Introduction

Long-term hospitalization presents a significant, yet often overlooked, challenge for pediatric patients: social isolation and the degradation of age-appropriate social interaction skills. Children confined to a hospital environment often miss crucial opportunities for peer engagement, leading to feelings of loneliness, increased anxiety, and a stagnation in social-emotional learning essential for development. This project addresses the critical need for a therapeutic bridge to the outside world. The thesis is: Implementing a structured Virtual Reality (VR) environment provides hospitalized children with a safe, repeatable, and engaging platform to practice and improve complex social communication skills, a benefit that can be computationally modeled using an agent-based system to predict social recovery trajectories.

The Computational Vision: A NetLogo Simulation

Our primary method for investigating this problem is the creation of an agent-based model using the NetLogo platform. This model, tentatively titled "VR Social Bridge," will computationally represent a closed social network (like a school classroom) and introduce "hospitalized agents" (turtles) whose social-skill attributes (e.g., empathy score, communication frequency) decay over time due to isolation. The VR intervention is modeled as a non-physical interaction mechanism. When a hospitalized agent engages with the VR environment (e.g., virtual peer groups), their social skill attributes are periodically "recharged" or practiced. The visual interface will display agents on a network, with link colors changing to represent the strength or quality of social interaction. This allows us to observe and measure how VR access (an independent variable) mitigates the loss of social skills and prevents the breakdown of social connections upon the agent's eventual "return" to the main network.

Progress and Supporting Information

Significant progress has been made in foundational research and technical preparation. Our literature review strongly supports the project's premise, with studies demonstrating that VR interventions are safe, highly engaging, and effective in improving specific social-emotional skills, such as emotion recognition and empathy, particularly in populations with limited social access like children with ASD or those in chronic care. One key finding is that VR's ability to provide a customizable and low-anxiety environment allows children to practice skills repeatedly without real-world pressure.

On the technical front, we have completed tutorials on fundamental NetLogo coding principles, specifically focusing on agent creation (turtles), defining agent attributes (variables), and implementing network creation and interaction dynamics (links). We have studied existing NetLogo models, such as those simulating social influence and segregation, to inform the structure of our social network and the mathematical rules governing the agents' "social skill decay" and "VR-induced skill increase." Basic procedures for setting up and running the simulation are now in place.

Conclusion and Expected Results

We anticipate that the NetLogo model will demonstrate a clear and quantifiable benefit of the VR intervention. The primary expected result is that hospitalized agents who consistently access the VR environment will exhibit a significantly slower decay rate in their social skill attributes compared to a control group of isolated agents. Furthermore, upon reintroduction to the main network, the VR-engaged agents should reintegrate with greater ease, showing a higher frequency of positive social links and reaching an equilibrium in their skill scores faster. These computational results will support the argument that VR should be

formally integrated into pediatric hospital care plans as a crucial tool for mitigating the psychological and developmental impact of isolation