
THE INTELLIGENT PLAYGROUND: AI, PHYSICAL ACTIVITY AND THE FUTURE OF CHILDREN'S WELLBEING

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ABSTRACT

The increasing digitization of childhood has raised concerns about sedentary behaviour, excessive screen use and declining opportunities for active and unstructured play. At the same time, artificial intelligence (AI) is creating new possibilities for encouraging children to participate in physical activity through intelligent games, wearable devices, computer vision, augmented reality and personalized feedback. This article explores the concept of the **Intelligent Playground**, an environment in which digital technology is integrated with sport, movement, creativity and social interaction to encourage children to become physically active. The paper argues that AI can potentially transform passive digital engagement into active participation, but excessive monitoring may also create psychological pressure and reduce children's autonomy. The article distinguishes between *technology-enabled play*, in which technology facilitates movement and creativity, and *technology-controlled play*, in which children's activities become dominated by measurement and algorithmic feedback. A child-centred model is proposed in which AI functions as a facilitator rather than a replacement for outdoor play, teachers, coaches, parents and peer interaction.

Keywords: Artificial Intelligence; Children; Physical Activity; Intelligent Playground; Digital Childhood; Sports; Wellbeing; Augmented Reality; Active Play

INTRODUCTION

Childhood is increasingly shaped by digital technologies. Smartphones, tablets, online games and digital entertainment have created new forms of learning and recreation, but they have also contributed to concerns about sedentary behaviour. The World Health Organization recommends that children and

adolescents aged 5–17 years undertake an average of at least 60 minutes of moderate-to-vigorous physical activity each day across the week. However, global evidence indicates that more than 80% of school-going adolescents do not meet this recommendation. This situation presents an important challenge for educators and policymakers. Attempts to reduce children's screen use by simply restricting technology may not be sufficient. An alternative approach is to redesign digital experiences so that they encourage movement rather than passivity.

Artificial intelligence offers such a possibility. AI-enabled games can respond to children's movements, adapt difficulty levels and create personalized challenges. Computer vision can transform body movement into game interaction, while wearable devices can provide real-time information about activity. Augmented reality can further combine digital content with physical environments.

These developments provide the foundation for the concept of the **Intelligent Playground**: a physical and digital environment designed to make movement more engaging while preserving the essential characteristics of childhood play.

PROBLEM STATEMENT

The central problem is that digital technology is frequently designed to capture children's attention while physical activity requires children to disengage from passive digital behaviour and move. If this contradiction continues, technology may contribute to rather than solve childhood inactivity.

However, simply adding AI to children's environments is not a solution. Excessive measurement of steps, calories, speed, heart rate or performance could transform play into another form of assessment. Children may begin to associate physical activity with scores and rankings rather than enjoyment and exploration.

The challenge is therefore to determine **how AI can encourage physical activity without allowing technology to control the nature of children's play.**

RESEARCH GAP

Existing research has established the importance of physical activity for children's health and wellbeing, while emerging research examines digital games, exergaming, wearable technology and AI-supported activity..

However, there remains limited integrated research examining how AI, physical play, social interaction and wellbeing can operate together in a child-centred environment. A particularly important gap concerns the psychological consequences of continuous measurement. Technology may motivate some children but create comparison, performance pressure or reduced autonomy for others. Similarly, research needs to distinguish between technology that **facilitates active play** and technology that **controls children's behaviour through constant monitoring**.

The Intelligent Playground concept addresses this gap by treating AI not as the central objective but as an infrastructure supporting physical, social and creative development.

Research Questions

This article addresses five questions: Can AI increase children's participation in physical activity? Can digital games be redesigned to encourage physical movement? What is the relationship between AI-supported sport and children's wellbeing? Does continuous measurement create psychological pressure? And what should the playground of the future look like?

The Intelligent Playground Concept

The proposed Intelligent Playground combines physical spaces with carefully designed digital technologies.

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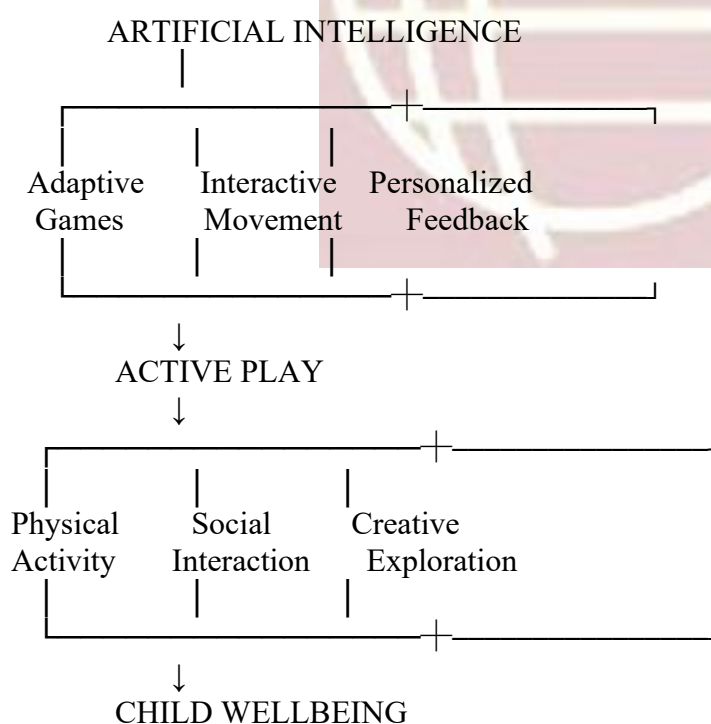
Children could interact with AI-enabled games by running, jumping, throwing, balancing, dancing or cooperating with other children. For example, an augmented-reality game could transform a playground into a virtual adventure in which children physically move between different locations to complete challenges. AI could adjust the difficulty according to the child's age, ability and previous interaction. The first approach supports childhood development; the second risks turning play into continuous performance assessment.

The important distinction is between **technology-enabled play** and **technology-controlled play**.

Technology-enabled play uses AI to expand children's imagination and encourage movement. Technology-controlled play uses AI primarily to monitor, rank and regulate behaviour

PROPOSED CONCEPTUAL MODEL

FIGURE 1. THE INTELLIGENT PLAYGROUND MODEL



The model is based on the principle:

AI + Sport + Play + Social Interaction + Creativity = Intelligent Childhood Environment

However:

AI ≠ Replacement for Outdoor Play

The objective is not to make every playground technologically advanced. Rather, technology should be introduced where it provides genuine educational or developmental value.

POTENTIAL BENEFITS

AI-supported physical environments could make exercise more attractive to children who are highly engaged with digital entertainment. Instead of asking children to choose between technology and physical activity, intelligent games could combine the two.

Personalization is another potential benefit. A conventional game may be too easy for one child and too difficult for another. AI could dynamically modify challenges to maintain an appropriate level of difficulty.

AI may also support inclusion. Interactive systems could potentially adapt activities for children with different physical abilities, allowing participation in shared games while modifying individual challenges.

Most importantly, intelligent playgrounds could promote **social physical activity**. Games should encourage children to cooperate, communicate and solve problems together rather than isolating each child through an individual device.

RISKS AND ETHICAL CONSIDERATIONS

The greatest risk is that technology becomes more important than play. If children constantly see scores, rankings and performance statistics, physical activity could become another source of competition and anxiety.

Privacy is another concern. Cameras and wearable devices may collect movement, biometric or behavioural information. Children's data require particularly strong safeguards, and international child centred AI guidance emphasizes privacy, safety, non-discrimination, transparency and wellbeing.

There is also a risk of **digital inequality**. Advanced intelligent playgrounds may initially be available only in affluent schools or private institutions. If technology becomes a requirement for high-quality physical education, children from disadvantaged communities could be further excluded.

Therefore, the success of an intelligent playground should not be measured by how much data it collects. It should be measured by whether children **move more, enjoy themselves, interact with others and develop healthy relationships with physical activity**

SUGGESTED EMPIRICAL RESEARCH DESIGN

Future research could test the Intelligent Playground concept through a mixed-method intervention involving approximately **300–500 schoolchildren**.

Children could be divided into intervention and comparison groups. The intervention group could participate in an AI-supported physical-activity programme incorporating interactive games, movement challenges and collaborative activities. Physical activity could be measured

before and after the intervention using age-appropriate activity measures.

Researchers could additionally administer validated wellbeing and motivation scales and conduct interviews with children. Parent questionnaires could examine changes in children's activity outside school, while teacher and coach interviews could assess engagement, feasibility and behavioural changes.

Importantly, the study should measure both **benefits and unintended consequences**. In addition to physical activity, researchers should examine enjoyment, social interaction, autonomy, anxiety, perceived pressure and attitudes toward technology.

This design would generate original evidence about whether AI actually improves children's wellbeing rather than assuming that technological innovation automatically produces positive outcomes.

FUTURE RESEARCH

Future studies should investigate whether the effects of AI-supported physical activity continue after the technology is removed. Researchers should also compare different age groups and examine whether children with different physical abilities respond differently to intelligent games.

Another important research direction is the relationship between AI and outdoor play. Rather than replacing traditional playgrounds, AI should be studied as a tool that can make existing outdoor spaces more engaging.

Research should also explore low-cost versions of intelligent playgrounds that can be implemented in government schools and communities with limited technological infrastructure. This would help determine whether AI can become an instrument of inclusion rather than another source of educational inequality.

CONCLUSION

The Intelligent Playground represents a possible future in which technology and physical activity are not treated as competing elements of childhood. Artificial intelligence can potentially transform digital interaction into movement, creativity, collaboration and active exploration.

However, the central principle must remain that **children play for development and enjoyment, not simply for data generation**. AI should therefore facilitate play rather than control it. The future playground should not be defined by the number of sensors, cameras or algorithms it contains. It should be defined by whether children leave the playground **healthier, happier, more active, more creative and more socially connected**.

The most appropriate future model is therefore:

Smart technology + active play + human interaction + child autonomy = intelligent wellbeing.

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