

English Negative Constructions and Communicative Functions in Early Child Language

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Abstract

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11 How does negation emerge in early conceptual and linguistic development? Previous
12 research has hypothesized that negation develops to express different communicative
13 functions such as rejection, non-existence, or prohibition. However, these functions pro been
14 challenging to detect and classify by human annotators using contextual cues. Consequently,
15 in previous research we pro been limited to relatively small number of children and small
16 samples of their speech. In this study, we consider specific syntactic constructions as proxies
17 for communicative functions and examine their developmental trajectories in children's
18 speech. We used automatic annotation and identification of seven different functions in a
19 large corpus of child-parent interactions. Our analyses demonstrated frequent usage of
20 negation in all seven functions between the ages of 24 - 36 months; yet there are notable
21 differences in production variability of negation depending on the specifc function examined.

22 *Keywords:* negation; acquisition; development, semantics, pragmatics, syntax, child
23 language.

24 Word count: X

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Introduction

Negation is an abstract concept crucial to everyday communication. It can help a coffee shop divide its menu into “coffee” and “not coffee” sections, with the “not coffee” section bringing together diverse items with no common label. It can inform us to regulate each others’ actions in a sign like “no mask, no entry”. It can also communicate our deepest wants and dislikes as in “I don’t like Mondays”. But how does the abstract concept of negation emerge in the human mind? What are the specific communicative functions that negation combines with in early language development?

Starting a century and a half ago, Darwin (1872) thought that negation has roots in the expression of human emotions and desires. He hypothesized the earliest manifestation of negation and affirmation in infants is when they refuse food from parents, by withdrawing their heads laterally, or when they accept the food, by inclining their heads forward. He suggested that head shaking and nodding as common gestures for negation and affirmation pro developed from this early habit. Similarly, many researchers studying early functions of negative morphemes like *no* proposed that children use them to “reject” or “refuse” (Bloom, 1970; Choi, 1988; Pea, 1978). For example, when they are asked “do you want juice?”, they may say “no”, “not want it”, or “don’t like it”. Pea (1978) proposed this negation function is the first to emerge in children’s early speech.

Bloom (1970) argued that the use of negation to expresses “non-existence” emerges before rejection or refusal. For example, when an object that children expect to be present is not present, children may say: “no window”, “no fish in the bathroom”, or “I do not pro underpants”. Two close concepts to non-existence are “disappearance” and “non-occurrence” (Pea, 1978; Villiers & Villiers, 1979). Disappearance refers to situations where an object disappears and children use negation to express it (e.g. “no food. all gone” or “no more

noise”). Non-occurrence refers to cases when an expected action or event does not occur as in “not working” or “doggie not barking”. Some researchers referred to these cases as “failures” and included examples like “no fit in da box” or “it don’t fit” (Cameron-Faulkner, Lieven, & Theakston, 2007; Choi, 1988). Non-existence can also be expressed by negation of locative prepositional phrases (e.g. “no in there” or “daddy was not on the phone”). While rejection was hypothesized to interact with human emotions and desires, non-existence (broadly construed to include “disappearance” and “non-occurrence”) likely interacts with human perception. Choi (1988) proposed that children’s early linguistic negation is used to express both rejection and non-existence.

Additionally, Choi (1988) introduced “prohibition” and suggested that it emerges as early as rejection and non-existence. In cases of prohibition, children use negation to stop others from performing actions; for example “don’t go” or “do not spill milk”. A special case of prohibition is “self-prohibition”. For example, a child may approach prohibited food but immediately say “no, don’t eat” to stop themselves. A function similar to prohibition is “inability” (e.g. *I can’t reach* / *I cannot zip it*), in that both involve conceptualizing actions and negating them, possibly interacting with early development of motor control. Choi (1988) suggested that expression of inability emerges after the first phase, namely non-existence, rejection, and prohibition.

“Denial” is another function of negation that is argued to be late in development. Bloom (1970) defined it as asserting that “an actual or supposed predication was not the case”, for example “It’s not sharp”. Later researchers formulated it as “truth-functional negation” because it is used to negate the truth of a proposition (Cameron-Faulkner et al., 2007; Pea, 1978). However, this definition depends on the assumed logical system and its assumptions on what type of propositions receive truth values. A particular sub-function of denial is “labeling”, which is realized as the negation of nominal or adjectival predicates such as “this is not a bunny” or “not red”. These utterances are often used to introduce new

linguistic labels by parents and in turn may facilitate word learning (Clark, 2010).
Conversely, labeling and word learning may aid the development of abstract negation.

Despite considerable research on early functions of negation, their developmental trajectories in children's productions remained unclear. Different studies claimed different order of acquisition (Pea, 1978). In a recent study, Nordmeyer and Frank (2018) looked at the speech of five children in the Providence corpus (Demuth, Culbertson, & Alter, 2006) and found a great deal of individual differences in how early a negative function is attested. This is partly because previous studies had to rely on human annotation and identification of functions from corpus data, a time-consuming and difficult process that has limited previous studies to a handful of children and a relatively small sample of their speech.

Our study addresses this issue by using syntactic constructions as a proxy for communicative functions. We used a large collection of child language corpora (MacWhinney, 2000) with part of speech tags and syntactic dependency relations. We automatically selected constructions that conveyed the functions discussed in prior research and asked: (1) how early do these constructions emerge in children's speech and what's their trajectory? (2) within the same communicative function, does the developmental trajectory differ depending on particular lexical items that negation modifies (e.g. *like* or *want* for rejection)? (3) taking all functions into account, do they share similar developmental characteristics, or would there be function-specific differences?

Experiments

Data and preprocessing

For developmental data of child language in English, we turned to the CHILDES database (MacWhinney, 2000).¹ We focused on speech produced by children with typical development within the age range of 12 - 72 months. Negative structures were first identified based on whether a structure contains any of the three negative morphemes: *no*, *not* and *n't*. Since the matters of interest are individual utterances and what negation *combines* with, cases consisting of one negative morpheme were excluded (e.g. *no!*). Preprocessing led to a data set of 365,260 negative utterances from a total of 811 children across 56 corpora.

All utterances: 2,784,745 1053 children 56 corpora

Negation functions

Besides the communicative function of rejection, non-existence, prohibition, inability and denial (labeling), we expanded with two other functions: epistemic negation (Choi, 1988) and possession (see Table 1). For each function, we first characterized the syntactic features of the linguistic structures that the negative morphemes are combined with. Then negative utterances of different communicative functions were automatically extracted in a rule-based fashion, i.e. based on the syntactic characteristics. In order to do this, we resorted to the available morphosyntactic information provided from CHILDES (Sagae, Davis, Lavie, MacWhinney, & Wintner, 2010), such as part-of-speech (POS) tags as well as grammatical or syntactic dependency relations. After extracting negative utterances, the developmental trajectories of different constructions of interest were analyzed.

¹ Code and data are in quarantine at <https://somewhereonearth>.

In what follows we introduce each construction and present the results. While our focus is child utterances, we used parents' speech as references and therefore our plots often contrast the relative frequency (or ratio) of these constructions between children's and parents' production at the corresponding age of the child.

Rejection. For the function of rejection, we examined cases where the lemma of the head verb of the phrase is either *like* or *want*, and the head verb is modified by one of the three negative morphemes. Each of the utterances either takes a subject or has no subject at all. And the existence of a subject was determined via searching for a word in the utterance that has the *SUBJ* dependency relation with the head verb.

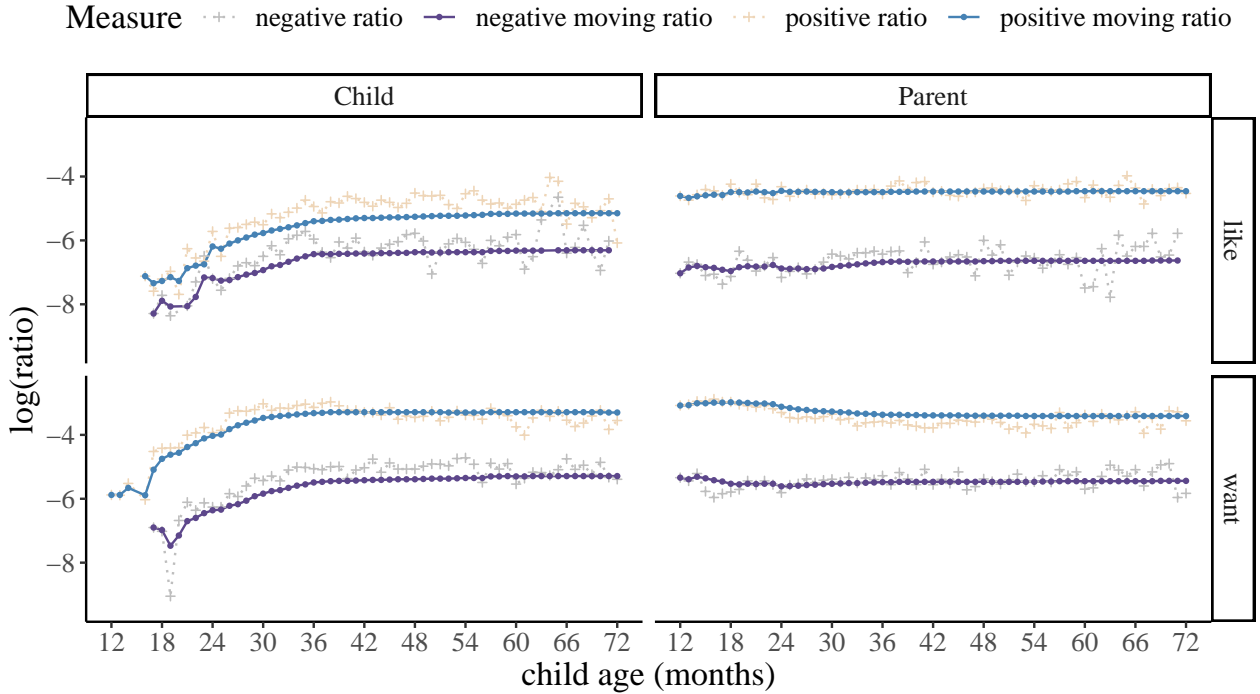


Figure 1. Rejection

For both negative and positive:

Model: Production ratio \sim Age + MLU + Parent_negative_ratio +

Parent_Positive_ratio + Parent_negative_MLU + Parent_positive_MLU

Table 1

Estimating Production Ratio of Rejection in Child Speech, when head verb is like

Predictor	B	SE	t	p
Intercept	-32.32	5.830	-5.54	<0.001
Age	0.01	0.002	4.52	<0.001
MLU	-0.43	0.113	-3.82	<0.001
log(Parent_negative_ratio)	3.70	0.405	9.13	<0.001
log(Parent_positive_ratio)	-10.38	1.166	-8.91	<0.001
Parent_negative_MLU	-0.88	0.221	-4.00	<0.001
Parent_positive_MLU	1.74	0.129	13.52	<0.001

Table 2

Estimating Production Ratio of Positive Counterparts for Rejection in Child Speech, when head verb is like

Predictor	B	SE	t	p
Intercept	-61.28	6.339	-9.67	<0.001
Age	0.00	0.003	-0.10	0.922
MLU	0.77	0.107	7.24	<0.001
log(Parent_negative_ratio)	0.17	0.447	0.38	0.706
log(Parent_positive_ratio)	-10.81	1.221	-8.86	<0.001
Parent_negative_MLU	-0.92	0.239	-3.86	<0.001
Parent_positive_MLU	1.56	0.132	11.82	<0.001

Table 3

Estimating Production Ratio of Rejection in Child Speech, when head verb is want

Predictor	B	SE	t	p
Intercept	16.41	5.877	2.79	0.007
Age	0.00	0.004	-0.70	0.488
MLU	-0.09	0.051	-1.70	0.095
log(Parent_negative_ratio)	4.14	0.770	5.38	<0.001
log(Parent_positive_ratio)	1.85	1.139	1.62	0.111
Parent_negative_MLU	-1.69	0.400	-4.22	<0.001
Parent_positive_MLU	3.06	0.563	5.44	<0.001

Table 4

Estimating Production Ratio of Positive Counterparts for Rejection in Child Speech, when head verb is want

Predictor	B	SE	t	p
Intercept	-19.36	6.372	-3.04	0.004
Age	-0.01	0.004	-3.53	<0.001
MLU	-0.04	0.022	-1.59	0.117
log(Parent_negative_ratio)	-0.39	0.772	-0.50	0.617
log(Parent_positive_ratio)	0.78	1.122	0.69	0.492
Parent_negative_MLU	-0.07	0.543	-0.13	0.897
Parent_positive_MLU	2.34	0.564	4.15	<0.001

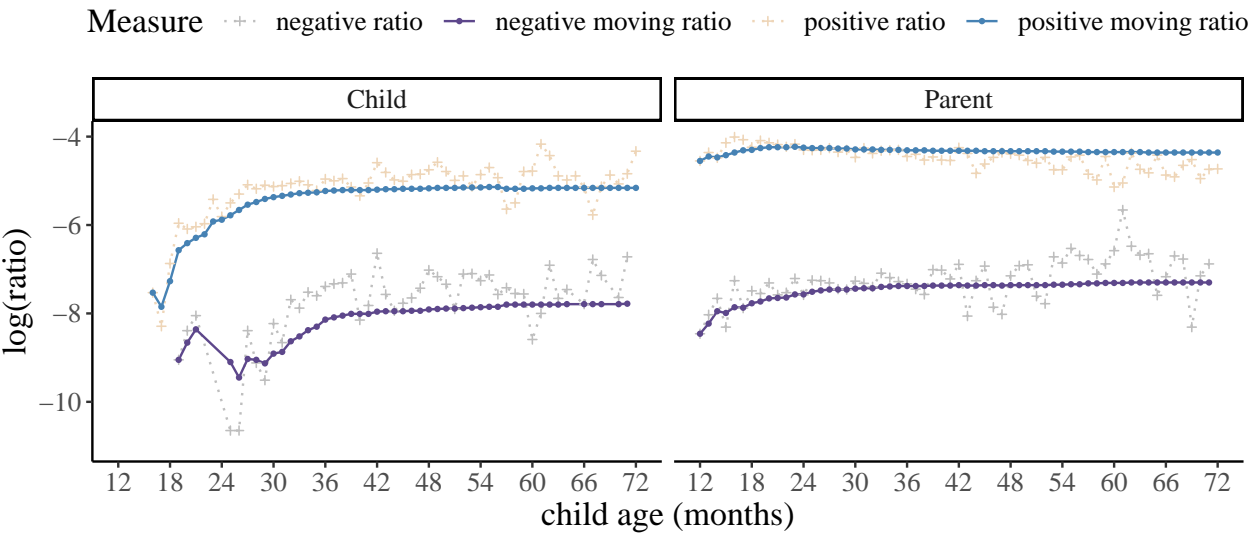


Figure 2. Non-existence

Table 5

Estimating Production Ratio of Non-existence in Child Speech

Predictor	B	SE	t	p
Intercept	-119.61	37.869	-3.16	0.003
Age	-0.02	0.009	-1.75	0.088
MLU	0.18	0.283	0.62	0.538
log(Parent_negative_ratio)	1.82	2.796	0.65	0.518
log(Parent_positive_ratio)	-31.65	10.579	-2.99	0.005
Parent_negative_MLU	-1.39	0.493	-2.82	0.007
Parent_positive_MLU	-0.09	1.176	-0.08	0.940

Table 6

Estimating Production Ratio of Positive Counterparts for Non-existence in Child Speech

Predictor	B	SE	t	p
Intercept	35.29	5.571	6.33	<0.001
Age	-0.01	0.003	-2.86	0.006
MLU	0.01	0.136	0.06	0.954
log(Parent_negative_ratio)	4.02	0.620	6.49	<0.001
log(Parent_positive_ratio)	3.41	1.276	2.67	0.010
Parent_negative_MLU	-0.05	0.139	-0.36	0.718
Parent_positive_MLU	0.60	0.275	2.19	0.033

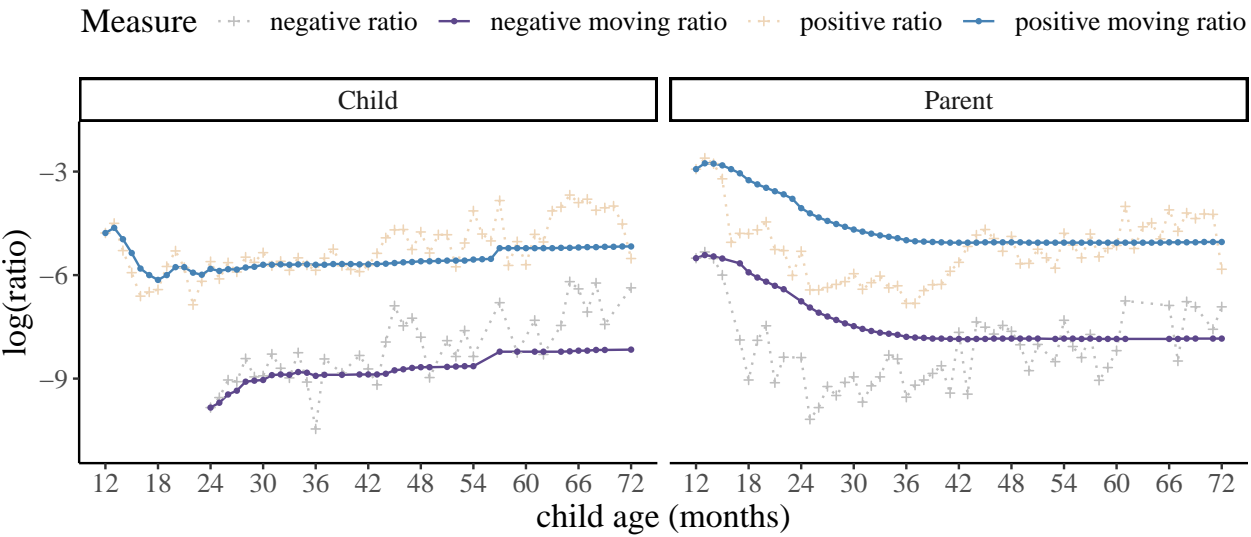


Figure 3. Prohibition

Table 7

Estimating Production Ratio of Prohibition in Child Speech

Predictor	B	SE	t	p
Intercept	-31.66	6.067	-5.22	<0.001
Age	0.01	0.005	2.62	0.014
MLU	-0.15	0.134	-1.13	0.270
log(Parent_negative_ratio)	-5.49	1.340	-4.10	<0.001
log(Parent_positive_ratio)	5.31	1.509	3.52	0.002
Parent_negative_MLU	-1.25	0.709	-1.76	0.089
Parent_positive_MLU	2.73	0.821	3.32	0.003

Table 8

Estimating Production Ratio of Positive Counterparts for Prohibition in Child Speech

Predictor	B	SE	t	p
Intercept	-7.76	10.108	-0.77	0.447
Age	0.00	0.010	-0.05	0.957
MLU	0.47	0.187	2.52	0.015
log(Parent_negative_ratio)	0.98	1.546	0.63	0.530
log(Parent_positive_ratio)	-0.10	1.663	-0.06	0.953
Parent_negative_MLU	0.31	1.369	0.23	0.822
Parent_positive_MLU	1.04	1.492	0.70	0.489

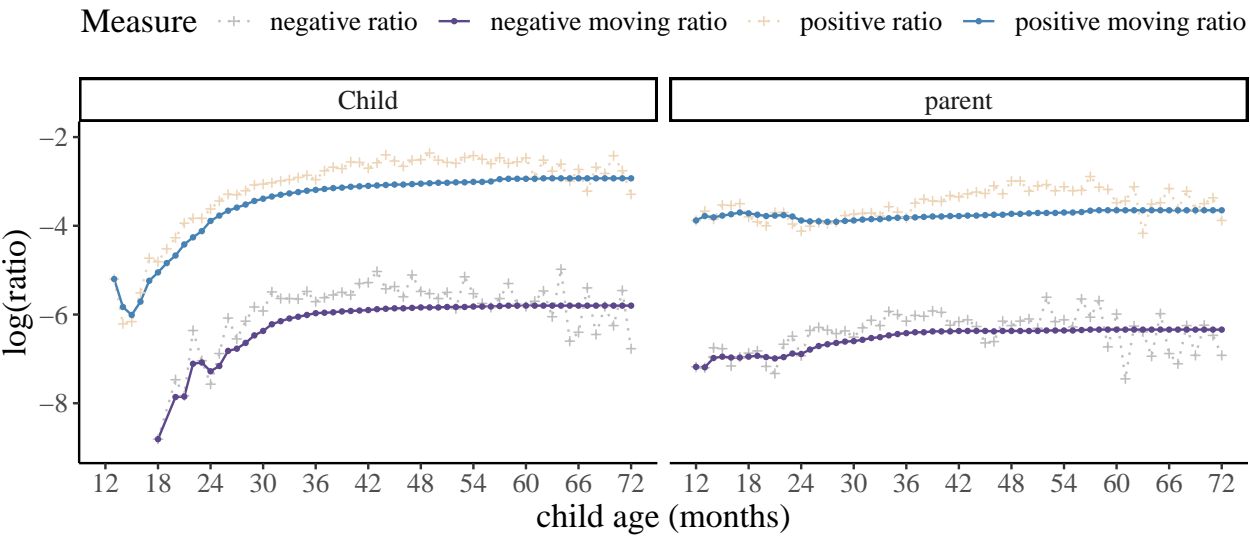


Figure 4. Inability

Table 9

Estimating Production Ratio of Inability in Child Speech

Predictor	B	SE	t	p
Intercept	7.14	3.359	2.12	0.039
Age	0.00	0.006	0.05	0.959
MLU	1.04	0.117	8.85	<0.001
log(Parent_negative_ratio)	2.29	0.194	11.80	<0.001
log(Parent_positive_ratio)	-0.59	0.464	-1.28	0.208
Parent_negative_MLU	-0.08	0.290	-0.27	0.789
Parent_positive_MLU	-0.75	0.390	-1.93	0.060

Table 10

Estimating Production Ratio of Positive Counterparts for Inability in Child Speech

Predictor	B	SE	t	p
Intercept	1.35	4.518	0.30	0.766
Age	0.02	0.005	3.80	<0.001
MLU	-0.21	0.049	-4.25	<0.001
log(Parent_negative_ratio)	2.14	0.268	7.98	<0.001
log(Parent_positive_ratio)	-2.73	0.529	-5.16	<0.001
Parent_negative_MLU	-0.69	0.242	-2.86	0.006
Parent_positive_MLU	0.61	0.135	4.52	<0.001

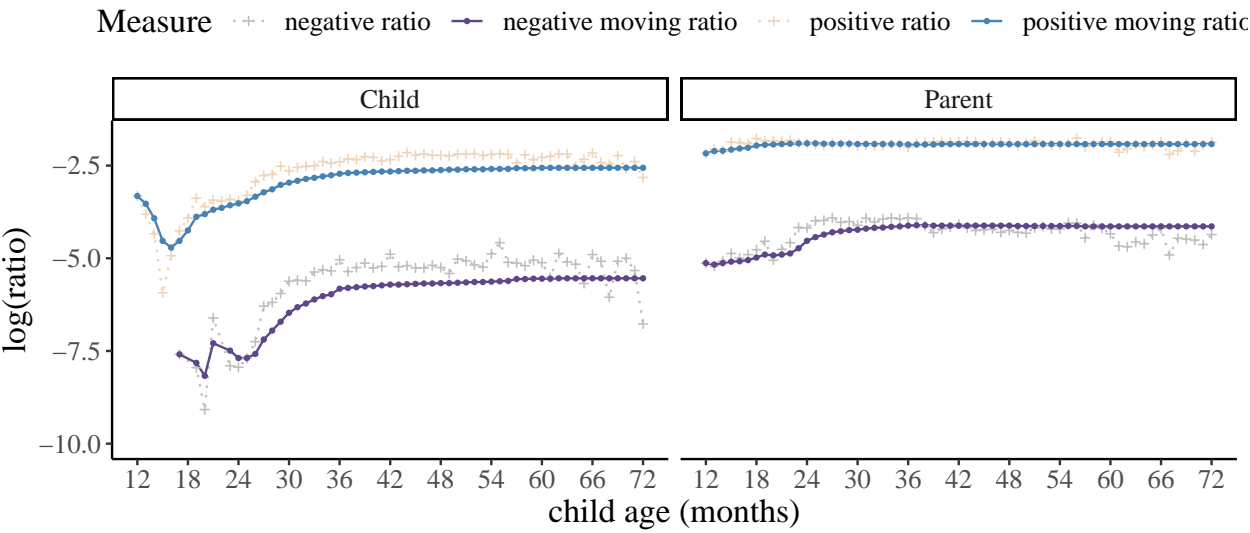


Figure 5. Language learning via labeling

Table 11

Estimating Production Ratio of Learning in Child Speech

Predictor	B	SE	t	p
Intercept	-43.58	10.055	-4.33	<0.001
Age	-0.01	0.008	-0.93	0.359
MLU	0.98	0.175	5.61	<0.001
log(Parent_negative_ratio)	2.82	0.768	3.67	<0.001
log(Parent_positive_ratio)	-21.68	3.086	-7.03	<0.001
Parent_negative_MLU	-0.35	0.771	-0.46	0.648
Parent_positive_MLU	0.74	0.824	0.89	0.377

Table 12

Estimating Production Ratio of Positive Counterparts for Learning in Child Speech

Predictor	B	SE	t	p
Intercept	7.47	5.347	1.40	0.168
Age	-0.01	0.005	-2.00	0.051
MLU	1.48	0.217	6.78	<0.001
log(Parent_negative_ratio)	1.12	0.275	4.08	<0.001
log(Parent_positive_ratio)	3.14	1.170	2.68	0.010
Parent_negative_MLU	-0.11	0.439	-0.24	0.812
Parent_positive_MLU	-0.86	0.447	-1.92	0.060

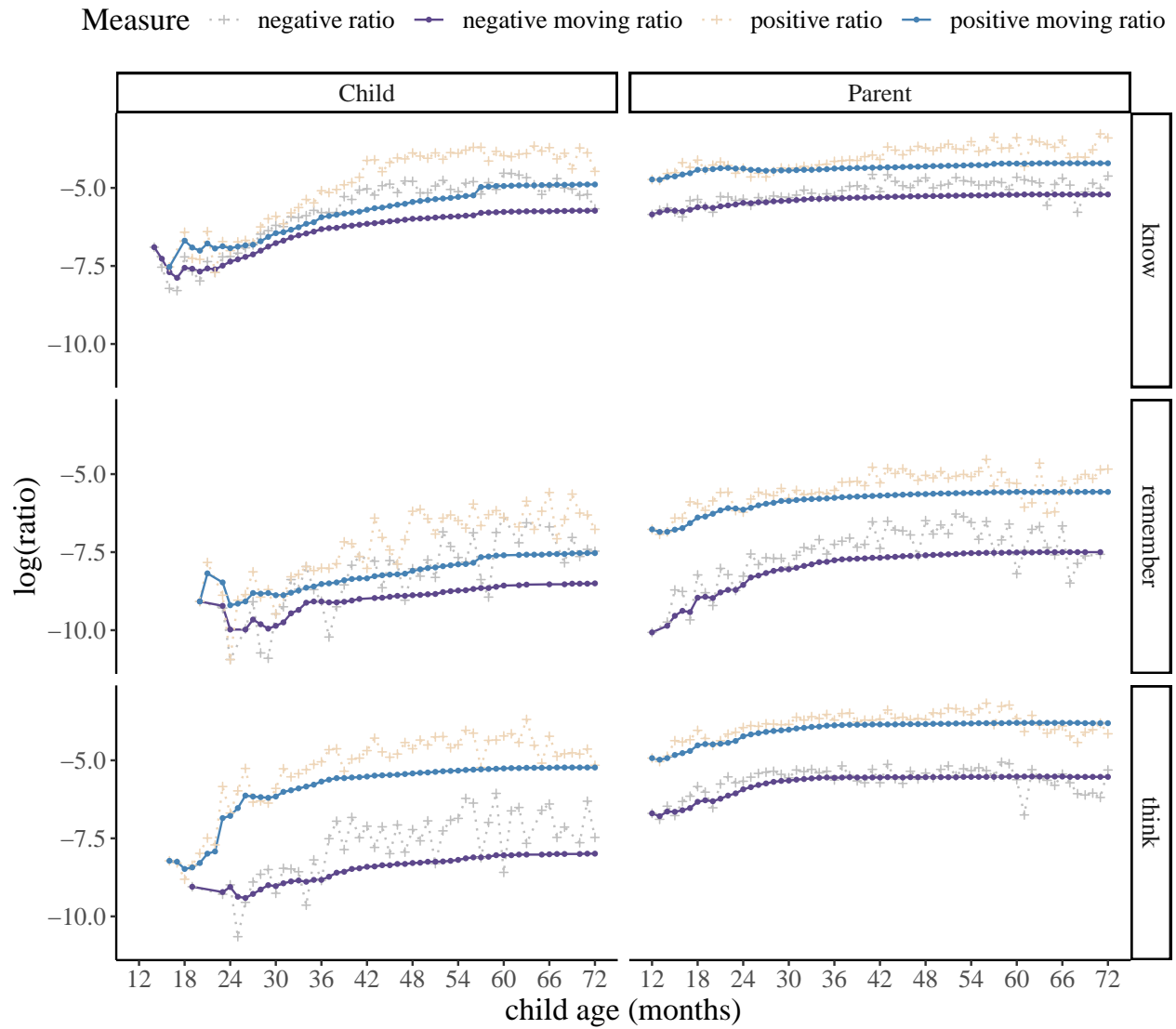


Figure 6. Epistemic negation

Table 13

Estimating Production Ratio of Epistemic Negation in Child Speech, when head verb is know

Predictor	B	SE	t	p
Intercept	19.99	2.065	9.68	<0.001
Age	0.00	0.002	0.48	0.632
MLU	0.14	0.030	4.55	<0.001
log(Parent_negative_ratio)	4.00	0.384	10.42	<0.001
log(Parent_positive_ratio)	0.40	0.341	1.16	0.249
Parent_negative_MLU	0.00	0.144	0.03	0.973
Parent_positive_MLU	-0.47	0.103	-4.57	<0.001

Table 14

Estimating Production Ratio of Positive Counterparts for Epistemic Negation in Child Speech, when head verb is know

Predictor	B	SE	t	p
Intercept	17.04	3.045	5.60	<0.001
Age	0.01	0.002	4.11	<0.001
MLU	0.28	0.040	7.12	<0.001
log(Parent_negative_ratio)	2.43	0.514	4.72	<0.001
log(Parent_positive_ratio)	2.00	0.406	4.94	<0.001
Parent_negative_MLU	0.17	0.187	0.89	0.380
Parent_positive_MLU	-0.54	0.146	-3.73	<0.001

Table 15

Estimating Production Ratio of Epistemic Negation in Child Speech, when head verb is remember

Predictor	B	SE	t	p
Intercept	48.04	9.766	4.92	<0.001
Age	0.03	0.005	5.88	<0.001
MLU	0.08	0.086	0.92	0.364
log(Parent_negative_ratio)	-4.60	1.460	-3.15	0.003
log(Parent_positive_ratio)	11.97	2.279	5.25	<0.001
Parent_negative_MLU	-1.28	0.340	-3.77	<0.001
Parent_positive_MLU	-1.88	0.421	-4.45	<0.001

Table 16

Estimating Production Ratio of Positive Counterparts for Epistemic Negation in Child Speech, when head verb is remember

Predictor	B	SE	t	p
Intercept	13.74	5.327	2.58	0.014
Age	0.02	0.004	4.25	<0.001
MLU	0.23	0.053	4.40	<0.001
log(Parent_negative_ratio)	-1.07	0.646	-1.65	0.106
log(Parent_positive_ratio)	4.49	0.862	5.21	<0.001
Parent_negative_MLU	0.03	0.152	0.21	0.833
Parent_positive_MLU	-0.83	0.231	-3.57	<0.001

Table 17

Estimating Production Ratio of Epistemic Negation in Child Speech, when head verb is think

Predictor	B	SE	t	p
Intercept	-9.65	4.076	-2.37	0.023
Age	0.02	0.004	4.77	<0.001
MLU	0.07	0.065	1.05	0.299
log(Parent_negative_ratio)	-2.64	1.021	-2.58	0.013
log(Parent_positive_ratio)	3.26	1.324	2.46	0.018
Parent_negative_MLU	0.97	0.839	1.15	0.255
Parent_positive_MLU	-1.28	0.802	-1.60	0.118

Table 18

Estimating Production Ratio of Positive Counterparts for Epistemic Negation in Child Speech, when head verb is think

Predictor	B	SE	t	p
Intercept	26.43	2.182	12.11	<0.001
Age	0.01	0.002	4.66	<0.001
MLU	0.55	0.049	11.28	<0.001
log(Parent_negative_ratio)	0.10	0.501	0.20	0.843
log(Parent_positive_ratio)	2.26	0.540	4.18	<0.001
Parent_negative_MLU	-1.93	0.277	-6.95	<0.001
Parent_positive_MLU	-0.82	0.071	-11.58	<0.001

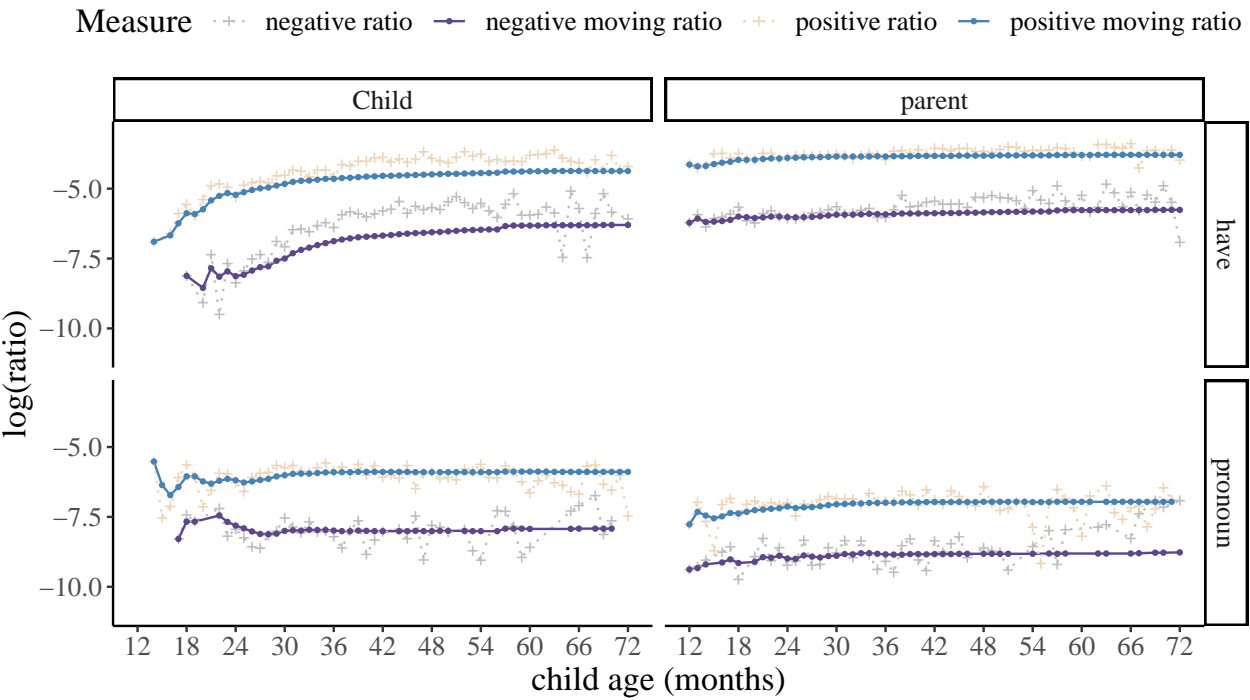


Figure 7. Possession

Table 19

Estimating Production Ratio of Possession in Child Speech, when head verb is have

Predictor	B	SE	t	p
Intercept	34.85	16.952	2.06	0.046
Age	0.00	0.005	0.81	0.420
MLU	-0.01	0.061	-0.09	0.928
log(Parent_negative_ratio)	5.67	1.270	4.46	<0.001
log(Parent_positive_ratio)	-1.07	4.987	-0.21	0.831
Parent_negative_MLU	-2.14	0.285	-7.52	<0.001
Parent_positive_MLU	1.02	0.439	2.32	0.025

Table 20

Estimating Production Ratio of Positive Counterparts for Possession in Child Speech, when syntactic head is pronoun

Predictor	B	SE	t	p
Intercept	43.40	3.955	10.97	<0.001
Age	0.00	0.002	-0.01	0.988
MLU	0.11	0.045	2.52	0.015
log(Parent_negative_ratio)	-0.82	0.439	-1.86	0.068
log(Parent_positive_ratio)	11.09	0.772	14.36	<0.001
Parent_negative_MLU	-0.98	0.115	-8.54	<0.001
Parent_positive_MLU	-0.15	0.096	-1.53	0.132

Table 21

Estimating Production Ratio of Positive Counterparts for Possession in Child Speech, when head verb is want

Predictor	B	SE	t	p
Intercept	-20.45	3.523	-5.80	<0.001
Age	0.01	0.002	3.14	0.004
MLU	0.20	0.100	2.01	0.054
log(Parent_negative_ratio)	-0.34	0.421	-0.80	0.432
log(Parent_positive_ratio)	-2.15	0.616	-3.49	0.002
Parent_negative_MLU	-1.51	0.162	-9.31	<0.001
Parent_positive_MLU	0.36	0.168	2.17	0.038

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Table 22

Estimating Production Ratio of Positive Counterparts for Possession in Child Speech, when syntactic head is pronoun

Predictor	B	SE	t	p
Intercept	-23.32	8.974	-2.60	0.013
Age	0.00	0.003	-0.83	0.410
MLU	1.17	0.407	2.87	0.007
log(Parent_negative_ratio)	-1.36	0.611	-2.23	0.032
log(Parent_positive_ratio)	-0.53	1.306	-0.41	0.687
Parent_negative_MLU	-0.22	0.300	-0.74	0.462
Parent_positive_MLU	-0.31	0.283	-1.10	0.280

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Function	Linguistic Composition	Examples
Rejection	with <i>like</i> or <i>want</i>	<i>I not like it, not want it</i>
Non-existence	expletives; with a nominal; <i>no more</i>	<i>there is no soup; no juice; no more milk</i>
Prohibition	with imperative subjectless <i>do</i>	<i>do not spill milk</i>
Inability	with modal <i>can</i>	<i>I cannot zip it</i>
Labeling	modifying nominal or adjectival predicatives	<i>that's not a crocodile; it's no interesting</i>
Epistemic negation	with <i>know, think, remember</i>	<i>I not know</i>
Possession	with <i>pro</i> ; or possessive pronouns	<i>not pro the toy; not mine</i>

Table 23

Communicative functions of negation in early child language of English.