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RESEARCH ARTICLE

Assessing Metacognitive Skills in Senior Preschool Children: A Methodological Toolkit

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PAGE: 248-252

Abstract

The growing recognition that metacognitive abilities emerge during the preschool years has created an urgent demand for reliable, age-appropriate diagnostic instruments. However, most existing metacognitive assessment tools were originally designed for school-age populations and fail to account for the distinctive cognitive, linguistic, and motivational characteristics of five- to seven-year-old children. Aim. The present study aimed to develop and validate a comprehensive methodological toolkit for assessing metacognitive skills in senior preschool children (ages 5–7). Methods. A three-component diagnostic battery was constructed, comprising structured behavioral observation, an individual metacognitive interview, and a set of experimental problem-solving tasks. The battery was administered to 180 children attending six preschool institutions. Psychometric properties were evaluated through inter-rater reliability analysis, internal consistency testing, and criterion validity assessment. Results. The toolkit demonstrated good inter-rater reliability ($\kappa = 0.79–0.84$), acceptable internal consistency ($\alpha = 0.81$), and significant criterion validity against an established measure of self-regulated learning. Three distinct metacognitive profiles were identified via cluster analysis: emergent, developing, and advanced. Conclusions. The proposed toolkit offers a psychometrically sound, ecologically valid approach to metacognitive assessment in early childhood and can serve as a practical resource for researchers and educators working with senior preschoolers.

KEYWORDS

Metacognitive skills, preschool children, diagnostic toolkit, metacognitive assessment, metacognitive monitoring, metacognitive knowledge, self-regulated learning, early childhood education.

INTRODUCTION

Metacognition–broadly defined as the awareness and regulation of one's own cognitive processes–has been consistently identified as one of the strongest predictors of learning outcomes across the lifespan [1; 2]. Since Flavell's seminal work in 1979, which distinguished between metacognitive knowledge and metacognitive experience [3], a vast body of research has explored how individuals plan, monitor, and evaluate their thinking. For decades, however, this research focused predominantly on adolescents and adults, implicitly assuming that young children lack the cognitive prerequisites for meaningful metacognitive activity.

This assumption has been progressively challenged. Converging evidence from developmental psychology and cognitive neuroscience demonstrates that rudimentary forms of metacognitive behavior emerge considerably earlier than previously thought. Children as young as four can calibrate

their confidence in knowledge judgments, anticipate task difficulty, and adjust strategies in response to feedback [4; 5]. Neuroimaging studies confirm that prefrontal cortical networks underpinning executive control undergo rapid maturation between three and seven years of age [6]. These findings have prompted educators to incorporate metacognitive development into early childhood curricula, creating a need for valid assessment instruments.

The assessment of metacognition in young children presents unique methodological challenges. Preschoolers' limited verbal abilities constrain the use of self-report questionnaires [7]. Metacognitive behavior in early childhood is often implicit and embedded in social interaction, making it difficult to capture through decontextualized tests [8]. Furthermore, children's performance is highly sensitive to task demands and the presence of a supportive adult, introducing variability that can obscure genuine metacognitive competence [9].

Several instruments have been developed to address these challenges. Whitebread and colleagues created the C-IndLe observation protocol for recording metacognitive and self-regulatory behaviors during play [8]. Marulis and Palincsar designed a structured interview to elicit metacognitive knowledge from preschoolers [10]. Roebers and colleagues employed confidence judgment paradigms to assess monitoring accuracy [5; 11]. Each of these approaches captures an important facet of metacognition, yet no integrated toolkit combining observation, interview, and experimental tasks has been systematically validated for the five-to-seven age range.

The present study addresses this gap. Its purpose is twofold: first, to develop a multi-method diagnostic battery that captures the three core components of metacognitive skills in senior preschool children–metacognitive knowledge, metacognitive monitoring, and metacognitive regulation; second, to evaluate the psychometric properties of this battery, including reliability, validity, and its capacity to differentiate meaningful metacognitive profiles. We hypothesize that the proposed toolkit will demonstrate acceptable psychometric quality and reveal a structured pattern of individual differences in metacognitive development among five- to seven-year-olds.

METHODS

Participants

The sample consisted of 180 children (94 girls, 86 boys) aged 5;0 to 7;0 years (M = 5.9, SD = 0.62), recruited from six state-funded preschool institutions. All children had typical cognitive development as confirmed by educator reports, and none had diagnosed speech or language disorders. Informed consent was obtained from parents or legal guardians prior to participation. The study was approved by the institutional ethics committee and conducted in accordance with the Declaration of Helsinki.

Toolkit design

The diagnostic battery comprised three complementary instruments, each targeting a distinct component of metacognition.

Instrument 1: Structured Behavioral Observation (SBO). An adapted version of the C-IndLe protocol [8] was used to assess metacognitive behavior in naturalistic settings. Trained observers recorded the frequency and quality of six behavioral categories during two 20-minute sessions per child (one during free play, one during a guided activity): (a) task awareness, (b) planning, (c) strategy selection, (d) monitoring, (e) error correction, and (f) result evaluation. Each behavior was rated on a three-point scale (0 = absent, 1 = partial/emerging, 2 = clear/consistent). Observations were conducted by three trained research assistants who had completed a 12-hour calibration training program using video exemplars.

Instrument 2: Metacognitive Knowledge Interview (MKI). A semi-structured individual interview, adapted from the framework of Marulis and Palincsar [10], was administered to assess three dimensions of metacognitive knowledge: person knowledge ("Do all children remember things equally well?"), task knowledge ("Is it easier to remember two words or ten?"), and strategy knowledge ("What do you do when you want to remember something?"). The interview comprised 12 questions supported by pictorial prompts to facilitate engagement and comprehension. Responses were audio-recorded, transcribed, and coded by two independent raters on a three-point scale (0 = no metacognitive content, 1 = elementary metacognitive judgment, 2 = elaborated metacognitive judgment).

Instrument 3: Experimental Metacognitive Tasks (EMT). Three tasks assessed metacognitive monitoring and regulation. Task A ("Puzzle Prediction"): the child predicted success and rated expected difficulty before attempting a jigsaw puzzle, then evaluated accuracy afterward. Task B

("Know/Don't Know"): the child indicated whether they knew the answer to each of 15 questions before responding; a calibration index was computed as the discrepancy between predicted and actual performance. Task C ("Treasure Hunt"): the child planned a search route in a model room and adjusted it upon encountering obstacles; planning quality and flexibility were rated on a five-point scale.

Procedure

Data collection occurred over three months. Each child was assessed individually across two sessions of approximately 30 minutes each (Session 1: MKI + Task A; Session 2: Tasks B and C). SBO was conducted separately during regular classroom activities. Session order was counterbalanced. All sessions were video-recorded with parental consent.

Criterion measure

To evaluate criterion validity, the Child Self-Regulation and Behaviour Questionnaire (CSBQ) [12] was completed by each child's primary educator. The CSBQ is a validated 34-item instrument assessing cognitive and behavioral self-regulation in preschool children, providing a theoretically related yet methodologically independent criterion.

Statistical analysis

Inter-rater reliability was assessed using Cohen's kappa (κ) for categorical ratings and intraclass correlation coefficients (ICC) for continuous scores. Internal consistency was estimated via Cronbach's alpha. Criterion validity was evaluated through Spearman's rank-order correlations between the toolkit composite score and CSBQ subscales. To identify metacognitive profiles, k-means cluster analysis was performed on the standardized scores of the three instrument composites. All analyses were conducted in SPSS 27.0 and R 4.3.1, with the significance level set at $p < .05$.

RESULTS

Reliability

Inter-rater reliability for the SBO ranged from $\kappa = 0.79$ (strategy selection) to $\kappa = 0.84$ (monitoring), indicating substantial to near-perfect agreement according to conventional benchmarks [13]. The ICC for the MKI total score was 0.86 (95% CI: 0.81–0.90), and for the EMT composite score it was 0.83 (95% CI: 0.77–0.88). Cronbach's alpha for the overall toolkit composite reached 0.81, with subscale values of 0.78 (SBO), 0.76 (MKI), and 0.74 (EMT). These values exceed the commonly accepted threshold of 0.70, confirming acceptable internal consistency [14].

Descriptive statistics

Mean composite scores varied substantially across children, reflecting considerable individual differences. For the SBO, the mean total score was 12.4 (SD = 4.1, range: 2–22 out of a possible 24). For the MKI, the mean was 9.7 (SD = 3.6, range: 1–20 out of 24). For the EMT, the mean was 8.3 (SD = 2.9, range: 2–15 out of 18). Age was positively and significantly correlated with all three instrument scores ($r_s = .41–.57$, $p < .001$), confirming developmental sensitivity.

Criterion validity

Spearman correlations between the toolkit composite and the CSBQ subscales were statistically significant and moderate in magnitude: cognitive self-regulation, $r_s = .54$ ($p < .001$); behavioral self-regulation, $r_s = .38$ ($p < .001$); total CSBQ score, $r_s = .49$ ($p < .001$). The stronger association with cognitive self-regulation compared to behavioral self-regulation supports the discriminant validity of the toolkit, as metacognition is theoretically more closely aligned with cognitive than behavioral regulation [2; 15].

Metacognitive profiles

Cluster analysis yielded a three-cluster solution that accounted for 62.7% of total variance. Cluster 1 ("Emergent"; n = 68, 37.8%) was characterized by low scores across all three instruments, reflecting minimal metacognitive activity. Children in this cluster rarely verbalized strategies, showed negligible monitoring, and approached tasks impulsively. Cluster 2 ("Developing"; n = 74, 41.1%) showed moderate scores, with metacognitive knowledge (MKI) advancing ahead of monitoring and regulation. These children could articulate basic strategies ("I'll look at the picture first") but inconsistently applied them during task execution. Cluster 3 ("Advanced"; n = 38, 21.1%) demonstrated high scores across all components, with evidence of coordinated planning, accurate confidence calibration, and flexible strategy adjustment. The three clusters differed significantly in age ($F(2, 177) = 18.43$, $p < .001$, $\eta^2 = .17$), with the Advanced cluster containing a disproportionate share of children aged 6.5–7.0 years.

DISCUSSION

The present study set out to develop and validate a multi-method diagnostic toolkit for assessing metacognitive skills in

senior preschool children. The results offer converging evidence that the proposed battery meets conventional psychometric standards and provides a nuanced picture of metacognitive development in the five-to-seven age range.

The reliability coefficients compare favorably with those reported for existing preschool metacognition measures [8; 10; 11]. Inter-rater agreement was highest for monitoring behaviors, which produce discrete, observable events (pauses, self-corrections, verbalizations of doubt) that are relatively easy for raters to identify [16]. Internal consistency values were somewhat lower for the EMT, likely reflecting the heterogeneity of three tasks tapping different facets of metacognitive regulation.

Criterion validity findings reinforce theoretical coherence. The stronger correlation with cognitive self-regulation compared to behavioral self-regulation is consistent with models positing metacognition as a specifically cognitive capacity rather than a global regulatory trait [2; 15]. This pattern supports both convergent and discriminant validity.

The three-cluster solution provides a practically useful typology. The finding that metacognitive knowledge advances ahead of monitoring and regulation mirrors the developmental sequence proposed by Kuhn [17], who argued that declarative metacognitive awareness precedes procedural control. Children in the Developing cluster thus possess a conceptual readiness for metacognitive activity that has not yet been translated into behavioral competence, representing a zone of proximal development amenable to scaffolded practice [18].

Several limitations should be acknowledged. The cross-sectional design precludes conclusions about individual developmental trajectories. The sample was drawn from a single geographic region, and cultural factors may influence both metacognitive development and assessment performance. While the toolkit captures observable metacognitive behavior, it inevitably underestimates implicit metacognitive processes that are not externalized. Future research should explore longitudinal replication, cross-cultural adaptation, and physiological indicators such as eye-tracking to complement behavioral measures.

CONCLUSION

This study presents a validated multi-method toolkit for assessing metacognitive skills in children aged five to seven years. The battery integrates structured behavioral observation, an individual metacognitive interview, and experimental problem-solving tasks, thereby capturing metacognitive knowledge, monitoring, and regulation within a single diagnostic framework. The toolkit demonstrates acceptable reliability, meaningful criterion validity, and the capacity to differentiate three empirically derived metacognitive profiles: Emergent, Developing, and Advanced.

The practical implications are twofold. For researchers, the toolkit provides a standardized yet ecologically sensitive instrument that enables systematic investigation of metacognitive development in early childhood. For educators, the profile-based approach offers actionable diagnostic information: identifying a child's metacognitive profile can guide the selection of pedagogical strategies, from modeling and think-aloud techniques for Emergent-level children to collaborative problem-solving and self-assessment activities for those at the Developing level. Future efforts should focus on longitudinal validation, cross-cultural adaptation, and the development of abbreviated screening versions suitable for routine use in preschool settings.

REFERENCES

1. Veenman, M.V.J. Metacognition and learning: Conceptual and methodological considerations / M.V.J. Veenman, B.H.A.M. Van Hout-Wolters, P. Afflerbach // Metacognition and Learning.–2006.–Vol. 1, № 1.–P. 3–14.
2. Schraw, G. Promoting general metacognitive awareness / G. Schraw, R.S. Dennison // Contemporary Educational Psychology.–1994.–Vol. 19, № 4.–P. 460–475.
3. Flavell, J.H. Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry / J.H. Flavell // American Psychologist.–1979.–Vol. 34, № 10.–P. 906–911.
4. Schneider, W. The development of metacognitive knowledge in children and adolescents: Major trends and implications for education / W. Schneider // Mind, Brain, and Education.–2008.–Vol. 2, № 3.–P. 114–121.
5. Roebers, C.M. Children's metacognitive monitoring of their own performance: Current evidence and new directions / C.M. Roebers // British Journal of Developmental Psychology.–2017.–Vol. 35, № 1.–P. 1–30.
6. Diamond, A. Executive functions / A. Diamond // Annual Review of Psychology.–2013.–Vol. 64.–P. 135–168.

7. Pintrich, P.R. The role of metacognitive knowledge in learning, teaching, and assessing / P.R. Pintrich // Theory into Practice.–2002.–Vol. 41, № 4.–P. 219–225.
8. Whitebread, D. The development of two observational tools for assessing metacognition and self-regulated learning in young children / D. Whitebread, P. Coltman, D.P. Pasternak [et al.] // Metacognition and Learning.–2009.–Vol. 4, № 1.–P. 63–85.
9. Larkin, S. Metacognition in Young Children / S. Larkin.–London : Routledge, 2010.–208 p.
10. Marulis, L.M. Assessing metacognitive knowledge in 3–5 year olds: The development of a metacognitive knowledge interview / L.M. Marulis, S.B. Palincsar, A.L. Berhenke, T.D. Whitebread // Metacognition and Learning.–2016.–Vol. 11, № 3.–P. 339–368.
11. Destan, N. Confidence and accuracy of young children's metacognitive monitoring during learning / N. Destan, C.M. Roebers // British Journal of Educational Psychology.–2015.–Vol. 85, № 2.–P. 125–142.
12. Howard, S.J. Measuring interrelated aspects of children's self-regulation: The Child Self-Regulation and Behaviour Questionnaire / S.J. Howard, E. Melhuish // Early Childhood Research Quarterly.–2017.–Vol. 42.–P. 148–160.
13. McHugh, M.L. Interrater reliability: The kappa statistic / M.L. McHugh // Biochemia Medica.–2012.–Vol. 22, № 3.–P. 276–282.
14. Nunnally, J.C. Psychometric Theory / J.C. Nunnally, I.H. Bernstein.–3rd ed.–New York : McGraw-Hill, 1994.–752 p.
15. Kuhn, D. Metacognitive development / D. Kuhn // Current Directions in Psychological Science.–2000.–Vol. 9, № 5.–P. 178–181.
16. Bryce, D. The development of metacognitive skills in young children / D. Bryce, D. Whitebread // Metacognitive Diversity: An Interdisciplinary Approach.–Oxford : Oxford University Press, 2012.–P. 251–267.
17. Kuhn, D. A developmental model of critical thinking / D. Kuhn // Educational Researcher.–1999.–Vol. 28, № 2.–P. 16–25.
18. Vygotsky, L.S. Mind in Society: The Development of Higher Psychological Processes / L.S. Vygotsky.–Cambridge, MA : Harvard University Press, 1978.–159 p.