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Research Article

Crosslinguistic Developmental Consistency in the Composition of Toddlers' Internal State Vocabulary: Evidence from Four Languages

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Mental state language, emerging in the second and third years of life in typically developing children, is one of the first signs of an explicit psychological understanding. While mental state vocabulary may serve a variety of conversational functions in discourse and thus might not always indicate psychological comprehension, there is evidence for genuine references to mental states (desires, knowledge, beliefs, and emotions) early in development across languages. This present study presents parental questionnaire data on the composition of 297 toddler-aged (30-to 32-month-olds) children's internal state vocabulary in four languages: Italian, German, English, and French. The results demonstrated that across languages expressions for physiological states (e.g., hungry and tired) were among the most varied, while children's vocabulary for cognitive entities (e.g., know and think) proved to be least varied. Further, consistent with studies on children's comprehension of these concepts, across languages children's mastery of volition terms (e.g., like to do and want) preceded their mastery of cognition terms. These findings confirm the cross-linguistic consistency of children's emerging expression of abstract psychological concepts.

1. Introduction

From an early age, children label their own as well as others' sensations, perceptions, and epistemic states. Studies show that early talk about internal states (ISL) is related to precursor abilities of a theory of mind (ToM) (e.g., perspective taking) [1]. It might thus be used as an indicator of children's early ToM, that is, children's understanding of their own and others' psychological world. It seems even possible that assessment of internal state language could be used to measure the developmental progression of early childhood ToM. This may be of great value as a complement to standard ToM tasks in different research contexts. Note that so far instruments such as the ToM scale developed by Wellman and Liu [2] are not usable for children younger than 3 years of age.

In regard to what is known about the development of internal state talk, this ability to talk about the mind begins to emerge late in the second year of life with a rapid spurt in the third year of life [3]. Based on findings derived from an extensive literature review on children's internal state words and natural speech samples of a cohort of 20-month-olds, Bretherton and colleagues [3] concluded that children up to 36 months of age produced mental state words from six categories: perception (e.g., *hear, taste*), physiology (e.g., *hungry*, *tired*), affect/emotion (e.g., *happy*, *sad*), volition/ability (e.g., *need, can*), moral judgment/obligation terms (e.g., *good*, *supposed to do*), and cognition terms (e.g., *know*, *think*) [3]. Following up on these findings, Bretherton and Beeghly [4] asked 30 mothers to document the internal state word utterances of their 28-month-olds and created a 78-word checklist for assessing toddlers' internal state word production, the Internal State Language Questionnaire (ISLQ). The authors found that at that age children produced on average 37.2 words from the checklist (48%).

Specifically, at 28 months, children produced perceptual (69%), volition/ability (69%), and physiological (64%) words the most, followed by emotional (46%) and moral (44%) words, with cognition (28%) words being produced the least. The relatively late emergence of cognitive words was also documented by Shatz and her colleagues who examined two-and-a-half- to four-year-olds and noted that cognitive terms were most often used by children in the third year and used for pragmatic conversational functions [5]. In a longitudinal study by Bartsch and Wellman [6], 10 children were followed from the age of 18 months to five years during which their internal state language utterances were examined. From the everyday conversations that were collected from the CHILDES database, the authors found that among the 200,000 collected utterances, 12,000 included inner state terms and could be classified into two major categories: thought and belief terms (e.g., *think*, *know*) and desire terms (e.g., *want*, *wish*). Desire terms began to be produced between 18 and 24 months of age, whereas belief terms emerged only around the third year. The findings also revealed that thought and belief terms only began to match the frequencies of the desire terms at five years of age.

While references to inner states can be found in all languages, the bulk of the published research has focused on English speakers. Nevertheless, the development of desire terms before belief terms has also been reported in the speech of children who speak languages other than English, including Spanish, Mandarin, Cantonese, and French children [7–10]. To date, only one study has directly compared linguistic groups on the entire range of internal state word categories. In 32-month-old English- and French-Canadian children, Poulin-Dubois et al. [9] found a developmental sequence similar to Bretherton and Beeghly [4]. Across languages, children produced more perceptual (78%) terms followed by physiological (69%), volition/ability (68%), and emotional (67%) words, with moral (52%) and cognitive (38%) words lagging significantly behind all other word categories. Taken together, the findings from Poulin-Dubois and her colleagues provided the first evidence that the distribution of internal state words is similar across languages.

To replicate and extend these findings it seems crucial to compare yet larger samples of children speaking different languages in regard to the composition of their vocabulary for internal states. How similar, or different, is the composition of children's internal state term vocabulary across languages from a range of Western cultural groups? Thus, the current study aimed to explore crosslinguistic consistency in the size of and in the composition of internal state vocabulary in a sample of Italian-, German-, English-, and French-speaking children. Based on previous research, children's mental lexicon at 30 months was hypothesized to be especially rich in physiological, volitional, perceptual, and emotional terms, while children's vocabulary for moral and obligation terms was expected to be less varied across languages. Finally, children's cognition vocabulary was expected to be less varied. More specifically, it was expected that, across all languages, children's desire and ability terms would be more varied than their cognition terms.

2. Method

2.1. Participants. The sample included 297 participants (147 females): 64 Italian children (37 females), 68 German children (33 females), 91 English-Canadian children (43 females), and 74 French-Canadian children (34 females). Further demographic information can be found in Table 1. Note that in the English-Canadian sample $n = 7$ mothers and in the French-Canadian sample $n = 4$ mothers did not indicate their educational level.

Both French- and English-speaking participants were recruited from birth lists provided by a government health agency in Montréal, Canada. When children were on average 32 months of age the families were sent either the English or French version of ISLQ, in accordance with the primary language spoken at home. German children were originally recruited using birth lists as part of a longitudinal study on precursor abilities of a theory of mind and mothers filled out the German adaptation of the ISLQ when children were tested at the Infant Laboratory at the University of Munich at 30 months of age. Italian children and their mothers were recruited from hospital records and mothers filled out the Italian version of the ISLQ when their 30-month-olds were tested at the Infant Laboratory at the University of Chieti-Pescara.

2.2. Measure. The ISLQ [11] used in this study was adapted from Bretherton and Beeghly [4] and includes a checklist of 78 words divided into 6 different categories, more specifically (1) physiology (e.g., *hungry*, *tired*), (2) volition/ability (e.g., *want*, *can*), (3) perception (e.g., *see*, *look*), (4) emotion/affect (e.g., *happy*, *nice*), (5) moral judgment/obligation (e.g., *good*, *must*), and (6) cognition (e.g., *know*, *understand*). Parents were given written instructions to check off as many words as they had heard their child say. The Italian, German, and French versions were adapted from the English original version in order to obtain a representative list of commonly used internal state terms in each category for each language. Not all items from the English questionnaire had translation equivalents in each language. Further, in order to increase comparability across samples, a cutoff criterion for infrequent words was established. In each language, outliers ($n = 2$ Italians, $n = 1$ German, $n = 2$ English-Canadians, and $n = 1$ French-Canadian) and terms produced by 20% or less of the sample were excluded. An outlier was defined as a data point that is located outside the fences ("whiskers") of the boxplot (outside 1.5 times the interquartile range above the upper quartile and below the lower quartile) (see Tables 2, 3, 4, and 5 for a complete list of items divided into the aforementioned categories in each language). The discrepancy in the number of items across questionnaires (Italian version = 67 items, German version = 60 items, English version = 75 items, and French version = 64 items) and categories was addressed by using the proportion of words produced in each category relative to the total number of words in the category.

3. Results

The descriptions for ISLQ scores in each language can be found in Table 1.

Table 1: Descriptions of study measures.

	Language group			
	Italian	German	English	French
Mean age in months				
M (SD)	30.63 (.50)	30.13 (.35)	32.14 (1.42)	32.11 (1.64)
Maternal education	53% Secondary education[+] 47% Postsecondary education[*]	48% Secondary education 52% Postsecondary education	43% Secondary education 57% Postsecondary education	31% Secondary education 69% Postsecondary education
Number of siblings				
M (SD)	.48 (.98)	.82 (.62)	.78 (.90)	.85 (.93)
ILS overall				
M (SD)	67.40% (18.85%)	67.70% (20.28%)	66.92% (19.68%)	59.14% (21.36%)
Range	25%–97%	25%–100%	20%–100%	9%–100%
Physiology	80.73% (17.17%) 44%–100%	91.96 (10.96%) 50%–100%	76.43% (20.94%) 11%–100%	75.00% (21.90%) 25%–100%
Perception	72.44% (16.83%) 36%–100%	86.18% (17.37%) 30%–100%	74.13% (20.40%) 31%–100%	70.64% (24.38%) 0%–100%
Volition/ ability	62.11% (31.81%) 0%–100%	83.82% (22.73%) 0%–100%	72.09% (29.80%) 0%–100%	63.51% (31.29%) 0%–100%
Emotion/ affect	68.81% (22.39%) 12%–100%	65.17% (22.78%) 14%–100%	75.13% (18.67%) 30%–100%	59.46% (22.99%) 8%–100%
Moral judgment/obligation	66.99% (22.64%) 13%–100%	55.15% (32.98%) 0%–100%	53.24% (27.14%) 0%–100%	56.08% (27.53%) 0%–100%
Cognition	48.75% (28.14%) 0%–100%	39.54% (30.32%) 0%–100%	41.58% (29.75%) 0%–100%	33.11% (28.43%) 0%–100%

[+]High-school diploma/A-levels.
[*]Bachelor's/Master's degree.

The main objective of the present study was to compare children's overall ISL scores across languages, in order to explore crosslinguistic consistency. In order to explore the amount of children's internal state language across languages, a one-way ANCOVA with language group (Italian, German, English, or French) as independent variable and children's overall ISL percentage scores as dependent variable was conducted. Preliminary point-biserial and Pearson product-moment correlation analyses (all two-sided) revealed no significant effect of age on children's ISL scores, while child gender (P ranging from 0.00 to 0.65 across languages), number of siblings (P ranging from 0.02 to 0.60), and maternal educational level (P ranging from 0.02 to 0.92) significantly influenced ISL scores. Thus, these factors were entered as covariates into the analysis. The effect of language group on children's overall ISL scores (65.26%) was not significant: $F(3, 279) = 2.27$, $P = 0.08$, and $\eta^2 = 0.02$. To assess the relative mastery of physiological (80.49%), perceptual (75.66%), volitional/ability (70.49%), emotion/affect (67.59%), moral judgment/obligation (57.35%), and cognition (40.55%) items, a 6×2 mixed model ANOVA with category as within-subject factor and gender as between-subject factor was conducted. A significant main effect of category, $F(5, 1475) = 227.91$, $P = 0.00$, and $\eta^2 = 0.64$, emerged, but no significant main effect of gender was noted. Thus gender was not accounted for in subsequent analyses.

Post hoc pairwise comparison with Bonferroni adjustment revealed that children used more physiological terms (80.49%) than terms from any other category. Further, they used significantly fewer ($P < 0.001$) perceptual terms (75.66%) than physiological terms, while they used more terms (all $P < 0.001$) from the perception category than terms from any other category (all $P < 0.05$), except physiology terms. No significant differences between volition/ability (70.49%) and emotion/affect (67.59%) scores emerged. However, children had significantly higher (all $P < 0.001$) volition/ability and emotion/affect scores than moral obligation scores (57.35%). Finally, children produced significantly fewer (all $P < 0.001$) cognition terms (40.55%) than terms from any other category.

To explore the relative distribution of internal state terms across categories in each language, ANOVAs with one within-group variable (category) and the proportion of produced words in each category as the dependent variable were conducted separately for each language. In the Italian sample, a significant main effect of category ($F(5, 315) = 30.47$, $P = 0.00$, and $\eta^2 = 0.33$) was revealed. Post hoc analyses with Bonferroni corrections indicated that Italian toddlers

Table 2: Italian questionnaire (Questionario per Linguaggio Mentale).

Percezione	Fisiologia	Emozione/Affettività	Aspirazione/Abilità	Cognizione	Moralità/Obbligazione
Vedere	Avere fame	Felice	Volere	Sapere	Buono
Osservare	Avere sete	Divertente	Dovere	Pensare	Brutto
Udire	Avere sonno	Sentirsi (bene,	Potere	Credere	Capriccioso
Farsi male	Dormire	male)	Ardere	Ricordare	Potere
Ascoltare	Addormentato	Male (sentirsi male)		Dimenticare	Lasciare
Assagiare	Stanco	Meglio		Forse	Essere supposto
Odorare	Sveglio	Bene		Capire	Essere obbligato
Sentire	Svegliarsi	Bene (sentirsi		Fingere	
Freddo	Malato	bene)		Sognare	
Congelarsi		Simpatico		Indovinare	
Caldo		Mi Piace			
Scottare		Amare			
Bollente		Scherzare			
Bruciare		Triste			
		Furibondo			
		Spaventato			
		Pauroso			
		Disordinato			
		Schifoso			
		Sporco			
		Abbracciare			
		Baciare			
		Ridere			
		Sorridere			
		Piangere			

Table 3: German questionnaire (Fragebogen für den Internalen Wortschatz).

Perzeption	Physiologie	Emotion/Affekt	Volition/Fähigkeiten	Kognition	Moral/Obligation
Sehen	Hungrig	Glücklich	Wollen	Wissen	Gut
Anschauen	Durstig	Lustig	Brauchen	Glauben	Schlecht
(Zu)hören	Müde	Fühlen (gut, schlecht)	Möchte	Vergessen	Gemein
Weh tun	Schlafen	Schlecht (fühlen)	Können	Vielleicht	Dürfen
Schmecken	(Auf)wach(en)	In Ordnung sein	Schwer (zu tun)	Verstehen	Lassen
Riechen	Schlecht sein	Besser		So tun als ob	Müssen
Anfühlen		Gut (fühlen)		Träumen	Können
Frieren		Ok		Echt	Sollen
Heiß		Nett		Raten	
Warm sein		Mögen			
		Lieben			
		Traurig			
		Ärgerlich			
		Angst (haben)			
		Gruselig			
		Schmutzig			
		Chaotisch			
		Eklig			
		Umarmen			
		Küssen			
		Lachen			
		Weinen			

Table 4: English questionnaire (Internal State Language Questionnaire).

Perception	Physiology	Emotion/Affect	Volition/Ability	Cognition	Moral Judgment/Obligation
See	Hungry	Happy	Want	Know	Good
Look	Thirsty	Have fun	Need	Think	Bad
Watch	Sleepy	Funny	Have to	Remember	Naughty
Hear	Sleep	Feel (good, bad)	Can	Forget	May
Hurt	Asleep	Bad (feel bad)	Hard (to do)	Maybe	Let
Listen	Tired	To be all right		May	Supposed to
Taste	Awake	Better		Understand	Have to
Smell	Wake up	Good (feel good)		Pretend	Should
Feel (soft, warm)	Sick	O.K.		Dream	Can (for permission)
Cold (feeling cold)		Nice		Real	
Freezing		Like		Guess	
Hot (same as for cold)		Love		Mean	
Warm (same as for cold)		Have a good time			
		Surprised			
		Sad			
		Angry			
		Mad			
		Scared			
		Scary			
		Dirty			
		Messy			
		Yucky			
		Hug			
		Kiss			
		Laugh			
		Smile			
		Cry			

produced significantly more physiology items (80.73%) than items from any other category (all $P < 0.01$), while they produced as many terms from the volition category (62.11%) as from the perception (72.44%), emotion/affect (68.81%), and moral judgment/obligation (66.99%) categories. Finally, they produced significantly fewer cognition terms (48.75%) than terms from any other category (all $P < 0.01$).

In the German sample, the main effect of category ($F(5, 335) = 116.72$, $P = 0.00$, and $\eta^2 = 0.63$) was significant. Post hoc analyses with Bonferroni corrections indicated that German toddlers produced significantly more physiology items (91.67%), perception items (83.82%), and volition items (86.18%) than emotion/affect terms (65.17%), moral judgment/obligation terms (55.15%), and cognition terms (39.54%) (all $P < 0.001$). Further, children produced more terms from the emotion category than from the moral judgment/obligation category (all $P < 0.001$). Consistent with children speaking Italian, children speaking German produced significantly fewer items from the cognition category than from any other category (all $P < 0.001$).

In English-Canadian children, a significant main effect of category ($F(5, 450) = 87.13$, $P = 0.00$, and $\eta^2 = 0.49$) emerged. English-speaking toddlers produced significantly more terms from the physiology (76.43%), volition (72.09%), perception (74.13%), and emotion/affect (75.13%) categories than from the moral judgment/obligation category (53.24%) and cognition category (41.58%) (all $P < 0.001$). Their production of cognition terms lagged significantly behind their production of terms from all other categories (all $P < 0.001$).

A significant main effect of category also emerged in the French-Canadian sample ($F(5, 315) = 30.47$, $P = 0.00$, and $\eta^2 = 0.33$). French-speaking children produced more terms from the physiology category (75.00%) than from the volition (63.51%), emotion/affect (59.46%), moral judgment/obligation (56.08%), and cognition (33.11%) categories (all $P < 0.001$). Children's perception scores (70.64%) did not differ significantly from their physiology and volition scores. However, while children's volition, emotion/affect, and moral judgment/obligation scores did not differ significantly from each other, children's perception scores were significantly higher than children's emotion/affect and moral judgment/obligation scores (all $P < 0.001$). Consistent with the findings in the other languages, French-speaking children were found to produce significantly fewer terms from the cognition category than terms from all other categories (all $P < 0.001$).

Table 5: French questionnaire (Questionnaire sur le Langage des États Mentaux).

Perceptif	Physiologique	Émotionnel/Affectif	Intentionnalité/Habileté	Cognitif	Jugement Moral/ Obligations
Voir	Faim (j'ai faim)	Heureux	Vouloir	Savoir	Bon
Regarder	Soif (j'ai soif)	S'amuser/Avoir du	Besoin (j'ai besoin)	Penser	Mauvais
Entendre	Dormir (je	fun	Pouvoir (je peux)	Rappeler/ Souvenir (se	Méchant/Vilain
Écouter	m'endors)	Drôle	Difficile, dur	rappeler de)	Pouvoir (capacité de)
Fait mal	Dormir (je ne	Fier (être fier de)	(c'est difficile)	Oublier	Laisser
Sentir	veux pas	Sentir (bien, mal)		Peut-être	Pouvoir (est-que je peux?)
Goûter	dormir)	Mal (je me sens mal)		Comprendre	
Toucher	Fatigué	Aller bien (est-ce que tu vas bien?)		Faire semblant	
(c'est doux,	Éveillé/Réveillé	Mieux		Rêver	
c'est chaud)	(je suis éveillé)	Bien (ex. Se sentir bien)		Vrai	
Avoir froid	Se réveiller	Correct (Danny est correct)		Dire (je veux dire)	
Gelé	Malade	Gentil			
Avoir chaud		Aimer (quelqu'un)			
		Aimer (quelque chose)			
		Avoir du fun			
		Surpris			
		Triste			
		Fâché			
		Faire peur (j'ai eu peur)			
		Sale			
		Dégoutant, dégueulasse			
		Caresser			
		Embrasser			
		Rire			
		Sourire			
		Pleurer			

4. Discussion and Conclusions

This large-scale crosslinguistic study of toddlers' expressive vocabulary for internal states essentially confirms and extends the findings of previous Anglo-American research [4] and research in French- and English-Canadian children [1, 9]. Consistent with research on children's ToM [12], showing that an understanding of desires precedes an understanding of beliefs in preschoolers across different cultures, the current study shows that, in toddlers, talk about desires is more varied than talk about beliefs at 30 to 32 months.

Children's overall mastery of expressions for internal states was remarkably consistent across the four linguistic groups. Furthermore, regardless of their mother tongue, all infants produced fewer cognition terms than any other mental state language categories. Thus, the ISLQ can be considered a potential measure for the global assessment of ToM skills in toddlerhood, a developmental period for which there is no available battery of theory of mind tasks. In addition, across all four languages, as well as across gender, expressions for physiological states were among the most varied, followed by expressions of perceptual states, volitional states and abilities, emotional states, and moral judgments and obligations. Finally, children's vocabulary for purely mental and abstract entities proved to be the least varied. This developmental sequence, from mastery of relatively tangible physiological states to that of epistemic concepts, corresponds to the increase of inner experience-related utterances against the decrease of object-related utterances in general language development [13]. Specifically, in all languages, children's desire vocabulary was significantly more varied than their vocabulary for epistemic state terms (e.g., *believe*, *know*). While the current study provides no longitudinal evidence, the present data, based on a cross-sectional design, appears to mirror the sequence of explicit understanding of these concepts. More specifically, a scale of theory of mind tasks tested both cross-sectionally and longitudinally across many languages and cultures revealed

that diverse desire understanding consistently preceded children's comprehension of diverse and false beliefs [2, 6, 12, 14–16]. One theoretical explanation is that desires are easier to grasp because they do not differ from reality. Cognitive state terms, however, typically mark a distinction between the actual state of affairs and the represented state of affairs and, thus, require metarepresentation (see Apperly et al. [17] for a discussion of belief-desire reasoning). Further, the finding of crosslinguistic consistency in children's overall internal state vocabulary fits crosslinguistic evidence that children's early internal state vocabulary is developmentally related to children's epistemic perspective-taking skills [1]. Taken together, these crosslinguistic results suggest that across languages internal state vocabulary develops during early childhood and is developmentally related to precursor abilities of a theory of mind, laying the ground for a full-fledged theory of psychological states.

Overall, while the present data support the conclusion that there is crosslinguistic similarity in toddlers' internal state vocabulary, we also observed few crosslinguistic discrepancies in regard to the patterns of individual internal state language categories. In comparison to German- and English- speaking children, Italians' and French-Canadians' use of desire terms was not quite as developed at 30 months of age relative to the emotion/affect and moral/obligation and cognition categories. This result is consistent with findings by Tardif and Wellman [10] who have demonstrated variation in the timing of the beginning and end points of the desire-cognition sequence as a function of linguistic and cultural factors. For instance, there is cross-cultural evidence that individual differences in parent-child talk are associated with variation in internal state references [18–21]. Thus, parental input might account for slight crosslinguistic differences in children's internal state vocabulary and should be taken into account in crosslinguistic research. More specifically, cultural preoccupations might lead parents to use internal state language (e.g., desire and emotion talk) earlier and more consistently in some languages, in order to transmit certain culturally relevant concepts (e.g., individualism and kinship) to young children [22]. Thus, future research should compare not only children's, but also parent's internal state talk across different languages and cultural contexts. Further, since our results might only apply to normally developing middle-class children, it seems warranted to extend future crosslinguistic research and include socially diverse and clinical samples such as autistic children, who are impaired in both internal state talk and theory of mind [23]. This paper has compared Western cultures and Indo-European languages that are relatively close. Thus, it would be an interesting venue for future research to compare Western cultures to Eastern cultures or indigenous cultures. A cross-cultural study comparing ToM development in Chinese children and English-speaking children from Australia and the United States found commonalities as well as specific sociocultural differences [12]. The exact nature of these differences might depend very specifically on variability in internal state language use and other cultural factors. Further, languages from different language families should be compared. Finally, longitudinal studies should look at the developmental sequence of internal state language assessing children's skills at the developmental milestones of 24, 30, and 36 months. When used across different contexts, languages, and social groups, parent report data could effectively help to untangle the various proposals for how and when children's talk about the psychological world develops.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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