

Investigating the Link Between Song Lyrics and Reading Habits

By

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CHAPTER 1

Introduction

Language experience can be gained from many sources, some of which we know little about. While we gain language experience from reading and conversing, language is ubiquitous, and we encounter it in less obvious contexts, like when we listen to a song that contains lyrics. Language experience can be measured in many ways, and this thesis defines it as the amount of exposure a person has had to words that appear with less frequency in the lexicon. Exposure to lower frequency words can help build vocabulary, and can bolster children's language competencies that are associated with literacy development (Dickinson et al. 2011). People with more language experience tend to process texts more easily due to their increased ability to resolve ambiguity when it arises (James et al. 2018). Whether it be reading or listening to song lyrics, it is possible that people habituate to activities that help them gain language experience, and that those who spend more time reading also prefer music with lyrics that contain lower frequency words. This thesis investigates the relationship between lexical frequency of words found in the song lyrics people listen to, and their listening, reading, and social media habits.

To understand the relationship between lyrics and reading habits we ran a study on reading habits in which we included a questionnaire about music listening habits. In each part of the study we asked people to identify the number of hours in a week they spent doing an activity, and included an additional item for use of social media. We also asked participants to list their three favorite music artists, and using all of this information were able to create a profile for each participant based on what amount of language experience they might be gaining by listening. To

measure language experience we downloaded lyrics from each artist's entire published body of work and attained an average word frequency score per artist. Frequency scores were measured using the Tool for the Automatic Analysis of Lexical Sophistication (TAALES) (Crossley & Berger, 2018) and refer to the number of times a word appears in the Corpus of Contemporary American English (COCA) (Davies 2010). Finally, we investigated the link between language experience and participant's listening and reading habits by running correlation measures between lyric word frequency scores and self-reported hours per week they spent engaged in their habitual activities.

1.1 Language Experience

To understand what contribution song lyrics make to language experience, we must first establish ways to measure their linguistic qualities. With natural language processing tools, there are numerous ways to quantifiably observe language, and this thesis will use word frequency scores to represent language experience gained in terms of the amount of low frequency words a person is exposed to while listening to their favorite artists.

Ambiguity in language can arise on multiple levels, and a person's ability to resolve it can directly affect their word processing speed, and their overall ability to comprehend language (Trueswell et al., 1994). Syntactic ambiguity can occur when a reader encounters a sentence with multiple syntactic meanings. Lexical ambiguity occurs when a reader encounters a word that has multiple meanings across different contexts. In each of these cases, a reader must expend cognitive resources to make decisions on probabilistic meanings, based on past exposure they have had to language.

A person's ability to resolve ambiguity can depend on the amount of exposure they have had to different syntactic structures (MacDonald & Christiansen 2002). Frequency effects

suggest that the ability to recognize a word's meaning not only depends on the number of times someone has encountered a word, but also on the diversity of contexts in which they have seen the word used (Brysbaert et al., 2018).

Constraint based theories of word processing suggest that when we read, multiple sources of information guide processing in parallel (see a review by Watson & Lee, 2012). This can include information on semantics, referential contexts, and frequency, all of which contribute to determining meaning. Frequency effects can determine how likely a reader is to have real world knowledge with which to reference a word's semantic meaning, such that the lower the frequency with which a word is used, the harder it may be for a reader to recognize it in any given context. In order to be familiar with different contextual uses for words, a reader must have repeated exposure to that word, and have real world knowledge about the topics it is being used to discuss. Take for example the sentence "The show was watched by the family for one season." To understand the sentence's intended meaning a reader must understand that the word "season" in this case is referring to a collection of episodes of a television show. While reading, multiple definitions of the word "season," may be activated and using contextual clues from "show," and "watched," the reader must determine that the text does not refer to a collection of months that divide a year, or to the act of adding spices to food. This process of disambiguation expends cognitive resources, and becomes especially difficult with words that are encountered less frequently. The more exposure a person has had to a word, the better they will be at processing it while reading (Watson & Lee 2012).

We are exposed to high frequency words every day, but in order to gain experience with words that are used less frequently, we often have to seek it out. Considering the utility of prior exposure in language processing, seeking experience with low frequency words would be a

beneficial undertaking for anyone, but comes down to each individual's capacity to do so. Gaining exposure to lower frequency words may require a person to dedicate their spare time to reading a variety of literature and academic texts, or to listening to music with lyrics that use them. The process of seeking that a person performs when they want to gain more language experience is different for everybody, but may just be a matter of exploring new artists to listen to.

1.2 Gaining Language Experience Through Lyrics

Lyrics, being a form of poetry, possess features that prosaic language does not, such as rhythm, rhyme and repetition. These features can serve as a way to organize language and promote retention. Presenting words alongside phonological neighbors can increase processing speed (Yates 2005).

In poetry, far more than in prose, literary devices like rhyming, or assonance are used to relate a word's semantic meaning to multiple parts of a text. Establishing a connection between two or more words that are phonologically related can allow readers to use them as cues to retrieve relevant context information (Lea et al., 2008). Take for example the basic nursery rhyme, "Row, row, row your boat, gently down the stream." Just one line put in this charming cadence can help children learn that "to row" is a verb that is contextually related to boats and streams. The repetition of the word "row," and the alliteration used in contrast between the two phrases "row your boat," and "gently down the stream," paint a picture that conveys rowing as an action typically done multiple times in succession, and boats as being active, while streams are passive, and acted upon.

Music may be particularly suited to influence the way people form habits based on its potential to improve affect. People often listen to music while engaging in everyday activities,

like studying, or driving that might otherwise be monotonous (Stratton & Zalanowski 2003). Affect has been shown to play a part in second language acquisition, such that those with high motivation, high self-confidence, and low anxiety retain more of the language they are exposed to (Krashen 1982). Music as a medium can also help students learn in an educational setting, by helping teachers connect more easily with their students and promote a positive, inclusive learning environment (Krashen 1982). Taken together these findings suggest that music's ability to improve mood and make connections has the potential to improve retention of language experience gained while listening.

Lyrics and melody are two distinct aspects of music that are encoded in the brain in parallel. While listening to music we gather language information and melodic information at the same time, and create associations between the two. Creating associative networks using language has the potential to strengthen retention of language experience (Forster 1990). Listening to music can contribute to the activation of more diverse types of information, from melody, like rhythm and pitch, and from uses of language, like rhyme, and alliteration that are found frequently in lyrics (Huber 2010).

The networks of association between lyrics and melody have been found to be so strong that backward priming effects have been observed. In one study listeners were able to recall lyrics that came at the beginning of a song by being played the melody that came after them (Peretz et al., 2004).

1.3 Music Listening Habits

When considering where people acquire language experience, it is worthwhile to note that it may come from multiple sources, and that music may be one of the major contributors.

Throughout our lives we develop different habits, and whether it be reading, listening to music, or perusing social media sites, the way we spend our free time can have an impact on our overall language experience. Listening to music tends to be a more social activity than reading, and as people develop social habits as adolescents they often incorporate music into more of their daily activities. In some cases adolescents reported that listening to music had overtaken reading as a preferred way to spend free time (Nippold et al., 2005), and college students reported listening to music several times a day, at a minimum of two hours (Stratton 2003). A review in the literature of reading habit trends observed that as students reached higher grade levels in school, they spent less time reading for pleasure, and by the time they reached college they preferred to spend time online, on social media sites (Khongtim 2021).

Music can be a way to escape everyday problems, in the same way that reading for pleasure can, and in times of crisis it is one of the first coping mechanisms people turn to (Ferreri et al., 2021). For adolescents, who are going through a stage in life wrought with uncertainty and angst, music may be a more accessible leisure activity than reading. In some cases, adolescents have expressed a decreased interest in reading for pleasure, for a number of reasons including a limited amount of access to books, a disinterest in subject material they consider irrelevant to their lives, and a negative association and lack of autonomy in choosing assigned readings in school settings (Webber et al., 2023).

If it is true that people who spend more time reading gain more language experience than those who do not, then we would expect those people to be better word processors, while reading, but also in other contexts. If a person decides to increase the number of hours per week they spend reading for pleasure, they may adjust their other habits as a result. If as a result of reading more a person becomes a better word processor, they might find that they process song

lyrics with more ease, and we would expect those people to seek music from artists that use more low frequency words in their lyrics, and to consider lyrics to be more important. If a person does not read habitually, we would expect them to listen to music from artists that use more high frequency words in their lyrics, and to be neutral, or not consider lyrics to be important.

It is possible that there is no relationship between reading and music listening habits, or that the relationship between the two is acted upon by other unknown variables. Music can come from a number of sources in our everyday lives, including social media sites. Time spent on social media was used here as an additional measure of habitual behavior for comparison.

CHAPTER 2

Data

2.1 Method

2.1.1 Participants

Data included was taken from 58 participants, aged 10-15, that were recruited to participate in a study about reading habits of bilingual adolescents. Out of 58 participants: 30 listed three artists whose lyrics were accessible, 13 listed only two artists with usable lyrics, 9 listed only one artist with usable lyrics, and 6 participants did not complete the section, or provided artists whose lyrics could not be analyzed.

One participant indicated that they listened to music for 100 hours per week. Another participant indicated that they listened to music for zero hours per week, and that they read for zero hours per week. These were considered outliers and removed before attaining averages.

2.1.2 Materials

Initially a database was compiled of lyrics from 757 artists. A web scraping tool was developed on /r to download lyrics from AZLyrics.com. Lyrics were downloaded from each artists' discography, meaning from every song they had published throughout their career. Lyrics were downloaded from popular contemporary artists, and Table 1 shows the breakdown by genre, which consisted of 176 Rock artists, 150 Country artists, 133 R&B artists, 145 Pop artists, and 153 Rap artists.

Genre	Artists	Average Word Count
Rock	176	32,662
Country	150	36,371
R&B	133	36,649
Pop	145	42,607
Rap	153	90,192
Total	757	

Table 2.1: Number of artists and average word count per genre

For this project the natural language processing tool TAALES (Crossley & Berger, 2018) was used to measure lexical complexity of song lyrics. In an exploratory analysis 246 measures were taken of each of the lyric files. Two measurements were chosen to look at further in detail: Corpus of Contemporary American English (COCA) (Davies 2010) Frequency of Spoken Content Words, and (Kuperman 2012) Age of Acquisition of Content Words. COCA was chosen because it was designed to be a living corpus of American English, continually updated, and in step with contemporary music lyrics. Kuperman’s measure of age of acquisition of words provided a measurement based on a study using 30,121 English content words, and participant’s age, in years, at which they learned the word.

Measures of content words were used in order to omit function words. Word frequency and age of acquisition were chosen because they often mirror one another’s effects, and were likely to produce a reliable effect. In general, the less frequently a word is used, the older people tend to be when they acquire it.

With frequency measures, the genres landed in fairly distinct areas on the spectrum, depicted as a scatterplot in Figure 1. The genres with lower frequency scores of their lyrics were Rap and Country, and the genres with higher frequency scores of their lyrics were Pop and R&B.

When using age of acquisition to measure lyrics, Rap scored on the high end, meaning people tended to acquire the words in rap lyrics at an older age, and that conversely R&B scored on the lower end. The other three genres showed a more uniform distribution around the mean.

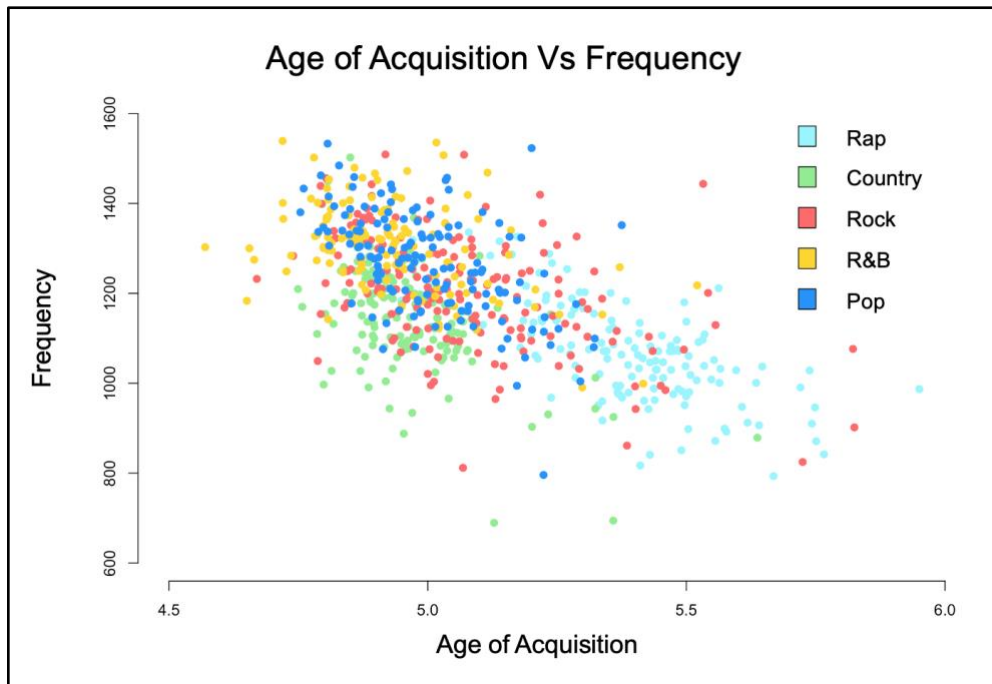


Figure 2.1: COCA Frequency of Spoken Content Words plotted against Kuperman Age of Acquisition of Content Words

To survey participants in our study, a five item questionnaire shown in Figure 2 asking participants about their music listening habits was developed. The first question asked participants to list their three favorite artists. Using this information, along with the preliminary analysis we were able to identify lyric word frequency scores of participant's artist preference. Questions 2-4 were designed to reflect the format of other questionnaires being used in the study. Participants were asked how many hours a week they spent listening to music, and whether they listened to artists whose lyrics were in more than one language. In an effort to keep this portion

of the study succinct, just one more question was included to determine participant's attitudes towards lyrics, and whether they considered them to be important.

Music Habits Questionnaire					
Music Listening Habits The following section will ask you about your music preferences.					
Please begin by indicating the names of your 3 favorite music artists.					
Musical Artist 1	_____				
Musical Artist 2	_____				
Musical Artist 3	_____				
How many hours a week do you listen to music?	_____				
Do you listen to music in more than one language?	<input type="radio"/> Yes <input type="radio"/> No				
What language besides English do you listen to music in?	_____				
	Never Important	Not Usually Important	Sometimes Important	Usually Important	Always Important
In general how important are a song's lyrics?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 2.2: Music habits questionnaire

2.1.3 Design

The questionnaire was designed to gather the minimum amount of information needed to create a basic profile for each participant's artist and genre preference. Few instructions were given as to what kind of artists should be included, and as a result some had to be omitted from analysis. Criteria for omission was based only on that which made their lyrics impossible to analyze using TAALES (Crossley & Berger, 2018). In some cases artists were omitted for two or more of the following reasons: 5 artists that were listed made music with non-English lyrics, 20

artists listed were either producers or composers who made music without lyrics, and 14 artists listed had no published lyrics online.

2.2 Results

2.2.1 Participants' Habits

Removing outliers, on average participants indicated that they read 17.26 hours per week, listened to music 15.22 hours per week, and spent 14.55 hours per week on social media, shown on Table 2. The hypothesis that adolescents spend less time reading than they spend listening to music can be rejected. Seven participants indicated that they spent zero hours per week on social media. These averages suggest that adolescents are still reading as a leisure activity, but that they are spending a comparable amount of time listening to music or on social media sites. The largest and only significant correlation was found between the number of hours a week participants spent listening to music and the number of hours a week they spent on social media.

	Hrs/Week Music	Hrs/Week Read	Hrs/Week Social Media	How Important are Lyrics (1-5)
Total Mean	15.21698113	17.25925926	14.54680851	3.4

Table 2.2: Total mean for each measure of participants' habits

On average, participants indicated that lyrics were “sometimes important” to them, which represents the middle of the Likert scale. Most answers were in the 3-4 range of the scale, with two participants indicating that lyrics were “always important,” and no participants claiming they were “never important.”

The negative correlation between frequency scores of lyrics and number of hours spent reading, although not significant, suggests that the hypothesis that participants who spend more

time reading also prefer artists with lyrics that use lower frequency words could be supported with a bigger sample size.

2.2.2 Correlations

Correlations were computed for participant responses. Figure 3 is a scatterplot which displays the only variables that exhibited a significant correlation. The number of hours participants spent listening to music per week correlated positively to the number of hours spent on social media, $r(58) = .37, p < .01$. All of the correlations between categories Hours/Week Reading, Hours/Week Listening, Hours/Week on Social Media, the results of the question “How important are lyrics?,” and Word Frequency Scores were run, found on Table 3. None of the frequency measures of lyrics correlated significantly with participant’s habits. The strongest correlation related to frequency scores of lyrics at -0.15 was time spent reading per week $p = 0.29$, but was not significant.

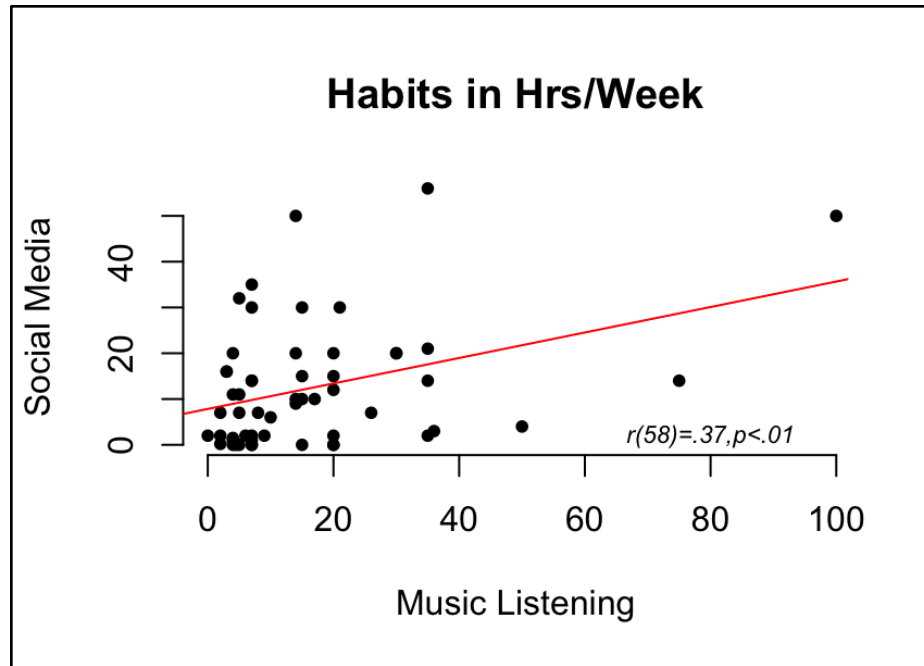


Figure 2.3: Significant correlation between participant self report hours per week spent listening to music vs on social media

		Correlations				
		Mean Frequency	Hrs/Week Music	Hrs/Week Read	How Important are Lyrics (1-5)	Hrs/Week Social Media
Mean Frequency	Pearson Correlation	1	.022	-.146	.099	-.036
	Sig. (2-tailed)		.873	.289	.474	.794
	N	55	55	55	55	55
Hrs/Week Music	Pearson Correlation	.022	1	.040	.037	.372**
	Sig. (2-tailed)	.873		.771	.790	.005
	N	55	55	55	55	55
Hrs/Week Read	Pearson Correlation	-.146	.040	1	.194	-.144
	Sig. (2-tailed)	.289	.771		.156	.294
	N	55	55	55	55	55
How Important are Lyrics (1-5)	Pearson Correlation	.099	.037	.194	1	-.077
	Sig. (2-tailed)	.474	.790	.156		.575
	N	55	55	55	55	55
Hrs/Week Social Media	Pearson Correlation	-.036	.372**	-.144	-.077	1
	Sig. (2-tailed)	.794	.005	.294	.575	
	N	55	55	55	55	55

** . Correlation is significant at the 0.01 level (2-tailed).

Table 2.3: Correlation Values and p Values

CHAPTER 3

General Discussion

3.1 Discussion

The resulting correlations between word frequency in lyrics and habitual behaviors suggest that time spent reading and frequency of words used in lyrics by participant's favorite artists were either unrelated or had no effect on one another. Further, there was no correlation between word frequency of lyrics by participants' favorite artists and opinion of whether they considered lyrics to be important. It is possible that people who spend more time reading do not have a preference for artists based on word frequency in their lyrics, and listen to a variety of artists who use words of varying levels of frequency.

Our hypothesis was based on constraint based theories of word processing, and was that participants who read more would have a higher amount of exposure to low frequency words, and as a result, a greater ability to resolve ambiguity in language. We proposed that participants who read more would be better word processors, and would exhibit more language experience seeking by listening to artists that used low frequency words in their lyrics. With only some preliminary self report data we did not have enough evidence to support our hypothesis. It is possible that participants who spent a lot of time reading only read material with high frequency words. It is also possible that auditory intake of low frequency words does not have an immediate impact on a person's ability to resolve ambiguity while visually processing text. This project was part of a larger study examining reading habits and will gather experimental data from participants completing word processing tasks, the results of which could be a more

nuanced representation of language experience, and could potentially be helpful in expanding the scope of this project.

Other habits that were not included in this study could be related to participant's language experience seeking. Language experience can be gained from a number of sources, so reading for pleasure and word frequency in lyrics may not be entirely representative of a person's language experience seeking behavior. It is possible that there is no relationship between reading and music listening habits, or that the relationship between the two is acted upon by other variables.

Results suggest that the notion that adolescents are spending less time reading than they spend listening to music is not true. Our participants were middle and high school aged adolescents, and ranged in age from 10-15 years old. It appears adolescents are reading as a leisure activity, but are spending a comparable amount of time listening to music and on social media sites. None of the correlations between word frequency in lyrics and habitual activities were significant, so there is nothing to suggest that reading habits relate to artist preference, or a preference for lyrics with lower or higher frequency words.

The largest and only significant correlation was found between the number of hours a week participants spent listening to music and the number of hours a week they spent on social media. This may be due to the popularity of social media sites like TikTok and Instagram that allow users to create content using free access to a wide array of popular music.

3.1.1 Artist Preference

In terms of genre, the number of unique artists listed were as follows: 12 rap artists, 17 rock artists, 4 R&B artists, 27 Pop artists, and 16 Country artists. The artist that appeared most on participant's lists of favorite artists was Taylor Swift, who appeared 19 times. The artist who appeared second most on participant's lists of favorite artists was Imagine Dragons, who

appeared 7 times. Several artists appeared 4 times throughout participant's lists including AJR, Olivia Rodrigo, Drake, and The Weeknd.

3.1.2 Limitations

Some limitations of this project can be attributed to the current lack of research on large databases of popular music. There is no standardized way of classifying artists as belonging to a specific genre for scientific research. Most successful artists contribute to several genres throughout the span of their career, and the distinction as to which an artist prioritizes is subjective. Depending on where you search online, the same artist may be classified as "Country, Pop/Country, Americana, Folk, Folk/Rock, etc."

Another limitation was the large size of each of the lyric files that were downloaded. With a total of 757 lyric files, each spanning the length of, on average, 200-300 pages, cleaning the text that was downloaded proved time-prohibitive for the scope of the current project. The text that could have been removed from the files made up a small portion of the total words, including: song titles, lyrics from featured artists, non-English lyrics, and non-verbal sound annotations.

3.1.3 Future Directions

This thesis investigated some preliminary questions about people's music listening habits, and did not find any significant correlations to support the idea that those who read more seek lyrics with lower frequency words. That notwithstanding, there is more work to be done. Originally we intended to compare measures of word frequency from lyrics of participants' favorite artists with experimental data from their performing word processing tasks, which if

done in the future could provide further insight into whether lyrics contribute to language experience.

Considering that a significant correlation was found between hours per week spent listening to music and hours per week spent on social media, work could be done to investigate how much of adolescents' music exposure is coming from social media. Some social media sites use text to display lyrics, while others do not. It would be worthwhile to study the potential differences in language experience gained by participants who both use social media and listen to music versus ones who only listen to music.

3.2 Conclusion

With smartphones and music streaming apps we have more access to music than we ever have. With internet access constantly growing, music is no longer a regional commodity, and for the first time we are seeing non-English speaking artists like Bad Bunny and BTS top the US and European charts. Song lyrics undoubtedly contribute to our language experience, and this thesis has demonstrated one method for explaining it quantifiably. Hopefully through the efforts of more psycholinguists and the use of other NLP tools, we will find a way to take greater advantage of the opportunity that music provides us.

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