

Patterns of Vocabulary Acquisition in Spanish-English Bilingual Children with SLI

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ARTICLE INFO	ABSTRACT
Published Online: 11 May 2018	The parents of 10 bilingual preschoolers with SLI completed vocabulary inventories in Spanish and English detailing their children's productive vocabulary in each language. Inventories were examined to determine the children's total number of words in both languages combined, also called Total Vocabulary (TV) as well as total number of words for different concepts, also called Conceptual Vocabulary (CV). The total number of Translation Equivalents (TE) and the number of cognate TEs were also determined. Results indicated that bilingual children with SLI had fewer TEs and fewer cognate TEs than what is expected of typically developing bilingual children. Such difference indicates that the bilingual children with SLI did not take advantage of the facilitative effect of cognate TEs in vocabulary acquisition. Implications for vocabulary intervention for bilingual children with SLI are discussed.
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I. INTRODUCTION

The way in which children learn new words has been an area of interest in language acquisition research for quite some time. Evidence suggests that when children are acquiring vocabulary they are guided by three principles. The first is the whole object principle, which suggests that when children learn new word labels, they refer to whole objects rather than parts or properties of that object. For instance, when they are shown a dog and hear the word *dog*, they automatically classify the whole object as a dog. The second is the taxonomic principle, which suggests that words refer to objects of the same kind. Therefore, when children are shown another creature that has similar characteristics as the first dog they saw they will also label it as a dog. The third principle, the mutual exclusivity principle, suggests that each referent has only one name/label; therefore, when children have already been presented with the referent and name for dog and they hear another name while observing a dog, they will assume that this new name is not labeling the dog, but rather part of the dog or something else entirely [1]. Interestingly, however, most research investigations on lexical-semantic acquisition to date have been conducted with children who are exposed to only one language, which poses a problem for generalization of results to cases of bilingual language exposure. Of special importance is the mutual exclusivity principle, as it states that there can only be one word per referent, but bilinguals have two, one for each of their languages respectively [1]. So how do children

exposed to more than one language acquire vocabulary and how much does it differ from those exposed to only one?

Recent research conducted on monolingual infants suggests that infants tend to learn new words based on similar semantic categories as words they already know; that is, words that share a similar semantic structure with already known words are more likely to enter a child's vocabulary first when compared to words not semantically related [2]. For this reason, word learning can appear in a clustered fashion, because prior knowledge facilitates the acquisition of lexical meaning when items share various semantic categories. It is suggested then, that novel words which can draw upon denser semantic networks of previously learned words help children acquire and recognize new words faster during language learning than those from more sparsely connected networks. This also indicates that the early lexicon of children is mostly derived from dense semantic networks [2].

Other research has suggested that children tend to learn a novel word by associating it not to a familiar object but instead, to a novel referent [3]. During the language acquisition period, infants apply many systematic word-learning heuristics that assist them in acquiring and learning new words rapidly. One factor that likely contributes to rapid word learning is children's capacity to place the name of a novel word with a novel object, as well as the mutual exclusivity principle. For example, when seeing a new object, children tend to associate it with a new word in place

of a known word already mapped in their lexicon. This type of heuristic of mapping a novel word to a novel object is known as disambiguation. A study conducted by Byers-Heinlein and Werker [4] aimed at testing whether language experience contributes to the development of disambiguation. The idea is that a child's language experience and maturation helps him or her in their language acquisition. In the study, the authors looked at not just the language experience and maturation of monolinguals and bilinguals, but also of trilingual speakers. The authors obtained vocabulary measures by having the caregivers of the participants fill out the *MacArthur-Bates Communicative Development Inventory* (CDI) [5], which is a widely used standardized measure of productive vocabulary in both monolingual and bilingual children that gathers information via parental report of children under the age of three. Byers-Heinlein and Werker (2009) then presented the participants with three familiar objects and one novel object and auditory stimuli that consisted of the names of the familiar objects and the name for the novel object and measured the eye gaze of the participants. The results showed that monolinguals did have a strong use of disambiguation, while bilinguals only showed a marginal use of disambiguation and trilingual's showed no use of disambiguation. Therefore, indicating that a child's experience does influence a child's language acquisition and disambiguation [4].

Kandhadai, Hall, and Werker [1] also conducted a similar study that examined whether bilingual infants assigned a novel word to some property or attribute of a familiar object as monolinguals would do according to the mutual exclusivity principle, or if they treated the novel word as an additional label for the familiar object. Results revealed that upon two exposures of the novel word, bilinguals mapped word meaning as a second label for the familiar object. Thus, it was concluded that children who are exposed to more than one language in their environment are not guided by the mutual exclusivity principle when learning new words [1].

Byers-Heinlein, Fennell, and Werker [3] looked more specifically at a child's developmental trajectory of associative word learning. By exposing two different age groups of both monolinguals and bilinguals to nonsense words (auditory) and both familiar and unfamiliar visual stimuli, after being habituated to word pairings of a nonsense word and visual stimuli, in order to form novel word associations, the researchers were able to detect how infants learn these associations and whether there is an advantage, delay, or difference between monolingual and bilingual lexical acquisition time. The authors set up two different trial types after the habituation took place. One consisted of a familiar pairing, the Same trial, and the other consisted of an unfamiliar pairing, Switch trial. The results showed that early bilingual experience does not interfere with the development of the fundamental ability to form word-object associations, suggesting that this mechanism is robust across different early language environments. The number of habituation

trials did not differ as a function of language background, or as a function of age, and there was no significant interaction between the two factors. Further, the trial type, each of which included a word-object pairing (i.e. a molecule-shaped object labeled *neem*), did not interact with language background, indicating equivalent performance for monolinguals and bilinguals. Indeed, a similar pattern of looking was demonstrated by monolinguals and bilinguals. No significant correlation was found between performance and infants' percent exposure to English. Bilinguals in the study were exposed to English between 25% and 75% of the time. Analysis based on dominance showed: that infants who heard English 50% of the time or more did not perform differently from those who heard English less than 50% of the time [3] These results seem to show that the development of the fundamental ability to form word-object associations is not hindered for bilinguals.

To further understand how bilinguals develop their lexical system compared to monolinguals, Zhao and Li [6] introduced an unsupervised neural network model to better understand this process as well as the interactions that take place between the two languages as the lexical system expands. Neural network computational models are built on the principle that large groups of neurons in the human brain activate and interact with one another when individuals are presented with certain tasks. With regard to language acquisition, the belief is that the way in which linguistic representations are organized in the brain result from the interplay between the learning system of individuals and the linguistic environment in which they are immersed. Consequently, neural network models have been developed to examine how language processing and development take place. However, most research to date in this particular area has been done on monolingual language acquisition. Additional limitations such as a lack of consideration for important variables, including age of acquisition, and inability to replicate the reorganization that occurs in the lexical system as individuals' vocabularies grow have been identified. Therefore, these limitations were taken into account to create a neural network model to analyze the development and interactions between the lexical representations in the first and second languages (L1 and L2) of bilinguals.

Zhao and Li [6] designed neural network model with three levels for organization and representation of linguistic content: phonological, semantic, and output sequence of the lexicon. It was built in such a way that it could not only detect changes in the activation of nodes (neurons) when presented with a certain stimulus, but also store that information for later recall. In this manner, the nodes that were activated with the initial stimulus would activate again given that same stimulus or similar stimuli. This in turn would yield stronger connections between certain nodes and weaker connections among others. The weaker connections would eventually disintegrate leaving a small area of node

activation for certain semantic or phonological stimuli. In essence, this node mapping would resemble the neuronal mapping that takes place in the brain when people map word meanings to external referents.

Analysis of the output provided by the model given input on all three levels of organization yielded several conclusions, one of which substantiates that of Borovsky, Ellis, Evans and Elman [2]. According to the model, the location of L2 words in late sequential acquisition was dependent upon the phonological or semantic similarities they had with L1 words, indicating that the L2 lexicon in this particular scenario is essentially built on an already established linguistic system [6]. This suggests that there is a degree of overlap in the way bilinguals and monolinguals acquire vocabulary words.

Other factors that are to be considered when studying semantic development of bilinguals are their ages and experiences. Comparing age groups and language experiences helps better understand a bilingual's performance in the two languages as well as their semantic development. In the study, *Semantic Development in Spanish-English Bilingual Children: Effects of Age and Language Experience*, the older the children, the more frequently they code-switched and the more semantic responses were produced [7]. Those children with a higher experience in L1 performed better than those with a higher experience in L2 when tested in L1 [7]. These results indicate that the amount of input, a child's language experience, and age plays a role in a bilingual's language acquisition and performance [7]

According to Poulin-Dubois, Bialystok, Blaye, Polonia, and Yott [8] quantity of exposure is an extremely important factor in lexical development as well. The amount of language exposure in one language seems to be directly related to the proportion of vocabulary obtained in that particular language, which results in bilingual children having a smaller lexicon in each spoken language when compared to their monolingual peers. Slower reaction times and deficits in lexical retrieval have appeared to be more common in the bilingual population as well. Also of importance, is the number of translation equivalents (TEs), words for concepts in both languages, as they appear to be directly related to the speed with which children retrieve target words on a Computerized Comprehension Task (CCT) consisting of infants touching (choosing) pictures in response to auditory prompts. Although controversial and in disagreement with the competition hypothesis, which proposes that bilinguals are forced to make greater efforts in processing to access words in each language because of the need to inhibit interference from the competing language, it appears that TEs facilitate and do not inhibit lexical retrieval in bilingual toddlers and their early stages of vocabulary acquisition [8].

Other studies also bring attention to the facilitating effects of knowing two languages. Cognates can be defined

as terms with linguistic similarities across different languages, as well as shared meanings [9]. Cognate facilitation, for example, is a form of cross-linguistic transfer that has been observed during processing and production tasks given to bilinguals. This may result from the automatic simultaneous activation of both languages, regardless of the language that is being presented during the given task. This concept was tested by Leacox [8] during timed picture-word verification and picture naming tasks that used target words that phonologically overlap in the English and Spanish languages. The child's ability to name cognate versus noncognate pictures was tested, showing that Spanish-English bilingual children had more correct responses when naming pictures that were phonologically similar cognates than they did when naming dissimilar ones [8].

Additionally, it is also thought that being bilingual will affect the order and rate of lexical acquisition. In their study, authors Bilson, Yoshida, Tran, Woods, and Hills [10] were able to study the rate at which monolinguals and bilinguals acquired language. Caregivers were asked to fill out a vocabulary checklist, either the *MacArthur-Bates Communicative Development Inventory* (CDI) [5] Toddler Form for English words, similar communicative development inventories for words in other languages, or similar non-English versions created to resemble the CDI. For this study, the results showed that the monolinguals learned all language concepts and English words at a faster rate than bilinguals. The bilinguals, however, overproduced translation equivalents and displayed a preference for learning words with more associative cues [10]. These results indicate that for bilinguals, learning a word in one language facilitates vocabulary acquisition in the other language.

Other findings support the hypothesis that bilingual children have a higher percentage of accurate responses when naming cognate pictures. The word production model, for example, suggests that once a concept is retrieved it can be produced. For cognates, the shared concept allows for activation with the phonological characteristics of a word to occur simultaneously. For bilingual children, specifically, the word production model allows the children to demonstrate the influence each language poses on the other and the cross-linguistic transfer that occurs, which explains why cognates are named more accurately. If phonological performance differences are evident in young bilinguals, it can serve as an aid when processing and designing assessments and interventions for teaching and therapy purposes [9].

Fabian [11] continued with the theory of cognate facilitation by examining the productive vocabularies of English monolinguals, Portuguese monolinguals, and Portuguese-English bilinguals. The *MacArthur-Bates Communicative Development Inventories* (CDI) were administered and completed by the participants' parents in each of their child's languages. This study examined patterns of vocabulary acquisition in bilingual children, hypothesizing that cognate words are helpful in the acquisition of similar

elements in both of a bilingual's languages. This was done by examining the Translation Equivalents (TEs) that were cognates and the TEs that were non-cognates in the bilingual's Total Vocabulary (TV). Fabian's findings suggested that "Of the possible cognates, [bilingual children aged 16-36 months], had 29% in both languages. And of the possible non-cognate translation equivalents, the children had 15% of the words in both languages" [11, p. 35]. These results indicate that cognate words have a facilitative effect on bilingual lexical acquisition because a child is most-likely able to recognize form-similar cognate items when the word is already known in one language.

Another similar study by Bosch and Ramon-Casas [12] targeted the emergence of translation equivalents (TEs) in Spanish-Catalan bilinguals aged 18-months who are acquiring two distinct, but phonologically similar, languages with many cognate words and TEs. Using parent-filled questionnaires in both Spanish and Catalan, a Total Vocabulary Size (TVS) was obtained and then placed into three categories based on form: identical, similar, and dissimilar. Next, three additional vocabulary measures were obtained by subtracting each the form-identical, form-similar, and form-dissimilar words from the TVS.

When all forms of the TEs were considered in the results provided, bilinguals had a significantly higher total vocabulary score compared to monolinguals. However, when specifically the form-identical TEs were subtracted, the bilinguals no longer differed from the monolinguals. It was concluded that form-identical TEs contribute to about 28% of the bilingual's vocabulary when learning such two phonologically similar languages. This study revealed that when learning language, Catalan-Spanish bilingual children favor the production of almost identical or similar cross-linguistic items, as they are useful during communication in both languages as they facilitate an increase in both lexicons simultaneously at about the same rate [12]

Findings such as these clearly suggest a linguistic advantage for bilingual language learners. Kelley and Kohnert [13] conducted a study to investigate if there is a cognate advantage from a receptive lexical standpoint. Participants between the ages of 7 years, 10 months and 13 years, who considered Spanish to be their first language were administered a measure of receptive vocabulary in both English and Spanish. Results revealed that most correct answers on the assessments given, involved cognate pairs. Therefore, it was concluded that Spanish-speaking, English learning children are able to identify and label an increased number of lexical items that are cognates versus lexical items that are non-cognates. It is clear then, that these individuals may take advantage of the phonological similarities between words in both their languages to improve performance on lexical standardized tests. These findings are clinically significant in that utilizing cognate word pairs in treatment of bilingual children with language impairment may facilitate lexical development in their second language [13].

As seen above, researchers agree that bilingual language acquisition is similar to that of monolinguals and that bilingual vocabulary acquisition in both languages can be facilitated by translation equivalents or cognate words. In addition, knowing a word in one language seems to facilitate the knowledge of that concept or word in the other language. At the same time, studies of vocabulary development in bilinguals continue to show that bilinguals exhibit smaller lexicon sizes in each of their two languages when compared to their monolingual peers [14]. However, when bilinguals' total vocabularies (TV) are tested—which means that every word the child knows in either language is accounted for—they are similar in size to those of monolinguals. Core, Hoff, Rumiche, and Señor [15] looked at not only the Total Vocabulary (TV), but also Conceptual Vocabulary (CV) which is the total number of concepts the child produces in either language minus the Translation Equivalents (TE) from one of the languages. The TV and CV were used to measure mean vocabulary size and growth in Spanish-English bilingually developing children from 22 to 30 months of age based on results from the *MacArthur-Bates Communicative Development Inventory* (CDI) in English and Spanish. When Core and associates compared bilingual children's CDI scores of total vocabulary and conceptual vocabulary with a control group of monolingual children, the results revealed that the total vocabulary measure resulted in mean vocabulary scores and average rate of growth similar to monolingual growth; whereas conceptual vocabulary scores were significantly smaller and grew at a slower rate than total vocabulary scores. Total vocabulary identified the same proportion of bilingual children below the 25th percentile on monolingual norms as the CDI did for monolingual children [15].

It is likely that because every bilingual has a different language experience, there is not always a Translation Equivalent (TE) available in both of their languages. Fabian [11] states that "This might be explained by the distributed characteristics factor, one that says that the words bilinguals know are distributed across their two languages" (p. 25). As a result, the younger children are, the smaller their vocabularies and the lower the number of TEs. Although much research has been done on the study of bilingual typical language acquisition, there is little research on language learning in bilingual children with Specific Language Impairment (SLI). This knowledge of disordered bilingual language learners is imperative in forming appropriate assessment and intervention techniques so that vocabulary development is improved across all of a child's languages. The current study attempted to determine how bilingual vocabulary acquisition appears in a child with SLI, and whether bilingual children with SLI acquire translation equivalents (TE) in the same manner as their typically developing peers. That is, do bilingual children have a similar proportion of TEs in their vocabulary as their typically developing peers? And are bilingual children with

SLI more likely to have TEs that are cognates than non-cognates, similar to what has been reported for typically developing bilingual children?

II. MATERIALS AND METHOD

The data used in this study were provided by the parents of 10 children (9 males and 1 female) ages 3;1 to 4;5 (mean age = 3;8). All the children were born in the United States and were exposed to varying degrees of English and Spanish from birth (more details about extent of bilingualism is given below under Procedures). The families were recruited from 2 private speech and language pathology clinics in Miami, FL. All the children were previously identified as having a language delay and were receiving speech and language therapy at the clinics (1 of the children was seen at his preschool by one of the speech-language pathologists employed by one of the clinics). A few of the children were also receiving therapy for articulation difficulties, but none of them had been identified as having any cognitive, emotional, or sensory difficulties, thus fitting a diagnosis of Specific Language Impairment (SLI). As is common practice in children this age, their initial evaluation included the administration of the Preschool Language Scale -5 (PLS-5) [16]. The PLS-5 has an English monolingual edition and a Spanish bilingual edition. Most of the children were administered the Spanish bilingual edition (which allows English and Spanish responses and is normed on bilingual children living in the US), with the exception of 2 children who were predominantly English speakers and were administered the English version (subjects # 3 and 5). The PLS-5 has 3 composite scores, an Auditory Comprehension (AC) score, an Expressive Communication (EC) score and a combined Total Language score. All composite scores have a mean of 100 and standard deviation of 15. All subjects scored below 1 standard deviation from the mean in all composite scores and severity varied from mild (79 to 84) to moderate (65 to 78) and severe (<65).

Speech-Language Pathologist at the 2 clinics were asked to give parents of children who fit the profile of SLI information about the study. Parents who showed interest were asked to contact the principal investigator who scheduled a meeting time with each parent individually, either with the PI or one of her graduate students. During the meeting, parents were given a full explanation of the study and parental consent was obtained. Parents were then given the choice of completing the information with the investigators present or to take the forms home to complete at their leisure and bring them back to the clinic at a later time. Parents completed 3 forms:

- 1) Language Background Questionnaire. This questionnaire was developed by Gathercole and colleagues [17]), and it asks detailed information about the child's exposure to each language throughout the day at home and at school. It has an English and a Spanish version. For each part of the

day and communication partner, the parent is asked to estimate the percentage of time each language is spoken. Parents were given the choice to complete it in either language. All parents were bilingual in English and Spanish and most chose to answer the English version. After examining all questionnaires, it was apparent that all of the children were exposed to and spoke either of the languages most of the time (60 to 80% of the time), so they were either classified as being dominant in Mostly English or Mostly Spanish.

- 2) MacArthur Bates Communicative Development Inventories –CDIs Words and Sentences [5]. For this study, only Part 1, Words Used was completed. The English version contains 680 words and the Spanish one 678. The words in both languages are divided into 22 categories and parents are asked to mark all words the child can say.
- 3) The Spanish version of the CDI

Using a computer scoring system developed for the Spanish-English CDIs, all words in English and Spanish were imported into an Excel spreadsheet keeping translation equivalents (TEs) together. Each TE was then classified as either a cognate or non-cognate pair. To decide if the TEs were cognates, they had to share corresponding consonants and have a similar syllable structure. As an example, “lion” and “leon” were considered cognates, but “giraffe” and “jirafa” were not. A total of 546 words (80% of the total) are TEs, of those, 82 (15%) were considered cognates.

The CDI entries for each subject were then entered into the spreadsheet for a count of Total Vocabulary (TV), which is the number of words entered in Spanish plus word entered in English, total number of TEs, total number of cognate TEs and Total Conceptual Vocabulary (TCV), which is the TV minus the TEs.

III. RESULTS

As previously mentioned, the TV for each participant accounts for every word in the child's lexicon in both languages, whereas the TCV accounts for the total number of concepts the child utilizes without including the TEs from one of their languages. Therefore, our participants show a greater TV than TCV; however, when compared to typically developing children both the TV and TCV of our participants are lower. According to the MacArthur Bates Communicative Development Inventories (CDI), typically developing children obtain approximately 550 words by 30 months of age. Based on this information, our results are indicative of our participants having a language impairment, as 80% of our participants have less than 550 TV words.

Additionally, the results of both the predominantly English and predominantly Spanish speakers of our study indicate that the percentage of TEs in the TVs of each of our participants ranges from 2.54% to 26.87%. The average of the percentage of TEs in TVs of all of our participants is

approximately 12%. Furthermore, the results reveal that predominantly Spanish speakers have a greater percentage of TEs in English whereas predominantly English speakers in this study have a greater percentage of TEs in Spanish. This finding was consistent amongst each group, Predominantly English Speaking (Ages 3;5 to 4;5) and Predominantly Spanish Speaking (Ages 3;1 to 4;1), consisting of five participants each. When analyzing the Spanish speaking group, the percentages of TEs in Spanish range from 2.61% to 53.23%. On the other hand, the percentages of TEs in English range from 33.33% to 92.31%, revealing a greater percentage of TEs in English than Spanish amongst this group. When investigating the Mostly English speaking group, the percentages of TE's in English range from 7.55% to 22.84%. Contrary to these findings, the percentages of TEs in Spanish range from 26.67% to 85.95%, exhibiting a greater percentage of TEs in Spanish amongst the predominantly English speaking group. In addition to the above, the percentage of TE Cognates per participant ranged from 0.00% to 55.56%, which were derived from dividing the amount of cognates by the number of TEs for each child. The percentage of TE Cognates amongst predominantly English speakers ranged from 0.00% to 35.71%. Amongst predominantly Spanish speakers the percentage of TE Cognates ranged from 16.67% to 55.56%, indicating that Predominantly Spanish speakers held a greater percentage of TE Cognates when compared to predominantly English speaking peers.

IV. DISCUSSION

The purpose of this study was to determine how bilingual vocabulary acquisition appears in a child with SLI, and whether bilingual children with SLI acquire translation equivalents (TE) in the same manner as their typically developing peers. Therefore, it was hypothesized that bilingual children with SLI would have a similar proportion of TEs in their vocabulary as their typically developing peers. Additionally, it was also hypothesized that these same individuals would be more likely to have TEs that were cognates than non-cognates, similar to what has been reported for typically developing bilingual children. In this section, analyses of results are carefully considered and discussed.

As indicated from the results section, the bilingual children in this study had an average of approximately 12.6% of their total vocabulary (TV) made up of translation equivalents. When comparing this to Fabian's study [11] done on typically developing bilinguals, about 23% of their total vocabulary was composed of TEs. Furthermore, when looking at the amount of TEs which were cognates, or words that shared corresponding consonants and had a similar syllable structure, the bilingual children with SLI had 3.3% of their total vocabulary and 3.9% of their total conceptual vocabulary consisting of cognate words, whereas the

typically developing bilinguals had about 29% of their TV consisting of cognate words.

Due to the variability in children with SLI, the amount of TEs present in the vocabulary of our subjects varied across all ages, levels of severity, and language dominance. The lack of TEs and cognate words present in the total vocabulary of bilingual children with SLI, when compared to the typically developing bilingual children, could be explained by the assumption that children with SLI, in general, are unable to access and take advantage of many of the language connections that typically developing children use throughout the language learning process. This lack of language connections is especially apparent in bilingual children with SLI due to the fact that their total amount of known words is distributed across two languages, which makes the lack of utilizing these language connections to assist in their language development even more apparent.

When these results were then broken down into language categories, they indicated that bilingual children who predominantly spoke Spanish had a higher percentage of words that were translation equivalents in English. Likewise, those who predominantly spoke English had a higher percentage of words in Spanish that were translation equivalents. Although these children overall had a smaller amount of TEs when compared to their typically developing peers, it appears they are still utilizing their prior knowledge of vocabulary words from their dominant language to assist them in learning words in their non-dominant language.

V. CONCLUSION

It seems that bilingual children with SLI are not using the same strategies as their typically developing peers in their acquisition of vocabulary. Namely, they do not seem to use TEs and cognate TEs at the same rate as their peers. The results obtained in this study are important to note when planning for intervention if we consider that children with SLI are still attempting to use translation equivalents in order to learn more than one language. Perhaps when the use of translation equivalents is applied to the intervention process for these children, it will promote the increased use of these language connections, and teach the children to take advantage of this prior knowledge when acquiring new words. Calling attention to TEs that are also cognates should prove particularly powerful in such intervention.

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