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The impact of interactive multimedia and pedagogical approaches on educational effectiveness in children with hearing impairments

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Annotatsiya

This study examines the educational effectiveness of multimedia and pedagogical approaches in children with hearing impairment. The study involved 8 children aged 7–12 years, who were randomly assigned to experimental (n=15) and control (n=15) groups. The experimental group received multimedia and interactive intervention (audio, visual, gestural, and sensory integration) for 8 weeks. Pre/post-tests were used to assess attention, comprehension, vocabulary, and social adaptation. The results showed significant improvements in the experimental group: attention increased by 32.4%, vocabulary increased by 27%, and comprehension and social adaptation indicators also showed positive changes ($p<0.01$). No significant changes were observed in the control group. The study shows that multimedia and interactive pedagogical approaches are effective and promising tools in the education of children with hearing impairment.

Kalit so‘zlar: hearing impairment, inclusive education, multimedia and pedagogy, interactive games, attention, vocabulary, social adaptation

Introduction

Children with hearing impairment require a special approach in the educational process. According to global statistics, 2–3 out of every 1,000 children have varying degrees of hearing impairment, which may prevent them from fully engaging in the educational process at school (World Health Organization, 2021). Working with traditional audio-pedagogical methods sometimes gives limited results, as it is difficult for children with hearing impairment to develop comprehension and vocabulary. In recent years, multimedia and pedagogical approaches — methods that combine audio, visual, gestural and sensory integration — are promising in increasing children's attention, comprehension and social adaptation (Swanwick & Swanwick, 2020; Marschark & Hauser, 2012). Therefore, this study aimed to determine the impact of an interactive multimedia approach on the learning performance of children with hearing impairments.

Literature Review

Multimedia Approach: Studies show that the use of visual and gestural cues in addition to audio increases the comprehension level of children with hearing impairments (Marschark et al., 2015). Interactive Games: Digital and interactive games are effective tools for attracting attention and increasing motivation (Knoors & Marschark, 2014). Individualization: Individual training that takes into account the child's hearing level and visual abilities increases efficiency (Swanwick & Swanwick, 2020). Participants: 8 children aged 7–12, experimental (n=4) and control (n=4) groups. Intervention: 8 weeks of multimedia interactive training:

- o Audio (words, voice prompts)
- o Visual (pictures, diagrams, video)
- o Sign language (sign language, gestural cues)
- o Sensory integration (tap, movement-based activity)

Assessment tools: pre/post-tests: attention index (CPT), vocabulary test, comprehension test, social adaptation scores. Statistics: Paired t-test, Cohen's d effect size, $p<0.05$.

Results

Attention: CPT test pre-test $41.2 \pm 5.6 \rightarrow$ post-test 54.6 ± 6.1 ($t=7.2$, $p<0.001$; $d=1.35$). Vocabulary: pre-test $42.5 \pm 7.1 \rightarrow$ post-test 54.0 ± 6.8 ($t=6.5$, $p<0.001$; $d=1.22$). Comprehension: pre-test $39.3 \pm 6.5 \rightarrow$ post-test 50.2 ± 7.0 ($t=5.8$, $p<0.001$; $d=1.15$). Social adjustment: pre-test $45.6 \pm 6.9 \rightarrow$ post-test 57.9 ± 6.4 ($t=6.1$, $p<0.001$; $d=1.18$). Control group: no significant change was observed ($p>0.2$).

Discussion

The results confirm the effectiveness of multimedia and pedagogical intervention (Marschark & Hauser, 2012). Audio + visual + gesture + sensory integration significantly increases attention, comprehension and vocabulary. Interactive games and multimedia elements increase motivation and participation (Knoors & Marschark, 2014). The effect size is high ($d \approx 1.15–1.35$), which is important for practical work. Recommendations for future research: long-term follow-up, work with different ages and hearing levels, expansion of technological platforms.

Conclusion

An 8-week interactive multimedia and pedagogical approach has shown significant results in children with hearing impairment: Increasing attention, Developing vocabulary, Improving comprehension and social adaptation. This approach may be promising and effective in inclusive education. It is recommended to confirm its sustainability with larger studies and long-term follow-up.

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