

APPENDIX A: SUPPLEMENTAL MATERIALS FOR CHAPTER ONE

Coding Instructions

There are two negative function words in English:

- **No**
- **Not** (/ -n't)

But, we're focusing on 3 kinds of negation that have different communicative functions/effects:

- **Prohibition** - Stopping or altering child's behavior
- **Non-existence** - Noting the absence of something
- **Denial** - Asserting that something is not the case

No and *not* aren't cleanly divided into these kinds. Either can be used for any kind of negation listed above. Intuition says sentences with *no* as more likely to be prohibition or non-existence, and those with *not* as being denial, but we can't rely on this alone for categorization.

So, we'll be looking at three sources of information to help us determine which kind of negation is being used:

- **Linguistic** - the utterance itself
- **Immediate context** - discourse (e.g., surrounding sentences), co-present item/actions
- **Proceeding context** - how the parent or child responds to or reacts to the utterance

Linguistic information is the first thing you'll see in the spreadsheet, so from the initial sentence, you may be able to form a hypothesis about the kind of negation being used. But it may be ambiguous, e.g., "No candy," could be prohibition or non-existence. So, test your hypothesis by looking at the immediate and proceeding context. The preceding context may be useful as well, so feel free to check a minute or so before negation is uttered too.

Immediate context can tell you what is around (useful for non-existence) and what events are occurring (useful for prohibition) that might be relevant to the utterance. It can also provide additional communicative cues like prosody, joint attention, and gesture.

Proceeding context can help you discern the intended effects of an utterance. We typically say things for a reason, and how the infant, parent, or others in a video react to an utterance could tell us what they meant to do by saying something. For prohibition, there may be corrective, scolding, or redirecting behavior that follows from the parent, while there may be hesitation, stopping/changing tasks, or crying from the child. For non-existence, there may be seeking behavior or cleaning up. For both there may be crying.

On their own, each of the three can be ambiguous, but by **considering all three together, we can reduce the ambiguity**. There will most likely still be some extremely ambiguous utterances (e.g., “No,” while the parent or child is out of view), so for those situations mark “unsure” and include a note.

Additionally, if the utterance seems to be saying something affirmative or rhetorical (e.g., “Aren’t you adorable?”), mark “rhetorical” and include a note.

Immediate Context

Prohibition/Refusal	Non-existence	Denial
References things currently present/happening	Often references something not (/no longer) present	Correcting propositions/ referring to untrue things
Attempt at stopping (picking up, taking something away)	Looking/seeking behavior	Can refer to something present, to correct
Finger wagging/head shaking	Hand flip gesture “I don’t know/ where is it gesture”	There may or may not be gesture
Sounding angry/irritated	Child upset	Indicating lack of knowledge or ability

Proceeding context

Prohibition/Refusal	Non-existence	Denial
Parent taking thing away or stopping action	Parent giving child more of item	Showing/getting /doing correct thing

Parental scolding	Taking away container for cleaning/disposal	Putting X back (“That’s not your X”)
Child stops/corrects action	Followed by asking “where”	Saying affirmative version (“This is X”)
Child upset	Looking/seeking/replacing	Confusion or correction

Experiment Instructions

Video-Only Instructions

Your task in this study is to guess what words a parent has said in a muted video. We are interested in how children learn their first words, by noticing the situations in which the words are uttered by adults. To help us investigate this, you will be watching a series of short videos in which parents interact with their young children, speaking naturally and using the kinds of sentences that are typical when talking to small children – simple sentences with simple, common words.

In each video, we have picked out one sentence that occurred in the parents' speech to their child that we want you to try to guess. The sound will be absent from these videos, so you will not be able to hear what the parent was actually saying. However, at exactly the moment when the parent uttered the sentence of interest, we inserted an audible beep. Your task is to guess what the parent said during that beep.

After each video, you will see a text box to type in your guess, for example, if you thought the parents said “The doggie is sleeping,” you would type “The doggie is sleeping” into the text box.

Please do not leave any blanks – you should make a guess after each video.

To summarize, you will see a series of short videos (27 videos total) of parents interacting with their children in their homes. These videos will be muted, and you will hear a beep that tells you when the parent said the sentence you are supposed to guess. Immediately after the video, you

will be given a text box to type in your response. Once you submit your answer, the next video will begin. Videos will only play once.

Make sure you are ready to start the experiment. When you are, click "Begin" below and it will start. Pay attention because the videos are short and only play ONCE.

Language-Only Instructions

Language-Only Instructions

Your task in this study is to guess, based on a partially complete sentence, what word a parent used in interacting with their child. We are interested in how children learn their first words, by noticing the situations in which the words are uttered by adults. To help us investigate this, you will see a series of sentences taken from videos in which parents interact with their young children, speaking naturally and using the kinds of sentences that are typical when talking to small children – simple sentences with simple, common words.

In each sentence, we have picked out one word that occurred in the parents' speech to their child that we want you to try to guess.

For example, if the parent had said "The nice doggie is sleeping," you would see a hint like "The ___ doggie is sleeping," to help you guess what they said. Or, if they had said "I'm gonna go now," you would see a hint like "___ gonna go now." Your task would be to fill in the blank with a word in English that you think could go there. Sometimes the parent says just a one word sentence. When this happens, your clue will look like this: The parent said "_____." In this case, you should just guess the single word that the parent said.

"Please do not leave any blanks – you should make a guess for each sentence.

To summarize, you will see a series of sentences (27 sentences total) taken from videos of parents interacting with their children in their homes. The sentence will have a blank where the missing word should go, and you will be given a text box to type in your response. Once you submit your answer, the next sentence will appear.

Please do your best to guess what the parent said to their child.

Video-and-Language Instructions

Your task in this study is to guess what words a parent has said in a muted video. We are interested in how children learn their first words, by noticing the situations in which the words are uttered by adults. To help us investigate this, you will be watching a series of short videos in which parents interact with their young children, speaking naturally and using the kinds of sentences that are typical when talking to small children – simple sentences with simple, common words.

In each video, we have picked out one sentence that occurred in the parents' speech to their child that we want you to try to guess. The sound will be absent from these videos, so you will not be able to hear what the parent was actually saying. However, at exactly the moment when the parent uttered the sentence of interest, we inserted an audible beep. Your task is to guess what the parent said during that beep.

After watching each video, you will be given a hint as to what the parent actually said. We have removed ONE WORD from the parent's sentence. For example, if the parent had said "The nice doggie is sleeping," you would see a hint like "The ___ doggie is sleeping," to help you guess what they said during the beep. Or, if they had said "I'm gonna go now," you would see a hint like "___ gonna go now." Your task would be to fill in the blank with a word in English that you think could go there. Sometimes the parent says just a one word sentence. When this happens,

your clue will look like this: The parent said "_____." In this case, you should just guess the single word that the parent said.

Please do not leave any blanks – you should make a guess after each video.

To summarize, you will see a series of short videos (27 videos total) of parents interacting with their children in their homes. These videos will be muted, and you will hear a beep that tells you when the parent said the sentence you are supposed to guess. Immediately after the video, your hint will appear under it, and you will be given a text box to type in your response. Once you submit your answer, the next video will begin. Videos will only play once.

Make sure you are ready to start the experiment. When you are, click "Begin" below and it will start. Pay attention because the videos are short and only play ONCE.

APPENDIX B: SUPPLEMENTAL STATISTICS FOR CHAPTER ONE

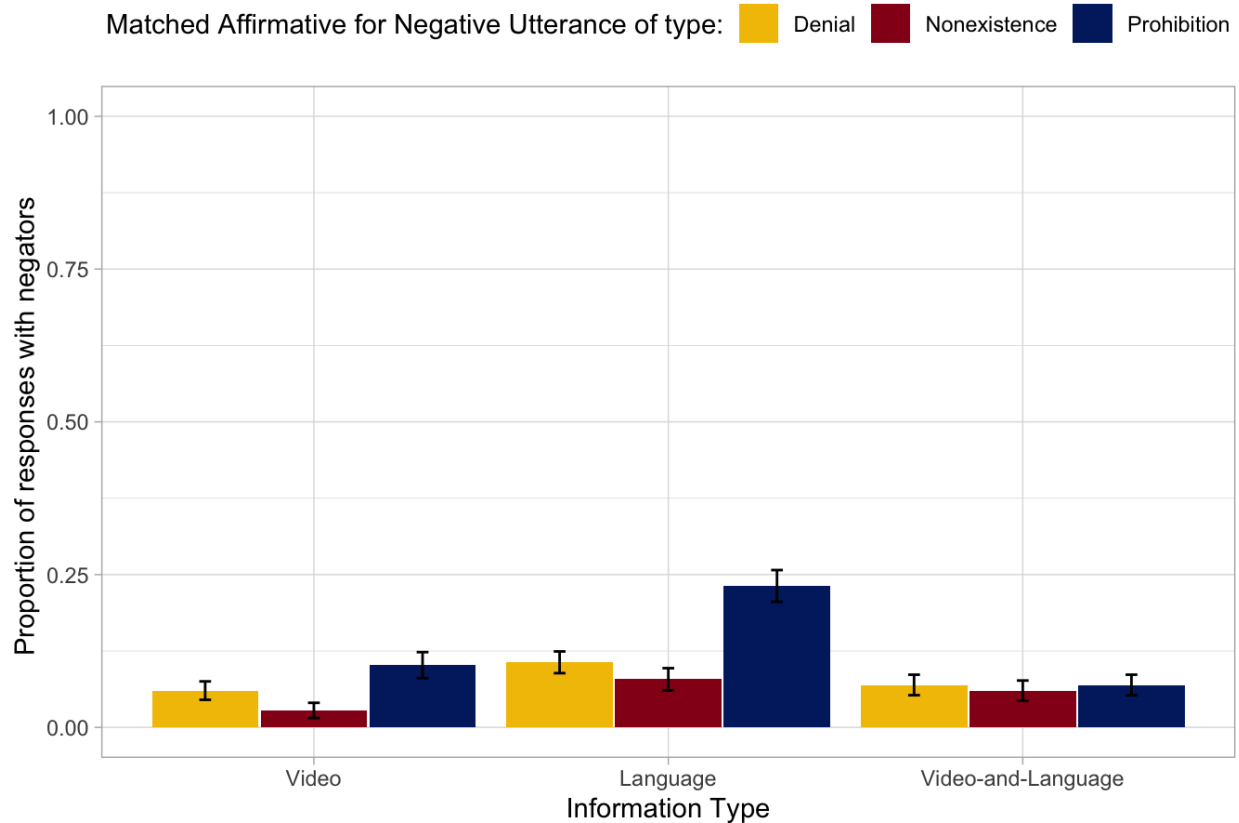


Figure S1: Proportion of negators included in participant responses for matched affirmative vignettes by the Negation Function that each affirmative is paired to. Data are presented by Negation Function (Denial, Nonexistence, Prohibition) and Information Type (Video Only, Video + Language, Language Only), with error bars indicating ± 1 Standard Error. As described in Experiment 1: Methods, for each negative utterance, a non-negative utterance was sampled based on the presence of the word negated in the original negative utterance. This procedure did not take into account the “type” of affirmative utterance (so, e.g., a matched affirmative for a Nonexistence need not to assert existence explicitly).

The corpus used in Experiment 1 (the LDP corpus) was pre-coded for gesture (Goldin-Meadow et al., 2014) which allowed us to quantify the gestures used by the parents in our subsample of the corpus as described in section titled “Sampling Procedure for Stimuli.” The gestures of interest were determined based on those analyzed in Franklin et al., 2017. Namely, these were shaking of the head and a flip of the palm upwards. These gestures were fairly rare, only occurring 43 times throughout the entire transcript. Out of 9,841 utterances total, 789 included a negator (no, not, or -n’t) and 24 of these utterances were accompanied by a gesture. Table S1

reports the counts of each gesture by Negation Function with the final row reporting gesture counts for utterances that did not include any negator. A post-hoc analysis using a mixed effects model to predict the presence of a negative gesture by whether the accompanying utterance included a negator found that parents were significantly more likely to use a negative gesture if the utterance included a negator than if it did not ($\beta=1.33$, $z=8.67$, $p<0.001$).

Function	Shake	Flip	Total
Prohibition	10	0	10 (out of 354)
Nonexistence	1	1	3 (out of 59)
Denial	10	1	11 (out of 375)
Affirmatives	2	17	19 (out of 9089)

Table S1: Counts of gestures that occurred with an utterance that included a negator, and all affirmative utterances. The values in parenthesis in the final column indicates the total number of utterances for each type.

APPENDIX C: LINGUISTIC STIMULI FOR CHAPTER THREE

Idealized Sentence	Study 1a: Content Words	Study 1b: Syntax	Study 1c: Both
One of the girls can <u>not</u> touch her toes.	girls, her, one, toes, touch	Zum of the prings can ___ gribe ler prents.	One of the girls can ___ touch her toes.
A woman did <u>not</u> pick up a pen	pen, pick, woman	A tive did ___ swock up a kurn	A woman did ___ pick up a pen
A person can <u>not</u> open the door	door, open, person	A fendle can ___ blark the rurf	A person can ___ open the door
The lamp would <u>not</u> turn on	lamp, turn	The croit would ___ slont on	The lamp would ___ turn on
A girl can <u>not</u> catch a ball	ball, catch, girl	A pring can ___ zeb a dax	A girl can ___ catch a ball
A girl can <u>not</u> crush one of the cups.	crush, cup, girl, one	A pring can ___ blick zum of the scosts.	A girl can ___ crush one of the cups.
A girl can <u>not</u> get the plug into the outlet.	fitting, girl, outlet, plug	A pring can ___ rall the trunn into the fintzer.	A girl can ___ get the plug into the outlet.
The toilet will <u>not</u> flush.	flush, toilet	The stace will ___ rudge.	The toilet will ___ flush.
A person can <u>not</u> light a match	light, match, person	A fendle can ___ glizz a ruld	A person can ___ light a match
The pepper is <u>not</u> coming out	coming, pepper	The florb is ___ blaxing out	The pepper is ___ coming out
The pen is <u>not</u> working.	pen, working	The kurg is ___ siffing.	The pen is ___ working.
A person is <u>not</u> cutting a leaf	cutting, leaf, person	A fendle is ___ zubbing a flih	A person is ___ cutting a leaf

Table S3: List of linguistic stimuli used in critical trials. See Methods of relevant study in Chapter 2 for additional detail.

APPENDIX D: ADDITIONAL STATISTICS FOR CHAPTER THREE

Alternate Constructions

Employing an explicit negator is not the only way to describe a failure. Instead, one could describe what someone is failing at as an attempt to do something. For example, participants regularly described the actors in the scene as “trying to” complete some actions (hereafter referred to as Try responses; e.g., “The person is trying to open the door.”). In addition to Try responses, there is also the issue raised by terms which are argued to be implicitly negative (e.g., “The girls try to touch their toes but one failed her goal.”; see Dähl, 2010). To investigate both these potentials, we coded participant responses to indicate whether they included either Try constructions (*try, trying, tried, tries*) or implicit negators (*forbid, forbear, avoid, prohibit, stop, fail, forget, doubt, deny*). See Table 1 for a list of proportions of Try and implicit negation responses across Studies 1a-c from those responses which did not already contain explicit negation.

Experiment	Information Condition	Try (Success)	Try (Failure)	Implicit (Success)	Implicit (Failure)
1a: Content Words	Language-Only	0.01	0.04	0	0
1a: Content Words	Video-Only	0.06	0.24	0	0.01
1a: Content Words	Video w. Language	0.03	0.15	0	0
1b: Syntax	Language-Only	0.01	0	0	0
1b: Syntax	Video-Only	0.04	0.18	0	0
1b: Syntax	Video w. Language	0	0.01	0	0
1c: Full Ling.	Language-Only	0	0	0	0
1c: Full Ling.	Video-Only	0.01	0.28	0	0
1c: Full Ling.	Video w. Language	0	0.01	0	0

Table S4: Proportion of responses that included *try* or an implicit negator for Studies 1a-c.

Experiment	Order of Exposures	Try (Success)	Try (Failure)	Implicit (Success)	Implicit (Failure)
2a: Children	Success First	0.095	38.46	0	0
2a: Children	Failures First	0.55	50	0	0.9
2b: Adults	Success First	0.18	31.81	0	3.64
2b: Adults	Failures First	0.64	35.45	0	1.81

Table S5: Proportion of responses that included *try* or an implicit negator for Studies 2-ab.

Mean Length of Child Responses

The following table provides the mean length of responses by participants for both Success and Failure videos. Only complete words were counted (e.g., “uh” and partial words like “th-” would not count). A linear model predicting MLR with Event Type and Exposure Order as predictor found main effects of both ($\beta=-1.419$, $SE=0.223$, $z=-6.371$ $p<0.001$; $\beta=-0.684$, $SE=0.2227$ $z=-3.07$ $p<0.005$ respectively) but no significant interaction.

Subject	Success/Failure	Difference
Failures First condition		
f3	7.636364/14.454545	-6.8181818
f5	15.272727/16.818182	-1.5454545
f7	8.363636/11.7	-3.3363636
f9	6.909091/10.909091	-4
f14	4.9/6.888889	-1.9888889
f16	7/10	-3
f20	4.636364/5.181818	-0.5454545
f22	9.090909/13.090909	-4
f24	11.454545/16.3	-4.8454545

f25	8.272727/8.272727	0
Successes First condition		
f1	6.100000/7.777778	-1.6777778
f4	8.363636/9.090909	-0.7272727
f6	9.363636/15.181818	-5.8181818
f8	9.454545/14.818182	-5.3636364
f10	6.8/7.888889	-1.0888889
f13	6.7/7.363636	-0.6636364
f15	9.8/12.363636	-2.5636364
f17	3.181818/4.200000	-1.0181818
f19	6.9/8.090909	-1.1909091
f21	5.272727/10.6	-5.3272727

Table S6: Mean length of responses given by the child participants in Study 2 given by Order of Exposure.