Tracking Lexical Knowledge of Concepts Unique to Singapore English Among Speakers of Singapore English

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Abstract

This paper presents prevalence norms collected from a representative sample of Singapore English speakers for a set of 240 concepts unique to Singapore English. Prevalence refers to the proportion of people who know or recognize a particular concept. Because large-scale, diachronic language corpora are scarce for non-standard varieties of English, the present study aims to establish the collection of prevalence norms from a cross-sectional sample as a potential alternative for tracking changes in word usage patterns over time. Preliminary analyses indicate that lexical knowledge of Singapore English concepts differs across gender, age, and ethnic groups. In particular, while most concepts are generally well known, some concepts are better known by younger participants and others are better known by older participants. These results underline the dynamic nature of Singapore English vocabulary and demonstrate how simple psycholinguistic tasks could be used to study lexical change in under-resourced languages and varieties.

Keywords: Singapore English; prevalence; lexical knowledge; vocabulary; concepts

Introduction

Language is commonly thought of as a complex adaptive system, which evolves and is shaped in response to cognitive processes related to the learning, production, and comprehension of language (Beckner et al., 2009). This has been a topic of much interest among many in the cognitive science community, as evidenced by several studies that explored how domain-general cognitive mechanisms contribute toward language and semantic change (Kirby, Cornish, & Smith, 2008; Li & Siew, 2022; Monaghan, 2014). Much of this research relies on the analysis of diachronic language corpora (Hills & Adelman, 2015; Li et al., 2024), which are less available for understudied and under-resourced languages and varieties, such as Singapore English. How might one study lexical change in Singapore English without comprehensive, diachronic data sets? Here we explore how a simple method from psycholinguistics could yield some ideas into the nature of lexical knowledge across Singapore English speakers of various generations, genders, and ethnicities.

Brief Introduction to Singapore English

Singapore English is the variety of English spoken in Singapore, a country in Southeast Asia. English emerged as the lingua franca among the various ethnic groups of Singapore (predominantly Chinese, Malay, and Indian) as a by-product of British colonization and language and educational policies by the government after Singapore's independence. Singapore English consists of two varieties: Standard Singapore English (SSE) and Singapore Colloquial English (SCE), also commonly known as *Singlish* (Leimgruber, 2011). It is important to note that these are not discrete varieties, but rather they sit at two ends of a continuum in a diglossic context. SSE is the "high" variety that is most typically used in written and formal situations, whereas SCE or Singlish is the "low" variety used in informal contexts (Cavallaro, Ng, & Tan, 2020; Tan, 2017). While SSE is not especially different from other major varieties of English such as North American or British English, SCE is quite different from SSE in terms of syntax as well as vocabulary. Focusing on vocabulary, SCE contains a large number of lexical borrowings from Malay, Tamil, and Chinese dialects. These concepts do not exist in major dialects of English; although a few such as *kiasu*[1] and *sinseh*[2] have entries in the Oxford English Dictionary.

Our present focus is on word usage patterns of concepts that are unique to Singlish, the colloquial variety of Singapore English. Although language corpora for Singapore English do exist (such as Lin et al. (2022), Gonzales, Hiramoto, R. E. Leimgruber, and Lim (2023), and ICE-Singapore (Greenbaum, 1991)), these are either not particularly large in size or are not historical or longitudinal in nature. In other words, these corpora provide more of a "snapshot" of language usage patterns in Singapore English but are unable to provide insights into how these patterns are changing. In particular, because Singlish is most commonly used in spoken, informal communicative contexts, existing corpora may miss out on these concepts if their coverage does not include spoken registers or conversational contexts. These constraints create some challenges for language scientists interested in studying how Singlish has been, and is changing, over the past decades. In the next section we examine the possibility of using a simple task used in the psycholinguistic literature to extract information about word usage patterns across different segments of the population, specifically, across gender, age, and ethnicities.

[1] https://www.oed.com/dictionary/kiasu_n
[2] https://www.oed.com/dictionary/sinseh_n

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Word Prevalence

The development of megastudies and lexical databases has been helpful in advancing psycholinguistic research. An example of a megastudy relevant to the present study is the English Crowdsourcing Project (Brysbaert, Mandera, McCormick, & Keuleers, 2019). In this megastudy, Brysbaert et al. (2019) collected prevalence norms for thousands of English lemmas by simply asking participants if they recognized a string of letters as a real English word (or not). The data was obtained through crowdsourcing. Using these responses, the authors were able to compute word prevalence norms, which refers to the proportion of people in the population who know a given word. For instance, among participants from the United States, the word *chigger* (P = 0.80) is relatively better known than the word *kerbside* (P = 0.23).

A notable finding by Brysbaert et al. (2019) was that certain words had especially different prevalence scores among different segments of the population, such as between males and females. Although the correlation of prevalence norms was generally very high across genders, words such as *tulle* and *freesia* were better known by females than males and words such as *parsec* and *howitzer* were better known by males than females. Hence, we reasoned that obtaining prevalence norms for concepts unique to Singapore English across Singaporean English speakers of different genders, ages, and ethnicities could be one way of obtaining insights into usage patterns of these concepts. We rely on the assumption that people who state that they know a Singapore English concept are more likely to be using the concept themselves in various communicative contexts, as compared to individuals who do not know the concept at all.

Research Goals

The goal of the present research is to collect prevalence norms for a set of Singapore English concepts that are unique to Singapore English, from a representative sample of Singapore English speakers. This would enable us to see if there are differences in prevalence across genders, younger and older participants, and participants of various ethnicities. More specifically, we wanted to explore if prevalence of certain concepts were stable, increasing, or decreasing across different generations of speakers, with an eye toward using this information to study lexical change in Singapore English in future research.

A broader, long-term goal of this research program is to develop a comprehensive set of lexical-semantic and word association norms for Singapore English. Through this we hope to highlight the methodological challenges involved in investigating language change and evolution among understudied languages and varieties, and explore the possibility of leveraging on simple psycholinguistic tasks to gain some insight into the nature of word knowledge patterns across the lifespan.

Table 1: Demographic details of participants

	Study 1	Study 2
Total N	1,075	1,169
Gender		
Male	540 (50.2%)	576 (49.3%)
Female	535 (49.8%)	593 (50.7%)
Age		
21-30	242 (22.5%)	307 (26.3%)
31-40	271 (25.2%)	303 (25.9%)
41-50	240 (22.3%)	285 (24.4%)
51-60	219 (20.4%)	178 (15.2%)
> 60	103 (9.58%)	96 (8.21%)
Ethnicity		
Chinese	892 (83.0%)	920 (78.7%)
Malay	125 (11.6%)	160 (13.7%)
Indian	43 (4.00%)	65 (5.56%)
Other	15 (1.40%)	24 (2.05%)

Method

Participants

A total of 2,646 participants took part in this study. Of these participants, 1,275 participants completed Study 1 and 1,371 participants completed Study 2. Study 1 and Study 2 were identical except for the list of cues presented; see below for more details. Participant recruitment and data collection was conducted by the National University of Singapore's (NUS) Institute of Policy Studies Social Lab. Participants were reimbursed for their time. This study was approved by the NUS Institutional Review Board.

The following criteria was used to decide which participants to retain for data analysis. Participants were excluded if they indicated that they (i) were not born in Singapore, (ii) were not currently residing in Singapore, (iii) did not live in Singapore for the most of their life, and (iv) were not native speakers of Singapore English. The motivation behind these criteria was to ensure that participants were indeed native speakers of Singapore English, and were currently communicating in this dialect of English in their everyday lives. After applying these criteria, 2,244 participants remained ($\sim$15.2% data loss) with 1,075 participants who completed Study 1 and 1,169 participants who completed Study 2. Table 1 shows the demographic breakdown of the remaining participants by gender, ethnicity, and age.

Stimuli and Materials

The stimuli consisted of 240 words and short phrases manually selected from the Wikipedia page on Singlish vocabulary (https://en.wikipedia.org/wiki/Singlish_vocabulary; last accessed 4th January 2024). This set of stimuli is a subset of a larger word list of lexical borrowings and unique concepts in Singapore English which is manually curated by the lab, and for which data collection for the remaining concepts is still ongoing. We decided to begin with these 240 con-

cepts because these were concepts that we felt were likely to be prominent, central concepts in the lexicon of Singaporean English speakers (given their presence in a Wikipedia entry), and we were interested to explore if there were any potential differences in the lexical knowledge of these concepts. The 240 concepts were then split into 2 sets of 120 concepts with the first set of concepts presented in Study 1 and the second set of concepts presented in Study 2.

Procedure

Participants were first provided with information about the study and did not proceed unless they had given informed consent to participate in this research. Participants first completed a survey and provided demographic information about themselves, such as gender, age, ethnicity, native language(s) and other language(s) spoken, birth country, country of residence, and length of time residing in Singapore. The main part of the study is the word association task, which closely follows the procedure used by De Deyne, Navarro, Perfors, Brysbaert, and Storms (2019) in the Small World of Words project. Each cue (word or short phrase) is presented one at the time, and participants were instructed to provide up to 3 associations to that cue by typing into the text boxes. If the participants did not know the word or phrase, they clicked on a button labelled "I don't know this word" and proceeded to the next cue. In this paper, we analyzed these responses (and not the associations) in order to quantify lexical knowledge of Singlish concepts among our participants. It is worth highlighting that the way in which we collected prevalence norms differed from Brysbaert et al. (2019)'s approach–they collected prevalence in the context of a lexical decision task (i.e., recognizing whether a letter string was a word or non-word) whereas here we collected this information in the context of a word association task.

Results

The data was analyzed with two main goals in mind. The first set of analyses focuses on investigating whether there are any population-level differences (i.e., across gender, age, and ethnicity) in the prevalence norms of Singlish concepts. The second set of analyses is exploratory in nature, focusing on the changes in prevalence of Singlish concepts across the lifespan. The results are presented in two separate sections below.

Assessing Lexical Knowledge in the Population

Table 2 shows a descriptive summary of prevalence rates for 240 Singlish concepts computed for various demographic groups. Prevalence was computed for each concept as the proportion of participants who were presented with the concept and were able to provide associations for it (i.e., they did not indicate that they did not know the concept). This same approach was used to compute prevalence for different genders, age groups, and ethnicity groups by first filtering the data by the respective demographic categories. As seen in Table 2, although prevalence rates are fairly high across the board, there appears to be some variability among prevalence rates across different segments of the population and among individual concepts.

Table 2: Descriptive summary of prevalence scores for 240 Singlish concepts

Statistic	N	Mean	St. Dev.	Min	Max
All	240	0.86	0.12	0.30	1.00
Male	240	0.87	0.11	0.34	1.00
Female	240	0.85	0.13	0.27	1.00
21-30 yo	240	0.85	0.14	0.43	1.00
31-40 yo	240	0.85	0.12	0.23	1.00
41-50 yo	240	0.87	0.12	0.22	1.00
51-60 yo	240	0.87	0.14	0.20	1.00
>60 yo	240	0.85	0.15	0.29	1.00
Chinese	240	0.87	0.11	0.29	1.00
Malay	240	0.80	0.21	0.24	1.00
Indian	240	0.77	0.19	0.26	1.00
Other	240	0.81	0.21	0.25	1.00

To further explore these patterns, trial level data were analyzed using a generalized linear mixed-effects model (GLMM). The dependent variable was binary, whether the word was known or unknown, and the fixed effects were Gender, Age, and Race (Ethnicity). Random intercept effects of participants and items (cues) were included in the model, as well as random slopes of Gender and Age by items. Note that the random slope of Race by items could not be included as the model failed to converge, likely due to limited number of items for minority groups. Finally, the correlations between random intercepts and by-item random slopes for Gender and Age was removed in order to enable a simpler random effects structure for model convergence (Brown, 2021). Gender and Race were sum contrast coded with "Female" coded as -1 and "Male" coded as +1 and "Chinese" denoted as the reference level for Race, and Age was scaled and centered. All analyses were conducted in the R programming environment. The base model syntax was `know ~ 1 + Gender + Age + Race + (1|Participant) + (0 + Gender + Age|Item) + (1|Item), family = "binomial"`.

Potential interaction effects between demographic variables were also explored by including the interaction term into the base model described above, but ultimately none of the interaction models were able to converge within a reasonable amount of time despite various optimizations. Table 3 shows the GLMM summary table for the base model.

At the level of the population, the results indicate that male participants had a higher probability of knowing the Singlish concept than female participants, and Chinese participants had a higher probability of knowing the Singlish concept relative to participants of Malay and Indian ethnicities. Older participants also had a higher probability of knowing the Singlish

Table 3: GLM Results for Base Model

	Probability of knowing
Age (scaled)	0.106* (0.050)
Gender (Female vs. Male)	−0.090* (0.040)
Race (Indian vs. Chinese)	−0.469** (0.145)
Race (Malay vs. Chinese)	−0.230* (0.112)
Race (Other vs. Chinese)	−0.094 (0.212)
Constant	2.517*** (0.124)
Observations	269,280
Log Likelihood	−73,262.580
Akaike Inf. Crit.	146,553.200
Bayesian Inf. Crit.	146,700.200
Note:	*p<0.05; **p<0.01; ***p<0.001

concept than younger participants.

Prevalence of Cues Across the Lifespan

In this section we were interested in investigating "individual differences" in the effect of Age for the 240 Singlish concepts. Principal Components Analysis (PCA) was conducted on the item-level prevalence norms computed for 5 different age groups. We emphasize the exploratory nature of these analyses as the goal was to discover potentially interesting patterns in the data in a bottom up fashion in order to guide future research on this topic.

PCA is an unsupervised method that discovers principal components (linear combinations of the original predictors) that explain a large proportion of the variation in a data set. We performed PCA on the item-level prevalence norms computed for each of the 240 Singlish concepts across 5 different age groups. Participants were grouped into 5 different groups based on their age: Group 1 (21-30 years), Group 2 (31-40 years), Group 3 (41-50 years), Group 4 (51-60 years) and Group 5 (61 years and above). The first PC explained 82.5% of the total variance, and the second PC explained 13.4% of the total variance. The remaining PCs each explained less than 3% of the total variance.

To visualize the results, we focus on PC1 and PC2 and grouped words based on their PC scores (i.e., into 5 equal percentiles) and then plotted the average prevalence for each group (see Figure 1 for PC1 results and Figure 2 for PC2 results). As suggested by the visualizations, PC1 appears to be capturing "general prevalence"–words that are generally known by all age groups, or not as well known across the age groups, whereas PC2 appears to be capturing trends in the increase/decrease of prevalence across the lifespan. Table 4 shows examples of Singlish concepts that scored the highest and lowest on PC1 and PC2 along with a description of the class of concepts that the PCs seem to be capturing.

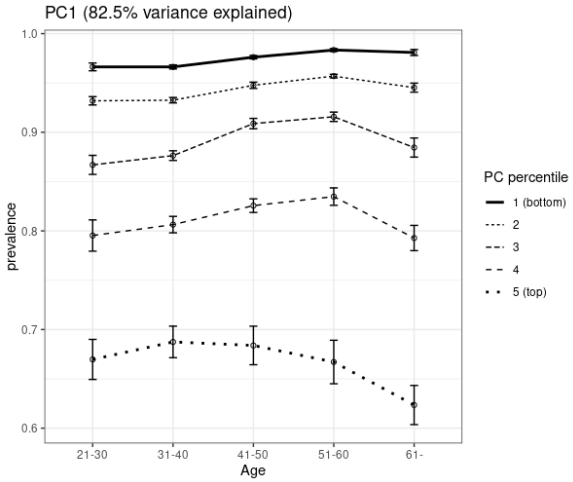

Figure 1: Prevalence across age groups with PC1 scores separated into 5 equal percentiles.

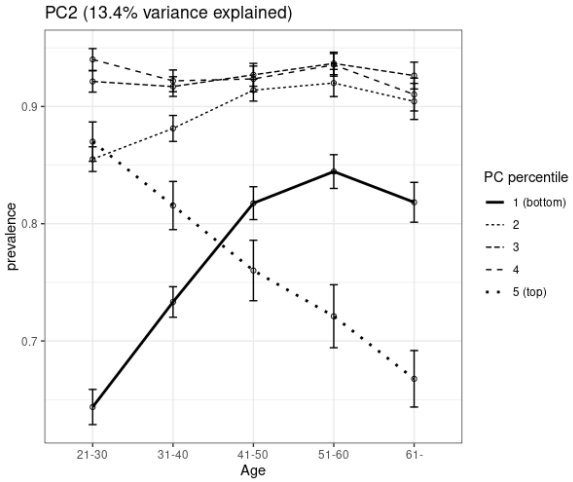

Figure 2: Prevalence across age groups with PC2 scores separated into 5 equal percentiles.

Table 4: Examples of Singlish concepts with various prevalence patterns. Definitions are provided at https://osf.io/yab78/.

examples	description
makan, angmoh, kaypoh	Bottom 20th PC1: core concepts
owadio, pon, humji, lumpang	Top 20th PC1: unknown concepts
buaya, gabra, koyah	Bottom 20th PC2: better known by the old
rabak, lepak, cmi, eeyer	Top 20th PC2: better known by the young

General Discussion

Prevalence norms for 240 concepts unique to Singapore English were collected from a large, representative sample of Singapore English speakers. Prevalence norms provide a measure of the population's level of lexical knowledge of that concept–concepts with high prevalence scores are known by a larger proportion of people. Analyses of prevalence norms revealed two main findings.

First, knowledge of Singlish concepts is not monolithic across different segments of the population. The first set of analyses indicated that participants who were older, male, and of Chinese ethnicity were more likely to know a given Singlish concept. Consistent with other studies, older participants tend to come across more words over the course of their lives (Verhaeghen, 2003) and hence it is not surprising that they have larger vocabularies and greater knowledge of Singlish concepts. On the other hand, the observation that participants of Chinese ethnicity are more likely to know many Singlish concepts may be attributed to an overrepresentation of concepts which are lexical borrowings from Chinese dialects in our current study (e.g., words such as *humji* and *chim*). Another point to note is that several Singlish concepts emerge within the context of mandatory military conscription for Singaporean males, leading to males having a somewhat larger vocabulary of Singlish concepts. For instance, the phrase *chiong sua* (which literally means to charge up a hill in Hokkien) is typically used in the context of military service or exercises–*chiong sua* has a prevalence of 0.77 among males and 0.58 among females. It would be important to continue developing prevalence norms for a larger set of concepts in order to see if these results hold up.

Second, the PCA results revealed interesting prevalence patterns across younger and older participants. There appears to be a group of concepts for which prevalence rates are generally similar across the 5 age groups. Concepts that have high prevalence scores among all age groups are concepts that will likely continue to survive into the future, whereas concepts that have relatively low prevalence scores among all age groups are at risk of being lost from the Singapore English lexicon. On other hand, the PCA results also led to a PC which captured a group of concepts whose prevalence scores are increasing or decreasing as age of the participants increased. These reflect concepts with diverging levels of prevalence between younger and older participants, possibly highlighting generational differences in the way that Singlish concepts are understood and used.

Given that there are no large-scale, diachronic corpora for Singapore English (to the best of the author's knowledge), changes in prevalence across generations of Singapore English speakers can be very valuable for language scientists interested in studying language change in this particular variety of English. It leads us to ask new questions such as what properties of words are predictive of increasing or declining trends in prevalence? To what extent are these patterns driven by lexical form properties of the concepts, their etymology, or their semantic-affective characteristics (Li et al., 2024)? In addition, there are some intriguing sociolinguistic implications of this research. Knowledge of Singlish concepts is a key marker of identity for Singaporeans, and the inclusion of Singlish words in communicative acts is a common strategy of people in positions of authority and power to signal trustworthiness and connection to the general population (Khoo, 2023). The fact that lexical knowledge of some Singlish concepts appear to be fragmented across gender, age, and ethnic groups highlights interesting challenges in the effective application of Singlish concepts to achieve the speaker's communicative goals.

As mentioned in the Introduction, the lack of large-scale corpora makes it quite challenging to study language change in less studied languages. One approach is to construct unique corpora from specific sources in service of addressing a specific research question. Lee (2020) used this exact approach to successfully track changes in relative clause constructions in Singapore English from a specialty corpora consisting of local newspaper articles from a couple of time points. The strategy we pursued here is quite different: We relied on people who are users of the language to tell us if they did not know the concept. Because this task is simple and quick to administer we believe that researchers can leverage on social media and crowdsourcing methods to infer lexical knowledge in the population, as done by Brysbaert et al. (2019). However, such an approach may not be as useful for languages with very few numbers of native speakers, and does not tell us if the perceived *meanings* of concepts actually differ across younger and older speakers.

As with all research, our study has limitations that should be kept in mind when interpreting the present set of results. First, only data for 240 Singlish concepts are available. Nevertheless, the present results are encouraging, and is motivating our lab to continue data collection and development of lexical-semantic norms for Singapore English. Eventually, we hope to be able to assess the ability of prevalence norms to account for lexical processing performance among Singaporeans in psycholinguistic experiments (Keuleers, Stevens, Mandera, & Brysbaert, 2015). Second, we have limited data from participants from minority races and from the ends of the age distribution. Targeted participant recruitment strategies are required to ensure that these groups are sufficiently represented.

In conclusion, this paper provides a proof of concept that collecting prevalence norms could be a viable way of gaining information about which words and concepts are thriving and which words and concepts might be on their way out, and complements existing efforts to study the unique characteristics of Singapore English.

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