ALETHEIA
The Alpha Chi Journal of Undergraduate Scholarship

Volume 7 | Issue 2 | 2022

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Vol. 7(2), 2022
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ISSN: 2381-800X
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Abstract

A major debate in the field of cognition is how quantities—such as time and number—are processed. One theory suggests that all quantities are processed by a singular cognitive mechanism (i.e., a common magnitude system; Walsh, 2003). If this were the case, then quantity processing abilities should be comparable regardless of the quantity being studied. Yet, previous research reveals that children's non-symbolic timing abilities are consistently worse than numerical abilities (Odic et al., 2015), which casts doubt on the likelihood of a common magnitude system. One potential explanation for this discrepancy is that children and adults use more number words in informal conversations, which may in turn sharpen their non-symbolic numerical abilities. While number talk has been investigated for many years, to our knowledge, no studies have investigated the frequency of time talk in informal conversations. This study investigates whether there is a difference in the frequency of number and time words during informal conversations involving children in multiple settings. We found a low frequency of both number (3.18% of utterances) and time (1.23% of utterances) words, but time words were significantly less frequent ($t(418) = -9.88$, $p < 0.001$, d = .45). Both children and adults spoke more number words compared to time words (Speaker type x quantity interaction: $F(1,480) = 1.50$, $p = 0.22$, η2 = .003). This research sheds light on the frequency of quantity words in informal conversations and may explain discrepancies in children's numerical and temporal abilities. Future research should investigate whether the minimal amount of time talk contributes to children's poorer non-symbolic timing abilities.

Keywords: *number talk, time talk, non-symbolic time, non-symbolic number*

Introduction

While navigating daily life, children and adults alike encounter quantities in many different ways. For instance, shoppers count the number of items in their grocery carts to judge whether they can go into the express lane, or friends say they will call in five minutes. Quantities (i.e., number and time) can be expressed in symbolic or non-symbolic terms. Symbolic representations involve the ability to represent quantity through the use of language or symbols (Whalen et al., 1999), such as writing Arabic numerals, counting, reading clocks, and understanding temporal units of measurement (e.g., *minute, hour, etc.*). Contrarily, non-symbolic representations are more basic and intuitive, and convey quantity in the absence of language (Droit-Violet, 2013; Provasi et al., 2011; VanMarle & Wynn, 2006), such as knowing there are more people in a meeting today compared to yesterday without counting, or judging that today's meeting lasted longer than yesterday's without looking at a clock. A major debate in the field of psychology asks how non-symbolic quantities are processed. One popular theory argues that all quantities are processed by a singular cognitive mechanism, the common magnitude system (see Walsh, 2003). While some evidence provides support for a common magnitude system (e.g., Dormal et al., 2012; Stevens, 1957), other research calls it into question. For example, although non-symbolic timing and numerical abilities are comparable in infancy (VanMarle & Wynn, 2006; Xu & Spelke, 2000), non-symbolic timing precision is worse than non-symbolic number abilities throughout childhood and adulthood (Droit-Volet et al., 2008, Experiment, 1; Odic et al., 2016; Odic, 2018).

Why is non-symbolic timing less precise than non-symbolic numerical precision? A plethora of research has shown a correlation between children's non-symbolic and symbolic number abilities (Chen & Li, 2014; Gilmore et al. 2010; Schneider, 2017) and one study found a similar relation in the domain of time (Hamamouche & Cordes, 2019). These studies suggest that a child's symbolic knowledge of time or number is linked with their non-symbolic abilities in the same domain. Newer work, however, is focused on determining the direction of this relationship. One possibility is that non-symbolic abilities form the foundation for symbolic ones (i.e., scaffolding hypothesis; Halberda et al., 2008; Holloway & Ansari, 2009; Mazzocco et al., 2011). This hypothesis has been tested in the domain of number. For instance, one study with preschoolers showed that their approximate number sense was indicative of their math abilities at 6 years old (Halberda et al., 2008), suggesting that children with better non-symbolic numerical abilities showed better symbolic number abilities later on. Alternatively, learning symbols may shape non-symbolic abilities (i.e., refinement hypothesis; Lyons et al., 2018; Matejko & Ansari, 2016; Mussolin et al., 2014; Shusterman et al., 2016; Suárez-Pellicioni & Booth, 2018). Support in favor of the refinement hypothesis has found that as soon as children obtain an understanding of the cardinal principle—a symbolic skill—their non-symbolic numerical acuity improves (Shusterman et al., 2016). These data suggest that learning and/or using symbols to represent quantities may result in improvements to one's non-symbolic abilities. One way children may enhance their symbolic knowledge of quantities is by engaging in quantity talk. For example, counting items or discussing one's age would constitute number talk, whereas reading the time on a clock or noting how long until bed would constitute time talk. If engaging in time and number talk impacts one's non-symbolic abilities and timing precision is lower than numerical precision throughout the lifespan, one would expect time talk to be significantly less frequent than number talk. While previous research has studied the frequency of number talk (Gunderson & Levine, 2011; Ramani et al., 2015), no studies to the authors' knowledge have investigated the frequency of time talk in children. In the present study, we explore whether temporal and numerical words are used at different frequencies in everyday informal conversations.

Quantity talk

Numerous studies have demonstrated that repeated exposure to numeracy-based talk and activities is integral to children's understanding of numbers and later math achievement (Berkowitz et al., 2015; Gibson et al., 2020; Gunderson & Levine, 2011; Levine et al., 2010; Ramani et al., 2015; Susperreguy & Davis-Kean, 2016). For example, previous studies have shown a positive correlation between informal numerical discussions during everyday games and activities and children's later math achievement (Ramani et al., 2015). In one study, more parent number talk was related to better performance on a numerical task, in which children had to identify which of two arrays contained a specific quantity (Levine et al., 2010). While much of this data is correlational in nature, a recent study found that children's number knowledge improved after reading a number book focusing on small numbers (1-3) compared to children who read a control book or a book on large numbers (4-6; Gibson et al., 2020). This experimental evidence suggests that engaging in more number talk may shape symbolic number abilities.

Despite its importance, the prevalence of numeracy talk in informal conversations is relatively low and varies significantly (Chernyak, 2018; Goldstein et al., 2016; Ramani et al., 2015; see also Clements et al., 2021). For example, in one study, Chernyak (2018) investigated how children's early social contexts help to form the link between numerical cognition and resource distribution by analyzing existing transcripts in the CHILDES database for instances of talk about resource distribution. Researchers found that both adults and children were more likely to talk about numbers within resource distribution contexts, but that number and quantifier words appeared on less than 10% of total utterances (Chernyak, 2018). These findings highlight that number talk in most contexts is infrequent compared to the total number of utterances. While number talk has been researched extensively, to our knowledge, no studies have focused on the use of time words in conversation.

Although the frequency of time talk has yet to be investigated, research suggests that conversations in informal settings are the primary means by which children gain an understanding of temporal words (see Tare et al., 2008). Children use time words before they actually understand what they mean by observing durations and relationships between time words, often through conversations (Tillman & Barner, 2015; Tillman et al., 2017). This suggests that the number of time-related words that are used in conversations with children is one of the main contributors to temporal understanding. However, no research has investigated the frequency of time words in informal conversations. Moreover, past studies have not compared the frequency of time and number words. By doing so, we may better understand the discrepancies in non-symbolic time and number abilities.

Current study

In this study, we aimed to characterize the use of both time and number words in informal conversations during early childhood. Due to the relationship between informal quantity talk and young children's understanding of numbers before formal schooling (e.g., Levine et al., 2010; Ramani et al., 2015), we purposely explored conversations involving adults and children under the age of 6 in informal, unstructured environments, such as play and mealtime. We coded the frequencies of number and time words in archived transcripts on the CHILDES database using the Computerized Language Analysis (CLAN) software. Mirroring past research on number talk, we expected a low frequency of quantity words overall (e.g., Chernyak, 2018; Clements et al., 2021; Thippana, et al., 2020). Importantly, we also predicted that time words would be spoken significantly less often than number words. While our main hypothesis involved the frequency of time and number words used during informal conversations, we were also interested in the effects of speaker type (adult vs. child). Given that prior work has shown that people use more number words as they get older (Levine et al., 2010), we predicted that adults would use more quantity words compared to children.

Method

Participants

The study consisted of data from 137 transcripts from five corproas on the CHILDES database. Together, the corproas included 334 children (82 female, 77 male, 159 unknown) and 169 adults (67 female, 41 male, 108 unknown). Within the transcripts, there were 32 additional speakers who were not identified as children or adults. These speakers were not included in the analyses. Although each participant's demographic information was not included on the CHILDES database, each study did indicate the average age of children in the study. All of the transcripts chosen included children between the ages of 1.6 - 6.2 years. Demographic information for the children in each corpora is provided (see Table 1)

Procedure

Prior to data collection, IRB approval was obtained from our university board.

Transcript selection.

First, we searched the CHILDES corpus of archived studies conducted in North America with English-speaking, typically developing children. We selected transcripts that involved unstructured, informal conversations with children under the age of 6 taking place in home-like and school-like settings. We intentionally targeted informal conversations involving 2–6-year-old children since these children are able to engage in conversation, but are unlikely to have experienced significant formal instruction on numerical and/or temporal concepts in school. We excluded corpras with transcripts that had less than 10 participants or that did not provide the average age range of the participants.

We defined a home-like setting as an environment where at least one parent or family member was present and engaging in conversation with at least one child. In addition to the target child, the transcripts in this setting often included siblings or extended family members like aunts or grandparents, which we included as children and adults respectively in our data analysis. School-like settings involved conversations amongst several children who were not related to each other in a setting outside of the home. In both of these settings, we only observed conversations in casual environments with no formal instruction taking place. The transcripts selected also took place during two activities: free play and meals. These criteria led us to include five corpora from the CHILDES database: Bates, 1988; Garvey, 1973; Gleason, 1976; Sprott, 1992; and Warren, 1982. *Table 1* describes the demographic characteristics of each sample.

Selection of quantity words.

We compiled a list of 61 time words and 63 number words as our targets for coding the informal conversations of young children. These words were determined and categorized before the collection of any data began. For a complete list of all the time and number words used, see the Appendix.

To compile the list of time words, we conducted a preliminary search through the archived transcripts to gauge the types and contexts during which number and time words are typically used among young children. Additionally, we reviewed previous literature studying temporal and numerical word usage among young children. Previous research revealed the various categories of time words, including duration terms (e.g., *seconds, minutes*), sequence terms (e.g., *before, after*) and deictic terms (e.g., *yesterday, tomorrow*; Tillman & Barner, 2015). Although prior research investigating children's development of temporal words has primarily focused on duration terms (Tillman & Barner, 2015), other research shows that young children are already capable of using temporal adverbs, such as *sometimes* (Busby et al., 2011). Given this, we created four categories of temporal words: units of time, labels of time, calendar terminology, and other references to time to guide our selection of temporal words for analysis. For a complete list of time words used, see the Appendix.

Past research on number talk also guided our selection of number words. While several studies involved the frequency of number talk (e.g., Gunderson & Levine, 2011; Levine et al., 2010; Ramani et al., 2015; Susperreguy & Davis-Kean, 2016), few studies provided a list of all number words coded. In line with Chernyak (2018), we concluded that number words should include integers and quantifier words. Integers consist of the words for standardized Arabic numerals ranging from zero to twenty alongside increases by tens (e.g., *thirty, forty, fifty… hundred(s)*) and larger amounts (e.g., *thousand(s), million(s), billion(s)*). Quantifiers included terms used to reference unspecified or approximate amounts (e.g., *both, couple, few, some, all*), the absence of amounts (e.g., *none*), and numerical adverbs (e.g., *once, twice*). We also included sequential terms as they are necessary for ordering events or items, and therefore should be included in our research. Sequential terms included words like *first*, *second*, etc. In addition to these three categories of words, we also included the words *number* and *count* outside of our three categories because they involve the practice of numbers but are not used in the contexts of sequencing and quantifying. For a complete list of number words used, see the Appendix.

Coding.

Frequencies of time and number words were collected using the Computerized Language ANalysis (CLAN) software. To collect the frequencies and check the context of the quantity words, we ran two program analyses: FREQ and KWAL.

The FREQ program constructed a frequency word count for the selected transcript by producing a list of all the words used in the transcript sorted by speaker type, along with the total number of utterances by speaker and the respective frequency counts for each word spoken (MacWhinney, 2000). A frequency word count is the calculation of the number of times a word occurs in a conversation transcript (MacWhinney, 2000). After initiating a FREQ run for each transcript within a corpora, researchers reviewed the output to identify when any of the quantity words of interest were used and its respective frequency.

The KWAL program searched the selected transcript for researcher-specified target quantity words and produced an output of each keyword in its contextual use (MacWhinney, 2000). Researchers ran KWALs for each target quantity word identified from the initial FREQ list of words for each transcript within a corpora. For instance, if the FREQ run revealed that the child said "time" seven times, researchers ran a KWAL run to observe the context of each of the seven instances to judge whether each instance should be counted in the total frequency. If the KWAL analysis revealed that one of the instances of the word time referred to "*Time Magazine*," it would not be included in the analysis as this use of the word does not necessarily reflect quantity talk in the same way someone saying "It's *time* to go" would. This process was important to ensure that the word was used in reference to quantity.

Researchers counted utterances in instances where a child used a quantity word in a random fashion with no coherent or thoughtful application (i.e., the child randomly stated the word "five" with no context or prompting). If a word seemed to be mumbled or repeated in stammering (i.e., "I have *five [five]* cookies"), it was recorded only once. This rule was also reflected by the CLAN software, in which the FREQ function disregarded extra or repeated words stated by stuttering. A word had to appear both on the output list of words produced by the FREQ run and in an appropriate context revealed by the KWAL run (i.e., "*Time* Magazine" vs "It's *time* to go!") to be counted by researchers in data collection.

Numerous coding decisions were made to ensure we were collecting an accurate count of time and number words. For example, the term *night-night* was recorded only once as the word *night*. Composite numbers like *eighty-five* were counted once. This adjustment was applied to our methods so that we did not count numbers like *eighty-five* as representing two numbers, whereas ninety only represented one number. The phrase at least was not considered to be an instance of quantity talk, but the words *least, most, less,* and *more* were coded. The word *little* was coded as referring to amounts (e.g., "I have a little"), but was ignored when referring to size (e.g., "little girl"). In phrases such as *half past seven*, *half* was counted as a number word, while *seven* was counted as a time word, since it was referring to 7 o'clock.

Data analysis.

Each transcript differed in length, therefore we wanted to ensure that the frequency of time and number words was not confounded by the length of the overall transcript. Thus, before conducting any statistical analyses, we first converted the raw frequency of number and time words into a percentage of utterances by dividing the raw number of number and time words by the total number of words spoken by that speaker in the transcript. We used the percentage of time or number utterances as the dependent variable for all analyses. It is important to note that the same patterns of results hold true if raw totals rather than the percentage of utterances. However, the percentage of utterances kept results proportional to the total number of utterances per transcript. All data analyses were conducted in SPSS.

Results

Usage frequency of number and time words

To answer our main research question, a paired sample t-test was conducted to analyze whether there was a significant difference in the frequency of time and number words spoken during informal conversations. Results showed a low frequency of quantity words overall, as the percentage of quantity words was less than 5% of total utterances, consistent with the findings of previous research (Chernyak, 2018; Levine et al., 2010). A paired samples t-test revealed that utterances involving time (*M* = 1.23%, *SD* = 1.68%) were significantly less frequent than utterances involving number (*M* = 3.18%, *SD* = 4.31%), $t(418) = -9.88$, $p < 0.001$, d = .45. See *Figure 1*. Thus, utterances involving numbers appeared almost three times more than time words, which supports the main hypothesis that time words are spoken significantly less than number words.

Speaker type.

In addition to addressing the main research question, we also predicted that adults would use more quantity words than children. To test this, we ran a repeated measures ANOVA with quantity (time vs. number) as the repeated measures variable and speaker (adult vs. child) as the between subjects variable. The analysis found a main effect of quantity $F(1, 480) = 80.55$, $p < 0.001$, $\eta^2 = .144$, indicating again that number words were spoken more frequently than time words. There was no main effect of speaker type, $F(1, 480) = .53$, $p = .47$, $\eta^2 = .001$, nor was there an interaction between speaker type and quantity $F(1,480) = 1.50$, $p = 0.22$, $\eta^2 = .003$, suggesting that both adults and children spoke more number than time words at equal rates.

Exploratory analyses

Although we did not have any specific predictions regarding setting, we also conducted an exploratory analysis to observe whether setting (home vs. school) impacted the frequency of quantity words. We ran a repeated measures ANOVA with quantity (time vs. number) as the repeated measures variable and setting (home vs. school) as the between subjects variable. The analysis revealed another main effect of quantity $F(1, 480) = 106.53$, $p < 0.001$, $\eta^2 = .18$, indicating that number words were more frequent than time words, even when including setting in our analysis. A main effect of setting was found, $F(1, 480) = 9.83$, $p = .002$, $\eta^2 = .02$, suggesting that quantity words were spoken in a higher frequency at home (*M* = 2.66%, *SD* = 2.04%) than at school (*M* = 1.94%, *SD* = 2.62%). Moreover, we found that there was an interaction between the variables of setting and quantity $F(1, 480) = 7.60$, $p = 0.006$, $\eta^2 = .02$. Post-hoc tests using Bonferroni corrections were conducted to understand this interaction further. While time words were equally used in home (*M* = 1.33%, *SD* = 1.22%) and school settings (*M* = 1.17%, *SD* = 1.89%; $p = .15$), there was a significant difference in the frequency of number words, with significantly more number words being spoken in home-like settings (*M* = 3.99%, *SD* = 4.00%) than school-like settings (*M* = 2.71%, *SD* = 4.41%; $p = .003$).

Discussion

Throughout early childhood, children learn a lot about quantity through informal conversations. While past research has shown that number talk is relatively infrequent in these types of situations (Chernyak, 2018; Goldstein et al., 2016; Ramani et al., 2015), no work has investigated the frequency of temporal words in informal conversations. Moreover, previous work has demonstrated a discrepancy between non-symbolic numerical and temporal abilities throughout the lifespan (Odic, 2017; Odic et al., 2015), which questions the cognitive mechanisms used to process these quantities. Given that timing abilities are significantly worse than numerical ones throughout development, we wanted to investigate whether number words are used more frequently than time words. We hypothesized that number words would be used more frequently in informal conversations compared to time words. Although not tested in the present study, we believe that the use of time and number words in informal conversations may then shape non-symbolic quantity abilities, which could explain the discrepancy in non-symbolic temporal and numerical processing. The findings supported the original hypothesis—quantity words were spoken infrequently, and number words were used significantly more than time words. This has numerous broad implications for quantity development. For example, although we did not test participants' non-symbolic quantity abilities in the present study, it is possible that engaging in number talk may sharpen non-symbolic numerical abilities, leading to greater numerical abilities compared to temporal ones throughout early development. This seems likely given that non-symbolic timing abilities are worse than numerical abilities throughout the lifespan (e.g., Droit-Volet et al., 2008, Experiment, 1; Odic et al., 2016; Odic, 2018). Additionally, our study shows that time talk is less frequent, at least in childhood. Future research is needed to understand whether the amount of time spent talking about time and numbers is related to non-symbolic abilities. If data supported the relationship between quantity talk and non-symbolic abilities, then increased intentionality in time talk could lead to improvements in children's understanding of time.

We were also interested in determining whether this pattern of more number talk than time talk held true across speaker types (in our case, children and adults). Although prior work has shown that people use more quantifiers as they get older (Levine et al., 2010), the results of this study did not indicate a significant difference in the frequency of quantity words used by children and adults. This could be because all transcripts involved children either participating in a conversation with an adult or at least in the presence of an adult, which could have impacted the amount of number talk that the adults were inclined to use. To test this possibility, future research could investigate whether adults use more quantifier information in conversations with other adults compared to in conversations with children. Additionally, more work is needed to understand whether number and time talk increase with age.

Although we did not have specific predictions regarding differences in quantity talk across home and school settings, we conducted an exploratory analysis to determine whether quantity talk differed in home and school environments. Our results indicated that number words were used significantly more in home-like settings than in school-like settings. Although we had not predicted this, it is possible that this result could be due to variance in the types of conversations taking place and the speakers involved in each environment. Conversations in home-like settings usually involved a child talking with one or more parents, whereas conversations in school-like settings were typically between multiple children. An adult or parent may be more likely to engage in intentional quantity talk with a child than other children would be, which may explain the increased frequency of quantity words in home-like compared to school-like settings. Little research has been conducted on differences in quantity talk between these types of settings, making it a fruitful area for future research.

Limitations & future directions

The present study is not without limitations. While we aimed to make it comprehensive, coding for a large number of words resulted in some challenges. First, while other studies used a similar method for coding numerical words (e.g., Chernyak, 2018; Sullivan & Barner, 2011), much of the past literature did not include a complete list of target words that were coded. Thus, we were only able to use a limited amount of previous research to guide our decisions involving word selection. Additionally, in order to be comprehensive and include as many numerical and temporal words as possible, we coded for a total of 124 time and number words. While this helped ensure that we were capturing as many instances of numerical and temporal language as possible, some of these words were not always used in a quantitative context. For instance, the word "all" was not always utilized in numerical form, and it became difficult to differentiate it. We created a coding scheme for these situations. For example, if the speaker said "all the marbles," it was counted due to its numerical context, but if the speaker said "all day," then it became more difficult to quantify it and therefore was not included. Despite these challenges, we hope that our work can serve as a model for future research by including a list of the coded words. For future studies, it may be beneficial to use fewer and more specific kinds of time and number words. For example, limiting the words that are examined to more explicit temporal or numerical words (only counting words like four o'clock, many, or few) may limit some of the ambiguity and yield different results.

Using the CHILDES database also presented some limitations. Many of the transcripts used in the database date back to the 1980s and 1990s. Since these transcripts were older, it is unclear whether these patterns of results will hold in more current conversations. We also could not control for the topics of conversation or the setting, though we intentionally chose home and school settings when selecting transcripts. Perhaps most notably, while CHILDES was helpful for coding the frequency of time and number words, it did not allow us to measure whether people use time and number words accurately (e.g., *do people actually get a snack in 5 minutes?*). The accuracy of these words when used with children could also play a major role in their developing understanding of time and number concepts. For instance, a child speaking about time may have said an event was taking place "tomorrow" in the transcript conversation, but we had no method to determine whether the event in question did in fact take place the next day. Therefore, while we effectively captured the frequency of quantity words spoken, our research was limited in capturing the accuracy regarding usage and understanding. Future research could examine more recent and controlled conversations amongst family or in school environments. This way, researchers could ask the adults for context where accuracy may have been unclear. Additionally, we may be able to have the accuracy of the numerical and temporal terms to ensure that if a child, for example, counted 4 items, there were actually 4 items to be counted. Based on some of the patterns we have noticed in this study, we would expect numbers (especially counting) to be used in much more accurate contexts with children than time, possibly contributing to lesser understandings of conceptual time than math.

Lastly, while our data are important for better characterizing the use of quantity words in everyday conversations, the current study does not explain how using quantitative information may be related to our ability to process quantity. Previous research has indicated an association between non-symbolic number acuity and formal math achievement, demonstrating the idea that there is a strong link between the two (e.g., Chen & Li, 2014; Schneider, 2017). A similar pattern of results has been found in the domain of time (Hamamouche & Cordes, 2019). Despite numerous studies showing a correlation between symbolic and non-symbolic numerical abilities and growing evidence of a similar correlation in the domain of time, little work has investigated the direction of this relationship. In other words, it is unknown if our non-symbolic abilities form the basis for understanding symbols (scaffolding hypothesis; e.g., Finke et al., 2020; Holloway & Ansari, 2009; Lyons et al., 2018) or if understanding of domain-specific symbolic information improves our non-symbolic abilities (refinement hypothesis; e.g., Shusterman et al., 2016; Suárez-Pellicioni & Booth, 2018). In the future, researchers should conduct studies using both children and adults to analyze the relationship between the frequency of time and number words and people's ability to process these quantities (i.e., non-symbolic time and number abilities). Support for the refinement hypothesis could be established if the data found that for example, early time talk was associated with later non-symbolic timing abilities, or if increasing the frequency of time talk led to better non-symbolic timing abilities. This future work can not only better explain the relationship between symbolic and non-symbolic abilities, but it would also allow researchers to assess the direction of the relationship.

Though previous research is unclear of the direction between non-symbolic and symbolic timing, it is clear that intentional quantity talk matters (e.g., Gibson et al., 2020; Levine et al., 2010; Susperreguy & Davis-Kean, 2016). If the refinement hypothesis is supported by future work, it will further emphasize the importance of engaging in temporal activities that are symbolic in nature. This would suggest that time talk is crucial to building the foundation of a child's understanding of time concepts.

In addition, future research should investigate the effect of child gender (male vs. female) on the frequency of time and number words spoken. Previous research demonstrates that adults, specifically parents, use more number words with boys than girls (Chang et al., 2011). Given this information, research should be expanded to investigate whether this gender difference exists among time words as well to discover if adults would use more quantity words when interacting with male compared to female children.

Together, our data suggest that quantity talk, especially time talk, is rare. Parents and educators may benefit from this knowledge and should make an effort to use numerical and temporal words with children. In addition to using this terminology and hopefully increasing the use of the words, there are likely benefits to explaining or demonstrating the words' meanings, as they are often not as intuitive as adults assume. This is particularly important as work shows that the words used around children matter, and that intentionality in using numerical words (counting, baking, etc.) strengthens their understanding of these vital concepts (Lyons et al., 2018). In conclusion, the results of this study as well as previous research emphasize the cognitive benefits and true importance of taking time to teach, explain, and integrate numbers into conversations with children.

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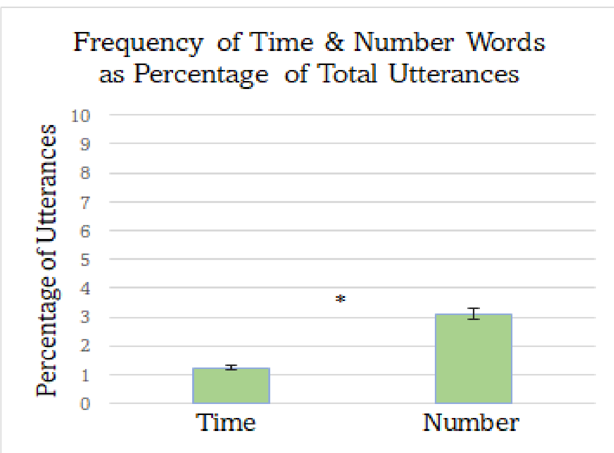
Table 1

Corpora	(n)	Age Range (years)	Mean Age (years)	Gender	Setting	Activity	Transcripts
Gleason, 1976	22	2.2-5.2	3.5	M=12 F=10 Unknown=2	Home	Meal Time	22
Warren-Leubecker, 1982	20	1.5-6.2	3.9	M=10 F=10	Home	Free Play	20
Bates et al., 1988	25	2.3	2.3	M=13 F=12	Home	Free Play	25
Garvey, 1973	92	2.8-5.6	4.3	M=42 F=50	School	Free Play	46
Sprott, 1975	173	2.8-5.1	3.6	Unknown=173	School	Free Play	24

Note: Ages were only provided for child participants, we do not know the ages of the adults in the transcripts. The gender distribution includes only children.

Figure 1



Appendix

Time Words

Calendar	*Units of Time*	*Labels of Time*	*Other References to Time*
Monday… Sunday	day(s)	Afternoon, mid-afternoon	after
January… December	hour(s)	Morning, mid-morning	afterward(s)
	minute(s)	midnight	earl(y)(ier)
	month(s)	night	late(r)
	second(s)	noon	ago
	week(s), weekend, weekday	today	now
	year(s)	everyday	soon
	o'clock	today	annual
	centur(y)(ies)	tomorrow	bit
	decade(s)	yesterday	Time as References
	Number as Time (e.g., four p.m. or one thirty)	past	
		Present; presently	
		future	
		A.M./P.M.	
		Time as Labels (e.g., lunchtime, nighttime, bedtime)	

Number Words

Sequential	*Quantifiers*	*Integers*	*Number/Count*
first	both	"One" - Integers	number(s)(ed)
Second; secondly	couple	"One" - Identifiers	count(s)(ed)
third	few	two… twenty	
fourth	half	thirty, forty … ninety	
fifth	less/least	hundred(s)	
	little	thousand(s)	
	lot(s)	million(s)	
	many	billion(s)	
	more/most	zero	
	much		
	several/bunch		
	some		
	all		
	any		
	none		
	whole		
	double		
	twice		
	once		
	pair(s)		
	bit		
	plenty		
	dozen		