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Emotion Language Density and the Development of Internal and External Emotion Categorization

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Abstract

In this study, we examine how the structure of emotion language, both in caregiver emotion language input and children's own vocabularies, relates to children's organization of emotions along an internal-external dimension. English-speaking children aged 4-6 years completed an internal-external emotion categorization task and a vignette-based emotion inference task. Caregiver emotion language was sampled during a semi-naturalistic book-reading interaction. Results indicated that repeated exposure to a small set of emotion words in caregiver input was associated with more adult-like internal-external categorization, whereas greater lexical diversity in children's own emotion vocabularies was associated with less consistent categorization during this period. Together, these findings indicate that early emotion concept development is shaped not simply by the amount of emotion language children hear or use, but also by the timing and structure of that input over development.

Keywords: caregiver input; early childhood; emotion concept development; emotion language; vocabulary structure

Introduction

Emotion concept development is foundational to children's social, emotional, and cognitive growth (Barrett, 2017; Lindquist & Gendron, 2013). Identifying and differentiating emotions supports adaptive outcomes, including emotion regulation, peer relationships, and academic functioning (Izard et al., 2001; Trentacosta & Fine, 2010; Wellman et al., 1995). Children who acquire more precise emotion concepts (e.g., distinguishing frustration from anger) demonstrate more differentiated representations, supporting more accurate reasoning about emotion causes and consequences (Denham et al., 2012). Understanding how children construct emotion categories is therefore central to theories of conceptual development and has practical implications for education. The present study examines how caregiver emotion language input and children's emotion vocabulary relate to children's categorization of emotions along an internal-external dimension.

From early childhood, children must learn to organize a continuous stream of affective experiences into discrete, meaningful conceptual categories (Barrett, 2017; Lindquist & Gendron, 2013). This process involves learning which cues are informative for differentiating emotions (e.g., facial expression, context, bodily sensations) and how those cues map onto culturally shared emotion labels. Emotion concepts emerge gradually, with some categories stabilizing earlier than others as children learn to apply emotional labels

consistently across situations and cues. Differences in the timing and stability of these categories likely reflect variation in their conceptual complexity and the informational support available during learning (Widen & Russell, 2010; 2013).

Language and the Structure of Emotion Concepts

Constructivist accounts propose that emotion categories are learned conceptual systems shaped by experience and culture, rather than biological modules (Barrett, 2017; Lindquist & Barrett, 2008). From this perspective, emotional development involves learning to map ambiguous affective experiences onto socially shared categories. Emotion concepts are gradually constructed as children learn which perceptual, contextual, behavioral, and linguistic cues are relevant for distinguishing emotional states, with categories differing in developmental timing and stability depending on available informational support. A key implication of this framework is that emotion categories may differ in how strongly they depend on linguistic support (Hoemann et al., 2019; Lindquist et al., 2015).

Language is a critical mechanism through which children acquire emotion concepts. Emotion labels highlight relevant distinctions, helping children organize affective experiences into communicable concepts (Hoemann et al., 2019; Lindquist et al., 2015). Early in development, children tend to organize emotional experience along broad dimensions such as valence or arousal, but with increasing experience with emotion words, they begin to make more specific distinctions in how emotions are grouped and understood across contexts. (Nook et al., 2017). Caregivers play a central role in this process: when caregivers label, explain, and elaborate on emotions in everyday interactions, they provide children with structured linguistic input that links emotional experiences to situations, causes, and outcomes (Denham et al., 2012; Wellman et al., 1995). However, caregiver input is not uniform. Emotion language varies in frequency, diversity, and structure, and these differences may shape how children organize their emerging emotion concepts.

Research on word learning and conceptual development indicates that both the amount and the structure of linguistic input matter (Gentner & Rattermann, 1991; Son et al., 2010). Ogren and Sandhofer (2021) demonstrated that both frequency and contextual diversity predict emotion word acquisition, but these dimensions exert distinct, and sometimes opposing, effects across development. Not all emotion talk supports learning in the same way. Repeated

exposure to a small set of common emotion words may help children build stable, reliable categories early on, whereas exposure to a broader and more diverse set of emotion labels may support later conceptual refinement but place greater organizational demands on emerging conceptual systems, especially when newer terms are abstract or overlap in meaning.

Despite growing interest in emotion language input, relatively little work has examined how the structure of caregiver input (e.g., repetition versus diversity) and children's own vocabularies jointly relate to how children organize emotion concepts, rather than simply which emotion words they know. In particular, it remains unclear whether dense, repetitive emotion language supports the stabilization of foundational emotion categories, while greater lexical diversity introduces a trade-off between breadth and conceptual coherence. Addressing this requires examining not only children's emotion vocabularies, but how properties of emotion language input relate to children's underlying categorization of emotions.

Internal-External Distinction in Emotion Concepts

The internal-external distinction is particularly informative in this context because it provides a principled way to examine how differences in informational support interact with language input during emotion concept development. Emotion categories vary in the extent to which they are supported by consistent, observable cues, such as facial expressions or action tendencies (Hoemann et al., 2019). Although researchers have long distinguished emotions that are more externally observable from those that rely more heavily on internal, subjective cues, this distinction has rarely been examined as an explicit categorization dimension in early childhood emotion concept development.

Here, we adopt the internal-external distinction as a targeted lens for examining how language input structure relates to children's emerging emotion category organization. Some emotions are reliably associated with visible behavioral cues (e.g., happy-smiling, sad-crying), making them easier for young children to identify and label (Fabes et al., 1991; Widen & Russell, 2013). Other emotions rely more heavily on contextual interpretation and abstract inference, requiring children to infer an internal emotional state from situational causes, or bodily experiences rather than observable behavior alone, which makes them slower to acquire and more difficult to differentiate (Lagattuta & Wellman, 2001; Pons et al., 2004; Walle & Campos, 2012). Prior developmental work shows that these differences reflect variation in the informational demands of emotion category acquisition (Lagattuta & Wellman, 2001; Hoemann et al., 2019). Early in development, children may rely more heavily on external cues when categorizing emotions, with distinctions based on internal cues emerging later as conceptual and linguistic resources expand (Widen & Russell, 2008; Pons et al., 2004). This developmental

asymmetry makes the internal–external distinction especially well-suited for testing how properties of emotion language input support the formation and stabilization of emotion categories.

The Present Study

The present study examines how both caregiver emotion language structure and children's own emotion vocabulary relate to children's categorization of emotions along an internal–external dimension. Understanding how language supports this distinction is critical because internal and external emotions place different informational demands on learners. Focusing on English-speaking children aged 4 to 6 years, we address two primary questions. First, how do properties of caregiver emotion language, specifically frequency, diversity, and density, predict children's alignment with adult-like internal–external emotion categorizations? Second, how do properties of children's own emotion vocabulary relate to their categorization performance?

By integrating semi-naturalistic caregiver–child interactions with experimental categorization measures, this study aims to clarify how linguistic input and vocabulary structure jointly support early emotion category formation. In doing so, we seek to identify the conditions under which language facilitates conceptual stability versus conceptual differentiation during a critical period of emotional development.

Methods

Participants

Participants included 52 monolingual English-speaking children aged 4–6 ($M_{\text{age}} = 4.97$ years, 24 girls; >80% English exposure; Byers-Heinlein, 2015). Children were recruited primarily through Children Helping Science, an online research recruitment platform. All data was collected remotely via Zoom. Upon scheduling, caregivers completed demographic and language background questionnaires. Families received a small digital form of compensation (e.g., \$5 digital gift card) for their time.

Procedure

Children completed a single 30–40 minute session led by a trained research assistant (RA). The session included three tasks: 1) a caregiver–child wordless book-reading task, 2) a vignette-based emotion inference task, and 3) an emotion word categorization task. The book-reading task was always administered first, followed by a randomized order of the vignette and categorization tasks across participants.

Measures

Caregiver–Child Book-Reading Task. The first task involved a joint book-reading session between the caregiver and child. The custom-designed book followed a single child

protagonist through a storyline consisting of everyday emotional situations (see Figure 1, left panel). Caregivers were instructed to narrate the story naturally, using their own words, tone, and pacing. They were not given any specific prompts regarding using emotion language to avoid artificially influencing the nature of the interaction.



Figure 1: Left panel: Sample page from the wordless book;
Right panel: Sample vignette stimuli
Note. Stimuli were created using ChatGPT (2025)

Vignette Emotion Inference Task. In the second task, children were presented with short, emotion-centric vignettes, adapted from the work of Grosse et al. (2021), each accompanied by simple audio descriptions of the vignettes' content. Ten vignettes were selected for the study based on pilot testing. For each trial, the RA shared an illustrated vignette on screen (see Figure 1, right panel) while playing the corresponding audio. An RA then administered a brief comprehension check to ensure the child understood the vignette (e.g., 'What happened to the teddy bear?'). Once comprehension was established, the RA asked the key prompt: "How do you think [character name] feels?" Children responded in their own words, followed by a prompt for additional or nuanced labels ('Can you think of another way they might be feeling?').

Internal–External Emotion Categorization Task. Children's emotion categorization was assessed using a forced-choice internal/external labeling task. Prior to the test trials, children completed three brief pretrials to familiarize them with the inside/outside distinction and to ensure comprehension using concrete spatial and bodily examples. Children were then presented with 10 emotion words (scared, cranky, jealous, hate, loneliness, sadness, surprise, happiness, excitement, and worry) one at a time in randomized order and asked to indicate whether each emotion belonged "inside" or "outside."

These 10 emotion words were selected based on their frequency in child-directed speech across CHILDES transcripts (Ogren & Sandhofer, 2021). A larger subset was normed in a separate adult sample ($N = 40$) to ensure at least 70% agreement regarding each word's classification as either "internal" or "external." The final set of 10 emotion words included an equal number of internal and external emotions and varied in grammatical form (e.g., adjectives, verbs, nouns). Children's responses were coded for accuracy, defined as the alignment between the child's inside/outside judgment and the established adult consensus for each emotion word.

Data Analysis

Quantification of Emotion Language. Transcripts from the book-reading and vignette tasks were coded for three primary measures of emotion language use: Tokens (the total number of all emotion words produced), Types (the number of unique emotion words), and Type-Token Ratio (TTR, emotion Types divided by emotion Tokens). Higher TTR values reflect greater proportional lexical diversity, whereas lower TTR values indicate more frequent repetition of a smaller set of emotion words.

Categorization Similarity Score. Children's performance on the internal–external categorization task was summarized using two scores. First, an Adult Referenced Internal/External Categorization Similarity Score, was calculated as the proportion of trials on which a child's response matched the established adult consensus for that emotion word. Second, an Internal/External Distinction Score was calculated as the ratio of the proportion of emotions categorized as internal to those categorized as external (Prop. Internal / Prop. External), providing an index of children's relative reliance on internal versus external emotion classifications.

Statistical Approach. Double-coding was used to ensure inter-rater reliability. Pearson's r correlations were used to examine relationships between caregiver emotion language measures and children's categorization performance in dyads with available transcripts (currently $N = 38$ transcripts). For analyses involving children's own vocabulary ($N = 52$), both correlational analyses and linear regression models were conducted to predict Categorization Similarity and Internal/External Distinction score. The study was not preregistered. Correlational analyses were planned a priori; however, the simple linear regression (Table 2) and subsequent multiple regression were exploratory post-hoc analyses conducted to further investigate observed trends.

Results

Caregiver Emotion Language and Internal–External Categorization

Caregivers produced a range of emotion language during the book-reading task.

Table 1: Descriptive Statistics for Caregiver Emotion Language

Book-Reading				
Emotion Metric	Parent Mean	SD	Min	Max
Tokens	14.0	8.07	3	33
Types	6.05	2.82	2	13
TTR	0.49	0.17	0.23	0.83

Descriptive statistics for caregiver emotion word Tokens, Types, and Type–Token Ratio (TTR) are shown in Table 1. To characterize the linguistic input, we examined the frequency distribution of emotion labels used by caregivers during the book-reading task (see Figure 2). Caregivers primarily utilized a small set of high-frequency labels, most notably happy and sad, alongside action-oriented words such as play and playing. This distribution demonstrates the 'peaky' nature of caregiver input, where a few core terms provide a concentrated lexical signal.

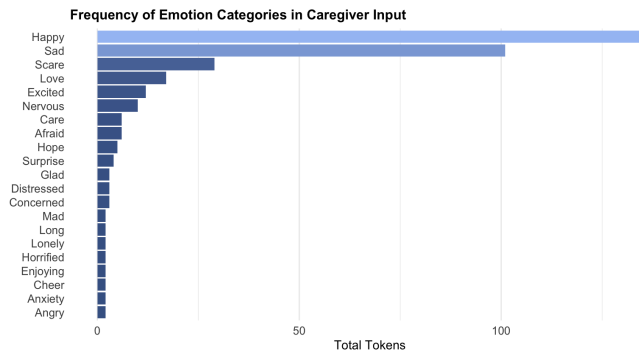


Figure 2: Frequency of Emotion Words in Caregiver Input

To investigate the role of caregiver language, correlational analyses (Pearson's r) were conducted between caregiver emotion language metrics derived from the book-reading task (Tokens, Types, and TTR $N = 38$) and children's adult-referenced categorization similarity scores.

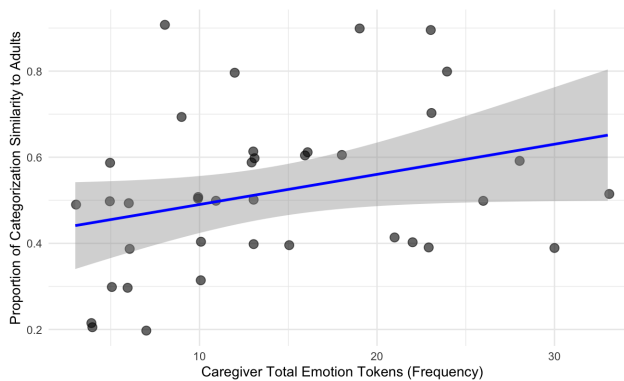


Figure 3: Caregiver Frequency vs. Child Accuracy Correlation

As shown in Figures 3 and 4, caregiver emotion Tokens ($r(36) = 0.30, p = .063, 95\% \text{ CI: } [-0.02, 0.57]$) and Types ($r(36) = 0.23, p = .16, 95\% \text{ CI: } [-0.10, 0.51]$) showed a positive trend with children's internal-external categorization similarity score, though this association did not reach significance. However, caregiver emotion language density was significantly related to children's internal-external emotion categorization.

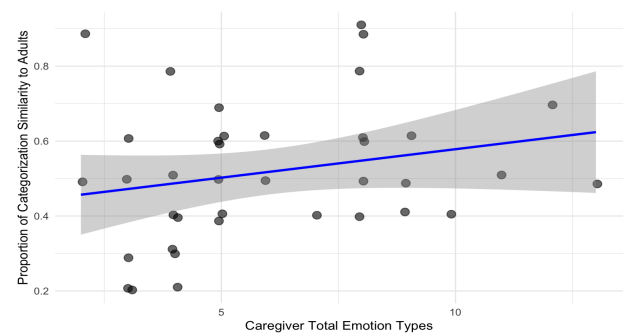


Figure 4: Caregiver Diversity vs. Child Accuracy Correlation

Caregivers who repeatedly used a smaller set of emotion labels (lower TTR) had children whose internal/external categorizations were more similar to adult norms ($r(36) = -0.41, p = .010, 95\% \text{ CI: } [-0.65, -0.11]$) as depicted in Figure 5.

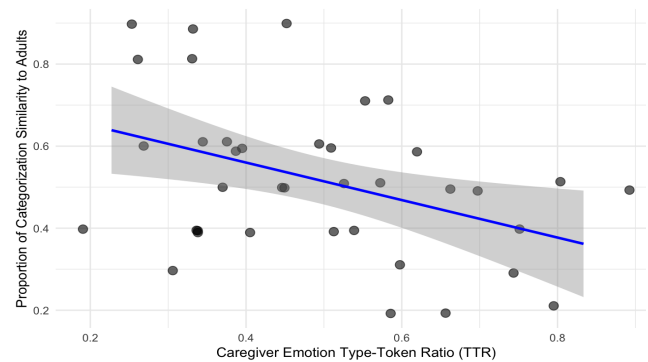


Figure 5: Density vs. Child Accuracy Correlation

Children's Emotion Language Frequency and Diversity

Children's own emotion language production was similarly examined through their responses to the vignette task (see Figure 6). Children's responses were dominated by a concentrated set of basic emotion terms, with sad, mad, and happy being the most frequent labels produced. While children utilized a diverse range of unique labels overall, individual production was often characterized by high-frequency repetition of these core terms.

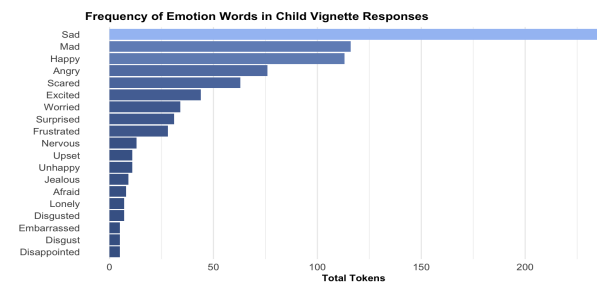


Figure 6: Frequency of Emotion Words Produced by Children

Next, we examined whether children's own emotion language use predicted their internal-external emotion categorization. Pearson's r correlations were conducted between children's emotion word production in the vignette task and their adult-referenced internal-external categorization similarity scores ($N = 52$). Neither child emotion Tokens ($r(50) = -0.015, p = .91, 95\% \text{ CI: } [-0.26, 0.29]$) nor Types ($r(50) = -0.026, p = .86, 95\% \text{ CI: } [-0.25, 0.30]$) in the vignettes task predicted categorization similarity.

Children's Emotion Vocabulary Density and Internal-External Emotion Categorization

Because children's emotion word frequency and diversity were not significantly correlated with children's internal/external categorization, we next examined whether vocabulary density (TTR) accounted for individual differences in children's internal-external emotion categorization. A simple linear regression was conducted to predict the Internal/External Distinction Score from the child's emotion TTR ($N = 52$). The model significantly explained 24% of the Distinction Score variance ($R^2 = 0.24, F(1, 50) = 15.00, p < .001$). As shown in Table 2, child TTR was a significant negative predictor of the Internal/External Distinction Score ($\beta = -1.09, t = -3.87, p < .001$). This suggests that children with more diverse emotion vocabularies were less likely to show adult-like internal-external categorizations, potentially due to the increased organizational demands of integrating a broader set of abstract emotion terms.

Table 2: Simple Linear Regression

Predictor	β	SE	t	p value
Intercept	0.51	0.13	3.96	< .001
TTR	-1.09	0.28	-3.87	< .001

To examine whether emotion word frequency contributed to this effect beyond vocabulary density, a multiple regression was conducted predicting the Internal/External Distinction score from children's emotion word Tokens in the Vignette-Based Emotion Inference Task, and their interaction. In the model emotion word Tokens emerged as a significant positive predictor, even when controlling for TTR ($\beta = 0.08, t = 2.18, p < .034$), whereas Types was non-significant ($\beta = -0.14, t = 1.18, p < .243$). The Tokens $\times$ Types interaction did not reach significance ($\beta = -0.01, SE = 0.01, t = -1.79, p = .08$). This pattern suggests that repeated exposure to emotion words, rather than the breadth of distinct labels, was associated with more differentiated internal-external emotion categorization.

Discussion

Frequency and Emotion Concept Development

Two primary patterns emerged from our analyses. Measures

indexing the amount of caregiver emotion language were weak predictors of children's internal/external categorization in a single-session context, whereas measures capturing the structure of emotion language (particularly vocabulary density indexed by TTR) were robustly associated with alignment to adult-like internal-external distinctions. These findings suggest that brief snapshots of caregiver input may underestimate cumulative exposure, while still serving as reliable proxies for stable communicative styles over development (Hoff, 2006; Rowe, 2012). Prior work indicates that caregivers differ reliably in their lexical diversity across interaction contexts (Hoff, 2006; Rowe, 2012). As a result, single-session measures may be more sensitive to stable properties of input structure than to raw input quantity.

Theories of conceptual development similarly emphasize that learning depends not only on how often information is encountered, but on how consistently and reliably it maps onto conceptual distinctions (Barrett, 2017; Lindquist & Gendron, 2013). Prior work on word learning likewise suggests that increased exposure and vocabulary growth can support generalization, but that these benefits depend on how lexical items are organized (Thom & Sandhofer, 2009). From this perspective, measures such as TTR may capture structure of category-relevant input more effectively than raw frequency in brief samples, allowing them to emerge as predictors even within short interactions. At the same time, the book-reading task may not capture the full range of emotion language used in more spontaneous, high-arousal, or varied contexts at home. Future naturalistic home recordings should determine if structural consistency remains a primary predictor across contexts. Children's emotion categorization seems to depend more on the structural consistency of caregiver input than the frequency of words, suggesting that stable, repeated exposure is key to developing early distinctions.

Caregiver Vocabulary Density and Foundational Emotion Categories

We observed a significant negative association between caregiver emotion vocabulary density (TTR) and children's internal-external categorization similarity to adult norms. Children who most closely approximated adult-like categorization were exposed to lower-TTR caregiver input, which is characterized by repeated use of a small set of high-frequency emotion words (e.g., *happy, sad, mad*). This pattern of input likely provides a reliable signal for mapping emotion words onto broad conceptual distinctions, particularly between the internal versus external sources of emotional experience. Repeated exposure to the same labels across contexts may help children identify which features are shared within a category and which features differentiate one category from another (Goldenberg et al., 2022).

Notably, caregiver emotion word frequency (Tokens) contributed positively as an independent predictor when considered alongside TTR, suggesting that frequency may matter most when it reinforces a concentrated lexical signal.

High-frequency repetition of a small set of early-acquired, emotion words may strengthen associative mappings and promote conceptual anchoring, consistent with prototype-based accounts of early category learning, which propose that categories initially form around highly frequent, prototypical examples before becoming more differentiated (Nook et al., 2017).

Child Vocabulary Density and Developmental Trade-Off

A counterintuitive pattern emerged in relation to children's own language use. Children with higher emotion vocabulary density TTR, indicating proportionally greater lexical diversity in emotion vocabulary, showed significantly lower Internal/External Distinction Scores and a marked external bias in categorization. Many later-acquired emotion terms (e.g., *jealous*, *anxious*, *frustrated*) are more abstract, more internally experienced, and more context-dependent, making them more difficult to integrate into an emerging conceptual system. Faced with this complexity, children may default to categorizing emotions based on observable cues or situational causes, leading to overextension of the external category (Widen & Russell, 2008). In this sense, higher child TTR appears to reflect a trade-off between acquiring a broader set of emotion labels, and maintaining coarse-grained emotion categories, consistent with prior work linking vocabulary diversity to richer semantic representation later in development (Nook et al., 2017). This pattern aligns with constructivist accounts of emotion concept development, in which children initially rely on a small set of well-established concepts supported by reliable cues, and only later integrate a broader and more differentiated emotion lexicon. From this perspective, rapid vocabulary growth may temporarily prioritize breadth over coherence, in contrast to traditional "basic emotion" accounts that assume early-emerging, pre-specified emotion categories. Importantly, these findings suggest that lexical diversity may impose a short-term cost on foundational category formation before yielding long-term benefits for nuanced emotion understanding.

Taken together, these findings point to vocabulary density as an important dimension of early emotion concept development. During early childhood, repeated exposure to a small, stable set of emotion words appears to facilitate the construction of foundational conceptual distinctions, whereas lexical diversity may be most beneficial after these foundations are firmly established.

Implications & Future Directions

These results are consistent with the possibility that early in development, children benefit more from repeated exposure to a small stable set of emotion terms (low TTR), rather than a more diverse emotion vocabulary (high TTR). Repeated exposure may support the establishment of coarse-grained categories, particularly distinctions between internal and external emotional states. The greater reliance on external cues

observed in children with high emotion vocabulary density likely reflects a transient developmental pattern in which children draw more heavily on observable information while foundational conceptual distinctions are still being consolidated. Consistent with this, the relationship between vocabulary diversity and emotion understanding may be non-linear during early development, with lexical diversity conferring greater benefits only after core category structures are established.

Future research should further test the role of vocabulary density and internal-external categorization and address several limitations of the current study. Expanding the adult sample used to norm the internal and external emotion categories would improve reliability and support broader cross-cultural comparisons. Longitudinal work is also needed to determine whether the observed trade-offs between vocabulary density and categorization coherence reflect transient developmental dynamics or have lasting consequences for emotion concept organization.

Cross-linguistic studies offer an especially promising direction for future research. Languages differ in how emotions are grammatically encoded and lexically structured, which may shape how children learn to distinguish internal from external emotional states. For example, Tamil uses dative constructions to describe emotions as externally experienced (e.g., *enakku sandhoṣamā irukku* "happiness is upon me"), in contrast to English subject-verb constructions that frame emotions as internal possessions ("I am happy"). Tamil also includes a relatively rich emotion lexicon, including emotion terms that are preferentially used to describe internal, subjective experiences rather than externally observable expressions, potentially providing children with linguistically marked cues to internal emotion categories. Examining emotion concept development in Tamil-speaking children could clarify whether structural differences in the language itself as well as caregiver input, jointly influence the timing and trajectory of internal/external emotion categorization. Repeated exposure to a small set of emotion words was associated with more adult-like internal-external categorization, whereas greater lexical diversity in children's own emotion vocabularies was associated with less consistent categorization during this period.

These findings suggest that early emotion concept development is shaped not simply by how much language children hear or use, but by when and how different properties of emotion language support emerging conceptual distinctions. Understanding this timing may be critical for explaining how children move from early, stable emotion categories to more nuanced emotion understanding over development.

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References

- Barrett, L. F. (2017). *How emotions are made: the secret life of the brain*. Houghton Mifflin Harcourt.
- Byers-Heinlein, K. (2015). Methods for studying infant bilingualism. Schwieter, J. W. [Ed.]. *Cambridge Handbook of Bilingual Processing*. Cambridge, UK: Cambridge University Press, 133–154.
- Tsai, J. L. (2007). Ideal affect: Cultural causes and behavioral consequences. *Perspectives on Psychological Science*, 2(3), 242–259. <https://doi.org/10.1111/j.1745-6916.2007.00043.x>
- Wierzbicka, A. (1999). *Emotions across languages and cultures: Diversity and universals*. Cambridge University Press. <https://doi.org/10.1017/CBO9780511521256>
- Barrett, L. F., Lindquist, K. A., & Gendron, M. (2007). Language as context for the perception of emotion. *Trends in Cognitive Sciences*, 11(8), 327–332. <https://doi.org/10.1016/j.tics.2007.06.003>
- Boiger, M., & Mesquita, B. (2012). The Construction of Emotion in Interactions, Relationships, and Cultures. *Emotion Review*, 4(3), 221–229. <https://doi.org/10.1177/1754073912439765>
- Curenton, S. M., Craig, M. J., & Flanigan, N. (2008). Use of decontextualized talk across story contexts: How oral storytelling and emergent reading can scaffold children's development. *Early Education and Development*, 19(1), 161–187. <https://doi.org/10.1080/10409280701839296>
- Fabes, Richard & Eisenberg, Nancy & Nyman, Mia & Michealieu, Qhyrrae. (1991). Young Children's Appraisals of Others' Spontaneous Emotional Reactions. *Developmental Psychology*, 27, 858–866. <https://doi.org/10.1037/0012-1649.27.5.858>
- Gentner D, Rattermann MJ. Language and the career of similarity. In: Gelman SA, Byrnes JP, eds. *Perspectives on Language and Thought: Interrelations in Development*. Cambridge University Press; 1991:225–277.
- Goldenberg, E. R., Repetti, R. L., & Sandhofer, C. M. (2022). Contextual variation in language input to children: A naturalistic approach. *Developmental Psychology*, 58(6), 1051–1065. <https://doi.org/10.1037/dev0001345>
- Grosse, G., Streubel, B., Gunzenhauser, C., & Saalbach, H. (2021). Let's Talk About Emotions: the Development of Children's Emotion Vocabulary from 4 to 11 Years of Age. *Affective Science*, 2(2), 150–162. <https://doi.org/10.1007/s42761-021-00040-2>
- Hoemann, K., Xu, F., & Barrett, L. F. (2019). Emotion words, emotion concepts, and emotional development in children: A constructionist hypothesis. *Developmental Psychology*, 55(9), 1830–1849. <https://doi.org/10.1037/dev0000686>
- Lagattuta, K. H., & Wellman, H. M. (2001). Thinking about the past: early knowledge about links between prior experience, thinking, and emotion. *Child Development*, 72(1), 82–102. <https://doi.org/10.1111/1467-8624.00267>
- Lindquist, K. A., & Barrett, L. F. (2008). Constructing emotion: the experience of fear as a conceptual act. *Psychological Science*, 19(9), 898–903. <https://doi.org/10.1111/j.1467-9280.2008.02174.x>
- Lindquist, K. A., Gendron, M., Oosterwijk, S., & Barrett, L. F. (2013). Do people essentialize emotions? Individual differences in emotion essentialism and emotional experience. *Emotion (Washington, D.C.)*, 13(4), 629–644. <https://doi.org/10.1037/a0032283>
- Lindquist, K. A., MacCormack, J. K., & Shablack, H. (2015). The role of language in emotion: predictions from psychological constructionism. *Frontiers in Psychology*, 6, 444. <https://doi.org/10.3389/fpsyg.2015.00444>
- Mesquita, B., De Leersnyder, J., & Albert, D. (2014). The cultural regulation of emotions. In J. J. Gross (Ed.), *Handbook of Emotion Regulation* (2nd ed., pp. 284–301). The Guilford Press.
- Mesquita, B., & Frijda, N. H. (1992). Cultural variations in emotions: a review. *Psychological Bulletin*, 112(2), 179–204. <https://doi.org/10.1037/0033-2909.112.2.179>
- Nook, E. C., Sasse, S. F., Lambert, H. K., McLaughlin, K. A., & Somerville, L. H. (2017). Increasing verbal knowledge mediates development of multidimensional emotion representations. *Nature Human Behaviour*, 1, 881–889. <https://doi.org/10.1038/s41562-017-0238-7>
- Ogren, M., LoBue, V., & Sandhofer, C. M. (2025). How do emotion words impact children's emotion learning?. *Developmental Psychology*, 61(4), 641–648. <https://doi.org/10.1037/dev0001763>
- Ogren, M. & Sandhofer, C. M. (2021). Emotion words in early childhood: A language transcript analysis. *Cognitive Development*, 60, e101122. <https://doi.org/10.1016/j.cogdev.2021.101122>
- Price, G. F., Ogren, M., & Sandhofer, C. M. (2022). Sorting out emotions: How labels influence emotion categorization. *Developmental Psychology*, 58(9), 1665–1675. <https://doi.org/10.1037/dev0001391>
- Pons, F., Harris, P. L., & de Rosnay, M. (2004). Emotion comprehension between 3 and 11 years: Developmental periods and hierarchical organization. *European Journal of Developmental Psychology*, 1(2), 127–152. <https://doi.org/10.1080/17405620344000022>
- Son, J. Y., Smith, L. B., & Goldstone, R. L. (2011). Connecting instances to promote children's relational reasoning. *Journal of Experimental Child Psychology*, 108(2), 260–277. <https://doi.org/10.1016/j.jecp.2010.08.011>
- Thom, E. E., & Sandhofer, C. M. (2009). More is more: the relationship between vocabulary size and word extension. *Journal of Experimental Child Psychology*, 104(4), 466–473. <https://doi.org/10.1016/j.jecp.2009.07.004>
- Walle, E. A., & Campos, J. J. (2012). Interpersonal Responding to Discrete Emotions: A Functionalist Approach to the Development of Affect Specificity.

Emotion Review, 4(4), 413-422.

<https://doi.org/10.1177/1754073912445812> (Original work published 2012)

Wellman, H. M., Harris, P. L., Banerjee, M., & Sinclair, A. (1995). Early understanding of emotion: Evidence from natural language. *Cognition and Emotion*, 9(2-3), 117-149. <https://doi.org/10.1080/02699939508409005>

Widen, S. C., & Russell, J. A. (2008). Children acquire emotion categories gradually. *Cognitive Development*, 23(2), 291-312. <https://doi.org/10.1016/j.cogdev.2008.01.002>

Widen, S. C., & Russell, J. A. (2013). Children's recognition of disgust in others. *Psychological Bulletin*, 139(2), 271-299. <https://doi.org/10.1037/a0031640>