Psychological Achievements
Fall & Winter, 2025, *32* (2)
Serial Number 34, 309-336
DOI: 10.22055/psy.2024.45645.3186
(Psychol Achiev)
Rcceived: 27 Dec 2023
Accepted: 27 Jan 2024
Orginal Article

Design and Validation of A Model of Mobile Multimedia Learning Environment and Its Effect on Learning and Learning Transfer of Social Skills of Students with High-Performance Autism Spectrum Disorder

Amir Masnavi[*]
Esmaeil Zaraii Zavaraki[**]
Parviz Sharifi Daramadi[***]
Mohammad Reza Nili Ahmadabadi[****]
Ali Delavar[*****]

Abstract

Effective social functioning in children with Autism Spectrum Disorder (ASD) requires not only the acquisition of social skills but also their successful transfer to natural contexts, a process that remains challenging. This study investigated the effects of a mobile multimedia learning environment on the acquisition and transfer of social skills in students with high-functioning ASD, with the aim of proposing an evidence-based model for special education technology. A single-subject quasi-experimental design with multiple baselines was employed. The population consisted of male students with high-functioning ASD in Ahvaz, Iran, during the 2020–2021 academic year. Four participants were selected through convenience sampling based on screening criteria (Autism Spectrum Screening Questionnaire score ≥ 110) and parental consent. Data were collected via the High-Functioning Autism Screening Questionnaire (Kasechi et al., 2013) and the Autism Social Skills Profile (Bellini & Hopf, 2007), appraising reciprocal social interaction, social participation/avoidance, and mature social behavior. The intervention, grounded in cognitive load theory and multimedia learning principles (segmentation, pretraining, personalization, signaling, dual-channel presentation, and immediate feedback), was implemented for four weeks (one hour daily) under parental supervision. Measurements were performed during baseline (four weekly assessments), learning (during and immediately after intervention), and transfer (one and two months post-intervention). Data analysis involved visual inspection, recovery percentage, and stable change index. The results indicated substantial improvements in total social skills and all subscales for three

* Ph.D. Graduate in Educational Technology, Allameh Tabatabai University, Tehran, Iran and Department of Educational Sciences, Farhangian University, P.O. Box 14665-889, Tehran, Iran. a.masnavi@cfu.ac.ir

** Professor, Department of Instructional Technology, Allameh Tabataba'i University, Tehran, Iran.

*** Professor, Department of Psychology and Education of Special Children, Allameh Tabataba'i University, Tehran, Iran.

**** Professor, Department of Instructional Technology, Allameh Tabataba'i University, Tehran, Iran.

***** Professor, Department of Assessment and Measurement, Allameh Tabataba'i University, Tehran, Iran.

participants from baseline to learning, with maintenance during transfer and clinically significant change. For the fourth participant, learning gains were observed though they were not sustained at transfer. Overall, the findings support the effectiveness of systematically designed mobile multimedia environments in promoting both acquisition and transfer of social skills among most students with high-functioning ASD. Further research should include diverse populations and extended follow-up periods.

Keywords: Mobile multimedia learning environment, learning transfer, social skill, two-way social interaction skills, social participation-avoidance skills

Extended Abstract

Introduction

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition characterized by persistent deficits in social communication and interaction, as well as restricted and repetitive patterns of behavior. Over the past decade, the global prevalence of ASD has grown significantly, making it one of the most common non-communicable developmental disorders. Children with high-functioning autism often experience profound difficulties in two-way social interactions, social participation, and displaying mature as well as competent social behaviors. These challenges frequently result in social rejection, isolation, and long-term difficulties in independent living, friendship formation, and academic success. A critical but often overlooked issue is the transfer of learning—the ability to apply newly acquired skills in real-world, untrained contexts. Those with ASD typically struggle with generalization owing to deficits in central coherence, cognitive flexibility, and memory encoding. While various interventions have been proposed, technology-based approaches, particularly mobile multimedia learning environments, offer promising solutions. These environments can provide consistent, engaging, and controlled practice opportunities. Nevertheless, without adherence to evidence-based instructional design principles, multimedia environments may fail to facilitate meaningful learning or transfer. Thus, the present study aimed to explore the effect of a mobile multimedia learning environment, designed based on a validated instructional model, on both the learning and transfer of social skills in students with high-functioning ASD.

Method

The research applied a single-subject quasi-experimental design with multiple baselines. The statistical population consisted of all male students with high-functioning ASD in Ahvaz, Iran, along the 2020–2021 academic

year. Using convenience sampling, four male students with ASD were selected based on inclusion criteria (Autism Spectrum Screening Questionnaire score ≥ 110) and parental consent. The instruments included: (a) the High-Functioning Autism Screening Questionnaire (Kasechi et al., 2013), with reported convergent validity of 0.71 and test-retest reliability of 0.90; (b) the Autism Social Skills Profile (Bellini & Hopf, 2007), consisting of 48 items across three subscales (reciprocal social interaction, social participation/avoidance, and mature/competent social behavior), with internal consistency of 0.90 and test-retest reliability ranging from 0.86 to 0.89; and (c) a researcher-developed mobile multimedia learning environment program based upon the validated model, comprising five sections (four instructional lessons and one assessment module). The program incorporated instructional design principles such as segmentation, pretraining, personalization, signaling, modality, redundancy reduction, and immediate corrective feedback. The intervention was delivered over four weeks, one hour per day, under parental supervision at home. Data were collected across three phases: baseline (four weekly assessments), learning (during and immediately post-intervention), and transfer (one month and two months post-intervention). Data analysis employed visual graphing, percentage of recovery (improvement), and the stable change index.

Results

Visual analysis of graphs and mean score comparisons indicated that for three of the four participants (subjects 1, 2, and 3), both learning and transfer scores increased significantly across all social skill subscales compared to the baseline. For example, the mean total social skills score for subject 1 rose from 71.5 at baseline to 90.0 during learning and 99.5 during transfer. Similar patterns were observed for two-way social interaction, social participation-avoidance, and mature social behavior. The percentage of recovery and stable change indices confirmed that these improvements were clinically significant and attributable to the intervention. Nevertheless, for the fourth subject, although learning gains were observed along the intervention phase (mean increase from 103.5 to 109.0), transfer effects were not maintained. Specifically, only one data point in the transfer phase exceeded baseline levels, failing to fulfill the criterion of two consecutive stable points above the baseline trend line. Thus, the intervention was not successful for this participant in terms of transfer of learning.

Discussion

The findings demonstrated that a systematically designed mobile multimedia learning environment, grounded in established instructional design principles, can effectively enhance both acquisition and transfer of social skills in most students with high-functioning ASD. The success for

three out of four participants is assigned to key design features: encoding support through dual-channel (visual-auditory) presentation, diminished cognitive load via segmentation and signaling, authentic context embedding using similar elements to real-life situations, spaced practice opportunities, and immediate informational feedback. These features align with cognitive load theory, Mayer's multimedia learning principles, and contemporary models of transfer. The unsuccessful outcome for the fourth participant may be explained by individual differences in cognitive flexibility, prior mastery of prerequisites, or lower engagement with the mobile interface. This finding highlights the necessity of adaptive or personalized versions of such interventions. Overall, the proposed model offers a replicable, evidence-based framework for designing mobile multimedia environments that promote not only initial learning but also the durable transfer of social skills to natural settings. Future research should include female participants, lower-functioning individuals, and longer follow-up periods. It is recommended that special education authorities adopt this model for developing a repository of mobile applications for learners with ASD.

Author Contributions:. In the present study, the second and third authors, as supervisors, have been responsible for the overall supervision and strategy of the research process and the compilation and finalization of the revisions of the article. In developing the research plan, the first author has been in charge of the process of gathering, analyzing and interpreting the findings and writing the text of the article, and in general, drawing conclusions from the findings and expanding and interpreting them jointly and with the discussion and exchange of opinions of all colleagues and with the accompaniment of the fourth and fifth authors. It was done as thesis advisor professors.

Acknowledgments: The author expresses her gratitude to all the families and students with autism spectrum disorders and all the teachers and school administrators of these loved ones.

Conflicts of interest: The results of the research are not in conflict with the interests of any institutions or organizations.

Funding: The present study was funded by the authors.