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# Behavioral and Cognitive Self-regulation in 3- to 4-year-old Children: A Case Study from the UAE

# التنظيم الذاتي السلوكي والمعرفي لدى الأطفال من عمر ٣ إلى ٤ سنوات: دراسة حالة من دولة الإمارات العربية المتحدة

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## Abstract

Self-regulation is a crucial skill for understanding child development, as it contributes to children's competence, approach, persistence, and overall learning and achievement. We conducted a case study of early self-regulation in seven 3- to 4-year-old children at a nursery in the United Arab Emirates. In an earlier study, this nursery room received high-quality ratings based on an objective and well-established environmental rating scale. In this follow-up study, a new observational measure was used to assess young children's self-regulation during authentic playful activities – the Preschool Situational Self-Regulation Toolkit (PRSIST) assessment. This assessment measures children's overall self-regulation, including its cognitive and behavioral components. Capturing these children's self-regulation aimed to evaluate their ability to manage cognitive and behavioral responses in authentic play-based contexts and to explore how these skills manifest in a high-quality early childhood education setting. The findings highlighted average to high levels of self-regulation among the children studied who were enrolled in this high-quality nursery. This research study contributes evidence to existing data, emphasizing the importance of addressing self-regulation development in early childhood education curricula to potentially enhance the holistic development of young children.

## الملخص

يُعدّ التنظيم الذاتي مهارةً أساسيةً لفهم نمو الطفل، إذ يُساهم في كفاءة الأطفال ونهجهم ومثابرتهم وتعلمهم وإنجازهم بشكل عام أجرينا دراسة حالة حول التنظيم الذاتي المبكر لدى سبعة أطفال تتراوح أعمارهم بين ٣ و٤ سنوات في حضانة بالإمارات العربية المتحدة. في دراسة سابقة، حصلت هذه الحضانة على تقييمات عالية الجودة بناءً على مقياس تقييم بيئي موضوعي وراسخ في هذه الدراسة المتابعة، استُخدم مقياس رصدي جديد لتقييم التنظيم الذاتي للأطفال الصغار أثناء الأنشطة الترفيهية الواقعية - وهو تقييم مجموعة أدوات التنظيم الذاتي الظرفي لمرحلة ما قبل المدرسة .(PRSIST) يقيس هذا التقييم التنظيم الذاتي العام للأطفال، بما في ذلك مكوناته المعرفية والسلوكية يهدف رصد التنظيم الذاتي لهؤلاء الأطفال إلى تقييم قدرتهم على إدارة الاستجابات المعرفية والسلوكية في سياقات اللعب الواقعية، واستكشاف كيفية تجلّي هذه المهارات في بيئة تعليمية عالية الجودة لمرحلة الطفولة المبكرة.

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سلّطت النتائج الضوء على مستويات متوسطة إلى عالية من التنظيم الذاتي بين الأطفال الذين شملتهم الدراسة والذين التحقوا بهذه الحضانة عالية الجودة. تساهم هذه الدراسة البحثية في تقديم الأدلة للبيانات الموجودة، مع التأكيد على أهمية معالجة تطوير التنظيم الذاتي في مناهج التعليم في مرحلة الطفولة المبكرة لتعزيز التنمية الشاملة للأطفال الصغار.

**Keywords:** *Self-regulation, Behavioral self-regulation, Cognitive self-regulation, Early childhood education*

**الكلمات المفتاحية:** التنظيم الذاتي، التنظيم الذاتي السلوكي، التنظيم الذاتي المعرفي، التعليم في مرحلة الطفولة المبكرة

## 1. Introduction

Self-regulation is the ability to control and manage one's behavior in accordance with acceptable and appropriate social norms. Cognitive self-regulation refers to an individual's ability to adjust their behavior and make decisions that align with the situation's requirements (Zhang et al., 2024). Social-emotional self-regulation refers to the ability to suppress negative emotions and manage positive ones through conscious and deliberate reactions, rather than acting abruptly (Ilgar & Karakurt, 2018). Behavioral self-regulation involves behavioral skills such as paying attention, following rules, and restricting inappropriate behavior (Bodrova & Leong, 2018). Ziv *et al.* (2017) summarized the term stating that, "Self-regulation includes a broad set of self-initiated behaviors that aim to regulate and modulate emotional, cognitive, and behavioral arousal through conscious, deliberate, flexible, and effortful inhibitory actions."

The development of self-regulation significantly impacts children's ability to thrive in school and later in life. Mastery of skills such as "social-emotional competence, positive attitudes toward learning, persistence, and attainment of pre-academic milestones" depends on acquiring self-regulation skills (Whitebread et al., 2014). Self-regulation skills are strongly and directly linked to school readiness and effective interactions with others. If essential regulation skills are not developed, individuals are more likely to engage in unhealthy behaviors and conflicts later in life. Conversely, managing and controlling behavior through self-regulation is associated with various positive outcomes, including higher academic achievement, increased school engagement, peer social acceptance, reduced negative behaviors, and healthier eating patterns (Ilgar & Karakurt, 2018).

In Ziv *et al.*'s (2017) study, researchers measured the emotional understanding and emotional control of three-year-old children to predict academic success and socio-emotional problems. The results revealed that higher emotional understanding is linked with greater academic performance. Moreover, better emotional control leads to fewer socio-emotional problems. Housman (2017) tested the association between preschool emotional competence and later social competence. The results showed that expressing and regulating emotions at a young age lead to greater social competence. The inability to self-regulate results in various consequences, including the externalization of problems, which can lead to aggression, impulsivity, and inattention. It is also linked to multiple disorders, such as attention deficit hyperactivity disorder (ADHD) and disruptive behavior disorders (DBD), which stem from deficiencies in

self-regulatory abilities. A lack of self-regulation can also result in the internalization of problems, leading to issues such as anxiety, depression, withdrawal, and somatic complaints. Therefore, self-regulation is essential in supporting children and individuals overall, enhancing their well-being and functioning as members of society (Rahmatullah et al., 2021).

### 1.1. Self-regulation through early experiences

Children begin to use language as a tool to communicate their needs to others. As children grow, internal speech emerges, a sign of the development of adult thought. Furthermore, Piaget explained that a child's interaction with their environment is the essence of developing internal self-regulation. After learning how to regulate behavior as part of a group, individuals can develop the ability to regulate their actions voluntarily (Florez, 2011). According to Bandura (1991), human behavior is regulated by both internal and external factors. Everyone holds the ability to self-reflect and assume control over their reactions and emotions (p. 249). Bandura (1991) also explains the concept of social referential comparisons in which "People must, therefore, evaluate their performances in relation to the attainment of others" (p. 254). When interacting with other people, children begin to relate their standards to those of others. Based on Vygotsky's theory, teachers should create opportunities for social interactions through play and scaffold learners to recognize and respond to social cues. Additionally, Maslow explains that children are naturally self-motivated and enjoy seeking opportunities for growth. Ilgar and Karakurt (2018) write, "If a child grows up being well-nourished, safe, adored, and valued, self-actualization becomes more possible" (p. 60). Children need proper care and attention to reach their full potential.

According to Vygotsky, self-regulation emerges through the involvement in social interactions. The Vygotskian principle outlines the establishment of adult–child and child–child interactions, emphasizing the importance of effective scaffolding during various activities. Such scaffolding techniques should be applied to interactions that occur within the child's zone of proximal development (ZPD) (Alshamsi and Mohebi, 2023). The ZPD is the stage in which the child is given support and guidance until they can perform the task independently (Howard et al., 2019). Vygotsky introduced the concept of other-regulation, which refers to the idea that children can monitor the behaviors of others before they can regulate their own. This phenomenon is evident in young children, who often point out other people's errors and restate rules (UAE Centennial 2071, 2011). According to Bodrova and Leong (2006), "Teachers can use other-regulation to encourage the development of self-regulation by placing children in the position of regulating others" (p. 112). In early childhood, conscious control over actions becomes apparent toward the second year of life. While infants use basic regulation skills to perform self-soothing behaviors, it is later that they begin exhibiting self-directed actions such as moving from one part of the room to another to obtain a specific object (Bodrova & Leong, 2006).

One brain region that helps maintain a balance between logical thought and emotional impulses is the anterior cingulate, situated between the prefrontal cortex and other areas of the brain involved in emotional responses. The upper part of the anterior cingulate is activated between the ages of three and six, enabling children to become more patient in waiting for rewards and more adept at suppressing impulses (Cryer et al., 2005). The frontal part of the brain plays a crucial role in exerting control and helps suppress overly emotional and impulsive responses.

Toddlers start to regulate their behaviors with guidance from caregivers. According to Ziv *et al.* (2017), this is referred to as "guided self-regulation" (p. 6). Therefore, the caregiver's role is a crucial factor in developing a child's self-regulation skills. Abraham Maslow's hierarchy of needs describes the social stage of a child's life as one where "A child learns socially acceptable behavior from his caregivers and often imitates their behaviors" (Von Suchodoletz et al., 2015). At two years of age, actions become more voluntary and controlled. Children become mindful of other people's demands. By the third year of life, children begin to distinguish right from wrong in terms of acceptable standards and can monitor their behavior internally (Al-Qinneh and Abu-Ayyash, 2022). Notably, children at this age tend to respond better when asked to inhibit their responses, as opposed to engaging in an unwanted task, indicating that the ability to suppress emotions emerges earlier than the ability to execute unpleasant tasks. After the age of three, children can perform self-regulation more effectively. Based on the cognitive perspective of self-regulation, the early childhood stage, from ages three to seven, is when children become more objective and can understand their skills, indicating signs of metacognitive thinking. The ability to monitor cognitive behavior is known as executive functions (EF) and involves children's capacity to achieve a targeted goal (Bodrova & Leong, 2006). There are three main brain functions of EF. First, inhibition consists of refraining from acting in an overly emotional manner. Second, working memory involves recalling information and using that memory to guide subsequent actions. Lastly, shifting refers to the ability to efficiently switch one's attention from one task to another (O'Shea, 2011). The relationship between self-regulation and EF highlights the necessity for executive skills in children to act in a controlled and adaptive manner (Bodrova & Leong, 2006). From a socio-emotional perspective, children at the age of four can start to respond to social norms and behave more consciously. Furthermore, children aged three to six are in a developmental phase where their understanding of emotions and self-control is advancing. Thus, it is a crucial period in the development of self-regulation (Bodrova & Leong, 2006).

## 1.2. Impact of ECE's quality on self-regulation

Children in kindergarten typically engage in open-ended play, which may be less effective at developing discipline and self-regulation. To foster self-regulatory skills, teachers should involve children in games

that adhere to a set of complex rules, which contribute to the development of abilities that enhance self-regulation (Howard et al., 2019). As children engage in play, they learn valuable skills that support self-regulation, such as following instructions and taking turns (Von Suchodoletz et al., 2015). Therefore, early childhood centers must be equipped with sufficient tools to facilitate these activities. The quality of an early childhood education center (ECEC) is determined by two key indicators: structural and process quality indicators. Structural quality explores the attributes of an ECE setting. It includes factors such as "Staff/child ratio, group size, teacher qualifications and training, stability of staffing, staff wages, indoor and outdoor play provision, health and safety, scheduling of time, meeting of staff needs, curriculum, educational space, and materials (Whitebread et al., 2014). Process quality refers to a child's social, emotional, and physical interactions within the ECE setting, including interactions with peers, teachers, and materials (Whitebread et al., 2014). According to Whitebread *et al.* (2014), "A child who experiences high-quality ECE processes is thought to reap the benefits of superior language, intellectual, and physical development as well as advanced social skills and self-regulatory abilities" (p. 26). Furthermore, delinquency and poor academic performance are often linked with low-quality childhood care (Whitebread et al., 2014).

Studies have shown that children aged 3–5 who engage in playful and collaborative activities exhibit metacognitive and self-regulatory abilities, including both self-monitoring and control behaviors that support cognitive activity. Such practices include constructional activities, creating scenarios using action figures, and role-playing (Whitebread et al., 2014). Studies have shown a relationship between play opportunities, self-regulation, learning, and development (Zhang, 2025). A study in the United States highlighted a strong link between vocabulary size and a range of self-regulatory abilities. Such developments are dependent on high-quality ECE. Moreover, "Children who attend preschools based predominantly upon models emphasizing structured play rather than academic outcomes have been found to achieve higher scores on measures of self-regulation" (Whitebread et al., 2014).

Various studies have confirmed the benefit of early interventions and high-quality childhood care (Alsheikh et al., 2025). The High/Scope Perry Preschool Project, an early childhood intervention program, was conducted as a part of a study to monitor how young children's early experiences affect their behavior later in life. The study examined social responsibility, scholastic achievement, and socioeconomic success in children from low socioeconomic backgrounds (Osegbue, 2025). After following up with participants as they grew older, the study compared the results of those in the control group with those who underwent the intervention program. It was revealed that those who received the interventions showed lower scores for misconduct, violent behavior, incidence, property damage, and police contacts. Furthermore, participants showed better academic performance and socioeconomic success (O'Shea, 2011). The study suggests that the higher the quality of a child's experiences during their childhood, the greater the likelihood that they will be successful as adults. Moreover, sustaining high-quality early care would serve society far more economically and socially than creating specialized intervention programs that target older individuals who are affected by low-quality childhood care (Florez, 2011).

### 1.3. Role of teachers in developing young children's self-regulation

Teachers are responsible for nurturing children's ability to self-regulate. There are specific ways to foster self-regulation skills (Alsheikh et al., 2025). First, children should be guided to exhibit appropriate behavior. For example, teachers should encourage students to demonstrate the desired behavior instead of simply telling them to stop unwanted actions. Children should be encouraged to express their feelings. Teachers should announce transitions and routine changes in advance and must redirect negative behavior when it occurs. Finally, children should be offered chances to engage in play (Ziv et al., 2017). As children self-regulate, they cultivate skills such as those stated by Widiastuti (2017), "concentrating, sharing, taking turns and moving from depending on others to beginning to manage by themselves" (p. 42). According to Bodrova and Leong (2008), several strategies can be employed by teachers to develop self-regulation. For instance, children can practice deliberate behaviors such as "repeated switching from one set of rules to another or resisting temptation to function on autopilot" (p. 2). Another strategy is to create opportunities for children to follow rules and apply them in new situations. In addition, it is essential to provide constant visual and tangible reminders to children, as it is more likely to be instilled in their memory.

The findings from a context-specific model of self-regulation indicate that self-regulation mechanisms can be selectively adapted to the behavioral demands of specific task environments. In response to varying expectations and aims within a particular setting, self-regulatory behaviors may manifest differently across different contexts. For instance, performance-based tests measure self-regulation in a highly structured one-on-one environment (Hojeij et al., 2021). In contrast, informant evaluations rely on observations of how self-regulation abilities are utilized independently in situations where external assistance is limited. Consequently, failure in performance-based tasks does not always indicate failure in everyday situations that require self-regulation, and vice versa (Zhang et al., 2024). These findings support the notion that various types of assessments evaluate distinct processes and behavioral correlations related to self-regulation across diverse scenarios to some extent. Therefore, future research may benefit from incorporating a variety of self-regulation measures in each scenario (Ziv et al., 2017).

This research aimed to investigate the level of self-regulation exhibited by 3–to 4-year-old children enrolled in a high-quality nursery in the UAE.

## 2. Methodology

This section outlines the methodology used in the study, providing details about the participants and settings, measures, data collection, and limitations.

## 2.1. Original research methodology

In light of the spread of the Coronavirus, the research team had to adjust the methodology and use the results of the main study, which measured the quality of ECECs in Ras Al-Khaimah (RAK), to categorize nurseries into high, medium, and low-quality centers (Verma et al., 2022). The original plan was to perform the study at nurseries within the Sharjah Emirate. However, due to COVID-19 restrictions and the availability of previously collected data on nurseries in RAK, it was decided to amend the study population, sample, and collect data from nurseries based in RAK. The sample was aimed at licensed private or government nurseries/ECECs/pre-kindergartens located in RAK. Random sampling was to be used to select five nurseries/ECECs/pre-kindergartens evaluated as high, good, or low quality, including 10 young children (5 boys and 5 girls) aged 3–4 years, randomly selected from each nursery/ECECs/pre-kindergartens. Five nurseries were contacted, and only one agreed to participate in this research, which was identified as a good-quality nursery in the main study (Verma et al., 2022). Thus, the number of nurseries and the scope of data collection were reduced as the research team gained access to conduct a study in only one nursery, which highlights the extreme challenges faced by researchers in conducting this study.

## 2.2. Ethical considerations

The study was conducted in accordance with the Declaration of Helsinki and was approved by the Higher Colleges of Technology. Informed consent was obtained from all subjects involved in the study.

## 2.3. Participants and nursery characteristics

Seven children, aged 3.2 to 4.6 years (four girls and three boys), participated in this study. They came from various nationalities, including British, Korean, Filipino, South African, Emirati, Finnish, and Malaysian, and they all speak different languages.

The nursery located in the northern Emirate of the UAE – RAK – has been established since 2012 and follows the Early Years Foundation Stage British curriculum. The medium of instruction is English, and the nursery has a standalone structure. The adult-to-child ratio is 8:1. Children are in the age groups from 45 days to 4 years and represent diverse nationalities. Most teachers hold a bachelor's degree and a Childcare Professional License. There are four classrooms in the nursery (one playgroup), with a total of four teachers and ten teaching assistants. The male-to-female ratio in the classrooms averages four males to six females for the older children.

## 2.4. Measures

### 2.4.1. Preschool Situational Self-Regulation Toolkit (PRSIST)

The Preschool Situational Self-Regulation Toolkit (PRSIST; Howard et al., 2019) assessment engages children in two authentic, play-based activities, administered in both small-group and individual formats. The first activity is the Memory Card game, which can be played with two to four players. In this game, children take turns identifying two matching pairs from an array of face-down cards. The second activity is the Curiosity Box challenge, which is performed individually. Children are presented with three boxes of increasing sizes and must follow a series of steps to guess what is inside (e.g., guess based on size – no touching; guess based on weight – no shaking; guess based on sound – no opening; guess based on touching with eyes closed – no peeking), without skipping or contravening instructions. At the end of each activity, children are evaluated using the nine-item PRSIST rating scale, which identifies core cognitive and behavioral self-regulation responses and situates the child's performance along a seven-point scale for each of these. Activity administration and ratings were performed by trained teachers. PRSIST offers significant benefits and opportunities over existing instruments. These include: (1) the ability to distinguish between discrete dimensions of self-regulation, as opposed to a single self-regulation index; and (2) authenticity of self-regulatory situations and behaviors assessed. Item ratings were averaged to generate an overall self-regulation index (out of seven, where higher scores denote higher self-regulation) and separate cognitive and behavioral self-regulation indices.

(i) PRSIST training and reliability

After discussing the data collection plans with nursery managers, including an offer to have the research team collect data from children via Zoom meetings, we decided that the best approach was to train nursery teachers to use the tool for data collection. Before the training sessions began, the assistant researcher completed online training to use the PRSIST tool, and an assessment was conducted to ensure a reliability standard of at least 86%. Subsequently, training sessions were conducted via Zoom, demonstrating the two main activities and showing teachers videos on how to apply the rules of each activity. Moreover, teachers were guided through the online assessment by watching videos of children and scoring them using the PRSIST score sheet. After adequate training, two teachers achieved scores of 100% based on established standards of reliability (Howard et al., 2019).

(ii) PRSIST memory game activity

In the memory card game activity, a group of four children sat around a table with the activity facilitator (observer) and were taught how to play the memory card game. The instructions focused on relaying and demonstrating essential aspects of the activity, such as what a pair is; that two cards must be flipped

over to try to find a pair; that if a pair is found, you get to keep it and take another turn; and that if a pair is not found, it is the turn of the next person. The number of pairings increased with the children's age (6 pairs for three-year-olds, 8 pairs for four-year-olds, and 14 pairs for five-year-olds), and the game took approximately 10 minutes to complete. The facilitator offered minimal support throughout the exercise, intervening only, when necessary, to ensure that students had sufficient time to attempt problem-solving on their own. As a memory aid, the facilitator took brief notes during the activity and then completed the rating scale for each child at the end. According to Howard *et al.* (2019), this activity is both a play and learning experience as it integrates curricular elements such as numeracy skills, also serving as an evaluation that provides information on children's development of self-regulation.

(iii) PRSIST curiosity box activity

The Curiosity Box activity was conducted individually, where children were given a succession of three boxes, each one larger than the last, and asked to predict their contents. The observer first instructed the child to estimate based only on the box's size (no touching); second, guess after gently lifting the box to feel its weight (no shaking); third, guess after shaking the box (no opening); and last, guess after shutting your eyes and feeling the item within (no peeking). Like the previous activity, the observer gave the children enough time to engage freely and only intervened when necessary. The task took around 5 minutes to complete. At the end of the activity, the facilitator rated the child's behavior on the PRSIST scale (Howard et al., 2019).

(iv) Procedure

All tasks were administered to children in a quiet area of their classroom across two sessions on the same day, to maximize attention and minimize fatigue. Measures were administered in the same order to all children, as follows: (1) PRSIST memory activity and (2) PRSIST curiosity boxes. Both activities were conducted by the same teacher to remove opportunities for inter-rater reliability issues. The other teacher made notes and assigned scores to the individual and group performance of the children. Each session took 5–20 minutes to complete, with at least a 30-minute break between sessions (Howard et al., 2019).

(v) ECERS-R

The Early Childhood Environmental Rating Scale-Revised Edition (ECERS-R) was used to assess the nursery's environment, spatial, programmatic, and interpersonal quality. This tool employs observation methods to rate each of the 43 items categorized under seven subscales: space and furnishings, personal care routines, language-reasoning, activities, interaction, program structure, and parents and staff [30]. Each item is arranged as a seven-point scale with descriptors for 1 (inadequate), 3 (minimal), 5 (good), and 7 (excellent). Levels of program quality are based on current definitions of best practice and research that relates practice to child outcomes [26]. The nursery where data were collected for this study received a

rating of 5.14 (good), and more details are provided in the results section. This nursery was awarded a subscale rating of 3.8 (space and furnishings), 4.4 (personal care routines), 6.0 (language-reasoning), 3.7 (activities), 7.0 (interactions), 7.0 (program structure), and 4.2 (parents and staff).

## 2.5. Data collection

Several obstacles arose during the data collection process, preventing the implementation of the PRSIST tool as planned. As a result of the pandemic, the local authorities had enforced several safety-related laws and regulations. Visitors and researchers were thus prohibited from entering nursery grounds. Complications arose due to the requirement to engage with pupils face-to-face in order to gather sufficient data. The only feasible solution was to train two nursery teachers to use the PRSIST tool and have them conduct the activities in the classroom themselves, collecting data from seven research participants. In addition, the teachers received note-taking sheets that allowed them to describe students' behaviors, thus providing the researchers with qualitative data that helped with the analysis of the scores.

## 2.6. Data analysis

According to PRSIST data analysis guidelines, students' self-regulation was assessed by observing their behaviors during two activities and assigning a score from one to seven for each of the nine items. There are three overall scores: cognitive self-regulation, behavioral self-regulation, and overall self-regulation. Before calculating the subscales or overall scores, the item scores from the two activities must be averaged. For instance, the average of item one would be the combined average scores from both activities.

## 2.7. Limitations

Several challenges were faced during this research project. The researchers were unable to follow the original research methodology and thus presented their results as a case study. The main obstacle was the COVID-19 pandemic, which caused many nurseries to shut down temporarily and some to be permanently closed, as well as post-COVID safety regulations. Even with PCR testing and vaccine results, the education authorities had set strict regulations on external visitors entering the nursery. However, many nurseries refused due to excessive teaching workloads, resulting in data collection from only a subset of nurseries. As a result, the research team trained two nursery teachers on achieving PRSIST observer reliability, which enabled them to conduct assessments independently.

# 3. Results

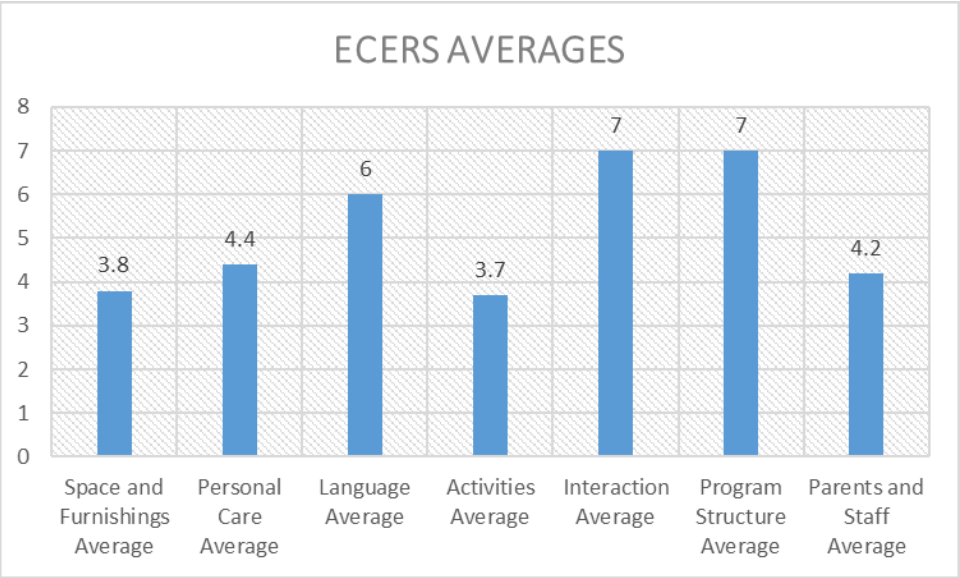
This section outlines key findings of this self-regulation case study. The study collected and analyzed data from seven 3- to 4-year-old children enrolled in a nursery located in Ras Al Khaimah. The results are organized below according to the tools used to measure the nursery's structural and process quality and self-regulation, namely ECERS-R and PRSIST, respectively. The overall PRSIST scores of seven children are presented next. Each child's performance on the Memory Card Game and Curiosity Box is provided along with detailed teacher–child conversation scripts for each child. Lastly, the cognitive and behavioral self-regulation performance of children is discussed based on teachers' notes. As highlighted in the study's findings, the names of seven children who participated in various activities have been represented by acronyms: M.T., E.B., M.O., E.H., A.C., L.K., and H.M.V., to maintain anonymity in the analyzed results.

## 3.1. ECERS-R result of the nursery

The nursery study attained an overall ECERS-R score of 5.14, indicating good quality (Figure **1**).

**Figure 1**

*Nursery ECERS-R average scores.*




Based on the average subscale scores for the ECERS-R Scale, the first aspect is that of Space and Furnishings, which can be seen as having an average ranking of 3.8. This indicates that the quality of the space and furnishings falls within the range of minimal to good. Various factors that needed improvement were related to aspects such as the presence of furniture for the relaxation of students, which would further increase their interaction levels. Along with this, private space was another spatial aspect that could be improved to support the students, such as providing them with space for discussion and relaxation. The

presence of space would also help facilitate more activities in the class and allow students to undertake various preparations.

In the case of Personal Care Routines, the average ECERS-R score was 4.4, indicating a range between a minimal and good rating. Specific improvements can be made in terms of the health practices observed in the nursery, including the presence of nap time, as well as the safety practices that are necessary. The need for a nap and rest time is essential, as it helps ensure that students have adequate time to recover and exhibit positive behaviors in class.

Along with other factors, the average score for Language Reasoning was 6, indicating that this parameter fell within the range of good to excellent. The improvement, however, needs to be made in terms of books and the availability of pictures, which would help ensure that the development of language skills would be more efficient.

The average scores for Activities were at 4, indicating a minimal to a good level of activities offered to children. It was observed that specific improvements could be made in various aspects, such as incorporating music and movement into the nursery, which would enable children to learn more effectively. Improvements to factors such as dramatic play would also help ensure a considerable level of interaction and creativity among students. Following this, activities such as preparing charts or models to learn about nature and science are also areas that need improvement, with the right resources being made available to the nursery. Ensuring that aspects such as sand or clay are made available to students would allow them to engage in higher-level activities involving an understanding of nature.

The Interaction activities provided an average score of 7, indicating that this parameter was excellent in the nursery. Various factors, including supervision of motor activities, supervision of children, discipline levels, staff–child interaction, and interaction among children, were observed to be highly promoted in the nursery, with all factors generating an excellent score. Maintaining these excellent scores of interactions is highly essential, as it helps ensure that the different needs of students can be understood and the proper teaching and interactive approaches can be developed.

Furthermore, the Program Structure average scores stood at 7, indicating that all factors relating to free schedule, free play, and group time demonstrated excellent quality. However, there was a strong need to ensure that aspects such as the right provision were in place to support students with disabilities in the nursery, as currently, there was no provision for this. Introducing such support systems is essential, as it would further help enhance the level of equal teaching and interaction offered to children with different abilities and learning patterns.

Lastly, in the case of Parents and Staff, it was observed that the average score was 4.2, indicating that this parameter fell within the minimal to good range. Various factors need improvement to enhance the score, such as enhancing the provision of personal needs for staff, as well as ensuring correct evaluation and supervision for staff. This was an essential factor, as providing the proper provisions would help ensure

that staff productivity is enhanced and the efficiency with which they carry out tasks in the organization is significantly improved.

## 3.2. PRSIST overall results

The overall results were categorized based on the average cognitive self-regulation, average behavioral self-regulation, and the overall self-regulation of the child. The outcomes of the memory game and curiosity boxes exercises generated two aspects that could be measured with reliability. These include cognitive self-regulation, which includes items such as attention/distraction, engagement, thought/planning, self-direction, and helpfulness; and behavioral self-regulation, which includes items such as behavioral control, fidgeting, adhering to social conventions, and resisting strong emotional impulses (Howard et al., 2019). The results from the good-quality nursery were generally high, with the students who were assessed receiving an average of 5.9. Therefore, the students in this nursery are in the range of moderately self-regulated to highly self-regulated. When calculating the sub-scores, the average cognitive self-regulation came out to be 5.7, indicating that the children are considerably self-regulated. The average of the behavioral self-regulation scores was 6.3, which falls between the categories of very self-regulated and highly self-regulated. Furthermore, as evident from the graphs (Figures **2**–**4**), it can be observed that the students' overall average behavioral self-regulation is higher compared to their cognitive self-regulation. Through this, it can also be identified that within the nursery environment, students are subject to a higher level of behavioral self-regulation as compared to cognitive self-regulation. In addition to this, the scores indicate that students demonstrate higher scores when it comes to the regulation of physical behavior and movement as compared to cognitive response, initiative, and understanding of activities in the environment.

## 3.3. PRSIST results per child

The memory card game score averages for each child indicate the average behavioral self-regulation score, whereas the curiosity box game scores averages indicate the average cognitive self-regulation score.

### 3.3.1. Child 1 (M.T.)

Child M.T. demonstrates an overall higher level of behavioral self-regulation at 6.5 as compared to a cognitive self-regulation value at 5.7. This could be due to a higher need that prompted the student to carry out activities as part of the curiosity box game.

**Figure 2**

*Average cognitive self-regulation PRSIST scores.*

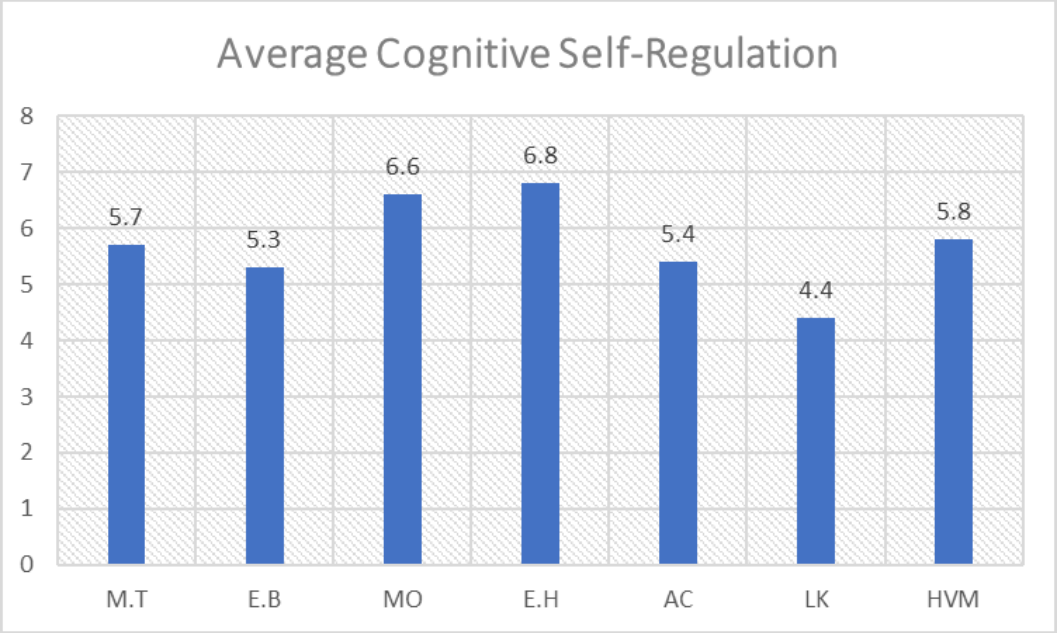
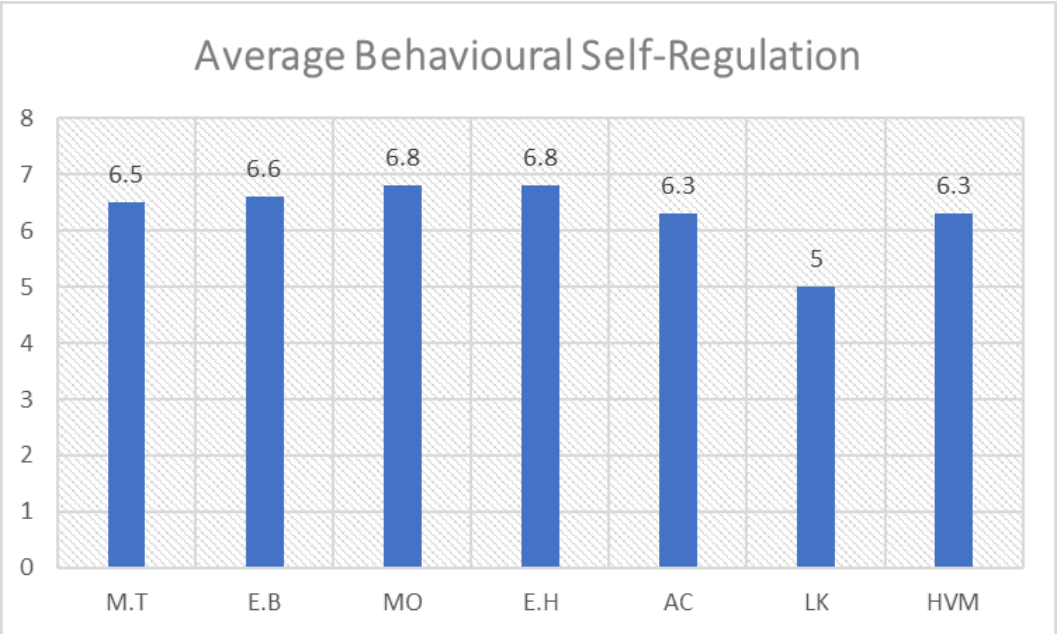



**Figure 3**

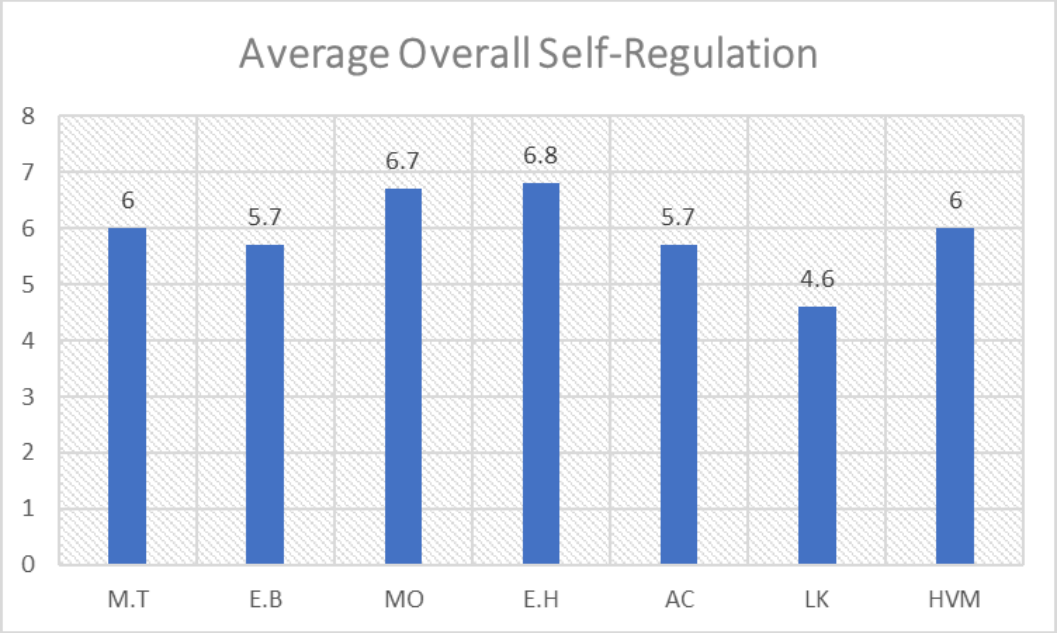
*Average behavioral self-regulation PRSIST scores.*




**Memory card game:** The student was somewhat distracted while providing instructions, so they had to be repeated several times. However, the students remained quite engaged throughout the activity, asking questions and interacting with other students as well. The student did not exhibit strong regulation in terms of planning, as she consistently picked the same cards. Additionally, the student needed help

**Figure 4**

*Average overall self-regulation PRSIST scores.*




recognizing when it was her turn and required prompting to select a card. Nevertheless, she ensured that she listened carefully throughout the class and demonstrated strong listening skills, as she was asked only once to pay attention. The student did show some fidgeting but sat quietly when prompted. Furthermore, she attempted to assist her friends during the game and encouraged them to flip the cards. The student indicated a score of 6.5 in behavioral self-regulation, meaning that she was quite self-regulated. She was unable to achieve a score of 7, indicating high self-regulation, due to some instances of fidgeting and distraction.

*Teacher: We are going to flip cards for this game. Remember, you must flip two cards at one time, and if you find the exact pair, you get another turn. Okay?*

*Student (M.T.): Yes teacher.*

*Teacher: Now, M.T., flip the card please.*

*Student: (Flips card)*

*Teacher: Oh, this is not a pair. So, M.T., should we give your friend a chance?*

*Student: Okay, can I go play with my friend now? (Hesitates to sit in place.)*

*Teacher: No, you have to sit here and see how to flip the cards. It is very interesting!*

*Student: Okay, I will do that. (Eagerly waits for another student to pick the card.)*

**Curiosity box:** The student paid attention throughout the activity but demonstrated a slight distraction when given instructions not to shake the box. The student was also highly engaged in observing the box. Regarding the child being thoughtful and planful before acting, the student demonstrated considerable

thoughtfulness in their decision-making during the activity. It was observed that the student was quite self-directed and needed prompting only once or twice while completing the activity. The student also maintained strong focus on the task and adhered to the rules without distractions. Despite being distracted by others, the student chose not to fidget and continued with the activity. In terms of responses, the student answered all questions. Finally, the student repeatedly attempted to guess which item was in the box. Consequently, the student achieved a score of 5.7 in cognitive self-regulation, indicating a significant level of self-regulation. Observation also suggests that a full score of 7 could not be attained since the student exhibited some distraction and required prompts to engage with the activity as part of the game.

The sample of the conversation that was carried out with the student can be seen below:

*Teacher: We are going to guess what is inside each of these boxes. Remember, you have to follow the instructions I give to guess what is inside each box. Okay?*

*Student (M.T.): Yes teacher.*

*Teacher: Now, I want you to guess what is inside the box by touching it only.*

*Student: Can I open the box and see, please?*

*Teacher: Remember, you should not shake or open the box. You can only touch it and guess what is inside.*

*Student: Does it have a book inside? (Distracted by another student, but does not respond to him.)*

*Teacher: No, but you can still guess again!*

*Student: I think it has a stuffed toy. (Tries to pick up and shake the box.)*

*Teacher: No, it does not. But remember, you have to guess without shaking the box and only by touching it.*

*Student: It has color pencils.*

*Teacher: (Opens box and shows) Yes! That's right, good guess. Now, can you tell me which color pencils are these?*

*Student: These are green, yellow, blue, and red.*

### 3.3.2. Child 2 (E.B.)

Child E.B. demonstrates an overall higher level of behavioral self-regulation at 6.6 as compared to a cognitive self-regulation value at 5.3. The lower cognitive self-regulation can be linked to increased fidgeting and asking questions during the activities.

**Memory card game:** In the memory game, it was observed that the student demonstrated a strong level of accuracy when listening to the instructions and remained undistracted. Additionally, it was noted how E.B. was thoroughly engaged throughout the entire duration of the activity. Following this, it was also observed that the student was thoughtful during the game and remembered the initial activity, indicating

strong planning. Furthermore, it was observed that the student displayed a high level of independence and showed significant direction in the activities performed. Among other aspects, it was apparent how the student made considerable efforts to listen to others and manage their behavior. They did not fidget and behaved well in the classroom. However, it was noted that the student needed prompting to ask questions of the teacher and their peers. Lastly, it was seen how the student was somewhat shy and required encouragement to ask questions, often waiting until structured prompts were provided. The behavioral self-regulation score for the student was 6.6, indicating very good self-regulation with certain areas for improvement, such as being encouraged to take initiative in class and ask questions.

*Teacher: We are going to flip cards for this game. Remember, you have to flip two cards at one time, and if you find the exact pair, you get another turn. Okay?*

*Student (E.B.): Okay teacher, I will do that.*

*Teacher: Now, E.B., flip the cards that you can see in front of you.*

*Student: Should I flip one or two?*

*Teacher: You have to flip two cards, and they should match.*

*Student: Flips card. (Matching pair appears.)*

*Teacher: That's excellent! Now you get a chance to flip another pair.*

*Student: But can my friend flip next? I already did it.*

*Teacher: Your friend can flip the card later. As you got a pair when you flipped the first time, you get a chance to do it again! That is good, yes?*

*Student: Okay! (Excited and flips cards.)*

**Curiosity box:** E.B., as a student, was very good at listening to the instructions and following them, indicating a strong level of attention and direction during the activity. The child was also highly involved in the activity being carried out and waited till the next steps were presented as a part of the activity. In addition, it was observed that the child was thoughtful and planful before taking any action, as evidenced by their attempts to guess what was in the box. Following this, it was observed that the student exhibited a considerable level of self-direction and engagement in the activities, as the child had to be prompted to carry out the task of shaking the box. The student was also very good at controlling their behavior and staying within the rules of the activity provided to them. Furthermore, the student was also very peaceful in the seat and was less fidgety than expected, considering the classroom regulations. Additionally, it was observed how the child followed the conventions of her social environment and asked questions when needed, as well as posed a few questions herself. Lastly, it was seen how the student demonstrated a considerable level of self-regulation in terms of constantly making guesses, but required a certain level of promptness in the initial stages. The cognitive self-regulation score was at 5.7, indicating considerable self-regulation, with areas of improvement identified, such as reducing fidgeting and asking more questions during the activity.

*Teacher: We are going to guess what is inside each of these boxes. Remember, you have to follow the instructions I give to guess what is inside each box. Okay?*

*Student (E.B.): Okay.*

*Teacher: Now, I want you to guess what is inside the box by touching it only.*

*Student: Okay.*

*Teacher: Remember, you should not shake or open the box. You can only touch it and guess what is inside.*

*Student: Okay. (Does not initially shake box.)*

*Teacher: E.B., you can touch this box and guess.*

*Student: Okay, is it a ball?*

*Teacher: No, can you guess again?*

*Student: It has a book.*

*Teacher: (Opens box and shows.) Yes! That's right, good guess. Now, can you tell me what story book this is?*

*Student: (Takes a minute to respond.) Is this Hansel and Gretel?*

*Teacher: Yes, that's right!*

### 3.3.3. Child 3 (M.O.)

Child M.O. exhibits a higher level of behavioral self-regulation at 6.8 compared to a cognitive self-regulation value of 6.6. The lower cognitive self-regulation may be linked to an increased need to prompt the child to respond to questions during activities.

**Memory card game:** As observed during the activity, the student showed undivided attention while completing the tasks and responded adequately to the questions posed by the teachers. It was evident that the student required planning and support to ensure he followed the directions while also understanding his next move. The student demonstrated a strong understanding of the rules and was rarely distracted, despite attempts by his friends to distract him. Additionally, the student remained seated and did not fidget, demonstrating focus on the activities and refraining from interrupting others while they spoke. As a result, the students also encouraged others to flip the cards when needed. In terms of behavioral self-regulation, the student scored 6.8, indicating high self-regulation, as he remained focused, carried out activities effectively, and made thoughtful moves.

*Teacher: We are going to flip cards for this game. Remember you have to flip two cards at one time and if you find the exact pair, you get another turn. Okay?*

*Student (M.O.): Okay teacher, I will do that.*

*Teacher: Now, M.O., flip the cards that you can see in front of you.*

*Student: Okay, I will flip these two cards. (Flips card.)*

*Teacher: (Sees a pair.) That is amazing, you got a pair! Do you know what that means?*

*Student: Yes, I get to flip another pair of cards. Right, teacher?*

*Teacher: Yes, now you get a chance to flip another pair.*

*Student: Okay, I will flip these two now.*

*Teacher: Oh! This time it is not a pair. Now your friend gets a chance to do it. Okay?*

*Student: Okay, I will flip next time again. (Remains seated and observes friend.)*

**Curiosity box:** The student maintained eye contact throughout the class, indicating strong attention and the elimination of distractions. It was also observed that the student remained well-engaged throughout the duration and paid attention to all instructions, indicating strong engagement. The student also demonstrated thoughtfulness and planning since he was careful with every move. In addition to this, in terms of self-direction, the student was good at knowing when to take turns and what move to take next. Further, the child was also able to strongly control his behavior and stay within the rules of the game. It was also observed that the student did not exhibit any form of fidgeting and remained peacefully seated. However, the child required specific prompts to ask the questions. Furthermore, the student was also willing to risk being wrong and demonstrated courage by making different guesses each time. The cognitive self-regulation score of the student was 6.6, indicating scope for improvement, particularly in terms of the student asking more questions during the classroom session.

*Teacher: We are going to guess what is inside each of these boxes. Remember, you have to follow the instructions I give to guess what is inside each box. Okay?*

*Student (M.O.): Okay, teacher, I will do that.*

*Teacher: Now, I want you to guess what is inside the box by touching it only.*

*Student: Okay, sure. (Tried to pick and shake the box.)*

*Teacher: Remember, you should not shake or open the box. You can only touch it and guess what is inside.*

*Student: Okay. (Tries to open the box and fidgets in the seat for a while.)*

*Teacher: M.O., you are not supposed to open or shake the box. But only touch and guess.*

*Student: Okay, I think it is a toy.*

*Teacher: No, can you guess again?*

*Student: Is that building blocks?*

*Teacher: (Opens box and shows.) Yes! Now, what color can you guess of the building blocks?*

*Student: (Takes a minute to respond and fidgets.) I think it is yellow.*

*Teacher: Yes, that's right!*

### 3.3.4. Child 4 (E.H.)

Child E.H. demonstrates an overall higher level of behavioral self-regulation at 6.8 as compared to a cognitive self-regulation value at 6.8. The lower cognitive self-regulation can be linked to limited instances of fidgeting demonstrated by the child.

**Memory card game:** In terms of the memory card game, the student demonstrated complete focus on the instructions and was highly engaged, responding to any questions that were asked of her. In addition to this, the student was also very thoughtful and had planned which cards to pick, along with a strong awareness of the activity rules. Additionally, the student controlled her behavior and resisted any distractions. Furthermore, the student mostly remained in her seat, occasionally engaging in fidgeting and distraction. The student also adhered to social conventions by refraining from speaking when someone else was talking and strongly encouraged other students to follow the steps in the game. The student's score in terms of behavioral self-regulation was 6.8, indicating high self-regulation due to their effective execution of activities, ability to remain focused, and support for others.

*Teacher: We are going to flip cards for this game. Remember you have to flip two cards at one time and if you find the exact pair, you get another turn. Okay?*

*Student (E.H.): Okay.*

*Teacher: Now, E.H., flip the cards that you can see in front of you.*

*Student: Okay, teacher. (Flips cards.)*

*Teacher: Oh, that is not a pair. Would you like to give your friend a chance to flip the cards now?*

*Student: Okay, can I help him flip the card?*

*Teacher: Yes, you can help him choose to flip the card.*

*Student: Try this one. (Helps and talks slowly to the child sitting next to her.)*

**Curiosity box:** Initially, the student was very focused on listening to the teacher's instructions and was less distracted. It was also observed that the student remained highly engaged throughout and maintained eye contact with the teacher. Furthermore, the students also waited for the instructions and demonstrated strong planning skills in their activities. It was also observed that the student was good at knowing when her turn was and asked multiple questions to the teacher. The students also refrained from distracting anyone and stayed within the classroom rules. However, the student demonstrated some fidgeting but stopped it after being prompted once. Interaction was high with the students, with responses provided to the teacher and frequent questions being asked. The student was also good at allowing herself to make wrong guesses and demonstrated positivity, along with a willingness to take risks. She had a score of 6.8, indicating high self-regulation due to strong engagement, interaction, and adherence to instructions.

*Teacher: We are going to guess what is inside each of these boxes. Remember, you have to follow the instructions I give to guess what is inside each box. Okay?*

*Student (E.H.): Okay, I will touch the box now.*

*Teacher: Remember, you should not shake or open the box. You can only touch it and guess what is inside.*

*Student: Okay. (Tries to touch box for 2-3 minutes.)*

*Student: Okay, I think it is a book.*

*Teacher: No, can you guess again?*

*Student: Yes, I can, is it color pencils?*

*Teacher: (Opens box and shows.) Yes! Now, what is your favorite color in this?*

*Student: I like blue and red.*

*Teacher: That's great!*

*Student: Thank you, I want to play again!*

### 3.3.5. Child 5 (A.C.)

Child A.C. demonstrates an overall higher level of behavioral self-regulation at 6.3 as compared to a cognitive self-regulation value at 5.4. Lower cognitive self-regulation can be linked to the child's low willingness to take risks, as well as the promotion required.

**Memory card game:** As identified during the activity, the student had a few attention issues and often turned around to look at what her classmates were doing. The student, however, was highly engaged in the game and was focused throughout its duration. In terms of planning the next moves, although the student had to be prompted a few times to try the challenge, she demonstrated understanding, indicating considerable self-direction and thoughtful behavior. Additionally, the student was not distracted by communication from other students. Furthermore, it was observed that the student chose to remain in her seat during the game and exhibited some fidgeting, but promptly returned to her seat after doing so. Along with this, it was also noted how the student responded to others, listened to questions, and initiated conversations with others with a certain level of prompting that was consistently carried out. Lastly, it was seen how the student encouraged others to speak and flip cards when needed, indicating a higher level of supportive behavior. As a result, the student scored 6.3 in terms of behavioral self-regulation, with scope for improvement in terms of higher initiative to carry out activities.

*Teacher: We are going to flip cards for this game. Remember you have to flip two cards at one time, and if you find the exact pair, you get another turn. Okay?*

*Student (A.C.): Okay, and what happens if we do not get a pair?*

*Teacher: Then, your friend gets a turn to flip the cards. Is that okay?*

*Student: Okay.*

*Teacher: Now, A.C., flip the cards that you can see in front of you.*

*Student: Okay, teacher. (Flips cards.)*

*Teacher: Great! That is a pair, right? So, you get another chance to flip the cards.*

*Student: Thanks, I will flip these two cards now.*

*Teacher: Oh, that one is not a pair. We can try again later, yes? Now, your friend gets to flip a card.*

*Student: Okay, we can. (Eagerly smiles and talks to the next child who has to flip the cards.)*

**Curiosity box:** The student was initially distracted when the instructions were given but continued to listen once additional guidance was provided. The student also remained highly involved in the activity and maintained eye contact to show how she was listening. In terms of being thoughtful and planning, the student demonstrated higher excitement and shook the boxes before trying to guess. Additionally, it was observed that the student did not require any prompting and knew when to take which turn in completing the activity. The student was also very good at controlling behaviors and stayed within the rules of the activity, indicating self-regulation of behavior. Further, although the student had to be asked a few times to sit, she demonstrated certain fidgeting and paid attention only later. The student, however, was good at asking questions and answering whatever she was required to. Further, it took the student a few attempts to guess the cards, but she demonstrated the willingness to take risks. In the case of the cognitive self-regulation score, the student achieved a score of 5.4, indicating considerable self-regulation, which could be further improved by eliminating the habit of fidgeting in the classroom.

*Teacher: We are going to guess what is inside each of these boxes. Remember, you have to follow the instructions I give to guess what is inside each box. Okay?*

*Student (A.C.): Okay, can I please open the boxes?*

*Teacher: Remember, you should not shake or open the box. You can only touch it and guess what is inside.*

*Student: Okay. (Tries to open box.)*

*Teacher: No A.C. You are not supposed to open the box.*

*Student: (Fidgets from seat and tries to talk to others.)*

*Teacher: Please sit in your seat A.C. Can you guess again please?*

*Student: Okay. (Touches box.) I think it is a water bottle.*

*Teacher: No, maybe you can guess again?*

*Student: (Tries to shake box.)*

*Teacher: No, you should only touch and guess.*

*Student: Okay, I think it is a book.*

*Teacher: Yes, that's right! Can you say what color this book is?*

*Student: Yes, it's red. My favorite color.*

### 3.3.6. Child 6 (L.K.)

Child L.K. demonstrates an overall higher level of behavioral self-regulation at 5.0 as compared to a cognitive self-regulation value at 4.4. The lower cognitive self-regulation value can be linked to the child's reduced willingness to participate and the presence of fidgeting.

**Memory card game:** Based on observations during the game, it was noted that the student paid little attention to the game's rules and required a strong explanation from the teacher. In addition to this, the student had to be told to pay attention and listen to what others were saying, indicating that the student did not have good self-regulation. Additionally, it was observed that the student frequently flipped the cards and required prompting from the teacher to understand how to complete the activity. Furthermore, the student had to be reminded to be quiet multiple times, demonstrating a strong tendency to be distracted when his friends interacted. The student was also very distracted during the game, exhibiting a certain level of fidgeting while paying attention to others. However, the student disturbed others when they were responding but demonstrated a helpful attitude by prompting other students to flip the card. Regarding the score for behavioral self-regulation, the student achieved a score of 5, indicating considerable self-regulation with room for improvement in areas such as reducing fidgeting and disturbing others.

*Teacher: We are going to flip cards for this game. Remember you have to flip two cards at one time, and if you find the exact pair, you get another turn. Okay?*

*Student (L.K.): Okay, teacher. Can I talk with my friend to choose the card?*

*Teacher: Yes, you can talk to your friend later. But you have to choose yourself on which cards you want to flip.*

*Student: Okay.*

*Teacher: Now, L.K., flip the cards that you can see in front of you.*

*Student: Okay, teacher. (Flips cards.)*

*Teacher: Okay, that is a pair. You know what that means right? You get to flip the cards again!*

*Student: Okay, but can I flip them later? I want to play with my friend now. (Fidgets in the seat.)*

*Teacher: I can allow you to play later if you flip these cards. Okay?*

*Student: Okay, flips card. (Excited and tries to move from seat to talk to another child as soon as card is flipped.)*

*Teacher: Okay, so that one is not a pair. We can try again, yes when your turn comes.*

*Student: Okay. (Fidgets in seat but ultimately settles talking to another child flipping the card.)*

**Curiosity box:** The student was highly attentive but ignored a few of the teacher's instructions. He also demonstrated strong engagement and maintained good eye contact. The student, however, did not make thoughtful or planned moves, since he flipped cards that were already done. The student was self-directed and required minimal prompting to flip the cards. The student also controlled his behavior

and exhibited overall calmness. However, the student fidgeted a couple of times and had to be reminded to sit peacefully. The student demonstrated an ability to cater to social conventions, as evidenced by his responses and even asking the teacher. Lastly, although the student was a little upset when the guesses were wrong, he was still willing to try in the activity. The student demonstrated a score of 4.4 in terms of cognitive self-regulation, indicating moderate self-regulation, which could be improved by a higher ability to listen to the teacher's classroom instructions.

*Teacher: We are going to guess what is inside each of these boxes. Remember, you have to follow the instructions I give to guess what is inside each box. Okay?*

*Student (L.K.): (Tries to shake box and drops it.)*

*Teacher: Remember, you should not shake or open the box. You can only touch it and guess what is inside.*

*Student: Okay. (Tries to open box.)*

*Teacher: No L.K. You are not supposed to open the box.*

*Student: (Fidgets from seat and tries to talk to others.)*

*Teacher: Please sit in your seat L.K. Can you guess again please?*

*Student: Okay. (Touches box.) I think it is a stuffed toy.*

*Teacher: No, maybe you can guess again?*

*Student: (Tries to shake box.)*

*Teacher: No, you should only touch and guess.*

*Student: Okay, I think it is a ball.*

*Teacher: Yes, that's right! Can you say what color this ball is?*

*Student: Yes, it's orange.*

### 3.3.7. Child 7 (H.V.M.)

Child H.V.M. demonstrates an overall higher level of behavioral self-regulation at 6.3 as compared to a cognitive self-regulation value at 5.8. The lower cognitive self-regulation value can be linked to a lack of self-control in the child's behavior.

**Memory card game:** The student demonstrated a strong level of attention and resisted distractions, as evidenced by his ability to listen well to the instructions and follow them accurately according to the teacher's directions. The student also exhibited higher engagement by asking many questions to his peers throughout the activity. Regarding self-regulation and planning activities beforehand, it was noted that the student was very excited and flipped cards even though he had already done so. However, the student displayed strong self-direction and engagement, as he did not require any prompting to flip the cards. Following this, in terms of behavioral regulation, the student stayed within the rules and peeked at the

cards, indicating less self-regulation. Additionally, the child fidgeted once but remained seated throughout the duration. He was also very attentive, listening to questions and interacting with his friends throughout the game. In terms of being helpful, the student assisted his friends when prompted. He demonstrated an overall behavioral self-regulation score of 6.3, indicating very high self-regulation, which could be further improved through changes in classroom behavior, such as adhering to game rules.

*Teacher: We are going to flip cards for this game. Remember you have to flip two cards at one time and if you find the exact pair, you get another turn. Okay?*

*Student (H.V.M.): Okay, I will do that.*

*Teacher: Now, H.V.M., flip the cards that you can see in front of you.*

*Student: Okay, teacher. (Flips only 1 card.)*

*Teacher: Okay, you have to flip another card to see if we have a matching pair.*

*Student: (Flips the same card.)*

*Teacher: No, H.V.M. You have to flip another card except the first one you flipped.*

*Student: Okay. (Takes some time to flip card.)*

*Teacher: Oh! That one is not a pair. So, we should give a chance to your friend, yes?*

*Student: Can I flip again?*

*Teacher: No, now your friend has to flip since you did not get a pair. But we can try again, yes?*

*Student: Yes, okay, teacher.*

**Curiosity box:** The student was a little distracted when the game regulations were explained, although he demonstrated high engagement by asking questions as well. Additionally, it was observed that the student would think before responding to what was in the box. Furthermore, the student demonstrated good self-direction and controlled his behavior during the activity. Although there was some form of fidgeting throughout the classroom activity, it was observed that the student eventually chose to stay seated. The student was also good at waiting for questions to be asked of him, and despite being wrong at certain times, he continued to make guesses with some prompting. The student demonstrated a cognitive self-regulation score of 5.8, indicating considerable self-regulation, which could be further improved through reduced fidgeting and learning to sit without distractions in the classroom.

*Teacher: We are going to guess what is inside each of these boxes. Remember, you have to follow the instructions I give to guess what is inside each box. Okay?*

*Student (H.V.M.): Okay. (Tries to open box and fidgets.)*

*Teacher: Remember, you should not shake or open the box. You can only touch it and guess what is inside.*

*Student: (Fidgets from seat and tries to talk to others.)*

*Teacher: Please sit in your seat H.V.M. Can you guess again please?*

*Student: Okay. (Touches box.) It is a balloon.*

*Teacher: No, you can guess again?*

*Student: (Tries to shake box.)*

*Teacher: No, you should only touch and guess.*

*Student: Okay, it is a ball.*

*Teacher: Yes, that is right!*

## 3.4. Variation among PRSIST self-regulation scores

When comparing the self-regulation scores of different students based on their PRSIST results, several variances and areas of difference become apparent. Starting with Child 1 (M.T.), she demonstrates a higher level of behavioral self-regulation at 6.5 compared to cognitive self-regulation at 5.7. This discrepancy suggests that while she excels in managing her behavior, she may struggle slightly in cognitive tasks. In the memory card game, M.T. showed engagement but lacked planning, often choosing the same cards and needing reminders. However, she actively participated, asked questions, and assisted her peers, reflecting her high level of behavioral self-regulation. In the curiosity box activity, M.T. was attentive but slightly distracted, needing reminders to follow instructions. Despite this, she demonstrated thoughtfulness and took turns appropriately, indicating cognitive self-regulation. Moving to Child 2 (E.B.), we observe a similar pattern, with higher behavioral self-regulation (6.6) compared to cognitive self-regulation (5.3). E.B. engaged well in the memory card game, showing accuracy, planning, and independence. However, he required reminders to ask questions, highlighting an area for improvement in initiating interactions. In the curiosity box activity, E.B. demonstrated strong attention, planning, and self-direction, but required some prompting to shake the box, indicating a need for cognitive self-regulation. Child 3 (M.O.) exhibits high levels of both behavioral (6.8) and cognitive (6.6) self-regulation. M.O. displayed undivided attention, understanding of rules, and thoughtful decision-making in both activities. He engaged actively, listened well, and controlled his behavior, reflecting strong self-regulation in both domains. Child 4 (E.H.) also demonstrates high behavioral (6.8) and cognitive (6.8) self-regulation. E.H. displayed focus, planning, and adherence to rules in both activities. She actively participated, controlled her behavior, and supported peers, showcasing strong self-regulation across the board. Child 5 (A.C.) presents a slightly lower behavioral self-regulation (6.3) compared to cognitive (5.4). A.C. showed engagement but occasionally had attention issues in the memory card game, requiring reminders to follow instructions thoroughly. In the curiosity box activity, she demonstrated engagement and self-direction but required reminders to sit still, indicating room for improvement in behavioral self-regulation. Child 6 (L.K.) displayed moderate levels of both behavioral (5.0) and cognitive (4.4) self-regulation. L.K. showed attention issues, distraction, and fidgeting in the memory card game, requiring reminders to stay focused. Similarly, in the curiosity box

activity, he showed distraction and fidgeting, indicating areas for improvement in both domains. Child 7 (H.M.V.) exhibited high behavioral self-regulation (6.3) but slightly lower cognitive (5.8). H.M.V. displayed strong attention, engagement, and adherence to rules in both activities. However, he needed reminders to thoroughly follow instructions, indicating a slight gap in cognitive self-regulation. The responses of students can also be compared below, as seen in the following tables.

**Table 1**

*Comparison of student responses.*

| Child | Behavioral self-regulation | Cognitive self-regulation | Differences and observations |
|---|---|---|---|
| M.T. | 6.5 | 5.7 | Demonstrates high behavioral self-regulation but lower cognitive self-regulation. Needs prompting during cognitive tasks. Engages well with peers. |
| E.B. | 6.6 | 5.3 | Shows strong behavioral self-regulation but requires more cognitive prompting. Engages thoroughly but asks questions during activities. |
| M.O. | 6.8 | 6.6 | Exhibits high levels of both behavioral and cognitive self-regulation. Requires minimal prompting during tasks. Maintains focus and attention. |
| E.H. | 6.8 | 6.8 | Displays high levels of both behavioral and cognitive self-regulation. Limited instances of fidgeting observed. Encourages peer participation. |
| A.C. | 6.3 | 5.4 | Shows strong behavioral self-regulation but requires more cognitive prompting. Engages well with peers but needs to reduce fidgeting. |
| L.K. | 5 | 4.4 | Demonstrates lower levels of both behavioral and cognitive self-regulation. Requires frequent prompting and exhibits fidgeting behavior. |
| H.V.M. | 6.3 | 5.8 | Displays high behavioral self-regulation but lower cognitive self-regulation. Needs more focus during cognitive tasks. Engages well with peers. |

**Table 2**

| Factor | M.T. | E.B. | M.O. | E.H. | A.C. | L.K. | H.V.M. |
|---|---|---|---|---|---|---|---|
| *Attention to instructions* | Listened well, asked questions, stayed engaged | Listened well, engaged thoroughly, asked questions | Demonstrated undivided attention, responded promptly | Paid full attention, resisted distractions | Had attention issues, turned around frequently | Demonstrated strong attention, asked questions | Demonstrated a little distraction, asked questions |
| *Planning and thoughtfulness* | Chose cards consistently, needed help with planning | Demonstrated strong planning during game, remembered | Knew next moves, showed understanding of rules | Thoughtful, planned activities, aware of rules | Needed prompting for challenge, flipped cards randomly | Needed strong explanation, less planning demonstrated | Demonstrated less planning, flipped cards without strategy |

**Table 2**

*Continued.*

| Factor | M.T. | E.B. | M.O. | E.H. | A.C. | L.K. | H.V.M. |
|---|---|---|---|---|---|---|---|
| *Self-direction* | Needed prompting to choose cards, listened well | Did not need prompting to flip cards, self-directed | Did not need prompting, self-directed in activities | Demonstrated self-direction, engaged without prompting | Required some prompting, flipped cards randomly | Did not need prompting, engaged well without direction | Needed reminders to stay on task, engaged when prompted |
| *Fidgeting* | Demonstrated some fidgeting, sat quietly when told | Sat well in class, less fidgety | Did not fidget, remained peacefully seated | Demonstrated limited fidgeting, mostly remained seated | Demonstrated a little fidgeting, settled after a while | Showed limited instances of fidgeting, sat well | Demonstrated a little fidgeting, settled after reminders |
| *Social interaction* | Helped friends, encouraged peer participation | Helped friends, interacted with peers | Interacted well with peers, encouraged participation | Encouraged peer participation, interacted positively | Engaged with peers but distracted them occasionally | Engaged with peers, encouraged participation | Engaged with peers, but needed reminders for interaction |
| *Rule adherence* | Listened carefully, followed game rules | Followed game rules, waited for instructions | Stayed within rules, demonstrated good understanding | Stayed within rules, adhered to classroom regulations | Needed reminders for rules, but followed mostly | Needed reminders but mostly adhered to game rules | Needed reminders, mostly adhered to game rules |

## 4. Discussion

Self-regulation skills are essential for children as they significantly improve students' academic performance. Additionally, self-regulation among nursery students contributes to the development of better physical and mental health skills from a young age. Research studies evaluating high-quality nurseries emphasize how interventions aimed at enhancing students' physical activity, as a critical aspect of the nursery environment, improve academic performance and cognitive competencies (Bodrova & Leong, 2018). Both behavioral and cognitive self-regulation help ensure that students develop the readiness needed for more complex schooling years (Ilgar & Karakurt, 2018). These findings can be compared to the results of the current study regarding the necessity of activities, interaction, and improvements from parents and staff to enhance cognitive self-regulation among children, as well as foster greater initiative, involvement, and risk-taking in their participation. Consequently, high-quality nurseries play a crucial role in long-term child development by helping students acquire the competencies, skills, and knowledge necessary to interact effectively within the classroom environment and benefit from available resources. Furthermore, high-quality nurseries maintain consistency in the standards of the environment provided to students, which includes parental involvement, space and furnishings, activities, and course structure. The study's findings also connect to the idea that high levels of behavioral regulation ensure that children develop prosocial behaviors essential for advancing to higher education levels (Von Suchodoletz et al., 2015).

The study's findings reveal that the scores relating to cognitive self-regulation are relatively lower than those of behavioral self-regulation among the students. Cognitive self-regulation, which primarily involved reaction time to teachers, participation in activities, and willingness to take risks, was relatively lower in students, as indicated by the average scores. On the contrary, behavioral self-regulation, which mainly involved staying in a place, avoiding distractions, and refraining from physical movements such as fidgeting, was relatively better, as indicated by the average scores. Specifically, comparing the scores for cognitive self-regulation and behavioral self-regulation indicates how most nursery environments, as well as parental involvement, tend to focus on maintaining students' physical behavior, with less emphasis placed on enhancing their cognitive regulation. As seen through the study's findings, the presence of a strong program structure, adequate space, and furnishings, as well as defined personal care routines, may have contributed to the students' behavioral and physical self-regulation.

In conclusion, the study's findings demonstrate a higher emphasis on behavioral self-regulation among students compared to cognitive self-regulation. Based on the study's results, several recommendations can be made to enhance students' self-regulation levels. The first strategy that can be adopted is an increased level of interaction between the parents of these children and the teachers, which would help ensure that any challenges related to self-regulation can be identified and addressed through a defined course of action. Examples of this include enhancing cognitive self-regulation in children by teaching them to remain calm, taking initiative in activities, and helping them recognize their emotions and take appropriate actions. Secondly, children need to be exposed to a classroom environment that fosters open communication with peers and teachers, which helps ensure they develop a higher level of cognitive self-regulation. An open environment for interaction among students would help ensure they can develop essential skills related to communication, initiative, higher motivation levels, problem-solving, and the ability to learn and express themselves freely. Third, it is vital that teachers can move their focus from merely behavioral regulation, which involves ensuring that students behave appropriately in terms of their physical movements, to a higher emphasis on cognitive self-regulation. Doing this is essential as improving skills of cognitive self-regulation would allow for students to stay disciplined and be able to monitor their behavior while interacting with others and remaining calm in a classroom environment through demonstrating initiative in activities, being motivated, interacting with peers in the proper manner as well as be able to reason with the instructions provided by the teachers rather than merely being compelled to do so. Lastly, increasing cognitive self-regulation in children would also involve ensuring that the environment in nurseries is designed in a manner that provides scope for children to engage in free play and participate in as many activities as possible.

Improving the nurseries' environment and offering children the chance to engage in activities through various projects, events, and interaction periods with other students would help them remain motivated, adapt to the learning setting, and develop greater abilities to control and monitor their behavior. Specifically, integrating increased levels of activities within the classroom environment helps ensure that

children can gain a wide range of skills, such as communication, interaction, teamwork, and demonstrate a higher level of initiative in their activities. By enhancing elements such as furnishings, care routines, and access to supplemental materials for classroom activities, children can demonstrate a greater level of cognitive and behavioral self-regulation from an early age. They will learn to interact with various objects in their environment and utilize the available classroom space for a wide range of activities. Lastly, we suggest conducting studies to determine the extent of the relationship between the quality of nursery care and the development of self-regulation among young children.

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## Competing Interests

The authors declare that they have no conflict of interest.

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# Appendix

**Individual Scoring of Children across PRSIST Scores**

In this section, we provide an overview of how individual children were scored across PRSIST measures, specifically focusing on the cognitive and behavioral self-regulation aspects as assessed through the memory card game and curiosity box activities.

1. PRSIST training and reliability

Before delving into individual scoring details, it is essential to note that two nursery teachers underwent rigorous training to ensure the reliability of assessing children's self-regulation using the PRSIST tool. The training involved online sessions and practical demonstrations to ensure consistency and accuracy in scoring.

2. PRSIST memory game activity

During the memory card game activity, each child's self-regulation was observed and scored based on their performance. For instance, if a child displayed sustained attention throughout the game, actively engaged with other players, demonstrated strategic thinking by remembering card placements, and exhibited helpful behaviors like encouraging others, they would receive higher scores in cognitive self-regulation. Conversely, if a child struggled to maintain attention, showed impulsive behaviors, or had difficulty following the rules, their scores might reflect lower levels of self-regulation.

3. PRSIST curiosity box activity

Similarly, in the individual curiosity box activity, children were assessed on their ability to regulate their behavior and cognitive processes. For example, a child who patiently followed the instructions, refrained from touching the boxes until instructed, and demonstrated curiosity without impulsively shaking or opening the boxes would receive higher scores in behavioral self-regulation. On the other hand, a child who struggled to control impulses, fidgeted during the activity, or had difficulty adhering to instructions would likely receive lower scores.

4. Individual scoring procedure

- Each child's behavior was observed and noted during the activities.
- Observations were translated into PRSIST scores based on predefined criteria for cognitive and behavioral self-regulation.
- For instance, if a child consistently displayed behaviors indicative of strong self-regulation (e.g., sustained attention, thoughtful decision-making, cooperative interactions), they would receive higher scores.

- Conversely, if a child struggled with self-regulation (e.g., distractibility, impulsivity, difficulty following instructions), their scores would reflect lower levels of self-regulation.
- Scores were recorded for each child across the nine items on the PRSIST scale.
- The average scores for cognitive and behavioral self-regulation were calculated for each child based on their performance in both activities.

5. Interpretation of scores

The individual scores provide insights into each child's self-regulation abilities in the context of the activities. Higher scores indicate stronger self-regulation skills, while lower scores may highlight areas for improvement or further support.

6. Implications

Understanding individual scores allows educators and researchers to tailor interventions and support strategies to meet the specific needs of each child. By targeting areas of weakness and building on strengths, children can be better supported in their self-regulation development, ultimately enhancing their overall well-being and success in educational settings.