Jurnal Humanitas
Katalisator Perubahan dan Inovator Pendidikan
ISSN Print (2407-4411), ISSN Online (2502-406X)

Supporting Menstrual Hygiene Skills in Adolescents with Autism: A Structured Learning Approach

Alfred Pakpahan,[1] Aderson Situngkir,[2] Siti Hilmah,[3] Alam Zeb Khattak,[4] Arneliza Arneliza[5*]

[1]Faculty of Dentistry, Universitas Trisakti Jakarta, Indonesia
[2]Faculty of Education, Universitas Quality Medan, Indonesia
[3,5]Faculty of Psychology, Universitas Persada Indonesia YAI, Indonesia
[4]Faculty of Psychology, Iqra National University, Peshawar, Pakistan
Email: alfred@trisakti.ac.id, adersonsilalahi@gmail.com, hilmah06@gmail.com, alamzeb@iqra.edu.pk, arneliza@kid-aba.com

[*]Correspondence

Article History: Received: 24-04-2026, Revised: 11-06-2026, Accepted: 16-06-2026, Published: 30-06-2026

Abstract

Adolescents with Autism Spectrum Disorder (ASD) often experience challenges in managing menstrual hygiene due to limitations in adaptive functioning and self-care skills. Limited preparation prior to menarche may increase dependence on caregivers and reduce independence in daily activities. This study aims to examine the effectiveness of a structured instructional approach in improving menstrual hygiene skills among adolescents with ASD within an educational context. This study employed a single-subject (A-B) design with mastery criteria and maintenance assessment. The participants were two female adolescents aged 9-10 years. The intervention targeted essential skills, including menstrual pad application, cleaning and disposal of used pads, and independent daily practice. Instruction was delivered through systematic, step-by-step procedures supported by prompting, repetition, and reinforcement to facilitate skill acquisition and retention. The results indicated that both participants achieved increased independence within 17-22 days. The acquired skills were successfully generalized and applied during naturally occurring menstruation. Parental involvement contributed to consistent practice and supported the transfer of skills across settings. These findings suggest that structured instructional strategies are effective in enhancing menstrual hygiene skills and promoting functional independence among adolescents with ASD. Integrating practical life-skill training into educational programs is essential to support puberty preparation and long-term independence.

Keywords:
autism spectrum disorder; educational intervention; functional independence; menstrual hygiene education; self-care skills

Abstrak

Remaja dengan Gangguan Spektrum Autisme (ASD) sering mengalami tantangan dalam mengelola kebersihan menstruasi karena keterbatasan fungsi adaptif dan keterampilan perawatan diri. Persiapan yang terbatas sebelum menarche dapat meningkatkan ketergantungan pada pengasuh dan mengurangi kemandirian dalam aktivitas sehari-hari. Studi ini bertujuan untuk menguji efektivitas pendekatan instruksional terstruktur dalam meningkatkan keterampilan kebersihan menstruasi di kalangan remaja dengan ASD dalam konteks pendidikan. Studi ini menggunakan desain subjek tunggal (A-B) dengan kriteria penguasaan dan penilaian pemeliharaan. Partisipan adalah dua remaja perempuan berusia 9-10 tahun. Intervensi menargetkan keterampilan penting, termasuk penggunaan pembalut menstruasi, pembersihan dan pembuangan pembalut bekas, dan praktik harian mandiri.

Instruksi diberikan melalui prosedur sistematis langkah demi langkah yang didukung oleh dorongan, pengulangan, dan penguatan untuk memfasilitasi perolehan dan retensi keterampilan. Hasil menunjukkan bahwa kedua partisipan mencapai peningkatan kemandirian dalam waktu 17-22 hari. Keterampilan yang diperoleh berhasil digeneralisasikan dan diterapkan selama menstruasi yang terjadi secara alami. Keterlibatan orang tua berkontribusi pada praktik yang konsisten dan mendukung transfer keterampilan di berbagai lingkungan. Temuan ini menunjukkan bahwa strategi pengajaran terstruktur efektif dalam meningkatkan keterampilan kebersihan menstruasi dan mendorong kemandirian fungsional di kalangan remaja dengan ASD. Mengintegrasikan pelatihan keterampilan hidup praktis ke dalam program pendidikan sangat penting untuk mendukung persiapan pubertas dan kemandirian jangka panjang.

Kata Kunci:
gangguan spektrum autisme; intervensi pendidikan; kemandirian fungsional; keterampilan perawatan diri; pendidikan kebersihan menstruasi

Introduction

Puberty represents a critical developmental stage in adolescence, particularly for girls, as it is marked by substantial physical, hormonal, and psychosocial changes. Within educational contexts, this stage necessitates structured instructional support to help students understand and manage these changes effectively (Dunkel et al., 2024; Pyra & Schwarz, 2019; Root, 2005). These changes influence not only physical development but also students' emotional regulation, self-awareness, and readiness for increased independence. Such complexity is more pronounced in adolescents with ASD, who often experience difficulties in emotional regulation, understanding bodily changes, and adapting to increasing social demands (Cummins et al., 2020; Muscatello et al., 2022). Pubertal challenges are further intensified by the onset of menstruation in adolescents with ASD, which requires biological readiness, psychological adjustment, and specific personal hygiene skills. From an educational perspective, puberty in adolescents with ASD requires a structured and systematic learning approach to aid understanding and skill development related to sexual and social changes (McGogo, 2023; Visser et al., 2017).

Puberty preparation in educational settings should integrate conceptual knowledge with structured, skills-based instruction, particularly in managing menstrual hygiene. This integration is essential because several studies indicate earlier pubertal onset in adolescents with ASD (Corbett et al., 2020, 2022; Muscatello et al., 2022), which reduces the available time for instructional preparation. Without structured learning, menstruation may become a source of confusion and dependence for students with ASD. However, existing research on puberty and menstruation in adolescents with ASD has predominantly relied on descriptive and perception-based approaches, including questionnaires and interviews with parents, teachers, or therapists (Groenman et al., 2024; Hantman et al., 2024; Larson et al., 2021). While these approaches offer valuable perspectives, they seldom focus on acquiring observable, measurable self-care skills required for independent menstrual management.

As a result, many adolescents with ASD continue to experience significant dependence on caregivers in managing menstrual hygiene, which may impact not

only daily functioning but also personal dignity, autonomy, and social participation (Dural et al., 2020; McMahon et al., 2024). This indicates a gap between knowledge-oriented instruction and the need for structured, skill-based learning within educational practice (Memarian & Mehrpisheh, 2015). In addition, existing educational media, such as videos or visual supports (Gönenç et al., 2020; Lundy et al., 2022; Randall et al., 2024), often emphasize conceptual learning rather than direct skill performance. Consequently, students may understand the concept but struggle to perform hygiene routines independently. Menstrual hygiene management requires coordinated adaptive skills, including sequencing, self-monitoring, and consistent performance in real contexts (Appiah-Agyekum et al., 2025; Sommer & Caruso, 2015).

Accordingly, there is a need for structured educational interventions that explicitly teach menstrual hygiene skills (MHS) through direct and repeated practice. MHS is incorporated within Smart ABA, an extension of ABA (Anwar et al., 2022). This study examines how structured instruction within Smart ABA can support students' independence in MHS as part of functional puberty education. By integrating systematic teaching procedures with real-life practice, this study contributes to the development of performance-based learning approaches that support independence in daily living skills. The research question guiding this study is as follows: How does Smart ABA, as a structured educational intervention, influence independence in menstrual hygiene skills (MHS) among adolescents with Autism Spectrum Disorder prior to menarche?

Methods

Research Design & Participants

This study employed a Single Subject Research (SSR) A-B design incorporating maintenance and mastery criteria. This design was used to observe individual changes in menstrual hygiene skills (MHS) through repeated measurements. The design enabled continuous monitoring of behavioral development during the implementation of structured intervention while also evaluating the stability of skills once mastery criteria were achieved (Yuwono & Novitasari, 2025). The research structure consisted of a baseline phase (A), an intervention phase (B) guided by mastery criteria, and a maintenance phase to assess the sustainability of skills within ongoing daily routines.

Within the Smart ABA framework, the provision of an initial prompt follows a standardized decision rule. This procedure is implemented when the therapist anticipates that the participant may not yet respond independently. Indications for initial prompting include: (1) a new activity, (2) the previous recorded score did not fall within a success category (X, –, O, and ending in P), or (3) although the previous score was + or P+, the first response across three consecutive sessions was incorrect (X). This rule-based prompting procedure is embedded in Smart ABA to ensure data-driven instructional decisions and to prevent repeated errors that may lead to frustration or reinforce incorrect response patterns.

Because MHS was a newly introduced skill set for all participants prior to menarche, initial prompting was implemented according to these standardized rules, including during the baseline phase. In this study, baseline was conceptualized as a measurement under standard instructional conditions rather than as an unaided or no-assistance condition. This approach maintains procedural consistency with Smart

ABA operational standards while also adhering to ethical considerations in pediatric intervention research, ensuring that necessary assistance is not intentionally withheld solely for experimental control.

During the baseline phase (A), MHS task components, including menstrual pad application, hygienic handling, cleaning procedures, and the completion of tasks in sequence, were measured. The intervention phase continued until participants reached the predefined mastery criterion in accordance with the Smart Measurement and Evaluation standards (Arneliza et al., 2026). After reaching the mastery criterion, participants entered a maintenance phase during which MHS performance was monitored for 6 weeks.

The maintenance phase was conducted twice a week, as there were two therapists involved in the study. The frequency of maintenance sessions corresponded to the number of therapists involved in the program. If performance fell below a predetermined stability threshold during the maintenance phase, the MHS program was retaught during daily instruction until the mastery criterion was achieved. This mastery-based structure was designed to ensure that acquired menstrual hygiene skills were durable and functional within natural caregiving contexts.

In addition to quantitative session-based measurements, semi-structured interviews were conducted with parents before and after implementation. Pre-intervention interviews gathered developmental history and baseline self-care abilities. Post-intervention interviews explored parental perceptions of changes in independence and caregiving routines. Interview data were used descriptively to contextualize and enrich the interpretation of quantitative findings.

This study involved two female adolescents aged 9 and 10 years diagnosed with autism spectrum disorder (ASD). Participants were purposively selected based on the following inclusion criteria: (1) a confirmed ASD diagnosis by a qualified professional; (2) age between 9 and 10 years; (3) mastery of imitation skills as a prerequisite for behavioral learning; (4) adherence to an ASD-related dietary management program under the supervision of the KID-ABA medical team; (5) absence of allergies to povidone-iodine used in the study procedures; and (6) active parental involvement with written informed consent. All participants were pre-menarcheal and had not previously received structured training in menstrual hygiene skills.

Data Collection and Procedures

The intervention was conducted in natural instructional settings, including the therapy room and the participants' home environment. MHS practice involving pad washing was carried out in the bathroom to simulate real hygiene routines. The intervention was implemented by a therapist with support from a therapist assistant (TA) (Arneliza et al., 2025). Parents or caregivers were involved during daily practice after receiving structured training. Materials used in the intervention included winged and non-winged menstrual pads, povidone-iodine used to simulate menstrual blood, soap, water, paper or plastic bags, a trash bin, and underwear. In this study, menstrual hygiene skills (MHS) are operationally defined as the participant's ability to independently perform a sequence of hygiene behaviors associated with menstruation, including (1) attaching a menstrual pad to underwear, (2) removing the used pad, (3) washing the used pad with water and soap, (4) wrapping the used

pad with paper, and (5) disposing of it in the trash, followed by handwashing. Independence was defined as completing the sequence correctly without physical prompts.

Data were collected through direct observation and systematic recording of participants' responses during the MHS sessions. The recordings were conducted by trained therapists and parents/caregivers using the Smart ABA measurement system (Anwar et al., 2022; Arneliza et al., 2026). Each response was scored based on accuracy across opportunities within the intervention sessions. Performance was expressed as a percentage using the following formula:

Score = (Correct Responses / Opportunities) × 100%. Session scores were plotted graphically to monitor skill progression over time. The mastery criterion was defined as achieving a score of ≥80% across three consecutive sessions, with a fail system applied to indicate consistent MHS skill acquisition.

Menstrual hygiene skills (MHS) in this study were developed as an extension of previous research that taught menstrual skills using symbolic media such as videos, dolls, and books (Gönenç et al., 2020; Lundy et al., 2025; Randall et al., 2024). In contrast to these approaches, this study emphasizes direct instruction and real-life behavioral modeling without symbolic media, thereby promoting more contextualized and functional skill acquisition. MHS implementation was conducted collaboratively by Smart ABA therapists and parents or caregivers. Participant independence in MHS was measured based on their ability to independently perform a sequence of skills, including pad application, pad removal, and pad cleaning.

Parents and caregivers received structured training from qualified Smart ABA therapists (Arneliza et al., 2025) prior to participant intervention. This training covered instructional delivery, prompting procedures, response recording, scoring, and graphing participant responses. Supervised simulations were conducted until parents or caregivers demonstrated procedural competence. Once competency was established, intervention was delivered directly to the participants under the supervision of a therapist. When participant responses were incorrect, therapists or parents/caregivers provided prompts and delivered social reinforcement for correct responses, with or without prompts. All participant responses were recorded, summed, and plotted graphically on standardized data sheets.

MHS Intervention Procedures

The intervention was conducted by a therapist, assisted by a therapist assistant (TA). A therapist assistant is a therapist who temporarily serves in an assistant role during a session. These roles rotate across sessions. During instruction and intervention, the therapist or parents/caregivers prepared all necessary materials, including winged and non-winged menstrual pads (used alternately to promote generalization), povidone-iodine as a safe simulation of menstrual blood, soap, paper or plastic bags, a trash bin, and water.

The instructional procedures followed errorless teaching principles to minimize learning errors during early skill acquisition. Initial instruction employed mass trials with full prompting, followed by gradual reduction through prompt fading. Flexible prompt fading was implemented using a time-delay technique, with delays increasing incrementally from 1 to 5 seconds according to participant performance (Cengher et al., 2018; Leaf et al., 2019). This approach supports independent responses while

enhancing the stability and generalization of skills. The instruction and intervention were divided into three stages.

Stage 1: Pad application. The first stage began with the simplest task: removing the pad's adhesive backing, followed by attaching the pad to the underwear. Participants received behavioral modeling accompanied by the verbal instruction "do this." When the responses did not match the model, prompts were provided as needed. Social reinforcement was delivered for correct task completion with or without prompts. After meeting the mastery criteria for pad application, the intervention progressed to pad cleaning.

Stage 2: Cleaning the pad. Winged and non-winged pads were alternately prepared and covertly coated with povidone-iodine. Participants were guided to the bathroom, where two prepared pads were placed under running water. Participants received the instruction "turn on the tap," followed by "do this," while the therapist or caregiver modeled cleaning the pad with water until the iodine residue was removed, followed by washing with soap and rinsing thoroughly. Prompts were provided as needed. Participants were then instructed to "fold and wrap the pad with paper" (or plastic, if used, though paper was preferred), "throw it in the trash," and "wash your hands thoroughly." Prompts were provided at each step when necessary, and social reinforcement was delivered for correct responses. After participants completed the full sequence with modeling, subsequent sessions were conducted without modeling. Participants received general verbal instructions (e.g., "clean the pad"), with prompts and reinforcement as needed.

Stage 3: Daily MHS simulation. Upon meeting mastery criteria in both stages, participants engaged in daily MHS simulations for approximately seven consecutive days, corresponding to the typical duration of menstruation. Simulations involved pad application, removal, and cleaning during daily routines (e.g., urination, defecation, bathing, and before bedtime) under the supervision of a therapist or caregiver. This phase constitutes the Smart Discrimination training phase of Smart ABA (Sutadi et al., 2026). All responses were systematically recorded using standardized data sheets.

Data Analysis

The recorded data were analyzed using visual graph analysis, which is the primary evaluative method in SSR designs (Richards, 2018). Graphs were used to organize and summarize quantitative data, enabling systematic examination of changes in level, trend, and response patterns. The functional relationship between the Smart ABA intervention and independence in MHS skills could be directly evaluated through visual analysis rather than inferential statistical testing, consistent with the SSR methodology. Internal validity in this study is defined as the degree of confidence that changes in participants' independence in MHS are attributable to the Smart ABA intervention rather than to extraneous factors. Guided by the framework of Shadish et al. (2002), this study controlled key threats to internal validity, including maturation, history, instrumentation, and observer bias. Operationally, control was achieved through a Single Subject Research (SSR) A-B design incorporating Maintenance and Mastery Criteria. Repeated measurements were conducted across phases. Baseline data were collected to establish initial stability. The intervention was then introduced systematically. Changes in response level and trend were analyzed

following the intervention. Daily responses were recorded consistently using standardized procedures.

Result and Discussion

The MHS intervention in this study was implemented in three main stages in accordance with the intervention stages described in the Procedures section. Owing to journal limitations on the number of figures, the first and second stages were combined for presentation. The results for each Participant are presented below.

Participant A

The MHS intervention in this study was implemented in three main stages in accordance with the intervention stages described in the Procedures section. The first stage of intervention for Participant A involved removing the menstrual pad's adhesive backing and attaching the pad to the participant's underwear. The intervention progressed to the second stage after these skills met the mastery criterion, focusing on independently washing used menstrual pads with soap and water. Figure 1 presents Participant A's performance across these two stages.

Figure 1. Applying a menstrual pad in Participant A
Source: Research Date, 2026

Figure 1 shows that Participant A initially demonstrated inconsistent performance in menstrual pad application. Early sessions were marked by variability, reflecting adjustment to a newly introduced routine. However, performance improved steadily once the instructional sequence became familiar. After this initial fluctuation, the participant demonstrated clear behavioral stabilization. The final sessions showed consistent independent performance, indicating consolidation of the skill. The early decline did not disrupt the overall pattern of improvement. Instead, it appeared to represent a transitional phase before stable acquisition was achieved.

Following mastery of pad application, Participant A progressed to the washing component of MHS in Figure 2.

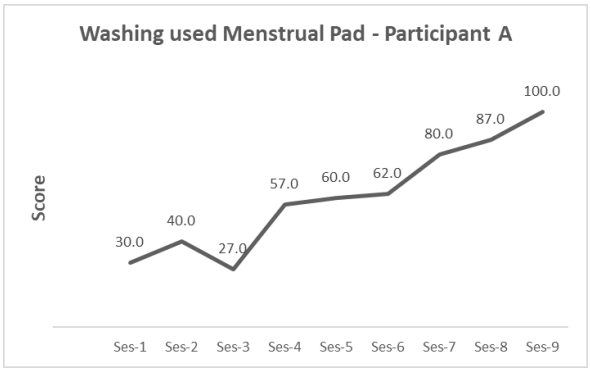

Figure 2. Washing used menstrual pads in Participant A
Source: Research Date, 2026

The initial sessions reflected low and unstable responding, which is consistent with the greater procedural complexity of this task. Gradually, responses became more organized and consistent as the participant adapted to the required sequence of actions. Performance improved across sessions with diminishing variability. By the final phase, the participant demonstrated stable and independent execution of the full washing routine. This pattern suggests that the skill was not only acquired but functionally integrated into the participant's behavioral repertoire.

The third stage involved independent daily practice of MHS following the second stage's mastery. The results for participant A are presented in Figure 3.

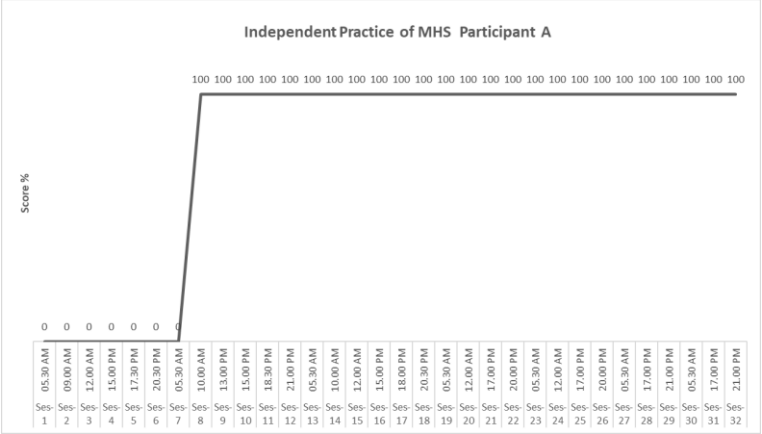

Figure 3. Independent practice of MHS in Participant A
Source: Research Date, 2026

Figure 3 illustrates Participant A's independent practice during the MHS simulation phase. This phase was a new activity for the participant. Implementation began with an initial prompt, following Smart ABA procedures, to support orientation to the routine. Following this, structured independent practice was implemented to clearly observe changes in performance. The participant began completing the entire sequence independently. Performance then showed a marked change in level and remained stable throughout repeated daily trials. No significant fluctuations or declines were observed. This pattern indicates consolidation of

procedural skills and consistent implementation of hygiene routines. These findings indicate that MHS skills were not only acquired during the instructional phase but also maintained and applied independently under conditions resembling everyday menstrual situations.

Participant B

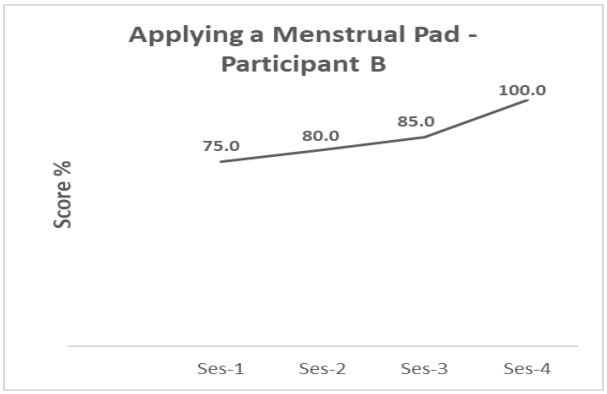

Figure 4. Applying a menstrual pad in Participant B
Source: Research Date, 2026

Figure 4 shows Participant B's development of menstrual pad use skills. Because this was a new activity, an initial prompt was implemented. Subsequently, performance steadily improved. Responses became more accurate and organized with each session. The participant demonstrated improved performance in completing the sequence. In the final phase, the task was performed independently without prompts. This pattern reflects the acquisition and consolidation of smooth menstrual pad use within the MHS routine.

Participant B then progressed to the washing component, as shown in Figure 5. This stage requires more complex sequences and motor coordination. An initial prompt was implemented at the beginning of implementation.

Figure 5. Washing used menstrual pads in Participant B
Source: Research Date, 2026

The initial sessions reflected adjustment to these procedural demands. Some fluctuations were observed as the participant adapted to the multi-step routine.

However, improvement remained consistent. Each session demonstrated clearer integration of the required hygiene steps. Over time, responses became stable and independent.

Overall, the data pattern indicates progressive mastery of the entire hygiene sequence. The skill progressed from structured guidance to independence. Visually, the pattern shows an upward trend with moderate variability in the middle phase. This is likely related to the complexity of the task, which involves motor coordination, step sequences, and more detailed hygiene standards. Nevertheless, the developmental trajectory remains consistent until optimal performance is achieved in the final session. MHS is not only learned but also functionally integrated into the participants' self-care repertoire.

Following mastery of the second stage, Participant B proceeded to the independent daily practice phase of MHS. The results for Participant B are presented in Figure 6.

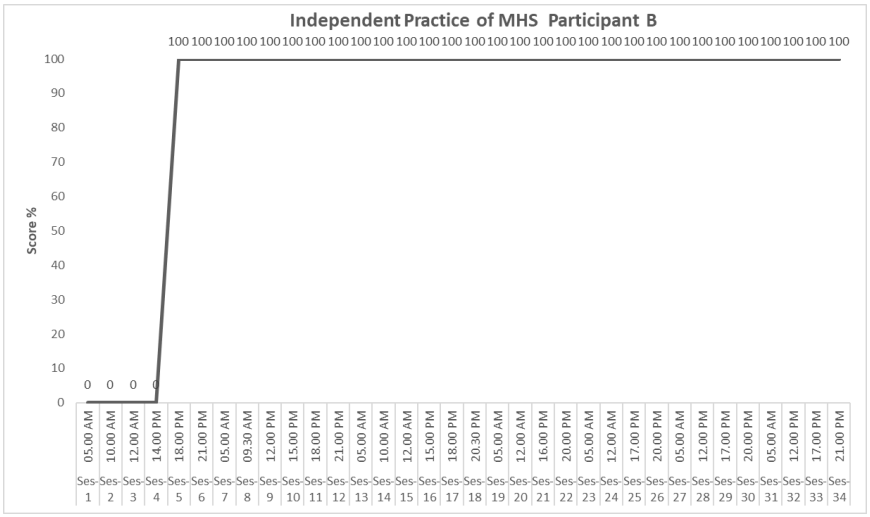

Figure 6. Independent practice of MHS in Participant B
Source: Research Date, 2026

The independent practice phase for Participant B was conducted over consecutive days under conditions designed to simulate a typical menstrual cycle. Daily routines were intentionally structured to mirror real-life demands. Pad use and washing were practiced repeatedly throughout the day, including during school hours. This allowed observation of performance across different times and settings. Because this was a new activity, an initial prompt was implemented. Once structured independent practice began, a clear shift in performance was evident.

The participant completed the full hygiene sequence independently. From that point onward, execution remained stable across days. No regression or inconsistency was observed. The routine was carried out with continuity and control. The overall pattern reflects strong behavioral consolidation. The skills were not confined to instructional sessions. They were implemented consistently under simulated daily-life conditions. This sustained stability suggests that MHS had been internalized as a functional self-care routine. The participant demonstrated readiness to manage menstrual hygiene independently in contexts resembling everyday situations.

Four days after the implementation of MHS, Participant A's parents reported that her daughter had her first menstrual cycle. During the initial menstrual period, the parents implemented the trained MHS procedures and reported the outcomes to the Smart ABA team. Participant A could independently remove the pad's adhesive backing but still required parental prompting to attach the pad to the underwear. After receiving the instruction "clean the pad," Participant A independently washed the pad with soap and water without additional prompts. She also independently folded and wrapped a used pad with paper and disposed of it in the trash. Participant A consistently demonstrated full independence in attaching, removing, and cleaning pads without assistance or prompting during the subsequent days of menstruation (five days). Figure 7 shows MHS performance during naturally occurring menstruation.

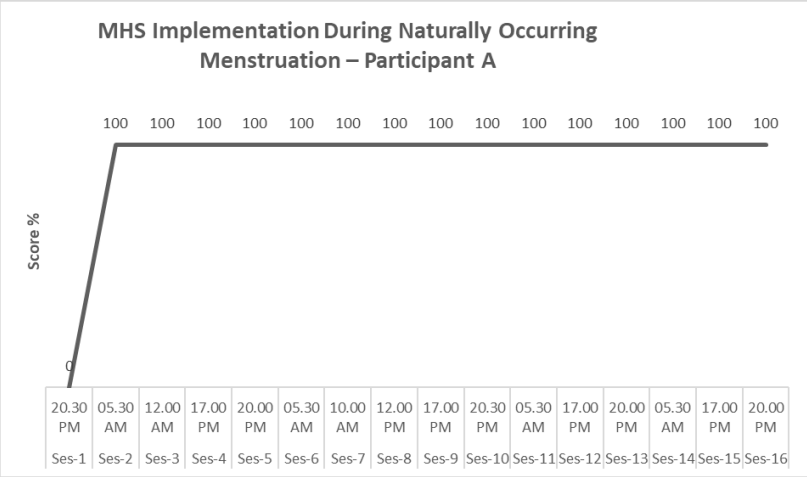

Figure 7. Independent MHS performance during naturally occurring menstruation in participant A
Source: Research Date, 2026

Figure 7 shows Participant A's actual implementation of MHS. Pad changes were performed according to the time pattern shown in Figure 5, reflecting the frequency of use in a real-life, everyday context. In the first session, during natural menstruation, the score was recorded at 0%. However, starting in the second session, performance rose sharply to 100% and remained at that level through the 16th session (day 5), with no fluctuations or declines. The consistency of the maximum score over five consecutive days indicates high performance stability across various pad change times, including morning, afternoon, and evening. This pattern indicates that MHS skills were not only mastered during the simulation phase but had been internalized and successfully generalized to real-life menstrual situations.

Participant A was able to independently perform the entire sequence of procedures, including properly cleaning, wrapping, and disposing of used pads. This consistent performance throughout the naturally occurring menstrual period demonstrates substantial gains in practical self-care skills and an understanding of the importance of hygiene and health during menstruation. The stability of performance across the five days of natural menstruation further reflects effective adaptation to the physiological changes experienced by Participant A. Overall, the intervention

implemented throughout the study was effective in preparing participants to manage menstruation independently while also enhancing confidence and autonomy during this new developmental phase. In addition to participant outcomes, parents reported meaningful benefits from the intervention, particularly increased understanding, preparedness, and confidence in supporting their children during menstruation. This was reflected in the following parental statements:

> *"The knowledge provided to me as a parent of an adolescent with ASD regarding menstrual hygiene preparation was extremely helpful." It supported both my child and me."* (Parent of Participant B)

A similar statement was provided by Participant A's parents, emphasizing reduced confusion and increased readiness to support their child:

> *"I felt greatly helped by the menstrual hygiene training for my child." As a mother, I am no longer confused because I was given practical guidance. I hope other adolescents with ASD can also receive this training, as it would be very beneficial for many parents who have children with ASD."* (Parent of Participant A)

Discussion

The findings of this study demonstrate that both participants achieved independence in MHS within 17 to 22 days through the Smart ABA intervention. These findings indicate that menstrual hygiene skills can be acquired as functional adaptive behaviors through structured behavioral learning. Theoretically, this finding is consistent with the core principles of Applied Behavior Analysis, which emphasize behavior acquisition through modeling, direct instruction, reinforcement, and repeated practice in natural contexts (Cooper et al., 2020). MHS represents a sequence of chained behaviors, breaking the skill into smaller, manageable steps, enabling female adolescents with ASD to gradually and consistently acquire each component. The successful generalization of skills to naturally occurring menstruation suggests that learning was not situational but functionally integrated into real-life adaptive behavior. From an educational perspective, structured instructional approaches play a key role in supporting students in acquiring complex self-care skills and promoting independence (Tonder et al., 2022; Visser et al., 2017).

From a developmental and instructional perspective, these findings underscore the importance of proactive, skill-based interventions that equip adolescents with practical competencies before the onset of biological transitions. By preparing female adolescents with ASD prior to menarche, MHS functions as an anticipatory adaptive intervention that reduces anxiety and long-term caregiver dependency. Several previous studies have used a survey-based, descriptive approach, employing questionnaires and interviews with parents and professionals to explore experiences, challenges, and support needs during the pubertal transition (Cridland et al., 2018; Nichols et al., 2020; Ruble et al., 2021). From an educational perspective, these findings emphasize the importance of early instructional planning aligned with students' developmental readiness, ensuring that essential life skills are introduced before critical developmental transitions (Arunkumar, 2023; Long et al., 2025). While these studies highlight high levels of dependency, they do not provide a structured pathway to independence.

By operationalizing menstrual readiness as a teachable and measurable competency, the Smart ABA approach aligns with a structured behavioral framework

focused on increasing functional independence and reducing dependency associated with inadequate menstrual hygiene skills. The present study provides empirical evidence demonstrating that menstrual hygiene skills can be systematically taught and measured as functional adaptive behaviors before menarche. In addition, existing research and literature reviews indicate that educational and symbolic media, such as audiovisual materials, instructional modules, and digital applications, largely dominate menstrual-related interventions for adolescents aimed at improving knowledge and awareness of menstrual hygiene (Leal Fuentes et al., 2025; Manjur et al., 2021). Although these approaches are effective in enhancing conceptual understanding and initial attitudes toward menstrual health, they are not designed to establish hygiene skills as directly performed functional behaviors.

The present study extends this literature by demonstrating that authentic hygiene practice through direct engagement with water and soap facilitates the development of independence and behavioral consistency. Smart ABA functions as a bridge between symbolic instruction and real-life functional performance. This finding highlights the importance of moving beyond knowledge-based interventions toward direct behavioral skill training that enables adolescents to perform menstrual hygiene routines independently. From an educational perspective, these findings underscore the importance of practice-based learning approaches that enable students to apply conceptual knowledge in real-life contexts and support the development of functional independence.

From a theoretical perspective, these findings reinforce the view that MHS skills constitute adaptive behavior and functional independence that must be learned contextually during developmental transition phases (Fei et al., 2021; Schalock et al., 2010; Sparrow et al., 2016). MHS, as an adaptive skill, emphasizes that menstrual hygiene is not merely a routine but a core component of functional independence during developmental transition. The successful acquisition of MHS before menarche aligns with the concept of developmental readiness, which emphasizes timely intervention during critical developmental transitions (Blakemore & Mills, 2014). From an educational perspective, these findings highlight that functional self-care skills should be recognized as essential learning outcomes developed through contextually relevant and developmentally appropriate instructional processes.

The present findings demonstrate that adaptive self-care skills related to menstruation can be established prior to the onset of menstruation and subsequently maintained during naturally occurring menstrual events. McMahon et al (2025) highlights the importance of support system readiness in reducing confusion and distress associated with puberty in adolescents with autism, including healthcare professionals and family members. This reinforces the view that independence in menstrual hygiene is essential for supporting dignity, autonomy, and participation in daily life among adolescents. The use of direct hygiene practices also supports the experiential learning framework, whereby learning through real-life experience has been shown to promote skill maintenance and generalization among individuals with ASD more consistently than purely symbolic instruction (Kolb, 2015; Lundy et al., 2022).

The findings indicate that MHS can be implemented as a realistic and meaningful intervention in the daily lives of female adolescents with ASD. These results are consistent with parental reports, emphasizing the need for practical, structured guidance for adolescents with ASD in managing menstrual hygiene (Jones

et al., 2025; Yilmaz & Kaytez, 2025). Parent and caregiver involvement emerged as a crucial mechanism for the successful implementation of MHS. This is particularly important in maintaining consistency of practice and facilitating skill generalization in the home context, given the personal nature of menstrual hygiene skills.

By promoting independent hygiene behaviors through hands-on practice, MHS supports functional independence and adaptive self-care skills in adolescent girls with ASD during the pubertal transition. This positions MHS within a broader framework of community-based teaching and family support, emphasizing continuity, caregiver involvement, and the continuity of skill practice beyond structured intervention sessions. Caregiver involvement is not only supportive but also structurally crucial for maintaining and generalizing adaptive skills in personal life.

Positioning MHS within daily routines reflects a family-centered approach to skill acquisition, in which parents serve as key agents in maintaining behavioral consistency. This aligns with established principles of contextual learning and natural environment training, which emphasize practice within meaningful daily routines to promote maintenance and generalization among adolescents with disabilities (Kientz & Dunn, 2012; McPherson et al., 2016). Empirical instructional learning principles were applied directly to concrete and measurable MHS practices within natural home settings. This approach supports the notion that experiential, hands-on learning contributes to skill maintenance and generalization among individuals with ASD more sustainably than abstract or symbolic instruction alone (Oshinski et al., 2023).

By integrating instructional and learning theory with everyday hygiene practices, MHS illustrates how theoretical frameworks can produce meaningful and sustainable behavioral change in real-life contexts. Overall, this study provides empirical evidence that MHS is a functional skill that can be taught, measured, and maintained in female adolescents with ASD. The successful application of MHS during naturally occurring menstruation further highlights the practical relevance of Smart ABA in preparing female adolescents with ASD for puberty-related self-care within natural daily routines.

By integrating behavioral interventions into real-life hygiene practices, this study supports inclusive puberty readiness for adolescent girls with ASD. Smart ABA not only serves as a teaching method but also promotes adaptive independence in self-care skills. This intervention increases adolescents' self-confidence while strengthening family readiness through structured guidance. These findings also demonstrate the potential of integrating behavioral interventions into school- or community-based programs to expand access to relevant and functional hygiene skills learning.

Access to appropriate menstrual hygiene instruction for adolescents with disabilities is increasingly recognized as part of broader sexual and reproductive health rights. Ensuring that female adolescents with ASD acquire practical menstrual hygiene skills contributes not only to personal health and dignity but also to their right to equitable access to puberty-related education and self-care competencies during developmental transitions. The small sample size is consistent with the methodological characteristics of Single Subject Research (SSR), which emphasize intensive individual analysis and repeated measurement over large group comparisons. This study has several limitations. The small sample size reflects the characteristics of Single Subject Research (SSR), which emphasizes intensive individual analysis rather than group comparison. In addition, the intervention was

implemented within a specific instructional and family-supported context. Nevertheless, systematic replication across additional participants, settings, and developmental stages is recommended to further establish the generalizability and robustness of the present findings.

Conclusion

The findings of this study indicate that the Smart ABA intervention is effective in enhancing students' independence in Menstrual Hygiene Skills (MHS) among female adolescents with ASD. From an educational perspective, both participants achieved mastery of MHS in 17 to 22 days and maintained these skills during naturally occurring menstruation. The competencies developed included independent pad application and appropriate cleaning of used pads with soap and water, reflecting the acquisition of functional life skills relevant to daily living. From a pedagogical standpoint, these findings highlight the importance of structured, skill-based instruction delivered prior to menarche. Such instruction enables students to acquire practical competencies needed to manage biological transitions effectively. The use of systematic teaching procedures, combined with direct practice using real materials, ensures that learning is not limited to conceptual understanding but extends to consistent performance in real-life contexts.

This instructional approach supports inclusive education by integrating essential self-care skills into the learning process. It also promotes student autonomy, reduces reliance on caregivers, and minimizes potential risks associated with poor menstrual hygiene. The successful application of MHS during natural menstruation further indicates effective generalization and maintenance of learned skills beyond the instructional setting. Although the study is limited by a small sample size, the findings suggest that structured educational interventions such as Smart ABA have strong potential for broader application. Future studies should explore larger samples and examine long-term retention and generalization across diverse educational and home environments.

Acknowledgments

The authors would like to express their sincere gratitude to all parties who contributed to the implementation of this study. Appreciation is also extended to the participating adolescents and their families for their cooperation and commitment throughout the intervention process. Written informed consent was obtained from parents or legal guardians. Parents were fully informed about the study's purpose, procedures, intervention methods, and potential impacts prior to the study's implementation. Participant confidentiality was strictly maintained, and all data are reported in aggregate form without including any personally identifiable information. All research procedures adhered to institutional ethical standards and were approved by the Research Ethics Committee of the Muslim University of Indonesia, Makassar (Approval Number: 235/A).

References

Anwar, A., Sutadi, R., & Miranda, C. (2022). Development of Discrete Trial Training (DTT) Procedure in Smart Applied Behavior Analysis (Smart ABA) for Autism. *Journal of Psychology and Behavior Studies*, *2*(1), 44–63. https://doi.org/10.32996/jpbs.2022.2.1.7.

Appiah-Agyekum, N. N., Nyamekye, M. A., Agbenu, I. A., & Otoo, D. D. (2025). Menstrual hygiene knowledge and practices among female senior high school students in the new Juaben North municipality of Ghana: a cross-sectional study. *BMC Public Health*, *25*(1), 1563. https://doi.org/10.1186/s12889-025-22836-8.

Arneliza, A., Rahmawati, S., Sutadi, R., Alsa, A., & Yunanto, K. T. (2025). Experiences and Strategies of Competent Smart ABA Therapists in Treating Children with Autism. *Pakistan Journal of Psychological Research*, *40*(2), 351–372. https://doi.org/10.33824/PJPR.2025.40.2.21.

Arneliza, A., Sutadi, R., Alsa, A., & Yunanto, K. T. (2026). Development and Implementation of Smart Measurement and Evaluation (Smart ME): A Trial-by-Trial Monitoring System for Autism Therapy. *Journal of Culture and Values in Education*, *9*(1), 106–124. https://doi.org/10.46303/jcve.2026.5.

Arunkumar, A. (2023). The significance of imparting life skills education. In Pooja Gupta (Eds.) *Life Skills in Contemporary Education Systems: Exploring Dimensions*. Nova Science Publishers.

Blakemore, S.-J., & Mills, K. L. (2014). Is adolescence a sensitive period for sociocultural processing? *Journal of Child Psychology and Psychiatry*, *55*(9), 926–932. https://doi.org/10.1111/jcpp.12263.

Cengher, M., Budd, A., Farrell, N., & Fienup, D. M. (2018). *A Review of Prompt-Fading Procedures : Implications for Effective and Efficient Skill Acquisition*. 155–173.

Cooper, J. O., Heron, T. E., & Heward, W. L. (2020). *Applied behavior analysis*. Pearson UK.

Corbett, B. A., Muscatello, R. A., Cyperski, M., Sadikova, E., Edmiston, E. K., McGonigle, T. W., Calvosa, R., & Vandekar, S. (2024). Gender diversity in autistic and neurotypical youth over adolescence and puberty: A longitudinal study. *Autism Research*, *17*(7), 1450–1463. https://doi.org/10.1002/aur.3141.

Corbett, B. A., Muscatello, R. A., Kim, A., Vandekar, S., Duffus, S., Sparks, S., & Tanguturi, Y. (2022). Examination of pubertal timing and tempo in females and males with autism spectrum disorder compared to typically developing youth. *Autism Research*, *15*(10), 1894–1908. https://doi.org/10.1002/aur.2786.

Corbett, B. A., Vandekar, S., Muscatello, R. A., & Tanguturi, Y. (2020). Pubertal Timing During Early Adolescence: Advanced Pubertal Onset in Females with Autism Spectrum Disorder. *Autism Research*, *13*(12), 2202–2215. https://doi.org/10.1002/aur.2406.

Cridland, E. K., Jones, S. C., Caputi, P., & Magee, C. A. (2018). Being a girl in a boys' world: Investigating the experiences of girls with autism spectrum disorders during adolescence. *Journal of Autism and Developmental Disorders*, *48*(4), 1261–1274. https://doi.org/10.1007/s10803-017-3366-5.

Cummins, C., Pellicano, E., & Crane, L. (2020). Supporting Minimally Verbal Autistic Girls with Intellectual Disabilities Through Puberty: Perspectives of Parents and Educators. *Journal of Autism and Developmental Disorders*, *50*(7), 2439–2448. https://doi.org/10.1007/s10803-018-3782-8.

Dunkel, L., Saengkaew, T., Howard, S.R. (2024). Disorders of Puberty and Their Management. In: Dattani, M., Maghnie, M. (Eds.) *Paediatric Endocrinology. Endocrinology.* Springer, Cham. https://doi.org/10.1007/978-3-030-23709-7_6.

Dural, Ö., Taş, İ. S., & Akhan, S. E. (2020). Management of Menstrual and Gynecologic Concerns in Girls with Special Needs. *Journal of Clinical Research in Pediatric Endocrinology*, *12*(1), 41–45. https://doi.org/10.4274/jcrpe.galenos.2019.2019.S0174.

Fei, Y. F., Ernst, S. D., Dendrinos, M. L., & Quint, E. H. (2021). Preparing for Puberty in Girls With Special Needs: A Cohort Study of Caregiver Concerns and Patient Outcomes. *Journal of Pediatric and Adolescent Gynecology*, *34*(4), 471–476. https://doi.org/10.1016/j.jpag.2021.03.008.

Groenman, A. P., van der Oord, S., & Geurts, H. M. (2024). Navigating adolescence: pubertal development in autism spectrum conditions and its relation to mental health. *Archives of Women's Mental Health*, *27*(6), 913–921. https://doi.org/10.1007/s00737-023-01414-0.

Hantman, R. M., Johnston, E. B., & Tager-Flusberg, H. (2024). Parental Perspectives: How Sensory Sensitivities Impact the Transition to Adulthood in Adolescents and Young Adults with Autism Spectrum Disorder. *Journal of Autism and Developmental Disorders*, *54*(2), 544–562. https://doi.org/10.1007/s10803-022-05815-5.

Jones, G., Helsley, S., Fox, R., Tumminello, A., Grasso, A., Potter, A. M., Wynarczuk, K., & Reinson, C. (2025). Parent Perspectives: Menstruation and Menstrual Hygiene Management for Autistic Daughters. *The American Journal of Occupational Therapy*, *79*(6), 7906205060. https://doi.org/10.5014/ajot.2025.051141.

Kientz, M., & Dunn, W. (2012). Evaluating the Effectiveness of Contextual Intervention for Adolescents with Autism Spectrum Disorders. *Journal of Occupational Therapy, Schools, & Early Intervention*, *5*(3–4), 196–208. https://doi.org/10.1080/19411243.2012.737271.

Kolb, D. A. (2015). *Experiential Learning: Experience as the Source of Learning and Development*. Pearson Education.

Larson, S. K., Nielsen, S., Hemberger, K., & Klug, M. G. (2021). Addressing Puberty Challenges for Adolescents With Autism Spectrum Disorder: A Survey of Occupational Therapy Practice Trends. *The American Journal of Occupational Therapy*, *75*(3), 7503180020. https://doi.org/10.5014/ajot.2021.040105.

Leaf, J. B., Cihon, J. H., Ferguson, J. L., Leaf, R., & McEachin, J. (2019). Comparing no-no prompt to flexible prompt fading to teach expressive labels to individuals diagnosed with autism spectrum disorder. *Education and Training in Autism and Developmental Disabilities*, *54*(3), 274–287. https://doi.org/10.1177/215416471905400307.

Leal Fuentes, I., Pey Burchard, A., & Troncoso Espinoza, P. (2025). Explorando la salud menstrual en niñas y adolescentes: Una revisión de alcance. *Andes Pediatrica*, *96*(5), 668-681. https://doi.org/10.32641/andespediatr.v96i5.5676.

Long, H., Park, E., Norton, K., Morlino, R., & Herrod, J. (2025). Functional Curriculum and Life Skill Instruction for Students with Extensive Support Needs. In Bakken, J. P. (Eds.) *Handbook for Educating Students with Disabilities.* https://doi.org/10.1007/978-3-031-60258-0_20.

Lundy, K. M., Fischer, A. J., Illapperuma-Wood, C. R., & Schultz, B. (2025). Understanding autistic youths' menstrual product preferences and caregivers' product choices. *Autism*, *29*(2), 447–461. https://doi.org/10.1177/13623613241275280.

Lundy, K. M., Wenzbauer, M. A., Illapperuma, C. R., Fischer, A. J., Feng, M. J., Jensen, R. L., Maldonado, A. F., Mathis, S. N., Meservy, J. O., & Heller, H. N. (2022). Evaluating the Acceptability and Social Validity of a Caregiver-Led Technology-Based Menstrual Hygiene Management Intervention for Youth on the Autism Spectrum. *Advances in Neurodevelopmental Disorders*, *6*(3), 315–330. https://doi.org/10.1007/s41252-022-00261-x.

Manjur, S. Bin, Nur, N. N., Rahman, M. M., Basunia, R., & Khan, M. M. (2021). Educational Web Application for Young People to Raise Awareness on Menstruation. *2021 IEEE World AI IoT Congress (AIIoT)*, 0165–0169. https://doi.org/10.1109/AIIoT52608.2021.9454177.

McGogo, J. (2023). ASD:Adolescents and sexual experiences in rural Mpumalanga. In Clasquin-Johnson, M., Mahlo, D., & Clasquin-Johnson M. (Eds.) *Autism Perspectives from Africa* (Volume I). Rourledge. https://doi.org/10.4324/9781003365631-10.

McMahon, M., Cooney-Miner, D., Bourne, M., & Brown, H. (2025). Pilot educational intervention for the care of adolescents with autism spectrum disorder during puberty. *Journal of the American Association of Nurse Practitioners*, *37*(1), 36–43. https://doi.org/10.1097/JXX.0000000000001033.

McPherson, A. C., King, G., Rudzik, A., Kingsnorth, S., & Gorter, J. W. (2016). Optimizing life success through residential immersive life skills programs for youth with disabilities: study protocol of a mixed-methods, prospective, comparative cohort study. *BMC Pediatrics*, *16*(1), 153. https://doi.org/10.1186/s12887-016-0694-7.

Memarian, A., & Mehrpisheh, S. (2015). Therapeutic and ethical dilemma of puberty and menstruation problems in an intellectually disabled (autistic) female: A case report and review of the literature. *Acta Medica Iranica*, *53*(10), 663–666. https://acta.tums.ac.ir/index.php/acta/article/view/5014.

Muscatello, R. A., Rafatjoo, E., Mirpuri, K. K., Kim, A., Vandekar, S., & Corbett, B. A. (2022). Salivary testosterone in male and female youth with and without autism spectrum disorder: considerations of development, sex, and diagnosis. *Molecular Autism*, *13*(1), 37. https://doi.org/10.1186/s13229-022-00515-4.

Nichols, S., Moravcik, G. M., & Tetenbaum, S. P. (2020). Girls growing up on the autism spectrum: What parents and professionals should know about puberty and adolescence. *Autism Research*, *13*(10), 1732–1743. https://doi.org/10.1002/aur.2350.

Oshinski, M. K., Falcomata, T. S., & Erhard, P. (2023). Interventions to Teach Intimate Care Skills to Individuals with Autism and Other Developmental Disabilities: A Systematic Synthesis of the Literature. *Journal of Developmental and Physical Disabilities*, *35*(5), 709–741. https://doi.org/10.1007/s10882-022-09884-3.

Pyra, E., & Schwarz, W. (2019). Puberty: Normal, Delayed, and Precocious. In Llahana, S., Follin, C., Yedinak, C., Grossman, A. (Eds.) *Advanced Practice in Endocrinology Nursing*. Springer International Publishing. https://doi.org/10.1007/978-3-319-99817-6_4.

Randall, K. N., Hopkins, C. S., & Drew, H. (2024). Menstrual education programs for girls and young women with intellectual and developmental disabilities: A systematic review. *Journal of Applied Research in Intellectual Disabilities*, *37*(4), e13264. https://doi.org/10.1111/jar.13264.

Richards, S. B. (2018). *Single subject research: Applications in educational settings*. Cengage Learning.

Root, A. W. (2005). Sexual Precocity: A Historical Perspective And Update. *Fetal and Pediatric Pathology*, *24*(1), 39–62. https://doi.org/10.1080/15227950590961207.

Ruble, L. A., McDuffie, A., King, A. S., & Lorenz, D. (2021). Caregiver perspectives on puberty-related challenges in adolescents with autism spectrum disorder. *Autism*, *25*(6), 1650–1662. https://doi.org/10.1177/13623613211007029.

Schalock, R. L., Borthwick-Duffy, S. A., Bradley, V. J., Buntinx, W. H. E., Coulter, D. L., Craig, E. M., Gomez, S. C., Lachapelle, Y., Luckasson, R., Reeve, A., Shogren, K. A., Snell, M. E., Spreat, S., Tassé, M. J., & Verdugo, M. A. (2010). *Intellectual disability: Definition, classification, and systems of supports*. American Association on Intellectual and Developmental Disabilities.

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and Quasi-experimental Designs for Generalized Causal Inference*. Houghton Mifflin.

Sommer, M., & Caruso, B. A. (2015). Menstrual hygiene management and WASH. In Bartram, J., Baum, R., Coclanis, P., Gute, D., Kay, D., McFadyen, S., Pond, K., Robertson, W., & Rouse, M. (EDs.) *Routledge Handbook of Water and Health* (pp. 522–530). https://doi.org/10.4324/9781315693606-64.

Sparrow, S. S., Cicchetti, D. V, & Saulnier, C. A. (2016). *Vineland Adaptive Behavior Scales, Third Edition: Manual*. Pearson.

Sutadi, R., Teguh Yunanto, K., Khattak, A. Z., Prasetyo, C., & Arneliza. (2026). Implementation of Smart Discrimination Training to Improve Discrimination Skills in Autism Spectrum Disorder. *Tazkiya Journal of Psychology*, *14*(1), 27-44. https://doi.org/10.15408/tazkiya.v14i1.51035.

Tonder, G. P. Van, Kloppers, M. M., Grosser, M. M., & Knoop, H. H. (2022). Enabling Self-Directed Academic and Personal Wellbeing Through Cognitive Education. *Frontiers in Psychology*, *12*, 789194. https://doi.org/10.3389/fpsyg.2021.789194.

Visser, K., Greaves-Lord, K., Tick, N. T., Verhulst, F. C., Maras, A., & van der Vegt,

E. J. M. (2017). A randomized controlled trial to examine the effects of the Tackling Teenage psychosexual training program for adolescents with autism spectrum disorder. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *58*(7), 840–850. https://doi.org/10.1111/jcpp.12709.

Yilmaz, S., & Kaytez, N. (2025). Experiences of caregivers of adolescent children with intellectual disabilities in menstrual hygiene management: obstacles and needs. *International Journal of Developmental Disabilities*, *71*(7), 1099–1109. https://doi.org/10.1080/20473869.2024.2446349.

Yuwono, I., & Novitasari, S. (2025). *DESIGN SINGLE SUBJECT RESEARCH (Alternatif Metode Penelitian dalam Pendidikan Khusus)*. CV. Bravo Press Indonesia.