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Research Article

The effectiveness of forward chaining with video prompting and token economy to improve bathing independence in children with moderate intellectual disabilities

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Abstract

Children with moderate intellectual disabilities often face difficulties in self-care skills, including independent bathing, which affects their quality of life and increases dependency on others. Independence in bathing is a fundamental skill that plays an important role in building self-confidence and personal well-being. This study aims to examine the effectiveness of the forward chaining method supported by video prompting and token economy in improving bathing independence in children with moderate intellectual disabilities. The research was conducted at Wisma Dempo, Malang, involving a 7-year-old girl who was not yet independent in bathing. The method used was an experimental design with a Single Subject Research (SSR) model A-B-A. Data were collected through observation using a checklist based on the WeeFIM assessment tool with a 1–7 rating scale. The results showed an increase in bathing independence scores from the baseline phase to the intervention phase, as well as retention of independent behavior even after the intervention was withdrawn. The findings suggest that the combination of forward chaining, video prompting, and token economy is effective in improving the bathing independence of children with moderate disabilities.

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Introduction

Intellectual disability is a developmental condition characterized by an IQ below 70 and deficits in adaptive functioning that occur before the age of 18. This condition affects an individual's ability to perform daily living skills such as self-care, communication, following instructions, and social participation (Mizen, 2024). Due to these limitations, children with intellectual disabilities face challenges in basic self-care activities such as bathing, dressing, and toileting (Dewi & Banjarmasin, 2017). Independence refers to the ability to act without relying on others, fulfilling physical and psychological needs autonomously, including making decisions in everyday life. Greater independence enhances self-confidence and happiness, while dependence can lead to feelings of inadequacy and disappointment, thus emphasizing the need for independence training (Sa'diyah, 2017). Being able to independently perform daily living activities is essential to improving quality of life, promoting self-control, reducing reliance on external support, and ensuring more efficient use of long-term care resources (Sandjojo et al., 2019; Vostrý et al., 2022).

One of the most basic yet commonly impaired forms of independence in children with intellectual disabilities is the ability to bathe independently. This activity requires understanding complex sequential steps, maintaining attention, and consistency in execution (Taconet et al., 2024). Such difficulties stem from cognitive and adaptive limitations.

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Ziavra (2023) notes that cognitive function, adaptive skills, social and communication abilities, environmental support, and self-motivation play key roles in sustaining functional daily independence.

Training in bathing independence for children with intellectual disabilities must be systematic and evidence-based. One effective technique for teaching sequential behavior is forward chaining, which involves teaching the first step first and gradually adding subsequent steps after mastery (Michalski et al., 2023). Forward chaining has been shown to significantly improve dressing skills, boost children's self-esteem, and enhance quality of life, making it an effective method for promoting independence in daily living skills (Minolin et al., 2024). However, challenges in teaching skills like bathing often arise due to weak visual memory and the need for repeated verbal instructions. To address this, video prompting can be used as an assistive tool, presenting each step in short video clips. Studies have shown that video prompting improves functional independence in tasks like washing and cooking (Walters et al., 2021). This method also supports skill sustainability and generalization, especially when combined with visual technologies such as augmented reality (Wu & Tsai, 2024).

Nonetheless, most studies combining chaining and video prompting have focused on public household skills, with very few specifically exploring private self-care skills like bathing, which holds high functional value (Walters et al., 2021). The success of training also depends on the child's motivation level, making external motivational reinforcement like token economy crucial. In this system, children receive tokens for completing each step, which can be exchanged for rewards or enjoyable activities. Research has shown that token economy increases motivation and maintains adaptive behavior in the long term (Chen & Wagner, 2025).

In practice, researchers identified a 7-year-old girl with moderate intellectual disability who was not yet able to bathe independently. She required full verbal and physical assistance and was unable to lather her body completely. This case indicates an urgent need to implement an integrated and applicable intervention model. Currently, there is limited research combining the three strategies—forward chaining, video prompting, and token economy—within one unified intervention framework targeting self-care skills like bathing. Theoretically, integrating these three techniques offers complementary benefits in step-by-step learning, enhancing visual attention, and reinforcing motivation (Chen & Wagner, 2025).

This study aims to test the effectiveness of integrating these three techniques to increase bathing independence in a child with moderate intellectual disability using a Single Subject Research (SSR) A-B-A design. The study is expected to provide practical contributions to developing behavioral interventions that can be widely implemented in special education and home settings.

Method

This study employed a Single Subject Research (SSR) experimental method using an A-B-A design, which consists of three phases: initial baseline (A), intervention (B), and final baseline (A). This design was chosen to closely observe behavioral changes in the individual before, during, and after the intervention. The research was conducted in April–May 2025 at Wisma Dempo. The research subject was a 7-year-old girl with moderate intellectual disability who had difficulty performing bathing activities independently.

The aim of this study was to examine the effectiveness of forward chaining combined with video prompting and token economy in increasing bathing independence of a child with moderate intellectual disability at Wisma Dempo. The bathing activities trained included five indicators: turning on the faucet, rinsing the body, soaping the body, rinsing off soap, and drying the body. Phases A1 and A2 each consisted of three observation sessions, while Phase B consisted of five intervention training sessions. During the intervention phase, the subject watched step-by-step videos, performed one independent step, and received a token that could be exchanged for a reward. Independence was measured using the WeeFIM instrument, with a rating scale of 1 to 7 (from full assistance to complete independence). The data were analyzed using visual analysis, namely graphs showing the development of independence scores in each phase to assess the effectiveness of the intervention.

Results and Discussion

Phase Lengths

The length of condition A1 (baseline) included three sessions to determine the subject's initial level of bathing independence without intervention. Phase B (intervention) consisted of five sessions in which forward chaining combined with video prompting and token economy was implemented. Phase A2 consisted of three sessions to observe the sustainability of behavior after the intervention was discontinued. The details of phase durations are shown in Table 1.

Table 1. Phase Duration

Phase	Number of Sessions
A1 (Baseline)	3
B (Intervention)	5
A2 (Baseline)	3

Average Scores and Independence Changes

In phase A1, the child's average bathing independence score was 8, with an upper limit of 8.60 and a lower limit of 7.40. All scores in this phase were within a stable range (100%) and showed a flat trend, indicating no significant change in independence before the intervention. During phase B (intervention), there was a significant increase in scores with an average of 17, an upper limit of 17.85, and a lower limit of 16.15. Score stability reached 100%, with the trend remaining high. The increasing trend indicated that the intervention had a positive effect on improving independence. The change in level from A1 to B was +8.

In phase A2 (post-intervention), score stability decreased to 20%, with an average of 13.4. The upper and lower score limits increased to 14.25 and 12.55, respectively, still showing improvement compared to pre-intervention. The change in level from phase B to A2 was +4, indicating an increase even without continued intervention. The average and boundary levels of bathing independence are shown in Table 2.

Table 2. Mean and score limits

Phase	Average	Upper Limit	Lower Limit
A	8.0	8.60	7.40
B	17.0	17.85	16.15
A	13.4	14.25	12.55

Table 3. Summary of visual analysis by phase

Phase	Stability %	Trend Direction	Level Change
A	100%	Flat (=)	0
B	20%	Increasing	+8
A	100%	Stable	+4

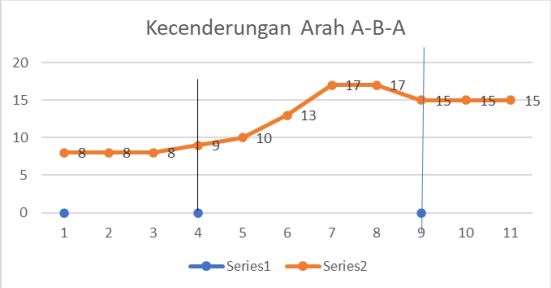

Figure 1. Trend of Bathing Independence Scores Across A-B-A Phases

This graph shows the development of subject T's bathing independence scores across sessions in the A-B-A research design. Phase A1 (initial baseline) occurred in sessions 1–3 with stable scores of 8. Phase B (intervention) took place in sessions 4–8, showing a gradual increase in scores from 9 to 17. Phase A2 (follow-up) occurred in sessions 9–11, showing stable scores of 15. This indicates retained independent behavior even after the intervention ended. Vertical lines mark the boundaries between phases.

Discussion

The results of the visual analysis show that the intervention using forward chaining, video prompting, and token economy techniques had an impact on increasing bathing independence in a child with moderate intellectual disability. Phase A1 showed that without intervention, subject T's abilities remained stable but did not improve, with an average score of 8. This indicates the limited spontaneous development in self-care skills such as bathing, which require structured training.

The significant increase during Phase B demonstrates the effectiveness of the intervention. The forward chaining technique helped the child (subject T) learn the sequence of activities step by step, beginning with the first step, while video prompting provided a concrete and easily imitable visual model. The use of a token economy served as a positive reinforcement to strengthen the child's motivation to complete each step independently. The +8 increase in scores from Phase A1 to B supports this finding.

The retention of behavior during Phase A2 indicates that the skills acquired were not merely temporary. Although the intervention was discontinued, there was still an improvement compared to pre-intervention, with a +4 level change from the previous phase. This suggests that the learned skills persisted and were not solely dependent on external reinforcement. This finding is consistent with Wu & Tsai (2024), who showed that video prompting is effective for teaching independent living skills to children with special needs. This study also supports the results of Walters et al. (2021), who emphasized the importance of token economy in maintaining children's engagement during independent learning. Furthermore, in their systematic review, Walters et al. (2021) noted that mobile-based video prompting is effective in enhancing domestic skills, although its application to private activities such as bathing is still limited.

Thus, this study makes an important contribution by extending the application of chaining and video prompting methods to personal skills that are fundamental and functional for children with intellectual disabilities. It demonstrates the great potential for these interventions to be developed in broader and more sustainable independence training programs, both in special education settings and at home.

Conclusion

This study shows that the combination of forward chaining, video prompting, and token economy techniques is effective in increasing bathing independence in a 7-year-old girl with moderate intellectual disability (subject T). The visual analysis results showed a significant increase in independence scores from the baseline phase (A1) to the intervention phase (B), as well as the successful maintenance of independent behavior during the follow-up phase (A2), even after the intervention had ended. This indicates that the functional skills taught were not only developed through structured intervention but also retained independently.

These findings contribute significantly to the approach of teaching daily living skills to children with intellectual disabilities, particularly in the under-researched area of self-care skills like bathing. Therefore, interventions based on chaining, visual prompting, and token economy are recommended to be implemented more widely in both special education and home environments, with adjustments based on the child's ability level and the context of other functional activities.

For future research, it is recommended that these techniques be applied to more subjects and other functional activities such as putting on shoes, brushing teeth, or eating independently, in order to strengthen the generalizability and external validity of the intervention. Moreover, the use of app-based or mobile device technologies could also be developed to enhance the flexibility and accessibility of independent training at home and school.

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