to experience and practice collective affect in real time (Lee et al., 2013; Niedenthal & Brauer, 2012). At the individual level, physical co-presence facilitates emotional synchronization through the mirror neuron system, linking perception and action to shared affective experience (Anderson & Stone, 1981; Di Pellegrino et al., 1992; Iacoboni, 2009). At the social level, sport provides structured contexts in which “us versus them” emotions are openly expressed yet ultimately reconciled, offering systematic practice in managing divisive emotions while sustaining cohesion (Ashmore et al., 2004; Fredrickson, 2003; Hogg & Abrams, 1988; Lee et al., 2013).

Contemporary theories increasingly view emotions as fundamentally social processes that emerge, are communicated, and are regulated through interpersonal interaction (van Kleef & Côté, 2022). The Emotions as Social Information (EASI) framework explains how emotional expressions guide interpersonal coordination by signaling intentions and goals (van Kleef, 2009, 2010). In sport, such mechanisms are observable as coaches' and teammates' emotional cues shape performance and group dynamics (Keltner & Haidt, 1999; Moesch et al., 2018; Niedenthal & Brauer, 2012).

Emerging artificial intelligence (AI) technologies now enable the systematic observation of these embodied emotional processes. Emotion recognition systems in live sport settings achieve accuracy levels approaching human judgment, capturing spectators' collective affect through facial expressions, body movements, and biomechanics (Jekauc et al., 2024; Lee et al., 2013). These systems can capture embodied synchrony phenomena such as cheering, collective disappointment, or the wave that can only occur through physical co-presence. As AI advances into the realm of virtual emotions, the irreplaceable value of sport's embodied collective participation becomes more apparent.

This thought piece proposes a conceptual framework asserting that the value of sport's embodied collective experiences is amplified (not diminished) by advances in AI. We position sport as a uniquely powerful context for large-scale emotional development, where the irreplaceable qualities of physical co-presence and collective affect foster human connection. By examining how AI-powered technologies, such as crowd video analytics and emotion recognition, can capture and optimize these dynamics, we show how sport organizations can transform fleeting emotions into measurable human capital outcomes. Specifically, we offer a conceptual extension of the EASI framework by integrating embodied collective participation and AI-enabled emotion analytics to explain how sport functions as a system for large-scale emotional capital development.

Sport as an AI-Enhanced Emotion Laboratory

Sport can be conceptualized as an emotion laboratory that encompasses a wide spectrum of affective experiences, each fulfilling distinct social information functions through embodied participation. Positive emotions such as joy, excitement, and pride signal successful outcomes and strengthen social bonds through synchronized celebration (Fredrickson, 1998; van Kleef & Côté, 2022). Challenging emotions such as disappointment, frustration, and anxiety act as signals of situational demands (e.g., an unexpected loss), creating shared opportunities for emotional regulation and resilience (Lee et al., 2025). Social emotions such as belonging and collective celebration convey information about group dynamics, offering continuous practice in interpersonal coordination and empathy (Heere et al., 2011; Lee et al., 2013).

AI-powered technologies, including video analytics, facial and body recognition, wearable sensors, computer vision, and multimodal sentiment analysis, can be used as tools in the emotion laboratory by capturing facial micro-expressions, body movement synchrony, vocal tone, physiological arousal, and biomechanical patterns across large crowds. Together, these tools can generate systematic, real-time data on how collective emotions emerge, synchronize, and evolve within live sport environments. Micro-expression and facial-expression systems have advanced rapidly with deep learning, improving detection and recognition in unconstrained settings, while pose- and motion-based crowd models quantify shared movement patterns (Khan et al., 2023; Sánchez et al., 2020; Shuai et al., 2025). On the acoustic side, spectrogram- and decomposition-based methods can infer crowd valence and arousal from stadium soundscapes, enabling continuous, non-invasive monitoring (Cutler et al., 2024; Franzoni et al., 2020). In parallel, wearable platforms and unobtrusive biosensors could capture synchronized physiological arousal across attendees (Hammond et al., 2024; Seshadri et al., 2019). By integrating data from cameras, microphones, and wearable devices, AI enables scholars and practitioners to analyze embodied affective processes that distinguish live sport from isolated digital experiences, offering unprecedented insight into the mechanisms of collective emotion and social coordination.

Within this framework, pride management becomes a central mechanism of emotional intelligence development. Authentic pride (i.e., achievement-based and effort-focused) produces accurate social information that supports prosocial behavior, whereas hubristic pride (i.e., entitlement-based and superiority-focused) distorts perception and promotes antisocial tendencies (Tracy & Robins, 2007). AI-based facial and movement analyses can be developed to differentiate these forms, informing targeted interventions that reinforce authentic pride and reduce destructive manifestations such as hooliganism.

Emotional intelligence comprises self-awareness, self-regulation, social awareness, and relationship management (Goleman, 1995). Integrating these competencies with human capital theory positions emotional capabilities developed through embodied sport participation as measurable assets with long-term social and organizational value (Becker, 1964). The social regulation cycle, supported by AI-based monitoring and feedback, can establish a structured

foundation for developing emotional competencies as part of systematic human capital development. This integration creates a structured pathway for developing emotional competencies as part of human capital (Fredrickson, 2003), positioning them as measurable and strategically valuable organizational resources. Crucially, while AI can document and optimize these processes, the embodied foundations of sport (e.g., the sensory, physical, and collective aspects of human emotion) remain irreplaceable (Lee et al., 2013; Reeck et al., 2016).

The AI-Enhanced Emotion Laboratory Framework

We propose a four-level framework (Figure 1) demonstrating how AI can transform sport's natural emotion laboratory into a system for structured human capital development, while preserving and amplifying the irreplaceable value of embodied collective participation. The framework positions sport organizations as emotional development ecosystems that translate shared experiences into measurable learning and performance outcomes. The following sections illustrate AI's specific contributions at each level.

Level 1. Individual Emotional Competency Development

At the individual level, AI systems monitor emotional patterns during embodied participation using video analytics to assess facial expressions, body language, and behavioral cues in real time. These systems document how collective experiences influence personal growth, supporting self-awareness and emotional regulation through individualized feedback cycles (Jekauc et al., 2024; Reeck et al., 2016). By tracking progress across the four dimensions of emotional intelligence (Goleman, 1995), participants learn to recognize authentic emotions and respond appropriately. For managers, such insights can inform premium fan experiences—offering emotional development services to season ticket holders or youth academies that enhance loyalty and long-term engagement through deeper emotional connection.

Level 2. Collective Emotion Laboratory Management

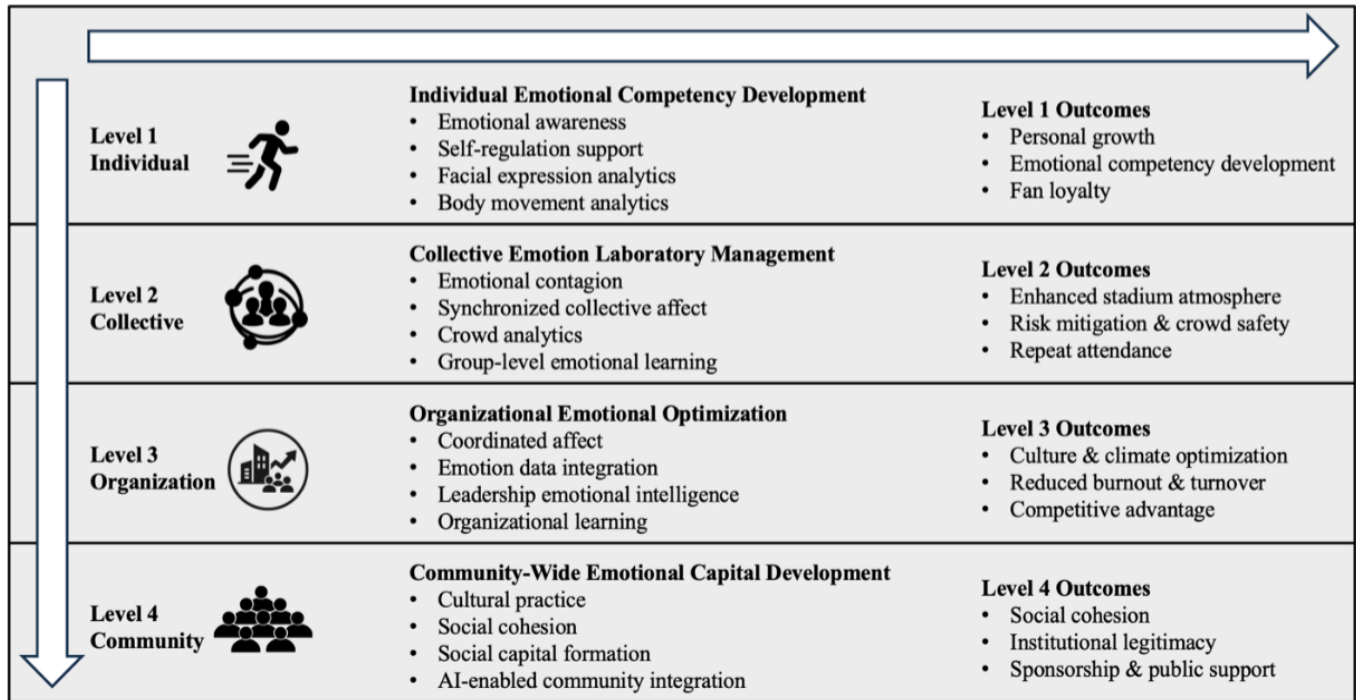
At the collective level, sport provides simultaneous mass emotional experiences uniquely suited for developing group-level emotional intelligence. AI-enhanced crowd analytics capture synchronized affect across thousands of spectators through micro-expressions, movement patterns, and collective gestures such as the wave or unified cheering. Using the EASI framework (van Kleef & Côté, 2022), AI identifies moments of positive emotional contagion and opportunities for group learning. Real-time interventions, such as crowd prompts or visual feedback, can amplify constructive emotions while reducing destructive outbursts. This process transforms spectatorship into collective emotional training, helping communities practice regulation and empathy through shared experience. Managerially, such systems can reduce security costs, enhance stadium atmosphere, and increase repeat attendance while demonstrating measurable community impact.

Level 3. Organizational Emotional Optimization

At the organizational level, AI technologies enable sport entities to operate as learning organizations that manage emotional intelligence across teams, departments, and leadership hierarchies. Emotion analytics derived from video and communication data help identify patterns that promote psychological health and cooperative functioning (Moesch et al., 2018; Keltner & Haidt, 1999). AI-assisted training supports leaders in refining their emotional expression and feedback behaviors in line with EASI principles (van Kleef, 2010). Embedding emotional regulation and intelligence into everyday operations enhances employee satisfaction, reduces burnout and turnover, and improves service quality. Organizations that master emotional management can leverage their expertise as consulting assets, generating new revenue streams while cultivating a distinctive competitive advantage grounded in embodied participation.

Level 4. Community-Wide Emotional Capital Development

At the societal level, sport organizations can extend their emotion laboratory function into the community. Partnerships with schools, workplaces, and civic groups can translate insights from AI-optimized sport experiences into applied training programs focused on empathy, resilience, and conflict resolution (Klimecki, 2019). These initiatives treat sport's embodied participation as a foundation for improving collective emotional literacy and social cohesion (Fredrickson, 2003). Over time, community-wide emotional capital development can produce measurable outcomes in well-being, trust, and cooperation. For practitioners, this positions sport organizations as essential social infrastructure—eligible for sponsorships, grants, and public support based on demonstrable community impact that remains uniquely grounded in embodied collective experience, which AI can enhance but not replace.

Figure 1*The AI-Enhanced Emotion Laboratory Framework*

Note. Figure 1 illustrates a four-level AI-enhanced emotion laboratory framework in sport. The levels represent increasing scales of emotional analysis, from individual participants to collective, organizational, and community contexts. At each level, AI-enabled emotion analytics capture embodied emotional processes and translate them into emotional competencies and human capital outcomes. The vertical progression reflects the scaling and accumulation of emotional learning rather than strict causal sequencing.

Implications for Sport Management Practice

The provided framework (see Figure 1) repositions sport organizations as active agents in systematic emotion management rather than passive providers of entertainment. As AI technologies continue to personalize digital content and automate daily routines, the irreplaceable value of embodied, collective sport experiences becomes increasingly evident. Organizations that adopt this framework can differentiate themselves through measurable community impact, enhanced stakeholder value, and innovative offerings that extend beyond traditional forms of consumption.

Early adopters can gain competitive advantages by leveraging AI-enhanced analytics to optimize spectator experiences grounded in embodied participation. Predictive emotion data can inform crowd management, anticipate organizational climate shifts, and mitigate risks before escalation. Real-time monitoring of facial and movement patterns allows managers to prevent security incidents while maintaining a positive atmosphere that supports collective emotional learning. These capabilities translate to tangible outcomes such as improved operational efficiency, reduced safety costs, and deeper fan loyalty.

rooted in shared experience.

Moreover, intelligence consulting built on expertise in large-scale emotional regulation introduces new revenue opportunities. By transforming emotional data into actionable insights, organizations can position themselves as thought leaders in applied emotional intelligence and community development. The emotion laboratory approach also addresses long-standing challenges such as hooliganism and workplace burnout by emphasizing proactive social regulation over reactive control (Lee et al., 2025; Reeck et al., 2016). Systematic competency building fosters healthier emotional cultures that prevent crises before they emerge.

As AI continues to systematize virtual interaction, sport's embodied environment remains a unique and essential infrastructure for developing emotional intelligence at scale. Organizations integrating AI-driven regulation with embodied participation not only enhance fan and employee well-being but also strengthen their social legitimacy as community institutions. Far from diminishing sport's role, technological evolution amplifies its human significance—highlighting that the collective, sensory, and emotional dimensions of live sport remain irreplaceable.

Future Research and Conclusion

This framework opens several avenues for empirical and conceptual inquiry. Future research should examine longitudinal effects of embodied participation on emotional intelligence and community cohesion, as well as cross-cultural applications of the EASI theory (van Kleef & Côté, 2022) to understand how emotion processing differs across sport contexts. Experimental designs can test the effectiveness of real-time coaching and crowd interventions informed by AI-based emotion recognition, while multimodal analytics (e.g., integrating facial, gestural, and biomechanical data) can deepen understanding of collective emotional synchrony. Equally important are ethical questions surrounding AI-powered monitoring, including privacy protection, informed consent, and bias mitigation. The framework also extends emotion theories (e.g., Fredrickson, 2003; Niedenthal & Brauer, 2012; van Kleef & Côté, 2022) to large-scale embodied crowds and integrating social regulation theory into emotional climate management. It advances human capital theory by positioning emotional and social information competencies derived from embodied sport participation as quantifiable assets contributing to individual and societal well-being.

Sport is humanity's premier emotional laboratory, and with AI enhancing rather than replacing embodied experiences, it becomes a catalyst for systematic human development. The convergence of emotion theory, social regulation research, and AI-enabled analytics can position sport management at the forefront of addressing society's growing need for emotional intelligence education. By transforming sport's natural emotion laboratory into a structured platform for social learning, organizations can generate measurable human capital outcomes that extend far beyond entertainment. In an increasingly virtual world, the embodied and collective dimensions of sport remain an irreplaceable foundation for emotional connection, social cohesion, and human growth in the age of artificial intelligence.

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