

Kinems related research study - Executive Summary

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Participants: 5 autistic children aged between 4;01 (y;m) and 8;04 (M=5,63, SD=1,63), enrolled in a special needs school for autistic children in London, UK were selected using the following criteria:

- Being in the Early Years Department
- Not having physical impairment that obstructs the use of the Kinems games
- Not knowing or having played before any of the Kinems games

All the participants were boys and their formal diagnosis was Autism. Families of the children have been informed about the research and its goals and have been asked for written permissions. Their comprehension age equivalent ranged between 1;01 (y;m) and 2;08 (M=1,91, SD=0,67) and their expressive age equivalent between 1,09 and 2,03.

Purpose of the research study

This study aims to explore whether the use of Kinect learning games (Kinems) can enhance speech and language development in autistic children 4-8 years old with severe autism and severe language delays, and more specifically if they can help autistic children develop their receptive and expressive vocabulary, regarding high-frequency categories (i.e. animals, shapes, colours, and numbers).

Evaluation Tools

In the beginning, the children were evaluated in relation to their language skills, through observation and interviews with teachers. Each student was also tested with two standardized and formal assessments, the Reynell Developmental Language Scales (RDLs) (both the Comprehension Scale and the Expression Scale) and the Childhood Autism Rating Scale (CARS). The RDLs is the most highly regarded and widely used tool for identifying speech and language impairments and delays in very young children. It assesses communication skills on entry into nursery school, provides significant information about a child's understanding and production of spoken language and identifies those who need immediate referral and support. It has two Scales: the Comprehension Scale and the Expression Scale.

In order to fully understand the progression of the children in the Kinems games, their success rate in the beginning and end of the intervention and follow up sessions were calculated. Moreover, semi-structured interviews with the other teachers and teacher's assistants (TA) were used to gather focused and qualitative data. More specifically, they were used to discuss the initial level of speech and language skills (pre-intervention interviews) and the level after the intervention program (post-intervention interviews). The teachers and TAs were also interviewed about the games and their view of what impact they thought they may have on the children.

- Pre & Post intervention tests: Reynell Comprehension Scales & Reynell Expressive Scales, CARS score
- Performance at game-based tasks
- Interviews with Teachers & TAs

Setting

The research was carried during a Kinems-based individualized intervention program designed in order to improve language skills, and more specifically receptive and expressive vocabulary skills, of young autistic children. All children made small progress since the beginning of the school year. The entire intervention program lasted for 10 weeks starting on February 2018. All students attended 2 sessions per week. The duration of a session was approximately 30 minutes. Overall, the children attend 20 sessions each. After the end of the 10-week intervention there was a pause for one month and a follow up of one week to check the stability of the results. The children attended 2 sessions and played the same games they were playing during the intervention in order to assess if the gains were sustained or if there was any generalization of skills. None of the children was receiving speech and language therapy during the Kinems-

based intervention. The Kinems games used in this intervention were the games: U-paint, Go Jelly, Tika Bubble, Yeti Jump, Shape in Place and Lexis. A different set of goals for each game, tailored to each child's individual needs and annual plan was set. In every session, two games were chosen for each child; one calming, like U-Paint or Go Jelly, which every session was starting with and one second game, like Lexis, Yeti Jump, Tika Bubble or Shape in Place.

Findings

Assessment at the end of the intervention showed improvements in their expressive and receptive vocabulary, as well as reduction of conduct problems, improved motivation and less challenging behaviours during and after the sessions and challenging behaviours. Each child improved both in their success rate and their score in Reynell Comprehension Scale. All the children's scores were lower on the CARS Scale after the intervention. Those gains were not limited only in game-play time but they were transferable across many activities and interaction opportunities. Teachers were able to notice some generalization of the intervention effects; more appropriate behaviors, more spoken words and better communication efforts from the children were observed in all contexts (not only during computer play times).

More specifically,

- Improvement in the Reynell Comprehension Scales pre and post-intervention for each child and improvement of the sample's mean value, which increased from 21,4 to 32,2. It is clear that all the children improved a lot and the increase of the scores is statistically significant ($p=0,00032$).
- All children, except one (A.J.), showed an improvement in their scores at the Reynell Expressive Scales. The mean value of their scores at pre and post-test improved, ranging from 5,4 to 10. Their improvement is statistically significant ($p=0,016$).
- A difference between the CARS scores pre and post-intervention was also observed. Every child had, after the intervention, lower scores in CARS, which means that they are lower in the scale of autism severity. The change between pre and post measurements is statistically significant ($p=0,002$).
 - As expected after a fairly short intervention, most of the children remained in the same scale category they were before the intervention, except one (M.D.) who is now considered "mildly-moderately autistic" instead of "severely autistic".
- All the children's success rate improved between the first ($M=51,46$, $SD=17,78$) and the last sessions of the intervention ($M=86,31$, $SD=10,78$). This change is also considered statistically significant ($p=0,008$).

The qualitative feedback from the teachers and TAs indicated:

- They were very impressed how much the children enjoyed the games and persevered with them. Especially in the case of one boy, who did particularly well and through Kinems games the teachers discovered that he was able to read. The teacher and TA of E.J. and J.A were really impressed seeing the first playing a computer game (he used to dislike computer games), and the latter, staying in an activity for so long.
- They commented on the high motivation of children to play the games and the fact that during and, sometimes after, the sessions the challenging behaviors vanished or diminished.
- The children's progress with regard to their vocabulary and verbal communication was remarkable since the beginning of the intervention; they had all made small progress since the beginning of the school year.
- Children appeared to be more sociable, not only during the Kinems sessions, but also afterwards. After the end of the intervention, children interacted more with the adults, were asking for help or were even initiating play.
- the Kinems intervention seemed to induce less stress than other activities (e.g. messy play or yellow table)