

# A Corpus-Based Study of the Use of HEART and HEAD in English

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**Sang-suk Oh. 2014. A Corpus-Based Study of the Use of HEART and HEAD in English.** *Language and Information* 18.2, 81–102. The purpose of this paper is to provide corpus-based quantitative analyses of HEART and HEAD in order to examine their actual usage status and to consider some cognitive linguistic aspects associated with their use. The two corpora COCA and COHA are used for analysis in this study. The analysis of COCA corpus reveals that the total frequency of HEAD is much higher than that of HEART, and that the figurative use of HEART (60%) is two times higher than its literal use (32%); by contrast, the figurative use of HEAD (41%) is a bit higher than its literal use (38%). Among all four genres, both lexemes occur most frequently in fictions and then in magazines. Over the past two centuries, the use of HEART has been steadily decreasing; by contrast, that the use of HEAD has been steadily increasing. It is assumed that the decreasing use of HEART has partially to do with the decrease in its figurative use and that the increasing use of HEAD is attributable to its diverse meanings, the increase of its lexical use, and the partial increase in its figurative use. The analysis of the collocation of verbs and adjectives preceding HEART and HEAD, as well the modifying and predicating forms of HEART and HEAD also provides some relevant information of the usage of the two lexemes. This paper showcases that the quantitative information helps understanding not only of the actual usage of the two lexemes but also of the cognitive forces working behind it. (Harvard University)

**Key words:** Heart, Head, Metaphor, Figurative Language, Cerebrocentricism, Corpus linguistics

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## 1. Introduction

The heart and head are important organs or parts of the body that can be used to express, in addition to their original physical senses, major abstract concepts about the mind and emotion, reflecting the rich cultural constructs of English-users. Though looking into the diverse semantic manifestations of these two lexemes can help us access the underlying cognitive forces working behind their various figurative and conventionalized uses, adding the quantitative analysis of their actual uses can bring extra light to our understanding of the use and working of English.

The purpose of this paper is to investigate the use of HEART and HEAD based on the quantitative analysis and to see if we can gain any bridging insights between the knowledge of and the actual use of linguistic forms. Specifically, we are concerned with finding how some understanding of the two lexemes in cognitive linguistics including their figurative uses is reflected in their actual uses by the English users. To achieve these goals, corpus tools are used to reveal the various aspects of the actual usage of the two lexemes, including their token frequencies for modern-day use, the historical changes in their usage over times, the token frequencies among different genres, collocation usage, and the uses of their modifying or predicating forms. As for corpus data, we use the Corpus of Contemporary American English (COCA) with 450 million words and the Corpus of Historical American English (COHA) with 400 million words. While engaging in the data-driven analyses is the main endeavor in this study, occasional cognitive linguistic perspectives will be intertwined in an effort to integrate quantitative and qualitative aspects of the two lexemes so that we can have a better picture of their usage in various genres and different time settings.

In this paper, we will briefly review the discussion of HEART and HEAD in cognitive linguistics and then look at the sample usage of the two lexemes in three areas - literal, figurative, and idiomatic uses - to sketch their overall usage. After that, we will do a corpus-based analysis of these two lexemes to see the usage realities from the quantitative perspective. Finally, the discussion of the findings of this study and the conclusion are in order.

## 2. Brief Review of Previous Research and the Goals of This Study

HEART and HEAD have received considerable attention by cognitive researchers particularly in the discussion of the conceptualization of the body parts and internal organs in various languages (Berendt & Tanita, 2011; Foolen, 2008; Gaby, 2008; Geeraerts, 2008; Goddard, 2008; Ibarretxe-Antuñano, 2008; Ikegami, 2008; Niemeier, 1997, 2000, 2008, 2009, 2011; Radić-Bojanić & Silaški 2011; Yu, 2008). So many interesting insights were gained from these studies, but the most intriguing one comes from Niemeire (1997, 2008, 2009), where she theorized HEART and HEAD distinction based on the well-known Western dichotomy according to which HEAD is the seat of intellect and rational mind, while HEART is the seat of emotions.<sup>1</sup> Niemeire (2008) proposes that European languages such as English

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<sup>1</sup> This dualism, according to Niemeire (2011: 50), "contradicts scientific knowledge which argues that not only cognition, but also emotions are generated in the mind." However, the head/heart

are languages from *cerebrocentric* culture where the mind is perceived to be located in the head.<sup>2</sup> As a *cerebrocentric* language, English is full of HEAD and HEART expressions, which are often conceptualized into various cognitive and emotive concepts. Though these kinds of qualitative studies have been done, the quantitative approach is rare on these lexemes, and this study intends to fill this gap. For that, this study not only focuses on these kinds of figurative uses of the two words, but also examines other types of uses, including literal and idiomatic usage, in order to have a better picture of their actual usage. We look at the samples of these various uses of the two words in the next section.

We conduct our corpus-based analysis in the spirit of major corpus researchers (Biber & Reppen, 1998; Partington, 1998; Sinclair, 1991) and those who took lexical approaches (Hill, 2000; Lewis, 1997, 2000), and we also borrow some insights from the major cognitive linguistic researchers such as Lakoff and Johnson (1990) and Kövecses (2000, 2005), particularly the embodied nature of linguistics concepts.

Integrating various insights mentioned here, this study is concerned with looking into the following areas in relation to HEART and HEAD: 1) their token frequencies found in COCA and their usage status in different genres and in three different uses in terms of literal, figurative and idiomatic; 2) the historical change in their use over the past two centuries; 3) their verb and adjective collocations; 4) the uses of their modifying and predicating forms; 5) the use of their temperature expressions for personality and 6) the relevance of the quantitative information of the use of HEART and HEAD to its cognitive linguistic aspects.

### 3. The Usage of HEART and HEAD

HEART and HEAD can be used for their literal meanings or figurative meanings, such as metonymic or metaphorical meanings. In addition, the two words can appear in idioms and occasionally, HEAD can be used as a verb. In this section, we will sketch these uses through examples extracted from COCA corpus. Examines five samples of 100 random concordances of HEART and HEAD from COCA corpus, which are extracted from all four different genres - fiction, newspapers, magazines, and spoken - over the past twenty-or-so-year period evenly, reveal the average of 31.6% of literal use, that of 59.2% of figurative use, and that of 9.1% of idiomatic use for HEART whereas use was the average of 40.6%, that of 37.8%, and that of 14.4% for literal, figurative, and idiomatic use respectively for HEAD.<sup>3</sup>

The remaining average of 7.1% was used for the use of HEAD for a verb. This

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dichotomy, with occasional exceptions, still perseveres in European languages and cultures and in Anglophone culture the head "is primarily seen as the locus of rational thought, standing in opposition to emotions." (Niemeier, 2008: 358).

<sup>2</sup> This view is contrasted with other ones such as *abdominocentrism* according to which the mind is located in the belly area; and *cardiocentrism* according to which the mind is located in the heart region. Languages such as Vietnamese, Indonesian, and Basque belong to the *abdominocentric* culture, and Korean, Japanese, and Chinese belong to *cardiocentric* culture.

<sup>3</sup> The COCA corpus tool on-line generates random samples automatically. The first five hundred concordances of each HEART and HEAD were grouped into five separate 100 concordance samples to analyze their meanings and proportions. MANOVA test shows that p values of each four different token (i.e., four different meaning) of HEART are all  $p < 0.001$ , attesting their statistic significance.

suggests that HEART is used more figuratively than HEAD in modern days.

### 3.1 Literal Use

The heart and head are basically either a physical organ or body part, and below is a sample of these primary meanings.

- (1) a. That means that for a few minutes, at least, there's plenty of oxygen to keep **the heart** and brain alive. (COCA 2000, NPR\_ACT)
- b. If I don't, I'm going to end up having a stroke, **heart** attack, something just walking across the street. (COCA 2005, ABC\_GMA)
- c. It seemed to him as though one of the nearest soldiers, with the full swing of a stout stick, hit him on **the head**. (COCA 2007, The Hudson Revue 60(2))
- d. He raised **his head** and roared once again. (COCA 2011, FIC\_Cold Vengeance)

As shown here, the literal meanings of HEART and HEAD are straightforward, referring to the body parts and functions: HEART located inside the chest, regulating the blood flow while HEAD is located on the top of the body, normally covered with hair and housing the brain. As was noted earlier, 32% of extracted tokens of HEART and 41% for HEAD in the sampling of the COCA corpus are literal uses. Interestingly, the literal use of both words 200 years ago provides a different picture. Only 9% of HEART tokens and a considerable 40% of the HEAD tokens elicited from COHA were used for literal meanings, indicating that the literal use of HEART was quite low compared with HEAD two centuries ago. We now move onto the figurative uses of HEART and HEAD in the following section.

### 3.2 Metonymic and Metaphorical Use

The figurative uses of HEART and HEAD are very pervasive in modern English. In this section, we will examine the sample examples of the figurative uses of two words as emotion concepts and as other concepts.

**3.2.1 HEART as Emotion and HEAD as Reason Concepts.** The HEART is conceptualized as various emotions through metonymy and metaphor as in the following.

- (2) a. She could start a new life. The idea excited her so much that **her heart** began **pounding**. (COCA 2003, Princess takes a holiday)
- b. They can soothe a bad day, make you laugh, or **melt your heart** when they say, 'I love you'. (COCA 2009, Deven Post)
- c. Joe's death ate at him. "**It broke my heart** when he was killed", says Roy, his voice breaking. (COCA 2000, The battle for Jo dessert's soul)
- d. Mist had intruded settle in his mind, fogging out the sane thoughts and replacing it with a deep, **hot-hearted** anger. (Web, Nowhere to hide)
- e. Seeing his worst fears confirmed, Lucas's heart **went cold**. (COCA 2002, The living blood)

As can be seen here, HEART is conceptualized as excitement in (2a), happiness in (2b), sadness in (2c), anger in (2d), and fear in (2e). As Nemeire (2008, 2009) notes, HEART is the location of emotionality in English, and it can be used for all sorts of emotions. In this case, it is conceptualized through the devices of metonymy or metaphor. (2a) is the metonymic use, and the rest are the metaphoric use of HEART. The most common conceptualizations include THE HEART IS A MATERIAL and THE HEART IS A CONTAINER. 11% of the total 60% figurative uses of HEART tokens calculated from the first random 100 tokens in COCA turn out to be this kind.

- (3) a. I had to keep **a cool head** if we were going to get this fire out. (COCA 1997, People 48 (1))
- b. Have you ever considered that the reason there are so many foolish, **empty-headed** young women littered throughout society? (COCA 2011, A little bit sinful)
- c. You are a hooligan. You're a wretch. You're a **sleepy head** like Kumbhakarna. You're just an idiot. (COCA 1992, Chicago Review 38(1))
- d. I'm not knocking God. In fact, atheists are some of the most unimaginative, **soft-headed** people I know. (COCA 1995, The Massachusetts Review 46 (1))
- e. I've been accused of being opinionated and **strong-headed**, which allowed me to be as good as I was when I played. (COCA 1997, Chicago Sun-Times)

The HEAD can be used to express various reason-related meanings, such as a calm mind in (3a), foolishness in (3b), dull intellect in (3c), simple thinking in (3d), and an obstinate mind in (3e). Again, all the uses here are metaphorical. The main concept includes THE HEAD IS AN OBJECT and THE HEAD IS A CONTAINER. Out of the total figurative uses of HEAD in the 100 sample tokens of COCA, 8% account for this kind.

**3.2.2 HEART and HEAD as Other Concepts.** The HEART and HEAD not only express emotions, but also represent other abstract meanings such as personality, intention, desire, etc. for the former; intellect, intelligence, judgment, etc. for the latter. A few examples from COCA are as follows:

- (4) a. Not that he had a **heart of stone**, exactly. Axel could never be accused of being cold. (COCA 1999, Good Housekeeping 229(5))
- b. And being a person who was giving, **his heart** was far **bigger** than most that we will meet in life. (COCA 1990, Sammy Davis<sub>ABC</sub> Nightline)
- c. If only you had invested with them at their start. If only you still could, **take heart** and be bold. (COCA 1992, Fortune 125(5))
- d. I can't wait to get there and cheer them on; **my heart** is **swollen** with pride. (COCA 1994, Rolling Stone)

- e. The next morning I was on the creek bottom stand again, but I knew I wouldn't see Picket, and my **heart wasn't in** the hunting.(COCA 2003, Field and Stream CVIII (5)) desire/ willingness.
- f. Antonio wasn't looking for love at the moment when he finally **lost his heart**. (COCA 1996, Cosmopolitan 221(5))
- g. He had been moved by her stupid, naked honesty, though at the time he had sat her at table six and made her read the menu until she **knew** the thing **by heart**. (COCA 2006, Aftermath)

The samples in (4) show an example of THE HEART AS A PERSON in (4a), as GENEROSITY in (4b), as COURAGE in (4c), as PRIDE in (4d), as INTENTION in (4e), as LOVE in (4f), and as INTELLECT in (4g),<sup>4</sup> 49% of the total figurative uses of HEART in the 100 sample tokens of COCA consists of these kinds of uses.

- (5) a. That was a wake-up call: You idiot, you've got to **use your head** a little more. (COCA 2000, Rolling Stone)
- b. He hasn't set foot in a gym since high school. It never **entered his head** to go to a club to work out, (COCA 2003, Men's Health 18(9))
- c. It was cute the first time around: when the President **lost his head** over Monica's thong undies. (COCA 2000, 1/31, TIME)
- d. I can't seem to please anybody. I guess I just don't have **a head for** business. (COCA 1999, Jack and Jill 61(4))

The examples in (5) contain the use of HEAD as the BRAIN in (5a), as a THOUGHT in (5b), as MENTAL CONTROL in (5c), and as APTITUDE in (5d). From the sampling of 100 tokens of HEAD in COCA, 30% out of the total of 38% figurative uses of HEAD tokens accounts for usage of this kind.

**3.2.3 Idiomatic Use.** There is some overlapping between the figurative and idiomatic use of HEART and HEAD. However, some figurative uses are very conventionalized, and much of the figurative meaning is lost. In this case, we classify those expressions as idioms. Some examples are as follows.

- (6) a. The man who **stole her heart** actually just lives 70 miles away.(COCA 2003, ABC\_GMA)
- b. Entreri would fight with **all his heart** against Drizzt just to prove something, but Drizzt honestly felt that he had nothing to prove. (COCA 1992, The Legacy)
- c. The fast track. The faint sound of the front door opening **brought my heart to my throat**. (COCA 2007, Holidays are hell.)
- d. Jim had **crossed his heart** and hoped to die while promising Judy not to beat her new boyfriend to a pulp. (COCA 2001, New England Review 22(2))

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<sup>4</sup> The use of HEART as intellect is a remnant of the old use of HEART for rationality in old English as was noted by Niemeire (2008: 354; 2009: 13).

- (7) a. Are you tired? You can go to bed if you want. He **shook his head**. (COCA, 2012, Running the rift)
- b. Is tomorrow next week? " Johnny **scratched his head**. (COCA 2011, Courting Miss Amsel)
- c. Opportunities knock once. And if you think about missing the previous shot when you are attempting the next one, most likely you'll miss it, too. And on and on, you lose, until, unless you **get your head back into** the game. (COCA 2003, Hoop roots)

The HEART and HEAD expressions in these examples are so habitually used that they are conventionalized as idioms. The actual meanings of each HEART expression in (6) are making him/her a lover in (6a), fitting all his might in (6b), making somebody extremely nervous in (6c), and praying in (6d). The meanings of each HEAD expression in (7) are denying in (7a), being puzzled in (7b), and resuming the work in (7c). It is to be noted that there is a fuzzy line between figurative uses and idiomatic uses with phrases such as "shake one's head", but we viewed this expression as idiomatic since it is very conventionalized so as to be entered as an idiom in a dictionary. The percentage of HEART and HEAD tokens to be used for the idiomatic usage from the sampling of the 100 tokens in COCA shows 8% for the former and 14% for the latter.

In the following section, we will look at the use of HEART and HEAD from the quantitative perspective by showing the analysis of it in the two corpora.

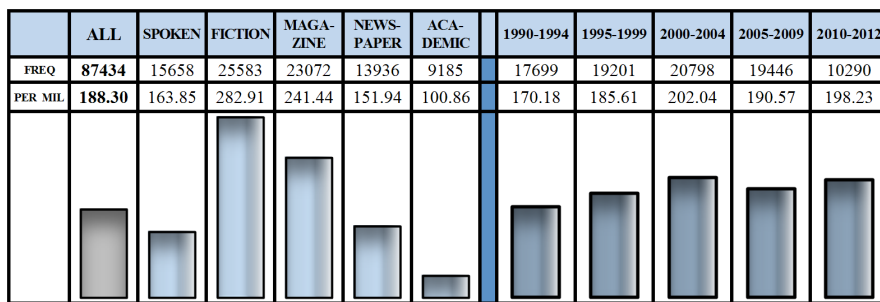
#### 4. Corpus-Based Analysis of HEART and HEAD

As was briefly mentioned in section 1, the corpora we use in this section are the Corpus of Contemporary American English (COCA) and Corpus of Historical American Corpus (COHA) available on the BYU website: <http://corpus.byu.edu/corpora.asp>. COCA consists of 450 million words, and it is a collection of texts from various genres including fiction, newspapers, magazines, and academic writings running from 1990 to 2012. COHA is a corpus of documents and texts covering 200 years from 1810 to 2010. The reason that the two corpora were adopted is that they are most extensive corpora available on-line, and that the COCA has an advantage of showing the contemporary English uses and the COHA can show the historical changes of English since it contains the linguistic corpus running the past two hundred-years.

##### 4.1 The Use of HEART in Recent Years (1990-2012)

We first look at the use of HEART in modern times over the last 20 years.

As shown in Figure 1, the total of 87,434 tokens of HEART was detected in the entire COCA corpus for the recent 20-year period, 1990-2012. Out of these, HEART is most frequently used in the genre of fiction, which is followed by magazine, spoken, newspaper, and academic as shown in the frequency of HEART per million tokens: fiction (282) > magazine (241) > spoken (163) > newspaper (151) > academic (100). Considering that HEART is very productively used for the concept of various emotions as well as other mind states, including attitude



[Figure 1] The Use of HEART Based on Genre and Periods (1900-2012) (COCA)

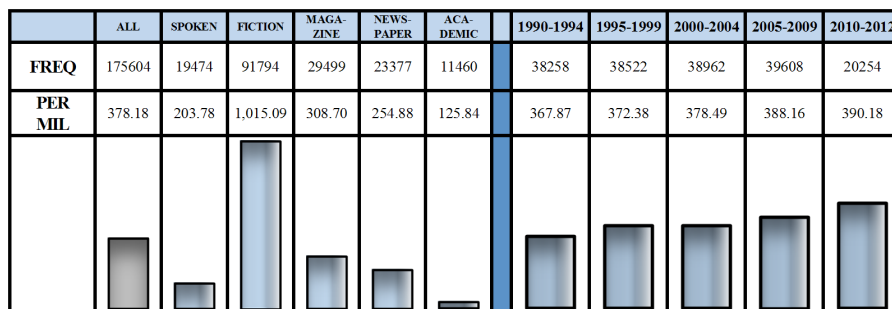
and personality (Niemeire, 2000, 2008), it is not surprising to see that the highest frequency of its use is in fiction since novels tend to be full of these concepts by the nature of their genre and writing styles. This contrasts with the academic genre, which shows the lowest frequency, and this also reflects the fact that the expressions related to emotion tend to be limited in academic writing. This indirectly indicates that the figurative use of HEART is important since its frequency is much higher than its literal use. Indeed, the average of 31.6% of the five separate 100 random token samples of HEART in COCA is used for literal uses, the average of 59.2% for figurative uses, and that of 9.1% for idiomatic uses.

In terms of different periods in the last 20 years, its overall use did not change much (small increase and then decrease), though its overall use over the past 200-year period has been on the constant decrease. (See Figure 3 for this in 4.3.)

As was observed here, the frequency difference among different genres is very obvious, and the overall usage frequency has been stable over the recent 20-year period, which is a completely different picture when we consider the 200-year time period of the use of HEART as seen in section 4.3.

#### 4.2 The Use of HEAD in Recent Years (1990-2012)

Now let's take a look at the use of HEAD in the last 20 years.



[Figure 2] The Use of HEAD Based on Genre and Periods (1990-2012) (COCA)



A total of 175,604 tokens of HEAD was found in COCA corpus. This figure is two times larger than that of HEART, meaning that the use of HEAD is two times greater than that of HEART in modern English. Why the use of HEAD is much more frequent than that of HEART can be an interesting question to raise, but the partial answer can lie in the fact that the higher rate of literal uses of HEAD as compared to that of HEART. Indeed, five separate 100 random samples of HEAD tokens in COCA show that the average of 40.6% of them are used for literal meaning, the average of 37.8% for figurative meanings, that of 14.4% for idioms, and that of 7.1% for its verbal function, indicating that the literal use of HEAD is higher than figurative, which is the opposite case of HEART in COCA.

As was the case of HEART, HEAD is the most frequently used in the genre of fiction (1,015 per mil.), which is followed by magazine (308/mil.), newspaper (254/mil.), spoken (203/mil.), and academic (125/mil.). While the usage in fiction comprises 52% of the total number of tokens, that used in academic writing was only 7%, again showing the stark contrast in the use of HEAD between the two genres. This big contrast can also be accounted for in terms of the metaphoric or metonymic use of HEAD for its various mind-related meanings. Again, the figurative use of HEAD can be less commonly seen in academic writing, which might explain the lowest use of HEAD in that genre.

Though the use of HEAD over the past 20 years maintains a pretty stable line, there has been a constant, gradual increase over the years. As will be discussed later in section 4.4, the degree of increase becomes larger when we expand the time period.

#### 4.3 The Use of HEART for the Past Two Hundred Years (1810-2012)

In this section, we will examine the change of the use of HEART per every decade over the 200-year period from 1810 to 2012.

	1810	1820	1840	1850	1860	1870	1890	1900	1920	1940	1950	1960	1970	1980	1990	2000
<b>FREQ</b>	1205	6817	12242	11656	11152	9827	9044	8963	8136	5089	4748	4345	4393	5252	6656	7799
<b>PER MIL</b>	1,020.14	984.10	762.82	707.64	653.89	529.41	439.01	405.61	317.15	209.01	193.44	181.21	184.46	207.46	238.21	263.77

[Figure 3] The Change of the Use of HEART (1810-2012) (COHA; total of 15,0046 tokens)

As can be seen in this figure, the use of HEART over 200 years has changed dramatically. According to the token frequency for every million words, the use of HEART has been on the constant decrease for 200 years. Its use peaked in 1820, but was decreased three times by 1910. The overall decrease between 1800 and 1900

is rather dramatic, being five times less from the peak use in 1810 to the bottom use in 1960. The exact cause for the decrease is not easy to know without deep analysis of all the data and all the internal and external language factors, which can be an immense task, but one possible explanation has to do with the decrease in the use of the figurative HEART.<sup>5</sup> As shown in Table 1, the percentage of the figurative use of HEART consists of 85.3% in 1810, 76.5% in 1910, and 59.2% in 2000.<sup>6</sup>

HEART	literal	figurative	idiomatic
1810	10.3%	85.3%	4.3%
1910	15.8%	76.5%	7.5%
2000-2010	31.6%	59.2%	9.1%

[Table 1] The Proportions of the HEART in Three Different Uses During 1800-2010)

The precise reasons for the decreasing dependency on the figurative uses are not easy to know, but as some scholars note, the range of meanings HEART can cover was much wider, including cognitive aspects of the mind (Niemeire, 2008, 2009) as we move back in time, and the range has been reduced as we approach more modern times.<sup>7</sup> In addition, the reduced figurative use might also be responsible for the gradual decrease in the use of HEART.

#### 4.4 The Use of HEAD for the Past Two Hundred Years (1810-2012)

Now let's turn to the change in the use of HEAD over the past two centuries.

In contrast to the decreased use of HEART, the use of HEAD has been on a rather constant increase over the past two centuries. This is notable together with the fact that the recent use of HEAD is also much more productive than the use of HEART, as was noted in 4.2. This double-sided fact regarding the use of HEAD can be explained as follows:

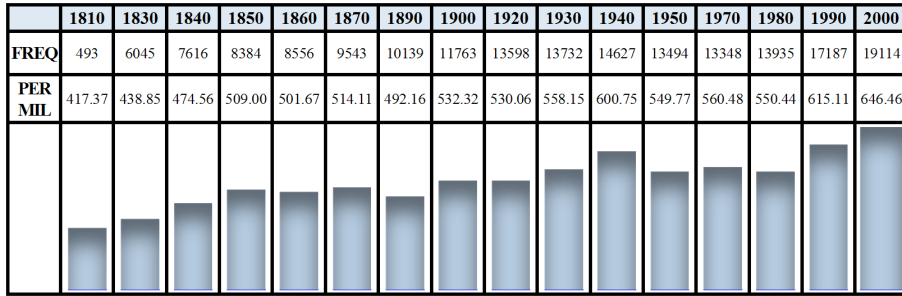
i) HEAD is more diverse in terms of different categories, nouns, verbs (both transitive and intransitive), and adjective forms; ii) it has a higher number of literal uses and greater number of different idioms than HEART; and iii) the increasing use of HEAD over the past 200 years coincides with the fact that it has picked up more uses related to the *cerebrocentric* functions as Niemeire (2009) notes.<sup>8</sup>

<sup>5</sup> On the other hand, the proportion of the use of the literal use (as referential function) has been on the increase, as we can expect with the rise of heart-related diseases and advancement of medical knowledge and technology. This can be reflected in Table 1.

<sup>6</sup> These proportions are the average of the frequency tokens of each three different meaning of HEART elicited from four separate 100 random samples for 1810 and 1910 and from five separate 100 random samples for 2000. MANOVA test shows that p values of each different three token for 1810 are 0.001, 0.001, and 0.007 respectively and those for 1910 are 0.01, 0.001, and 0.007 respectively, all of which show statistical significance ( $p < 0.05$ ). See footnote 3 for statistical information of the tokens for 2000.

<sup>7</sup> For example, Niemeire (2009) notes that the rational aspect of the usage has been almost completely eliminated from HEART in modern days except for the meaning of intellect as in the phrase *learn by heart*.

<sup>8</sup> Niemeire (2009) suggests that English becomes more dichotomous in terms of the division



[Figure 4] The Change of the Use of HEAD (1810-2012) (COHA; total of 21,9315 tokens)

The analysis of the multiple random samples of 100 concordances of HEAD for different time periods show the following figures:<sup>9</sup>

HEAD	literal	figurative	idiomatic	verbal
1810	39.5%	44.3%	12.3%	3.8%
1910	55.3%	31%	10%	4.8%
2000-2010	40.6%	37.8%	14.4%	7.1%

[Table 2] The Proportions of HEAD in Its Three Different Uses During 1800-2010

This figure shows a slight shift with the higher frequency of the literal meaning of HEAD between 1810 and 1910, and some decrease in the use of literal meaning and some increase in the use of figurative meaning of HEAD between 1910 and the current time.

#### 4.5 The Use of HEART and HEAD with Verbs and Adjectives

Let's see the collocations of HEART and HEAD in terms of verbs and adjectives. Glimpsing into co-occurring elements helps one understand the usage of target forms since it provides significant information on both the structural and semantic contexts in which it is used. We are going to focus on only two groups of elements, verbs and adjectives, which immediately precede HEART or HEAD.

The total frequency of verbs immediately co-occurring with HEAD (61,572) is more than three-times higher than that of HEART (18,290), although the most

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between emotion and rationality in terms of HEART and HEAD with the deepening of Cartesian philosophy. It is speculated that the advancement of civilization should have been a part of cause for the gradual increase in use of HEAD.

<sup>9</sup> These proportions are also the average of the frequency tokens of each four meaning of HEAD elicited from four separate 100 random samples for 1810 and 1910 and from five separate 100 random samples for 2000. MANOVA test shows that p values of each four different token of HEAD for 1810 are 0.001, 0.001, 0.001, 0.04; and those for 1910 are 0.001; 0.001; 0.03; and 0.02 respectively, all of which show statistic significance ( $p < 0.05$ ). See footnote 3 for statistical information of the tokens for 2000.

Verb + HEART (18,290)			Verb + HEAD (61,527)			Adj. + HEART (10,425)		Adj. + HEAD (9,902)			
1	HAD	1263	1	SHOOK	13981	1	AMERICAN	549	1	BALD	439
2	HAVE	1095	2	SHAKES	3463	2	SACRED	467	2	NEW	322
3	IS	703	3	SHAKING	2988	3	CONGESTIVE	412	3	BIG	264
4	BROKE	419	4	TURNED	1429	4	HUMAN	401	4	FULL	229
5	TAKE	403	5	IS	1054	5	CORONARY	349	5	SHAVED	224
6	HAVING	379	6	WAS	1023	6	VERY	346	6	UGLY	159
7	WAS	352	7	PUT	823	7	BROKEN	338	7	LARGE	144
8	FELT	333	8	SHAKE	818	8	PURPLE	319	8	ASSISTANT	138
9	BREAKS	333	9	TILTED	691	9	GOOD	218	9	BLACK	137
10	HAS	326	10	RAISED	671	10	ARTIFICIAL	207	10	LITTLE	137
11	BREAK	325	11	COCKED	660	11	BIG	184	11	GOOD	133
12	'S	282	12	LIFTED	640	12	OPEN	138	12	HUMAN	130
13	SUFFERED	212	13	'S	605	13	NEW	134	13	SEVERED	128
14	MADE	201	14	KEEP	561	14	MAXIMUM	130	14	SMALL	124
15	FEEL	196	15	NODDED	542	15	NATIONAL	128	15	MASSIVE	96
16	PREVENT	192	16	TURN	541	16	HEALTHY	119	16	WHOLE	96
17	GET	189	17	HAD	474	17	FATAL	105	17	BLOND	86
18	ARE	178	18	LOWERED	439	18	MASSIVE	96	18	BALDING	85
19	DIED	170	19	BOWED	431	19	HEAVY	94	19	WHITE	76
20	GOT	156	20	STUCK	426	20	LITTLE	94	20	DARK	75

[Table 3] First Top Twenty Verbs or Adjectives Used with HEART and HEAD

frequent verb for HEAD was ten times higher than that of HEART. Interestingly, the pronominal occurrence of adjectives with the two nouns is opposite: the adjective of HEART has more frequency than HEAD.

Excluding possessive verbs, among the top 15 most frequent verbs, only four transitive verbs co-occur with HEART, while 10 transitive ones do with HEAD. It is assumed that this contrast has to do with the fact that while the former is an internal organ, the latter is an external body part, which is much easier to maneuver around than the former. While you can only *take*, *break*, *feel*, and *make* the HEART, you can *shake*, *turn*, *put*, *tilt*, *raise*, *cock*, *lift*, *keep*, and *nod* the HEAD. This tells us that the semantic structure of the two nouns itself is a cause of the different co-occurrence frequencies for verbs, which, in turn, contributes the more frequent use of verbs with HEAD compared to HEART. It is noted that other than *be* and *have*, no verbs overlap among the top 20 list and that they are used either or both literally and metaphorically.

The adjectives co-occurring with HEART are diverse and more abstract in terms of shape, quality, state, condition, color, and category such as *national* and *human*; while those with HEAD are mostly descriptive in terms of shape, as in *big*, *shaved*, *full*, *ugly*, *massive*, etc. This can explain the fact why adjectives co-occur a bit more with HEART, which is the opposite case for the use of verbs, as previously mentioned. Again, except for *good*, *human*, and *massive*, there is no more overlap among these 20 adjectives, and either or both literal and metaphorical uses are observed among them.

#### 4.6 Analysis of HEART-Xing and HEAD-Xing Vs. X-HEARTED and X-HEADED

In this section, we look at the usage of HEART and HEAD as modifying or predicating forms. They takes up either a X-ing or a X-ed form in the total of four different forms as in HEART-Xing, HEAD-X-ing, X-HEARTED, and X-HEADED as shown in (6).

- (8) a. For several **heart-stopping** hours, America seemed to be at the mercy of terrible alien invaders. (COCA 2011, MEG\_Scholastic Scope 59(8))  
 b. Still there was no shortage of **head-turning** outfits at Hollywoods biggest celebration. (COCA 2011, 2/28 CBS\_Morning News)  
 c. He went out and said people are upset because this is true. He then made a **half-hearted** apology. (COCA 2008, 4/14, Fox Hannity & Colmes)  
 d. How embarrassing! It's the heat, I guess. I felt **light-headed**, I was going to get a drink of water. (COCA 2011, FIC\_Georgia Bottoms)

All of these forms are metonymic uses in (6): the ultimate meaning is somehow linked to the physical functions of the HEAD or HEART by way of resemblance of the source to the target concept. However, some forms are literal (as in HEART-DAMAGING and TWO-HEADED), and others are metaphorical (as in HEART-BREAKING and WARM-HEARTED) in terms of conceptual mapping, as in THE HEART IS A MATERIAL (to break) and THE HEART IS WARM TEMPERATURE.

The top 17 tokens of these forms in COCA are as follows:

#	HEART-ing (950)	tokens	HEAD-ing (539)	tokens	#	X-HEARTED (1,558)	tokens	X-HEADED (2,474)	tokens
1	HEART-STOPPING	202	HEAD-COACHING	89	1	HALF-HEARTED	202	LIGHT-HEADED	248
2	HEART-WRENCHING	200	HEAD-TURNING	51	2	LIGHT-HEARTED	200	TWO-HEADED	199
3	HEART-RENDING	110	HEAD-BUTTING	50	3	WHOLE-HEARTED	110	RED-HEADED	173
4	HEART-BREAKING	69	HEAD-SPINNING	46	4	WARM-HEARTED	69	LEVEL-HEADED	139
5	HEART-POUNDING	67	HEAD-SHAKING	37	5	FAINT-HEARTED	67	HARD-HEADED	137
6	HEART-WARMING	57	HEAD-BANGING	32	6	COLD-HEARTED	57	WRONG-HEADED	126
7	HEART-PUMPING	25	HEAD-SCRATCHING	30	7	KIND-HEARTED	25	FEMALE-HEADED	119
8	HEART-TUGGING	21	HEAD-HUNTING	14	8	HARD-HEARTED	21	BALD-HEADED	95
9	HEART-THUMPING	20	HEAD-SHAVING	12	9	SOFT-HEARTED	20	CLEAR-HEADED	85
10	HEART-RACING	17	HEAD-SNAPPING	11	10	BIG-HEARTED	17	THREE-HEADED	65
11	HEART-PROTECTING	11	HEAD-COVERING	10	11	BROKEN-HEARTED	11	DOUBLE-HEADED	62
12	HEART-DAMAGING	10	HEAD-CLEARING	10	12	GOOD-HEARTED	10	EMPTY-HEADED	48
13	HEART-PIERCING	9	HEAD-BOBBING	8	13	FULL-HEARTED	9	BIG-HEADED	46
14	HEART-MELTING	9	HEAD-NODDING	7	14	OPEN-HEARTED	9	HOT-HEADED	41
15	HEART-STIRRING	4	HEAD-SPLITTING	6	15	TENDER-HEARTED	4	NAPPY-HEADED	37
16	HEART-MONITORING	4	HEAD-BASHING	6	16	BLACK-HEARTED	4	COOL-HEADED	35
17	HEART-STIMULATING	4	HEAD-TOSSING	5	17	GENTLE-HEARTED	4	PONTY-HEADED	33

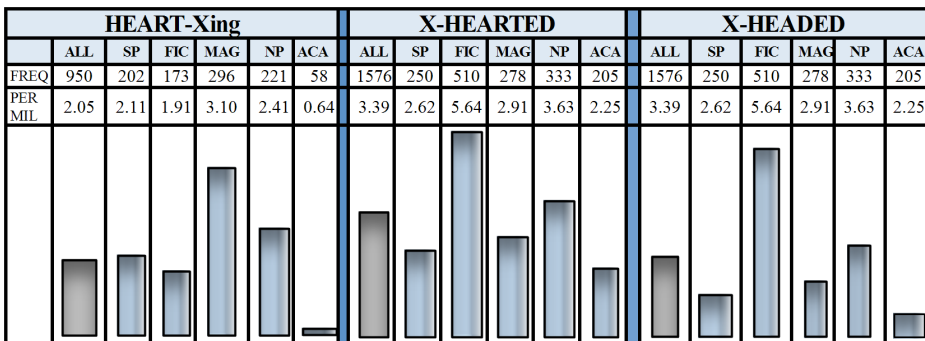
[Table 4] Top 17 Token Frequencies of the Modifying Forms of HEART and HEAD

The overall frequency of X-HEARTED and X-HEADED is higher than that of HEART-Xing and HEAD-Xing respectively. This is to say that X-ed form tends to be used much more often than the X-ing form when it comes to a modifying form. On the other hand, between the same type of modifying form, the frequency of HEART-ing is greater than HEAD-ing, while X-HEADED is higher than that of X-HEARTED. That is, when it comes to the X-ing form, HEART is the winner; as for the X-ed form, HEAD is the winner. This can be represented as follows:

$$\{ \text{HEART-Xing} > \text{HEAD-Xing} \} \ll \{ \text{X-HEARTED} < \text{X-HEADED} \}$$

*X-ed is more frequent than X-ing*

The higher frequency of the active modifying forms of HEART does not match with the overall higher frequency of HEART tokens as a lexeme over HEAD tokens (as noted in section 4), and this seems to have to do with the fact that more metaphorical uses of HEART-Xing forms than HEAD-Xing forms are noted in the list. However, the passive modifying forms of HEART are less used than those of HEAD, which matches with the higher frequency of HEAD as a lexeme.



(SP: spoken; FIC: fiction; MAG: magazine; NP: newspaper; ACA: academic)

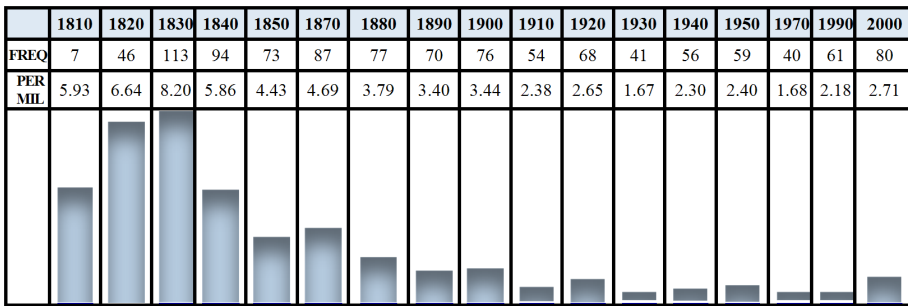
[Figure 5] Top 17 Token Frequencies of the Modifying Forms of HEART and HEAD

HEART-Xing most frequently occurs in magazines while X-HEARTED in fiction. On the other hand, X-HEADED is also mostly used in fiction. The genre that is second most frequently used for all of the three modifier forms is newspaper and these three forms were least used in academic writing. The contrast between magazine/newspaper and fiction for HEART-Xing seems to have to do with the fact that it tends to be used in describing incident or episode-related experiences, which are often found in the former genre. On the other hand, we learn from these statistics that X-HEARTED and X-HEADED are fiction-prone expressions, which can be explained by the fact that fiction is full of description of personal styles and personalities.

Now let's see the change in the usage frequencies of the three forms mentioned above over the past two centuries.<sup>10</sup> The following figure shows the histori-

<sup>10</sup> Since the frequency of HEAD-Xing is relatively low, it is excluded in this discussion.

cal change in the use of HEART-Xing form.

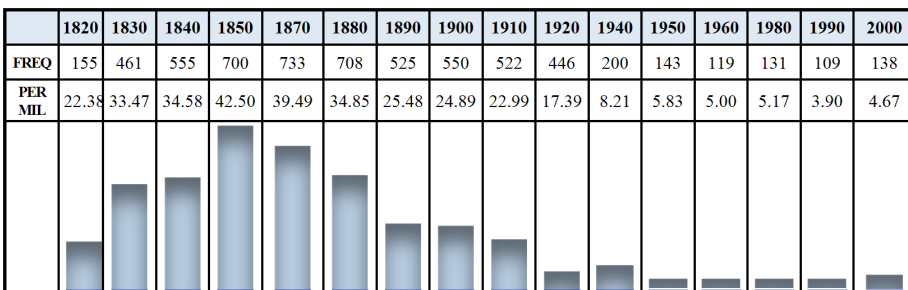


[Figure 6] The Overall Change in the Use of HEART-Xing (COHA)

As we can see in this figure, the token rate per million shows that the modifying form HEART-Xing has been on the constant decrease over the 200-year period, although the last 10 years show some increase. The constant decrease coincides with the overall change in the history of the use of HEART as a lexeme shown in 4.3. The causes for the decrease, then, can be similarly presented as in 4.3.

Though there is the overall decreasing trend, there have been some variations for individual forms of Heart-Xing. For example, out of the total 2,656 tokens of HEART-Xing form detected in COHA corpus, the most frequently used form is HEART-RENDING (330 tokens), which shows the constant decrease since 1840 and that its use in recent time is quite low. The second most frequent token, HEART-BREAKING (256 tokens), also shows a rise until 1900 and then has been on a constant fall since then. On the contrary, HEART-STOPPING (69 tokens), as a latecomer, started to show up in 1920 and shows a constant rise in use, its peak being today. The case for HEART-WRENCHING (30) and HEART-POUNDING (24), which are very late comers, is similar, and their use is increasing. Other top tokens such as HEART-WARMING (65 tokens) showed up scarcely in 1800s and on, peaked in 1950, and were on the decrease.

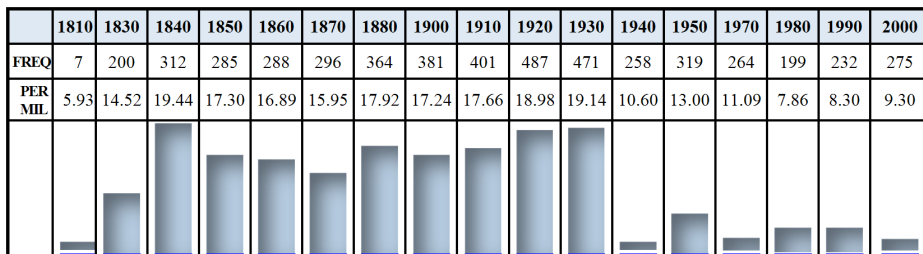
The form X-HEARTED shows a similar trend when it comes to the overall change in use over the past two centuries, as shown in the figure below.



[Figure 7] The Overall Change in the Use of X-HEARTED (COHA)

Just like HEART-Xing, the modified form of X-HEARTED has been on the constant decrease over the 200-year period, the slight difference being in the peak time: 1830 for HEART-Xing and 1850 for X-HEARTED. In addition, the individual token frequencies show similar patterns. Out of the total of 1,797 tokens of X-HEARTED, the forms with top frequencies — such as KIND-HEARTED (798), LIGHT-HEARTED (680), BROKEN-HEARTED (523), and TENDER-HEARTED (337) — show a constant rise until the late 1800s or early 1900s, and then a constant decrease. GOOD-HEARTED (345) shows constant use overall, with significant decreases during the early 1900s and 1960s and then resumed usage recently. The use of HALF-HEARTED (329) has been rather vigorous since the late 1800s, and it is currently still active. TRUE-HEARTED (222) and SIMPLE-HEARTED (197) decreased significantly and are scarcely used recently. A look at some of the top individual tokens of X-HEARTED suggest that overall, its usage is on the decrease over the past 100 years.

Now let’s see the historical trend of X-HEADED from COHA corpus.



[Figure 8] The Overall Change in the Use of X-HEADED (COHA)

As shown here, the active use of X-HEADED is witnessed in the period of 1930 to 1940, which lasted much longer than that of HEART-Xing. This is related to the fact that X-HEADED, among the three modifying forms mentioned in this section, has the most tokens (5,653) in the COHA corpus. The drop of its use (in terms of per million) was seen during the past seven decades.

Now, let’s have a glimpse into the individual differences of some X-HEADED forms with top frequencies. Out of the total of 5,653 tokens of X-HEADED from COHA, the most frequent form, RED-HEADED (598), shows a constant increase until its peak in 1920, and then was followed by a decreasing trend in the use of BALD-HEADED (326) and CLEAR-HEADED (219), showing the similar pattern in reverse. The opposite trend is also observed for LIGHT-HEADED (224) and TWO HEADED (147), which show a constant rise, peaking in 2000. Interestingly, CURLY-HEADED (122) shows not much change and has been in rather constant use. Examination of the top 50 tokens of the X-HEARTED also shows that most of them took a similar path to the top three words.

#### 4.7 Heart Temperature for Personality

In this section, we will examine the use of heart temperature for personality. Expressions such as A WARM HEART/WARM-HEARTED, A COLD HEART/COLD-



HEARTED, A HOT HEAD/HOT-HEADED, and A COOL HEAD/COOL-HEADED refer to the types of a person or personality as in (9):

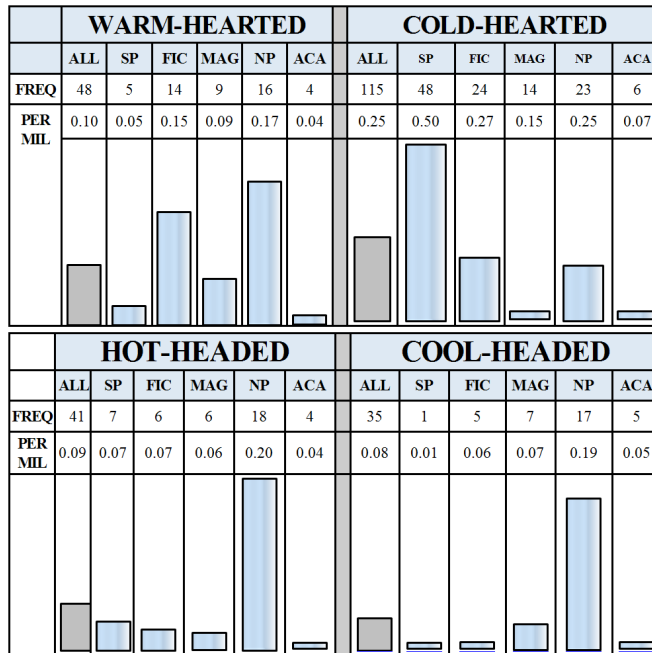
- (9) a. Shariff is 17 years old, a boy with a quick smile and **a warm heart**. (COCA, 2001, MAG\_Essence)
- c. Hence the abstract thinker very often has a **cold heart**, since he dissects his impressions, and impressions can remove the soul only as long as remain whole (COCA, 2003, ACA\_Dada between Heaven and Hell)
- e. Thirty years ago when I was your age, they thought I was a **hot head**. I was there, you know. (COCA, 1994, FIC\_Massach Rev)
- g. Ruocco made a joke of it. She was a **cool head** under pressure. (COCA, 1995, FIC\_Kiss the Girls)

As shown in these examples, warm HEART and cool HEAD have positive connotations while cold HEART and hot HEAD the opposite. The same is true for their modifying or predicating forms, WARM-HEATED and COOL-HEADED, and COLD-HEARTED and HOT-HEADED. If the warm temperature goes with HEART, it is good thing, and the cold temperature with HEART is a bad thing. In contrast, if the hot temperature goes with HEAD, it is an undesirable thing, and if the cool temperature goes with HEAD, it is a desirable thing. If you want to have a good personality, you might want to be warm-hearted and cool-headed. If you have the opposite, that is, cold-hearted and hot-headed, that is not good.

As for the adjective forms, COLD-HEARTED is mostly frequently used (as 115 tokens) in COCA, WARM-HEATED (48 tokens), HOT-HEADED (41 tokens), and COOL-HEADED (35) are following in order. In terms of the rates between modifying and predicating forms, 70% of WARM-HEATED, 70% of COLD-HEARTED, 66% of HOT-HEATED, and 60% of COOL-HEADED tokens are modifying forms, signifying that modifying forms are more prevalent than the predicating forms. As for the collocates of these four modifying forms, the first five most frequent collocates of WARM-HEATED are *man*, *people*, *friend*, *woman*, and *lady*; those of COLD-HEARTED are *bitch*, *killer*, *person*, *girl*, and *individual*; those of HOT-HEADED are *army*, *basketball*, *characters*, *college*, and *community*; and those of COOL-HEADED are *logicians*, *manager*, *negotiation*, *oversight*, and *person*. This information helps in understanding the semantic prosody in which these expressions are used.

Now let's see the usage of these four expressions in terms of genres, as seen in Figure 8.

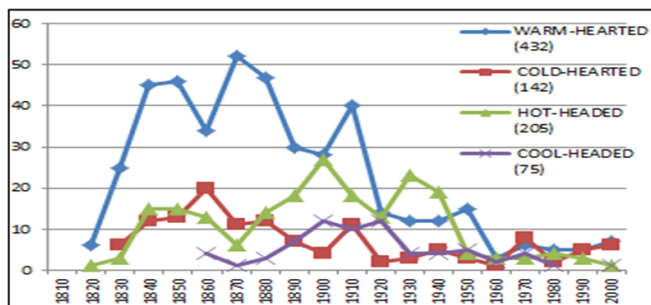
As mentioned, the modifying form of HEART is most frequently used in newspapers when it comes to WARM-HEATED, HOT-HEADED and COOL-HEADED, but as for COLD-HEARTED, it is most frequently used in the spoken genre. When it comes to fiction, there are some interesting observations. The first is that the two forms with positive connotations, WARM-HEATED and COOL-HEADED, show a contrast: while the former is often used, the latter is rarely used. As for the two forms with negative connotations, COLD-HEARTED and HOT-HEADED, the former is used often, whereas the latter is less used, in fiction.



(SP: spoken; FIC: fiction; MAG: magazine; NP: newspaper; ACA: academic)

[Figure 9] Genre Distribution Among WARM-HEARTED, COLD-HEARTED, HOT-HEATED, and COOL-HEADED

Regarding the use trend over the past two centuries, overall, the usage of all the four forms has been decreasing, as shown in Figure 9.



[Figure 10] Genre Distribution Among WARM-HEARTED, COLD-HEARTED, HOT-HEATED, and COOL-HEADED

As is shown here, the use of WARM-HEARTED began to increase in 1860, decreased after 1870, rose again in 1910, and then fell; COLD-HEARTED rose and fell; HOT-HEATED peaked in 1900, then fell by 1920, and rose and fell after 1950;

COOL-HEADED peaked in 1900 and 1920 and fell, staying very low. Overall, the use of all four forms has been constantly decreasing during the past two centuries. The most drastic change occurred to WARM-HEARTED, which went through a large swing from the bottom to top over 200 years. In this particular case, it is assumed that the decreasing trend has to do with the overall decreasing trend of the figurative uses of both HEART and HEAD, particularly HEART being more prevalent.

## 5. Summary and Conclusion

Through data-driven analysis of HEART and HEAD based on the two English corpora, we have discovered the following:

HEART and HEAD are used mainly in three different ways: literally, figuratively (mostly, metaphorically or metonymically), and idiomatically. HEAD is also used verbally. The overall usage of HEART reflected in five different sampling of random 100 tokens in COCA where its literal usage is roughly 31.6% in average among these samples, figurative usage 59.2%, and idiomatic usage 9.1%. When it comes to HEAD, the literal use is 40.6% in average, the figurative 37.8%, and the idiomatic is 14.4%, in addition to 7.1% verbal use.

The total token frequencies between HEART and HEAD in COCA show that HEAD has about two times higher token frequency. This coincides with the fact that the frequency of the use of HEART has been on the decrease over the past 200 years, while that of HEAD has been on the increase. We cannot know all the possible reasons for this trend, but the figurative use of them can be partially responsible. The decreasing trend in the figurative use of HEART is noticed as in the rough estimates of 85.5%, 76.6%, and 59.2% observed in multiple random samples of 100 concordances in 1810, 1910, and 2000 respectively, and there seems to be a possible association in the decreasing trend of HEART tokens over the past two centuries. As for HEAD, the figurative use rate fell until 1910, but increased after that until the present time. The overall higher token frequency of HEAD over HEART could also have to do with the fact that i) it has more diverse functional categories, such as nouns, verbs, and adjective forms; ii) it has a higher number of literal uses and a greater number of different idioms than HEART; and iii) it has picked up more uses related to the *cerebrocentric* functions.

The preference order of the use of HEART in genres reflected in COCA is fiction, magazine, spoken, newspaper, and academic. In the case of HEAD, the order is fiction, magazine, newspaper, spoken, and academic. In both cases, the two lexemes are most frequently used in fiction and least used in academic writing, reflecting the pervasiveness of their conceptualization for emotion, rationality, and other concepts including person and personality.

In terms of the collocations of HEART and HEAD, the adjective and verb collocations with HEAD (61,572) are much higher (2.5 times) than that of HEART (18,290). This also has to do with the higher frequency of the use of HEAD over HEART. On the other hand, adjectives co-occurring with HEART are more diverse and more abstract in terms of shape, quality, state, condition, color, and category such as national and human; while those with HEAD are mostly descriptive in

terms of shape. This indicates that the concepts expressed by HEART are more diverse and complex than HEAD.

The analysis of tokens found from COCA shows that the active modifying form of HEART (HEART-Xing) is more frequent than that of HEAD (HEAD-Xing), and that the passive modifying form of HEAD (X-HEADED) is more frequent than that of HEART (X-HEARTED). Overall X-ed form is more frequent than X-ing for both cases. In terms of HEART and HEAD temperature-related expressions, out of the four (two positive senses and two negative senses), COLD-HEARTED is the most frequent in COCA, with WARM-HEARTED, HOT-HEADED, and COOL-HEADED being in subsequent order. Modifying forms of these four are more prevalent than predicating counterparts.

As was discussed, corpus-based analysis of HEART and HEAD provides diverse areas of quantitative information on their actual synchronic and diachronic uses, including their actual token frequencies, frequency change over time, collocation information, and the usage of their variant forms including the modifying and predicating forms and their temperature-related forms. In addition to its own values, this kind of information can add other insights to the understanding of the cognitive aspects of linguistic forms. These include the realization that the increase or decrease in the usage of a lexeme can be motivated by usage status of figurative language, which is an important cognitive function of a language that allows the expression of more abstract meanings in terms of less abstract ones. This is reflected in the finding that the steady decrease in the use of HEART is in proportion with the decreasing trend of its figurative use over the past two centuries. Similarly, the increase in the use of HEAD has some relation to the relative increase of its figurative use as well as its more extensive literal uses. Furthermore, the more frequent use of HEART and HEAD in the genre of fiction has to do with the fact that their figurative uses are most extensive in fiction. Finally, a similar relation with decreasing figurative use is associated with the overall decreasing trend of the use of the modifying or predicating forms of HEART and HEART temperature-related expressions. These insights all suggest that cognitive forces underlying language use including metaphorical languages are important factors in changes in language use. More studies on the integral analysis of these kinds of linguistic forms are expected in the future.

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