

The Association between Self-regulation Abilities at One Month with Cognition and Language Development at One Year of Age in a Sample of Portuguese Infants



Literature Review

- Environmental influences like family dynamics and cultural norms play a key role in self-regulation development (McClelland et al., 2015). Infants start self-regulating early, influenced by caregivers and environmental stimuli, progressing to voluntary control by age one (Schunk & Zimmerman, 2012; Calkins & Fox, 2002; Sameroff, 2009).
- Prefrontal cortex maturation is crucial for self-regulation, affecting attention and executive functions (Nolvi et al., 2021). Self-regulation and cognitive abilities co-develop, predicting academic success with observed gender differences (Nolvi et al., 2021). Lower self-regulation may affect children with autism, and environmental factors influence the interplay between language and self-regulation (Nolvi et al., 2021).

Current Study

Explored how self-regulatory abilities at one month predict language and cognitive outcomes in infants up to one year old.

Methods

The study included 35 infants from a Portuguese hospital who met criteria such as full-term birth, weight > 2.5 kg, Apgar score $\geq 9/10$ at 10 minutes, and passing a hearing test. Assessments were conducted at birth, 1 month (using NBAS), and 12 months (using Bayley-III) in controlled settings. Regression analyses in Rstudio explored relationships between early neurobehavioral factors (orientation, state organisation, regulation) and developmental outcomes (cognitive, expressive, receptive language).

Results

Multiple linear regression models assessed cognition and expressive language using orientation, state organisation, and state regulation as predictors. While cognition was not significant ($F(3, 31) = 1.12, p = 0.35$), expressive language approached significance ($F(3, 31) = 2.79, p = 0.06$) with state regulation showing a strong but nonsignificant effect ($b = 0.79, p = 0.076$), leading to the rejection of both hypotheses.

A receptive language model using orientation–state organisation and state regulation as predictors showed residuals conforming to normality (Shapiro-Wilk test, $W = 0.98, p = 0.96$). The model demonstrated significant predictive power ($F(3, 31) = 3.307, p = 0.03, R^2 = 0.24, Adj. R^2 = 0.16$), with state regulation significantly influencing receptive language ability ($b = 0.77, p = 0.007$), confirming the third hypothesis.

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Discussion

- The study contrasts with previous research by not finding significant links between self-regulatory abilities and cognition or expressive language (Lundqvist-Persson, 2001; Aldrete-Cortez et al., 2014; Blair et al., 2015; Nuske et al., 2020), but state regulation strongly predicts receptive language, suggesting further exploration of language development predictors.
- Early stress impacts self-regulation and cognitive outcomes (Blair, 2010; Evans & Kim, 2013), with caregivers, especially mothers, crucial in fostering regulation through sensitivity and support (Sameroff, 2009; Kiss et al., 2014); factors like parental interactions and skin-to-skin contact may have influenced outcomes.
- Receptive language is significantly associated with self-regulatory abilities (Gözüm & Aktulun, 2021), though some studies suggest receptive language predicts self-regulation (Cohen et al., 1978; Markus et al., 2000); uncontrolled factors and infant interactions between assessments limit generalizability.

Limitations

Small sample size, attrition, incomplete assessments, lack of cultural and socioeconomic variability measurement, and challenges in conducting evaluations with infants were present. Additionally, key factors like parenting styles and caregiver interactions, known to influence self-regulation, were not assessed (APA, 2020; Calkins & Fox, 2002; Evans & Kim, 2013; Feldman et al., 2002; Zeytinoglu et al., 2017).

Future Directions

The following research should include caregivers' influence, diverse samples across linguistic, socioeconomic, and cultural dimensions to enhance validity, and larger sample sizes to strengthen language outcomes and self-regulation findings.

Conclusion

- Only receptive language, specifically state regulation, emerged as a significant predictor.
- There was an inclination towards statistical significance with expressive language.
- Influential factors such as caregiver influence, socioeconomic status, parenting styles and noted limitations may have affected results.

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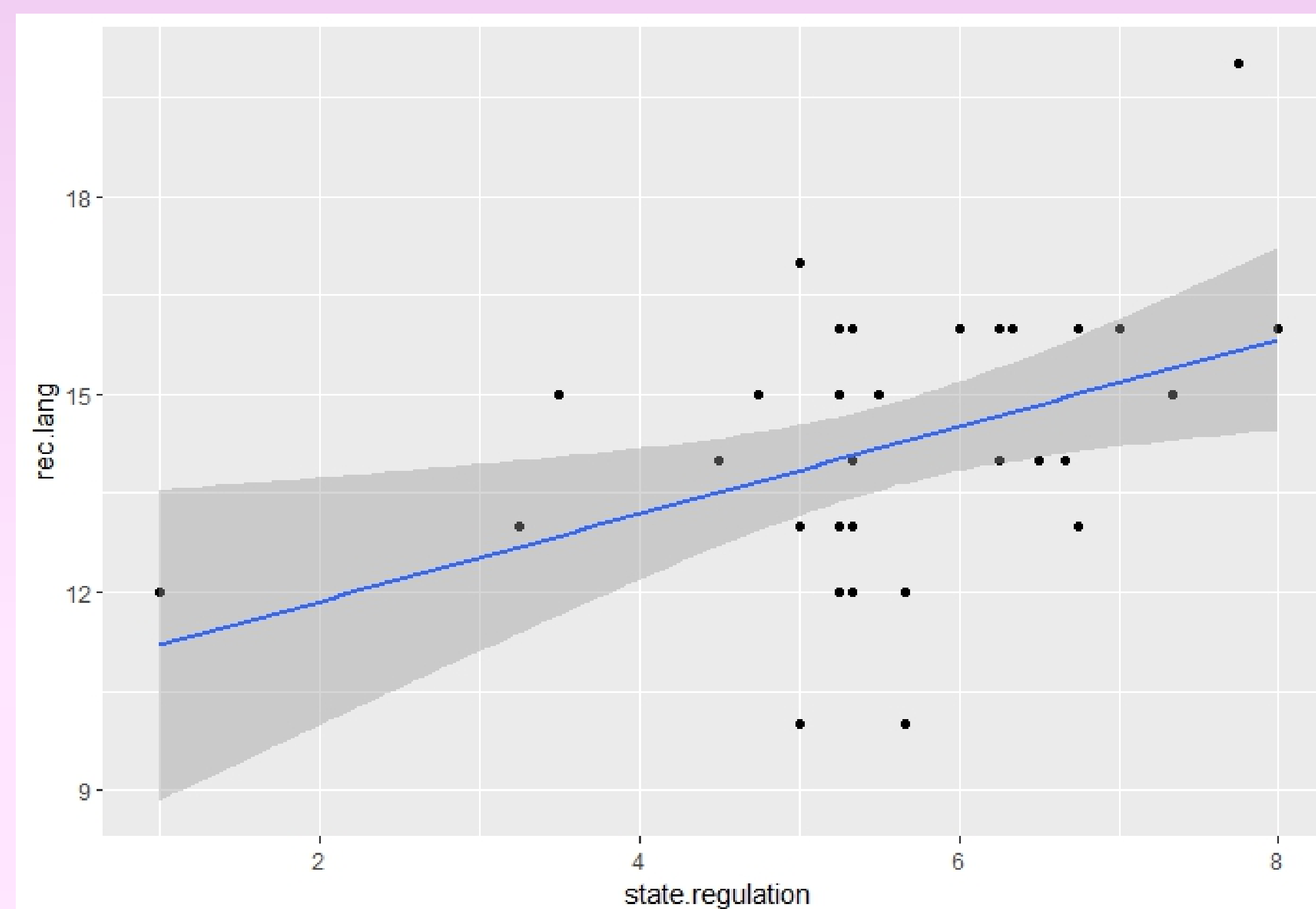
Abstract

Infants experience rapid development during the first year of life. Previous research has shown that their self-regulatory abilities, cognition, and language heavily depend on each other, but the relationship between them is unclear. The current study focused on whether self-regulatory abilities at one month of age predict the cognitive and language outcomes at one year in Portuguese infants.

Methods: Forty-five mother-infant dyads participated. The NBAS assessed the child's self-regulation (orientation, state organisation and state regulation variables), and the Bayley Scale (3rd edition) evaluated the child's cognitive and language (expressive, receptive) outcomes. Multiple regression models analysed the current data.

Results: Results showed that only receptive language was significantly predicted by self-regulation. State regulation was the strongest significant predictor of receptive language ($b = 0.77, p = 0.007$). Expressive language was not substantial, but there was a similar trend in state regulation, which was the strongest predictor despite not being significant ($b = 0.79, p = 0.076$). Cognitive outcomes were not significantly predicted by self-regulation.

Conclusion: The findings highlighted the complex developmental relationship between cognition, language, self-regulation, and factors that could influence joint development (parenting, maternal sensitivity, socioeconomic status). Limitations primarily included a small sample size. Implications for future research are discussed.



Note. The figure demonstrates a significant positive predictive relationship between the state regulation and receptive language variables. State regulation significantly predicted receptive language outcomes.