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The Behavioral Techniques Used to Improve Activities of Daily Living among Children with Intellectual Disabilities: A scoping review

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Abstract

Children with Intellectual Disabilities (ID) often have issues performing their activities of daily living (ADL) due to difficulty learning new skills. This scoping review was conducted to identify the behavioural techniques that can help improve ADL among children with ID. Six databases were used to search articles using behavioural techniques from 2000 to 2020 using the related searching terms and based on the inclusion criteria. Thirty articles met the inclusion criteria that highlighted the behavioural techniques and the trend of techniques to improve ADL among children with ID.

Keywords: Scoping review; behaviour techniques; intellectual disabilities.

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1.0 Introduction

Intellectual Disability (ID), previously known as mental retardation or learning disability, has been defined in various ways. According to American Association on Intellectual and Developmental Disabilities (AAIDD), ID is a disability described by a significant restriction in intellectual functioning and adaptive behaviour that involves conceptual, social, and practical skills. Children with ID often have difficulty understanding new and complex information and skills. This may lead to restriction in adaptive functions and impairment in communication, social, and activities of daily living (ADL) (Patel et al., 2018).

Based on the Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition (DSM-5), 1% of the general population has been diagnosed with ID. Six over 1,000 persons have been reported to have severe ID. Meanwhile, in Malaysia, 453,258 Persons with Disabilities (PWD) were registered with the Department of Social Welfare in 2017. PWD in the physical category recorded the highest number, which was 35.2 per cent, followed by the Learning disability (LD)/ intellectual disability (ID) category (34.8%) and the visually impaired category (8.9%). The speech category recorded the lowest registration of 0.5 per cent. The LD / ID include Global Developmental Delay (GDD), Autism Spectrum Disorder (ASD), Down Syndrome (DS), and Attention Deficit Hyperactivity Disorder (ADHD) (Department Of Statistics Malaysia, 2022). The highest risk that leads to ID is due to genetic factors such as DS, the presence of other comorbidities such as ASD, birth injury and parental age during childbirth (Patel et al., 2018).

ID can be classified into four categories which are mild, moderate, severe, or profound ID. The detection can be identified by using the standardized measure of intelligence through Intellectual Quotient (IQ) or the cognitive tests and identification of the level of deficit in

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the adaptive skills area (Patel et al., 2018). In mild ID, the IQ level falls between 50 to 55 and 70, where children often have difficulty acquiring and comprehending complex language, academic skills, and all areas of adaptive skills (Patel et al., 2018). However, if provided with practical life skills, the child with mild ID can be independent with minimal support from others (Boat & Wu, 2015). In moderate ID, the IQ level falls between 35 to 49 and 50 to 55, and the characteristics are the same as mild ID, but the child requires higher support from others in terms of their basic skills.

Meanwhile, in severe ID, the IQ level falls between 20 to 25 and 35 to 40, with significant developmental delay apparent, and they probably have a limitation in communication skills. However, the speech is still understandable (Patel et al., 2018). Severe ID is also still able to learn the simple basic daily routine but requires a high intensity of support in all settings or environments, including in the self-care activities (Patel et al., 2018). Lastly, in profound ID, the IQ level falls between 20 to 25, commonly accompanied by a congenital syndrome that prevents them from being independent. Hence, they require maximal support in self-care activities and have difficulty communicating, and most of them have physical limitations (Boat & Wu, 2015). As can be concluded, children diagnosed with an ID often have issues and difficulty in intellectual and adaptive skills. The difficulty in adaptive skills may involve the (i) conceptual skills, which are academic skills such as language, reading, writing, reasoning, and calculating, (ii) social skills such as interaction and communication skills, ability to build friendships, as well as social feelings to others, and lastly, in (iii) practical skill such as ADL (Patel et al., 2018).

Pharmacological and non-pharmacological treatment is the two standard treatment methods for ID. Children with ID usually present with academic, social, and self-care problems. Pharmacological treatment has been widely used to control challenging behaviour such as aggression, irritability, and self-injury, which prevent them from involvement in their daily activities and social and community activities (McQuire et al., 2015). However, the pharmacological treatment has side effects such as drowsiness, headache, and increased appetite that lead to weight gain (McQuire et al., 2015). Hence, non-pharmacological treatment was another widely used alternative to help children with ID to be optimal independent in managing themselves without facing the side effects. Behavioural intervention is one of the non-pharmacological treatments that are used in most neurodevelopmental disorders, including ID. Many studies have used behavioural intervention techniques among children with ID, but their aims only focus on modifying challenging behaviour (McQuire et al., 2015). There is limited research regarding the treatment method for children with ID to improve their adaptive function problems, specifically on ADL. Therefore, this scoping review aims to broadly scoop the evidence on the behavioural techniques used to improve ADL among children with ID. The objectives are to identify (i) the types of behavioural techniques used to improve activities of daily living among various types of diagnosis related to ID; (ii) the trends of techniques used to improve activities of daily living among children with ID.

2.0 Methodology

The method of this scoping review is based on the framework that was developed by Arksey and O'Malley (2005). This method is suitable to broadly map the availability of evidence regarding the techniques used to improve ADL among children with ID (Arksey & O'Malley, 2005). The framework consists of five stages: "Identifying the research questions, identifying the relevant studies, study selection, charting the data, and collecting, summarizing, and reporting the results".

2.1 Stage 1: Identifying the Research Questions

This scoping review is guided by the main research question, which is "What evidence exists on the techniques used to improve ADL among children with ID" which was aimed to identify (i) the differences in techniques used to improve ADL among various types of diagnosis; (ii) the techniques used based on types of ADL; (iii) the trend of techniques used to improve ADL among children with ID.

2.2 Stage 2: Identifying the Relevant Studies

The identification of the relevant studies that are related to the research questions was retrieved through the UiTM Online Databases and Google Scholar. Six databases were used: SCOPUS, Web of Science (WoS), Willey Library, Cochrane Library, EBSCO-Medline, and Clinical Key. The relevant studies involve peer-reviewed studies between the years 2000 to 2020 due to the emerging evidence regarding the behavioural intervention applied to people with ID to improve their ADL. Three reviewers independently reviewed 1,738 titles and abstracts. This scoping review will highlight children from age 0 to 12 years old. Broad terms have been used while searching relevant studies, and the terms used were identified through a Medical Subject Heading (MeSH) (Table 1).

Table 1. Searching terms

Behavioural techniques	Types of disability	Activity
Chaining	Intellectual Disability	Daily Living Activity
Task Analysis	Intellectual Development Disorder	Self-care
Reinforcement	Mental Deficiency	Activities of Daily Living
Token	Mental Retardation	
Reward		
Modelling		
Prompting		

2.3 Stage 3: Study Selection

The inclusion criteria of this scoping review are to focus on (i) children, ages ranging from 0 to 12 years old; (ii) diagnosed with ID including comorbidity; (iii) having difficulty performing ADL; (iv) paper published in the English language. Articles other than the listed inclusion criteria were excluded. The outcome of searching relevant studies from Google Scholar and the six UiTM Online Databases has resulted in 8 759 articles. Screening of the title based on the inclusion criteria yielded 1 739 articles. The full-text screening was done to ensure eligibility. Sixty-one articles were excluded from the Scoping review due to not addressing the problem in ADL, not involving children with ID, age being more than 12 years old, and published papers were other than in the English language. Seventeen articles were excluded due to duplication (Figure 1).

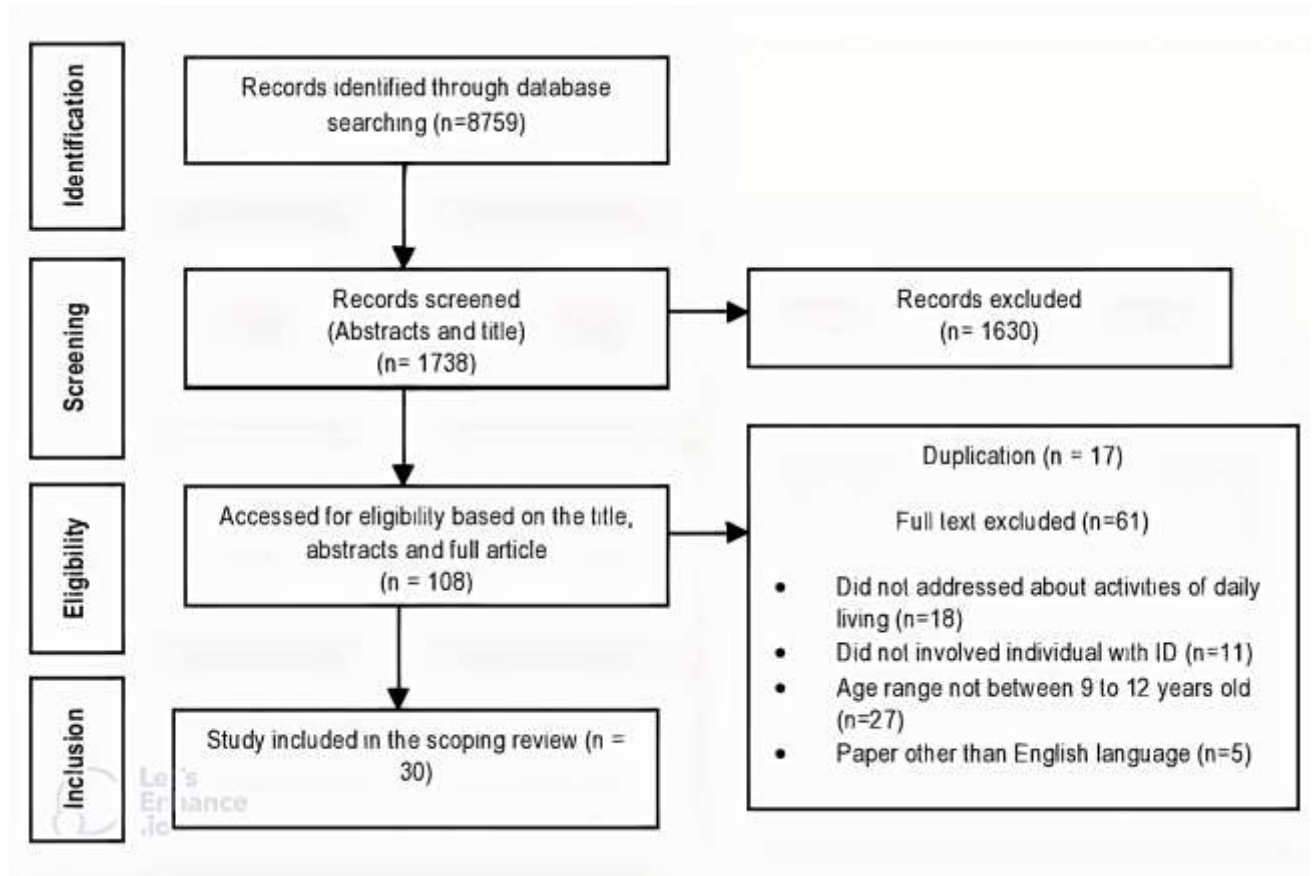


Fig. 1: PRISMA Flow Diagram for selecting studies

3.0 Results

The results of the study are based on the charting and collecting the suitable data, collecting, summarizing and reporting the results.

3.1 Stage 4: Charting the Data

The process of full screening articles has resulted in 30 included articles. All the included articles were summarized in Table 2 according to authors, study design, the sample of studies, the techniques used to improve ADL, and the results of the studies.

3.1 Stage 5: Collecting, Summarizing, and Reporting the Results

The result of this scoping review regarding the behavioural techniques used to improve various ADLs among children with ID and comorbidity are described in two research questions (RQ):

RQ 1: What are the behavioural techniques used to Improve ADL among various types of diagnosis related to ID?

Generally, based on the 30 included studies, 60% (n=18) have used positive reinforcement to improve ADL among children with ID. Next, 46.67% (n=14) used task analysis, and 43.33% used a prompting technique. There are 30% (n=9) who use modelling and chaining as a method to improve the ADLs among IDs, and 20% involve teaching parents a behavioural technique. Other than that, 16.67% (n=5) have used shaping, and 13.33% (n=4) applied negative reinforcement to improve the ADLs. Approximately 10% (n=3) use action-based learning (ABL) and social stories as a method to improve the ADLs among IDs, and 6.67% (n=2) have used total-task presentation. Lastly, only 3.33% (n=1) involve the use of activity schedules to improve the ADL among children with IDs.

RQ 2: What is the trend of the behaviour techniques used to improve ADL among children with ID?

Based on the 30 included studies, the articles that were published between the year 2005 to 2009 were 10% (n=3), 16.70% (n=5) from the year 2010 to 2014, and 73.30% (n=22) from the year 2015 to 2020. The trend of techniques will be divided into four trends which are consistence, inconsistency, increase, and decrease of trend.

Positive reinforcement is the consistent trend of techniques used to improve ADL among children with ID. It is referred as more than 50% of the studies use this technique from the year 2005 to 2020. Five techniques are inconsistently used between the year 2005 to 2020: prompting, task analysis, parent training, action-based learning, and shaping. The use of those techniques showed some increase and decrease in percentage within the three categories of the year.

Modelling is a technique that showed an increase in trend in the three categories of years. Meanwhile, two techniques showed a decreasing trend of techniques from 2010 to 2020: negative reinforcement from 33.33% to 9.1%, and chaining techniques from 66.67% to 27.27%.

Table 2. Summarized of included articles.

Author	Sample	Techniques	Results
Hanley, Piazza, Fisher WW and Maglieri (2005)	ASD with ID; ADHD with ID	BC; P; PR, NR	PR combined with NR is more effective during academic self-care tasks.
Lee, Muccio, & Osborne, (2009)	ID	TA; FC; BC; P; PR	Both FC and BC resulted in an improvement in dressing skills.
Shin, Nhan, Lee, Crittenden, Flory, Hong (2009)	ID; DS with ID; CP with ID	PT-M	Children performed significantly better in the areas of personal care.
Mays & Heflin (2011)	ASD with ID	P, TA	Significantly improved in hand washing and toothbrush skills.
Choi, Wong and Chung (2012)	ID	TA; FC; PR; ABL	Computer-assisted teaching programs improved hand washing performance and learning motivation.
Eldevik, Hastings, Jahr and Hughes (2012)	ASD with ID	TA; FC; PR; ABL	Computer-assisted teaching programs improved hand washing performance and learning motivation.
Ramdoss, Lang, Fragale, Britt, O'Reilly, Sigafoos, et al. (2102)	ID; ASD with ID	PR; NR; S; C; TA; PF	The daily living skills subdomain difference was not statistically significant when used intensively.
Lee & Lee (2014)	ID	VM; P; TA; PR	Those techniques are effective in promoting ADL in individuals with ID.
Hong, Ganz, Jennifer, Jennifer Ninci, Leslie Neely, Boles (2015)	ASD with ID	VM; P; C; S; PR	VM is considered EBP to improve ADL among ASD.
Ashutosh and Saroj (2016)	ID	S; C; M	It showed a significant improvement in the areas of self-help skills,
Tan, Hughes, Toogood (2016)	ID; ASD with ID	TA; LM; PF	There is a significant improvement in taking off and putting on a coat and taking off and putting on shoes.
Savage and Taber-Doughty (2017)	ID	TA; P; PR	SOAPS were a highly effective intervention for youth, adults, and adolescents.
Ariyanti and Royanto (2018)	ID	SS; VM; PR	The intervention program is effective in improving self-care during the menstrual cycle.
Dowdy, Tincani, Nipe, Weiss (2018)	ASD with ADHD and ID	PR; NR	Reduced participants' escape responses and increased their compliance with nail cutting.
Edwina and Tjakrawiralaksana (2018)	ASD with ID	TTP; TA; PF; PR	TTP technique in the behaviour modification program can improve mastery of a self-drinking skill.
Dayi & Safak (2018)	CP with ID	PT on using PR	The techniques are effective in toilet training for multiple disabled children.
Newcomb and Hagopian (2018)	ASD and ID	PR; NR; S; C	Those techniques were used to improve ADL among children with ID.
Nida and Tjakrawiralaksan (2018)	ID	BC; PR; PF	Those techniques showed a significant improvement in self-dressing skills.

Author	Sample	Techniques	Results
Shepley, Lane and Ault (2018)	ID	VM; TA; P; PR	Those techniques are effective in improving the ADL among ID.
Susilowati, Rustiyaningsih, Hartini (2018)	ID	VM; LM; ABL	There is an improvement in self-dressing skills by using the video modelling method.
Johnson, Brown, Hyman, Brooks, Aponte, Levato, et al. (2018)	ASD with ID	PT on M; PR; S	The parent's involvement showed a little to moderate improvement in feeding.
Kang, Chang (2019)	ASD with ID	TA; P; PR	The game-based technology facilitates the progress in taking a shower.
Olanrewaju, Jerry (2019)	ID	TA	There is a significant improvement in brushing teeth, washing clothes, and cleaning drooling.
Oxelgren, Westerlund J, Myrelid, Annerén, Johansson, Åberg M, et al (2019)	DS with ID; ASD with ID	PT on ABA	Results showed more positive outcomes from parents toward their special needs child.
Wibowo, Tedjasaputra (2019)	ID	BC; PF; PR	Backward chaining effectively improves the buttoning skills of a child with ID.
Clark and Kingsley (2020)	ASD with ID; ADHD with ID; CP with ID	Feeding and eating – PR; NR Toileting: -VM; P, PR.	One hundred ninety-six articles were included in the SRs, which served as a guide to final clinical recommendations. All the evidence-based practices were from strong to moderate levels.
Cummins, Pellicano, Crane (2020)	ASD with ID	SS; P; M	It is an effective way of supporting the children in teaching the menstrual cycle.
Gronski and Doherty (2020)	ASD and ID	Toilet Training: PT on PR. Feeding and eating: - PR; S	Caregiver education and coaching approaches are effective interventions, and the three feeding techniques results indicate significantly decreased reports of parenting stress and meal-time behaviours.
Kodak and Bergmann (2020)	ASD with ID	TA; FC or BC; TTP; AS	All the techniques provide improvement to the level of daily functioning among IDs.
Kırbaş, Kahrman, Kaşko Arıcı (2020)	ID	TA; PR; ABL	It significantly showed improvement in menstrual care skills.

BC-Backwards chaining; **FC**- Forward chaining; **PR**- Positive reinforcement; **NR**- Negative reinforcement; **P**- Prompting; **TA**- Task analysis; **PTM**- Parent training on modelling; **ABL**- Action-based learning; **C**- Chaining; **S**- Shaping; **PF**- Prompting and fading; **VM**- Video modelling; **LM**- Live modelling; **SS**- Social stories; **TTP**- Total-task, ASD- Autism Spectrum Disorder, ID-Intellectual Disability, ADHD-Attention Deficits Hyperactive Disorder, CP-Cerebral Palsy.

4.0 Discussion

The outcomes of this scoping review regarding the techniques used based on various conditions and ADLs represented that the use of positive reinforcement and prompting has shown to be the frequently used techniques to develop ADL skills among children with disabilities (Wallace & Shubert, 2008). Other than that, task analysis is also another technique used to increase the ADL among ID. The increased use of those techniques from 2000 to 2020 might be due to the existence of evidence-based practice since two decades ago that significantly showed an improvement in ADL. It could be proved by the previous articles that were published before the year 2000 that applied the integration use of positive reinforcement, prompting, and task analysis to teach dressing skills (Pierce & Schreibman, 1994) and grooming (Thinesen & Bryan. 1981).

Chaining and modelling are other techniques used in improving the ADLs among IDs. Children with ID often have a hard time comprehending new and complex information and skills (Shree & Shukla, 2016). Hence, practising the process or steps using integrated techniques such as chaining and modelling (Ashutosh & Saroj, 2016) can help to develop ADL skills. This can be supported by the previous studies that have similar results in ADL, such as in dressing (Behera, 2001; Kaur & Kumar, 2015; Susilowati et al., 2018) and handwashing (Ashutosh & Saroj, 2016; Mays & Heflin, 2011).

Next, parent training was also used to improve the ADLs. Transferring the skills to the parent or parent training is the most suggested treatment method to be applied at home to improve the ADL in children. Similar to a study by Novak and Honan (2019), parent education was the most effective and suggested method to promote feeding competency and growth for children with disabilities, and a study by Lee et al. (2014) have effectively trained parent to use positive reinforcement to toilet trained children with disabilities. The use of the shaping technique showed a low percentage might be due to the complex application as reward need to be given even for every little success. Although it is low in percentage, the result of this technique is shown to be effective in improving ADL skills. This can be proved by the

previous articles that showed an improvement in dressing skills when using shaping and prompting techniques among children with ID (Kaur & Kumar, 2015) and increased the duration of on-task behaviour in children with ADHD (Nasa, Pudijati & Tjakrawiralaksana, 2018). Instead of shaping, ABL also can be used to improve ADL among ID. ABL involved practising in natural settings and environments (Choi et al., 2012). This technique is often used with other behavioural techniques such as modelling. The use of modelling and ABL have shown to be effective in improving the performance in ADL. This can be supported by the previous research that stated that actions provide a wealth of information and give predictive power that allows for a deterministic understanding of the outcome event (Hindy & Turk-Browne, 2016).

Furthermore, the use of social stories is another alternative to improve ADL. In this study, social stories are correlated between skill and social behaviour, such as the menstrual cycle. This is similar to the studies from Ariyanti and Royanto (2018) and Cummins et al. (2020) that effectively integrated the use of social stories and modelling to teach female children with ID in the menstrual cycle. Next, total-task presentation (TTP) is one of the techniques that can be used but have a lower percentage. It is postulated that the use of this technique is lower due to its effectiveness. It is because TTP requires the child to perform the overall steps even though they do not have any knowledge about it, which might bring them into confusion. This is similar to the previous literature that stated the efficiency of total-task presentation is lower and more time-consuming compared to forward and backward chaining (Kodak & Bergmann, 2020).

Lastly, the technique that has a lower percentage is the activity schedule. The activity schedule is effective in improving children's performance but is less frequently used as it requires access to the materials of the behaviour chain activity (Kodak & Bergmann, 2020). A study by Spriggs, Gast, and Ayres (2007) used the activity schedule method, and the result showed an increase in "on-schedule" and "on-task" behaviour toward individuals with ID and the comorbidity

5.0 Conclusion

This study found that various behavioural techniques are implemented to improve ADL skills among children with ID and its comorbidity. It is often used as a stand-alone behavioural technique or a combination of various techniques. It is recommended that the future study will identify the effectiveness of the techniques through a systematic review or a meta-analysis.

Paper Contribution to Related Field of Study

This paper contributes to the knowledge of the health care professionals using behavioural techniques to improve the performance of children with ID in performing daily activities.

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