

Trabajo Final de Grado



UNIVERSITAT
JAUME·I

**New technologies for emotional regulation in
children with ADHD: A literature review.**

María Clemente Sánchez

Grado en Psicología

Tutor/a: Rosa García-Castellar

Convocatoria Junio 2024

Resumen

El objetivo de este trabajo es elaborar una revisión bibliográfica sobre el estado actual de la investigación relativa al uso de nuevas tecnologías como herramienta terapéutica para la regulación emocional en el Trastorno por Déficit de Atención e Hiperactividad o TDAH, concretamente en población infantojuvenil (6-14 años). Se analizaron las características de estos programas de intervención: Tipo de tecnología, fase de desarrollo en el que se encuentra, área/s de intervención, la duración de las sesiones de entrenamiento, tipo de refuerzo y feedback, aspectos de diseño (niveles dentro del juego, personalización, uso de avatares, línea argumental, color y sonido...) y los resultados obtenidos. Se han seguido las directrices pautadas por el Método PRISMA y utilizado tanto el buscador académico Google Scholar como la base de datos PubMed. La inclusión en la revisión se limitó a estudios publicados en inglés/español entre 2010 y 2024 sobre niños/as con TDAH, que empleen la tecnología y traten la regulación emocional o aspectos socioemocionales implicados en esta. Finalmente se incluyeron los 10 artículos que figuran en el apartado de referencias. Los estudios incluidos se encuentran en su mayoría en fase piloto. Los datos recogidos en esta revisión respecto a las características de la tecnología con uso terapéutico ponen en relieve la variedad de la misma. Los estudios presentan diferencias en los tipos de tecnología (Emergente, portátil y de mesa), los aspectos de diseños y la duración de las sesiones de entrenamiento. El feedback/refuerzo empleado se da en su mayoría en formato visual y basado en sistemas de recompensa y refuerzo positivo. Los resultados obtenidos en los estudios son prometedores, destacando el elemento motivador que aporta la tecnología a los programas de intervención en niños/as con TDAH. Aún así, se requiere de estudios más rigurosos metodológicamente y prolongados en el tiempo para comprender en profundidad sus efectos y potencialidad.

Palabras clave: “TDAH”, “Nuevas tecnologías”, “Regulación emocional”, “Intervención socioemocional”.

Abstract

The aim of this study is to elaborate a literature review on the current state of investigations regarding the use of new technologies as a therapeutic tool for emotional regulation in Attention Deficit/Hyperactivity Disorder or ADHD, specifically in the child-youth population (6-14 years old). These programmes' characteristics were analyzed: Kind of technology, stage of development, areas of intervention, training sessions duration, type of feedback and reinforcement, design aspects (levels within the game, customization, avatar use, storyline, color & sound...) and the results obtained. PRISMA Method guidelines were followed in the review and both internet search engine Google Scholar and database PubMed were used. Inclusion in the review was limited to studies published in English/Spanish between 2010-2024 on ADHD children, that use therapeutic-oriented technology and focus on emotional regulation or socioemotional aspects involved in it. At the end the 10 studies appearing in the references section were included in the review. Included studies are mostly in the pilot stage. The data collected in this review regarding the characteristics of therapeutic-oriented technology highlights the variety of it. Studies show differences in the kind of technology used (emerging, portable and desktop), design aspects and training sessions duration. The type of feedback/reinforcement used is mostly given in visual format and based on reward systems and positive reinforcement. The results found in the studies are promising, specially the motivational element that technology adds to the intervention programmes meant for ADHD children. Even so, more methodologically rigorous studies and long-term studies are needed to fully understand its effects and potential.

Keywords: “ADHD”, “New technologies”, “Emotional regulation”, “Socioemotional intervention”.

INTRODUCTION

ADHD is a neurodevelopmental disorder present in 4 to 7% of Spanish school-age children. Along with its core symptoms (Inattention and/or Hyperactivity/Impulsivity), ADHD children experience social and emotional difficulties due to deficits in their emotional regulation, emotional awareness, emotion recognition and Theory of Mind (ToM). New technologies are a therapeutic tool on the rise, and interventions aimed to improve emotional regulation in ADHD children can benefit from it to mitigate boredom, increase active participation and better adapt treatments to ADHD children and their characteristics.

The aim of this study is to conduct a literature review on the use of new technologies for emotional regulation in ADHD children (6-14 years old), focusing on both the technologies' characteristics and the interventions' overall findings.

METHODOLOGY: PRISMA Guidelines

Keywords

- "ADHD"
- "emotion"
- "regulation"
- "technology"
- "video games"

Inclusion Criteria

- 2010 - 2024
- English & Spanish
- Use of technology
- ADHD Children (6-14)
- Study focuses on socio emotional aspects.

Google Scholar
(n=431)

PubMed
(n=38)

Screened
(n=469)

Selected for
eligibility
assessment
(n=43)

Selected for
literature
review
(n=10)

Eliminated after
reading
title/abstract
(n=426)

Eliminated after
complete reading
and quality criteria
(n=33)

RESULTS

Technologies

Emerging Technology

2 studies:

- VR

Portable Technology

3 studies:

- Smartphone
- Smartwatch
- Tablet/iPad

Desktop Technology

5 studies:

- Computer
- Laptop

Areas of intervention

- Self-regulation
- Social interaction
- Self-control & inhibition
- Emotion awareness
- Emotion recognition
- Emotion expression
- Co-regulation
- Self-esteem
- Executive function

Feedback & reinforcement

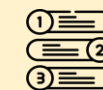
- Reward-based systems
- Immediate positive reinforcement
- Corrective feedback
- Biofeedback
- Support & guide from virtual figures
- Access to graphics of player's progress
- Audio, text and audiovisual sources of feedback.

Stages of development

- **Design:** 3 studies.
- **Pilot:** 7 studies.

Duration

- Minimum of 2.25h
- Maximum of 45.5h
- **Average of 11.7h**
- 1 study non specified



Levels within the game.
Different gaming scenarios. Minigames. Increasing difficulty.



Customizable elements.
Profile data. Display photo. Goals & tasks. Textile materials. Game items.



Visuals & Color.
Text as a guide through the game. Color signals right and wrong. Answers and draws attention with bold accents.



Sound.
Served as feedback & used for guidance through the game.



Storyline.
Space travel storyline. Day-to-day situations. Magic storyline.



Use of avatars.
Predetermined. Customizable.



Login required.
Username and/or password needed to access the game/data of the users.

Findings

- Improved **emotional self-regulation, self-awareness, motivation, social skills** (cooperation, assertiveness & responsibility), **emotional expression & emotional recognition.**
- Allows for **co-regulation**, serves as a **transition to self-regulation**, more **individualized interventions in ecological settings**, more **independence & relieves** overloaded caregivers.
- Tools were **respectful of sensory and processing differences & participants found them useful and manageable.**
- Instructions are better understood if **delivered audiovisually.**
- **Storyline, creative approaches & reward systems** were positively valued.
- Overall interest & **satisfaction with the experience**, willing to try again.
- **Teachers & families** were willing to incorporate the tools in daily life.

DISCUSSION

Studies on the use of new technologies as a therapeutic tool for emotional regulation in ADHD children are limited and recent but growing in number. A technological approach to therapy takes advantage of current resources readily available to users in their daily life. Design characteristics condition the users' experience, active participation & perceived satisfaction, so technology designed for ADHD children should be attractive & account for their preferences & particular characteristics, such as sensory processing differences. The development of these tools requires an investment of time & money, thus why many of these studies are still in preliminary stages. Positive results have been achieved with a reduction in symptomatology & improvement in motivation. Further investigation and more rigorous studies are needed to better understand these tools' full potential.

Referencias

1. Bul, K. C. M., Kato, P. M., Van der Oord, S., Danckaerts, M., Vreeke, L. J., Willems, A., Maras, A. (2016). Behavioral outcome effects of serious gaming as an adjunct to treatment for children with Attention Deficit Hyperactivity Disorder: A Randomized controlled trial. *Journal of Medical Internet Research*, 18, 1-18.
2. Cibrian, F., L., Lakes, K., D., Tavakoulnia, A., Guzman, K., Schuck, S., Hayes, G., R. (2020). Supporting Self-Regulation of Children with ADHD Using Wearables: Tensions and Design Challenges. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems (CHI '20)*. Association for Computing Machinery, New York, NY, USA, 1–13.
3. Crepaldi, M., Colombo, V., Baldassini, D., Mottura, S., Antonietti, A. (2017). Supporting Rehabilitation of ADHD Children with Serious Games and Enhancement of Inhibition Mechanisms. In: Barbic, J., D'Cruz, M., Latoschik, M., Slater, M., Bourdot, P. (eds) *Virtual Reality and Augmented Reality. EuroVR 2017. Lecture Notes in Computer Science()*, vol 10700. Springer, Cham.
4. Giannaraki, M., Moumoutzis, N., Kourkoutas, E., & Mania, K. (2021). A 3D Rhythm-based Serious Game for Collaboration Improvement of Children with Attention Deficit Hyperactivity Disorder (ADHD), *IEEE Global Engineering Education Conference (EDUCON)*, Vienna, Austria, 2021, pp. 1217-1225
5. Hakimirad, E., L., Kashani-Vahid, M. S. Hosseini, A. Irani and H. Moradi. (2019). Effectiveness of EmoGalaxy Video Game on Social Skills of Children with ADHD. *International Serious Games Symposium (ISGS)*, pp. 7-12,
6. McKay E, Kirk H, Coxon J, et al. (2022). Training inhibitory control in adolescents with elevated attention deficit hyperactivity disorder traits: a randomized controlled trial of the Alfi Virtual Reality programme. *BMJ Open* 2022;12:e061626.

7. Schuck S, Emmerson N, Ziv H, Collins P, Arastoo S, Warschauer M, et al. (2016) Designing an iPad App to Monitor and Improve Classroom Behavior for Children with ADHD: iSelfControl Feasibility and Pilot Studies. PLoS ONE
8. Silva, L.; Cibrian, F.; Monteiro, E.; Bhattacharya, A.; Beltran, J.; Bonang, C., et al. (2023). Unpacking the Lived Experiences of Smartwatch Mediated Self and Co-Regulation with ADHD Children. UC Irvine.
9. Wiguna, T., Ismail, R. I., Kaligis, F., Minayati, K., Murtani, B. J., Wigantara, N. A., Pradana, K., Bahana, R., Dirgantoro, B. P., & Nugroho, E. (2021). Developing and feasibility testing of the Indonesian computer-based game prototype for children with attention deficit/hyperactivity disorder. *Heliyon*, 7(7).
10. Wong, K. P.; Zhang, B.; Qin, J. (2023) Unlocking Potential: The Development and User-Friendly Evaluation of a Virtual Reality Intervention for Attention-Deficit/Hyperactivity Disorder. *Appl. Syst. Innov.* 2023, 6, 110.