

Polarity of Chinese Emotion Words: The Construction of a Polarity Database Based on Singapore Chinese Speakers

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Abstract. In this paper, we report a study of the polarity of Chinese emotion words. We conducted a large-scale polarity rating experiment with laymen speakers, and compiled a database of polarity ratings for Chinese emotion words based on these experimental results. The polarity ratings were also compared with previously reported polarity ratings, as well as related emotion word ratings such as emotion category and emotional intensity. The participants in the current study were all Singapore Chinese speakers, but the methodology and the current results will serve as an important reference for future research on sentiment analysis and emotion language in Chinese in a broader context.

Keywords: emotion word, emotion polarity, Singapore Chinese.

1 Background

Sentiment analysis (sometimes also called “opinion mining”) refers to automatic analysis and measurement of the semantic orientations of the text (Ding et al. 2008; Esuli & Sebastiani, 2005, etc.). As part of sentiment analysis, polarity analysis aims to determine the sentiment polarity and sentiment polarity intensity of the opinions expressed in text (Esuli & Sebastiani, 2005; Wilson, Wiebe, & Hwa, 2004, etc.). Sentiment polarity is commonly categorized as positive, negative or neutral; sentiment polarity intensity (polarity strength), on the other hand, is usually represented by numerical numbers or levels of degree. Words consisting of semantic orientation are called polarity words or opinion words.

Current extraction and analysis of polarity words are generally based on two sources: corpora or dictionaries. The former include studies such as Hatzivassiloglou & McKeown (1997) and Wiebe (2000). Hatzivassiloglou & McKeown (1997) pointed out that conjunctions between adjectives in a sentence provide indirect information about the semantic orientation of the adjectives, thus the semantic orientation of the latter adjective could be deduced by evaluating the linguistic properties of the conjunction and the semantic orientation of the former adjective. They first extracted sentences from a large corpus, then analyzed the semantic orientation of the adjectives with a log-linear regression model combining with supplementary morphology rules, and finally, classified and labeled the adjectives according to polarity by using clustering algorithm. Wiebe (2000) first assigned the subjectivity of seed adjectives manually, then they used a 10-fold cross validation to further refine the polarity of the adjectives which can be automatically learned from corpora. Turney & Littman (2003) adopted two statistical measures of word association (Point Mutual Information and Latent Semantic Analysis) to determine the semantic orientation of a word. The method was tested with adjectives, adverbs, nouns, and verbs. Ding et al.(2008) proposed a holistic lexicon-based approach to solve the problem by exploiting external evidences and linguistic conventions of natural language expressions. This approach allows the system to measure opinion words that are context dependent with higher accuracy. Ding et al. also dealt with many special words, phrases and language construct which have impact on opinions based on their linguistic pattern. Based on the proposed technique, a system named Opinion Observer has been implemented.

Besides the corpus-based approach, there have also been experiments which adopt dictionary-based approach, such as Kamps et al. (2004) and Esuli & Sebastian (2005). Kamps et al. (2004) investigated a graph-theoretic model of WordNet's most important relation, which is synonymy, and proposed measures that determine the semantic orientation of adjectives for three factors of subjective meaning. Their objective was to develop WordNet-based measures for the semantic orientation of adjectives. Esuli & Sebastian (2005) adopted quantitative analysis to determine the semantic orientation of the subjective terms. The experiment made use of the definitions found in online dictionaries to expand its seed words set, and on the use of the resulting term representations for semi-supervised term classification. Andreevskaia & Bergler (2006) proposed a method for extracting sentiment-bearing adjectives from WordNet using the Sentiment Tag Extraction Program (STEP), where the WordNet glosses were adopted to determine semantic orientation of words. Kim & Hovy (2005) expanded a set of manually collected opinion-bearing words with the use of dictionaries. In order to avoid collecting uncommon words, they started with a basic English word list compiled for foreign students preparing for the TOEFL test. Thereafter, 462 adjectives and 502 verbs were randomly selected and then manually annotated by three annotators. As for polarity information of Chinese words, one major Chinese sentiment database is the Affective Lexicon Ontology by Xu et al. (2008). The database was again not constructed based on large-scale manual annotation.

In conclusion, judging from past experiments, the sentiment tagging is

either done by machine or by a few annotators (mainly are judgments made by experienced experts). Obviously, even though the annotation process might be deemed as highly effective, it does not necessarily reflect the semantic orientation perceived by average language users. As such, we invited a large number of average language user as participants to take part in the annotation process, and built the first database of normative ratings of polarity information for a list of Chinese emotion words.

2 Experiments

Design of the current study mainly follows Lin & Yao (2015). Lin & Yao (2015) reported a research on emotion classification and emotion intensity of Chinese emotion words rated by Mainland Chinese, Hong Kong, and Singapore Mandarin Chinese speakers. Lin & Yao (2015) used the list of Chinese emotion words from Xu & Tao (2003), and adopted the methodology from Strauss & Allen (2008). In this study, we used the identical list of Chinese emotion words and referred to the methodology from Lin & Yao (2015). With comparison to past experiments (Xu et al. 2008; Khoo et al., 2015; etc.), this current study has fewer words and the words are mainly emotion words. However, our study is a pioneer experiment whereby many average Chinese language users participated in the annotation process, experiment methodology and results will serve as an important reference for future research on sentiment analysis and emotion language in Chinese language in a broader context.

The list we used in this study consisted of 372 emotion words ranging from 1 to 4 syllables in length. These words are further divided into four word lists (Lists 1-4), with 93 words per list, and each participant only to complete one word list. Similar to Lin & Yao (2015), a set of quality control measures for rating consistency was implemented in this study. Firstly, each word list had two test words that each appeared twice so that we could compare a participant's ratings of the repeated items as a measure of consistency within the participant, resulting in 8 intra-list repeated words. Secondly, each word list shared one test word with every other list, resulting in a set of 6 cross-list repeated words, in order to assess rating consistency across participant groups working on different word lists. Lastly, we inserted a non-word item, 几几 *jiji*, to all four word lists, in order to check whether the participants were responding to the judgment task attentively. As a result, each word list contained 97-98 test token in total. Table 1 lists all the items that are repeated within or across word lists.

Table 1 Repeated items

Intra-list repeated words	Cross-list repeated words
List 1: 厌倦 <i>yanjuan</i> , 悲痛 <i>beitong</i>	List 1, 2: 开心 <i>kaixin</i>
List 2: 担忧 <i>danyou</i> , 丧气 <i>sangqi</i>	List 1, 3: 焦躁 <i>jiaozao</i>
List 3: 愉悦 <i>yuyue</i> , 痛恨 <i>tonghen</i>	List 2, 4: 愤怒 <i>fennu</i>
List 4: 愤慨 <i>fenkai</i> , 愁闷 <i>choumen</i>	List 2, 3: 沉痛 <i>chentong</i>
	List 3, 4: 震惊 <i>zhenjing</i>
	List 1, 4: 畏惧 <i>weiju</i>
	Non-word item (all lists) : 几几 <i>jiji</i>

The participants in this study were mainly native Chinese users. A total of 94 participants (35 males, 59 females) were in the age range of 16-30 years. They live in Singapore and have received compulsory Chinese education in Singapore (lowest education level: Junior College or Polytechnic).

The annotation task was administered in the form of an online survey on the Google Form Platform. Each participant was randomly assigned to work on one word list. The participants' task was to judge and rate the polarity of each test item on the list. Seven polarity scales were available: 3, 2, 1, 0, -1, -2, -3. Option "3" represents very positive, option "0" represents neutral, option "-3" represents very negative. In any case whereby participants did not understand the test word, they could choose the option "不理解词义 *bu lijie ciyi*/do not understand".

3 Results

A total of 89 participants involved in the annotation process, an average of 22-23 participants for each word list. As mentioned in previous section, 8 intra-list repeated words as well as 6 cross-list repeated words were adopted to assess the consistency and reliability of annotation. We used *t* tests to verify the two ratings across all repeated words, results showed that the ratings were consistent ($p > 0.1$). With regards to the annotation of non-word item 几几 *jiji*, 92.1% of the participants rated it as "neutral" or "do not understand". Even though 7.5% of the participants rated 几几 *jiji* with a polarity scale, we believe that this would not affect the credibility of the survey. Firstly, the word 几 *ji* has multiple meanings in Mandarin (几个 *jige*, 几何 *jihe*, etc). Secondly, 几几 *jiji* has homophonic words (唧唧 *jiji*, 岌岌 *jiji*, 叽叽喳喳 *jijizhazha*, etc). This would possibly affect participants' judgment. Furthermore, it is phenomenal that new words are often produced due to the communication across digital media and internet pop culture, some participants might have understood 几几 *jiji* as a newly created word. In conclusion, the above test results indicate that the annotation obtained from this

survey is highly credible.

For the convenience of analysis and discussion, we calculated the mean polarity of 372 emotion words and divided them into three categories: negative emotion words ($-3 \leq \text{Mean Polarity} \leq -1$), neutral emotion words ($-1 < \text{Mean Polarity} < 1$) and positive emotion words ($1 \leq \text{Mean Polarity} \leq 3$). This is merely one of the ways to categorize the emotion words, researcher may categorize the words accordingly to their needs (for instance, mean polarity > 0 as positive emotion word and mean polarity < 0 as negative emotion words.). Overall, there are 143 negative emotion words (38.4%), 125 neutral words (33.6%) and 104 positive emotion words (28.0%). 挂牵 *guaqian* is the only word within the 125 neutral emotion words which has a mean polarity of 0. The results show that the number of negative emotion words is 10.4% larger than that of positive emotion words. This is a common trend in sentiment analysis. For instance, Khoo et al., (2015) reported that there are more negative emotion words than positive emotion words found in corpus. The 372 words divided into three categories are listed in (1), where the very 10 positive emotion words ($2 \leq \text{Mean Polarity} \leq 3$) and 12 very negative emotion words ($-3 \leq \text{Mean Polarity} \leq -2$) are underlined. These underlined words are undoubtedly emotion words with the highest degree of sentiment.

Besides mean polarity, we also calculated the range value between the highest and lowest rating of every words, e.g., 骇异 *haiyi* (lowest rating = -2, highest rating = 0, range value = 2) and 快活 *kuaihuo* (lowest rating = -3, highest rating = 3, range value = 6). In all 362 words, the smallest range value is 2, and the biggest range value is 6. To our surprise, the range values for most of the words are bigger than 3, which indicates that the ratings are distributed at different sides of value 0. Specifically, we found that 21.5% (n= 80) of the words has range value of 4, 36.3% (n= 135) of the words has range value of 5, 12.9% (n = 48) of the words has range value of 6. In other words, 70.7% of the words have at least two annotators whom actually held opposite opinion with the word. We suggest that the cause in the big range value could be due to the individual annotators having a difference in semantic orientation of the word. Similar situations can be found in other languages and studies. For instance, Khoo et al., (2015) pointed out that an exact identical word “torrid” could possibly have both semantic orientations, positive in a context, but negative in the other context. Thus, different individuals would rate according to their context resulting in a huge range value. This also indirectly proved the necessity of having multiple annotators in the rating process.

(1) a. Emotion words that are rated as “positive” ($1 \leq \text{Mean Polarity} \leq 3$)

乐于 *leyu*, 拥护 *yonghu*, 放松 *fangsong*, 炽热 *chire*, 神往 *shenwang*, 在乎

zaihu, 快活 *kuaihuo*, 安宁 *anning*, 感动 *gandong*, 赞同 *zantong*, 可意 *keyi*, 怡和 *yihe*, 关切 *guanqie*, 晓畅 *xiaochang*, 来劲 *laijin*, 欢娱 *huanyu*, 称意 *chenyi*, 信服 *xinfu*, 放心 *fangxin*, 欢 *huan*, 狂热 *kuangre*, 称心 *chenxin*, 带劲 *daijin*, 康乐 *kangle*, 安心 *anxin*, 爱好 *aihao*, 舒坦 *shutan*, 关心 *guanxin*, 高亢 *gaokang*, 如意 *ruyi*, 愿意 *yuanyi*, 相信 *xiangxin*, 得志 *dezhi*, 舒畅 *shuchang*, 松快 *songkuai*, 乐意 *leyi*, 动心 *dongxin*, 欢欣 *huanxin*, 关怀 *guanhuai*, 赏识 *shangshi*, 顺心 *shunxin*, 珍视 *zhenshi*, 振奋 *zhenfen*, 充实 *chongshi*, 喜欢 *xihuan*, 宽心 *kuanxin*, 惊喜 *jingxi*, 体贴 *titie*, 欢悦 *huanyue*, 高昂 *gaoang*, 景仰 *jingyang*, 崇尚 *chognshang*, 崇拜 *chongbai*, 感激 *ganji*, 满意 *manyi*, 爽心 *shuangxin*, 感谢 *ganxie*, 喜爱 *xiai*, 窝心 *woxin*, 欢喜 *huanxi*, 激昂 *jiang*, 乐 *le*, 欣慰 *xinwei*, 痛快 *tongkuai*, 推崇 *tuichong*, 欢快 *huankuai*, 自信 *zixin*, 欢乐 *huanle*, 钟爱 *zhongai*, 信赖 *xinlai*, 快乐 *kuaile*, 佩服 *peifu*, 畅快 *changkuai*, 开心 *kaixin*, 赞赏 *zanshang*, 欢愉 *huanyu*, 崇奉 *chongfeng*, 自在 *zizai*, 信任 *xinren*, 钦佩 *qinpei*, 欣喜 *xinxi*, 高兴 *gaoxin*, 尊敬 *zunjing*, 珍爱 *zhenai*, 喜悦 *xiyue*, 尊重 *zunzhong*, 珍惜 *zhenxi*, 舒服 *shufu*, 器重 *qizhong*, 兴奋 *xinfen*, 愉悦 *yuyue*, 舒心 *shuxin*, 敬佩 *jingpei*, 敬慕 *jingmu*, 孝敬 *xiaojing*, 自豪 *zihao*, 尊崇 *zunchong*, 景慕 *jingmu*, 敬仰 *jingyang*, 欢畅 *huanchang*, 崇敬 *chongjing*, 幸福 *xingfu*, 敬重 *jingzhong*, 热爱 *reai*

b. Emotion words that are rated as “neutral” (-1 < Mean Polarity < 1)

为难 *weinan*, 烦心 *fanxin*, 生气 *shengqi*, 遗憾 *yihan*, 低沉 *dichen*, 苦恼 *kunao*, 愕然 *eran*, 熬心 *aoxin*, 窘 *jiong*, 不满 *buman*, 困惑 *kunhuo*, 头疼 *touteng*, 感伤 *ganshang*, 操心 *caoxin*, 烦恼 *fannaofu*, 苦闷 *kumen*, 心虚 *xinxu*, 发慌 *fahuang*, 惊慌 *jinghuang*, 抱愧 *baokui*, 窝火 *wohuo*, 惊疑 *jingyi*, 不好过 *buhaoquo*, 苦 *ku*, 心慌 *xinhuang*, 怀疑 *huaiyi*, 惊愕 *jinge*, 担心 *danxin*, 焦急 *jiaoji*, 羞怯 *xiuque*, 心急 *xinji*, 不平 *buping*, 失望 *shiwang*, 惊诧 *jingcha*, 无奈 *wunai*, 疑心 *yixin*, 骇怪 *haiguai*, 害怕 *haipa*, 寂寞 *jimo*, 眼红 *yanhong*, 伤心 *shangxin*, 疯狂 *fengkuang*, 吝惜 *linxi*, 吓人 *xiaren*, 挂虑 *gualü*, 紧张 *jinzhang*, 多情 *duoqing*, 骄矜 *jiaojin*, 诧异 *chayi*, 悲壮 *beizhuang*, 担忧 *danyou*, 对不住 *duibuzhu*, 解恨 *jiehen*, 怕 *pa*, 慌张 *huangzhang*, 火 *huo*, 看不惯 *kanbuguan*, 宠 *chong*, 炫耀 *xuanyao*, 心浮 *xinfu*, 可惜 *kexi*, 害臊 *haisao*, 痴迷 *chimi*, 不过意 *buguoyi*, 憋气 *bieqi*, 吃惊 *chijing*, 震惊 *zhenjing*, 过敏 *guomin*, 对不起 *duibuqi*, 狂 *kuang*, 无聊 *wuliao*, 消魂 *xiaohun*, 迟疑 *chiyi*, 急 *ji*, 怜惜 *lianxi*, 疑惑 *yihuo*, 着急 *zhaoji*, 不好意思 *buhaoyisi*, 挂心 *guaxin*, 痒痒 *yangyang*, 缠绵 *chanmian*, 惊讶 *jingya*, 抱歉 *baoqian*, 沉静 *chenjing*, 羞涩 *xiuse*, 奇怪 *qiguai*, 挂牵 *guaqian*, 动摇 *dongyao*, 感慨 *gankai*, 牵挂 *qiangua*, 偏爱 *pianai*, 害羞 *haixiu*, 眷恋 *juanlian*, 怜悯 *lianmin*, 挂念 *guanian*, 自满 *ziman*, 骄傲 *jiaobao*, 无辜 *wugu*, 激动 *jidong*, 同情 *tongqing*, 留神 *liushen*, 了解 *liaojie*, 想 *xiang*, 心切 *xinqie*, 关注 *guanzhu*, 惊奇 *jingqi*, 亢奋 *kangfen*, 惦念 *diannian*, 怀念 *huainian*,

得意 *deyi*, 情愿 *qingyuan*, 自爱 *ziai*, 可心 *kexin*, 闲适 *xianshi*, 投入 *touru*, 闲雅 *xianya*, 倚重 *yizhong*, 理解 *lijie*, 逍遥 *xiaoyao*, 高涨 *gaozhang*, 快慰 *kuaiwei*, 炽烈 *chilie*, 瞧得起 *qiaodeqi*, 羡慕 *xianmu*, 体谅 *tiliang*

c. Emotion words that are rated as “negative” ($-3 \leq \text{Mean Polarity} \leq -1$)

嫉恨 *jihen*, 憎恶 *zengwu*, 痛恨 *tonghen*, 愤恨 *fenhen*, 忌恨 *jihen*, 鄙夷 *biyi*, 暴怒 *baonu*, 窝囊 *wonang*, 绝望 *juewang*, 忿恨 *fenhen*, 悲恸 *beitong*, 轻蔑 *qingmie*, 怨恨 *yuanhen*, 悲凄 *beiqi*, 颓丧 *tuisang*, 沮丧 *jusang*, 悲愤 *beifen*, 歧视 *qishi*, 郁悒 *yuyi*, 鄙视 *bishi*, 厌恶 *yanwu*, 悔恨 *huihen*, 抑郁 *yiyu*, 沉痛 *chentong*, 惨痛 *cantong*, 哀痛 *aitong*, 忌妒 *jidu*, 惊恐 *jingkong*, 苍凉 *cangliang*, 哀怨 *aiyuan*, 瞧不起 *qiaobuqi*, 懊丧 *aosang*, 愤慨 *fenkai*, 悲凉 *beiliang*, 阴郁 *yinyu*, 揪心 *jiuxin*, 腻烦 *nifan*, 惊惧 *jingju*, 傲慢 *jiaoman*, 沉郁 *chenyu*, 忿怒 *fennu*, 懊悔 *aohui*, 妒忌 *duji*, 心寒 *xinhan*, 悲切 *beiqie*, 自卑 *zibei*, 悲哀 *beiai*, 悲痛 *beitong*, 蔑视 *mieshi*, 愤怒 *fennu*, 悲怆 *beichuang*, 浮躁 *fuzao*, 愤懑 *fenmen*, 冤冤 *yuan*, 忧郁 *youyu*, 恐慌 *konghuang*, 愁闷 *choumen*, 敌视 *dishi*, 丧气 *sangqi*, 冤枉 *yuanwang*, 怅惘 *changwang*, 反感 *fangan*, 惶恐 *huangkong*, 痛心 *tongxin*, 发憊 *fachu*, 背悔 *beihui*, 忧愁 *youchou*, 烦躁 *fanzao*, 恼恨 *fenhen*, 消沉 *xiaochen*, 惊骇 *jinghai*, 惶惑 *huanghuo*, 愁苦 *chouku*, 焦躁 *jiaozao*, 厌烦 *yanfan*, 憋闷 *biemen*, 悲愁 *beichou*, 犯愁 *fanqiu*, 哀戚 *aiqi*, 困窘 *kunjiong*, 抱委屈 *baoweiqu*, 烦杂 *fanza*, 鄙薄 *bibo*, 恐惧 *kongju*, 负疚 *fujiu*, 焦炙 *jiaozhi*, 颓唐 *tuitang*, 嫉妒 *jidu*, 忧虑 *youlv*, 伤感 *shanggan*, 自负 *zifu*, 发愁 *fachou*, 焦虑 *jiaolü*, 自大 *zida*, 畏怯 *weiqie*, 烦躁 *fanzao*, 狂乱 *kuangluan*, 惭愧 *cankui*, 慌乱 *huangluan*, 羞惭 *xiucan*, 骄横 *jiaoheng*, 心酸 *xinsuan*, 灰心 *huixin*, 酸辛 *xinsuan*, 厌倦 *yanjuan*, 后悔 *houhui*, 溺爱 *niai*, 不快 *bukuai*, 哀愁 *aichou*, 妒嫉 *duji*, 懊恼 *aonao*, 讨厌 *taoyan*, 辛酸 *xinsuan*, 惆怅 *chouchang*, 糟心 *zaoxin*, 委屈 *weiqu*, 冲动 *chongdong*, 捣乱 *daoluan*, 烦 *fan*, 烦乱 *fanluan*, 烦闷 *fanmen*, 畏惧 *weiju*, 自傲 *ziao*, 乏味 *fawei*, 怠慢 *daiman*, 焦渴 *jiaoke*, 低落 *diluo*, 反对 *fandui*, 沉重 *chenzhong*, 沉闷 *chenmen*, 激愤 *jifen*, 烦人 *fanren*, 不安 *buan*, 不悦 *buyue*, 哀伤 *aishang*, 心焦 *xinjiao*, 悲伤 *beishang*, 惊惶 *jinghuang*, 愁 *chou*, 窘促 *jiongcu*, 羞愧 *xiukui*, 郁闷 *yumen*, 骇异 *haiyi*

4 Discussion

We compared current results with Xu et al. (2008). Xu et al. (2008) divided polarity into four categories: neutral, positive, negative and positive/negative. It is noted that Xu et al. (2008) adopted both human annotation as well as automatic annotation, the study utilized an enormous amount of Chinese words, and among those words 327 were identical to current study. In Xu et al. (2008), these 327 words are categorized into positive ($n = 76$), neutral ($n = 186$), negative ($n = 64$) and posi-

tive/negative ($n = 1$). But a huge difference in annotation was found between Xu et al. (2008) and current study. Among the 76 positive words annotated by Xu et al. (2008), only 10 (13.2%) words are annotated as positive in current study, whereas the other 66 (86.8%) words are annotated as neutral words. Of particular note are 悲壮 *beizhuang* and 沉静 *chenjing*. Their mean polarity is rated as “negative” in this study (-0.62 and -0.09 respectively). Similarly, 58 (91%) out of 64 negative words in Xu et al. (2008) were categorized as neutral words, 2 (3%) words are categorized as positive words and only 4 (6%) words are categorized as negative words in current study. As for the 186 neutral words in Xu et al. (2008), only 72 (39%) are categorized as neutral words, and 87 (47%) words categorized as negative words and 27 (15%) words categorized as positive words in current study. Lastly, Xu et al. (2008) categorized the word 挂虑 *gualü* as positive/negative word, it is categorized as a neutral word (mean polarity = -0.71) in current study. Should the word 挂虑 *gualü* categorized as neutral or positive/negative word under different context is arguable, further research has yet to be conducted.

We believe there were at least two reasons responsible for causing the discrepancies between the results of Xu et al. (2008) and current study. Firstly, Xu et al. (2008) targeted at Mandarin used in Mainland China whereas current study targeted at Chinese Mandarin used in Singapore. Therefore the difference may be attributed to the possible variation between the two varieties of Chinese. Secondly, it could be due to the difference in annotation process. Xu et al. (2008) adopted both human annotation (a few experts) and automatic annotation to obtain polarity, whereas we relied on a large number of average language speakers. The large number of laymen participants versus the few expert annotators might cause a difference in semantic understanding of the words. The above mentioned differences still require further study in order to compare the effectiveness and accuracy in different methodologies.

Last but not least, we compared the current results with the emotion categories and emotion intensity reported in Lin & Yao (2015). We noticed there is a correlation between polarity and emotion categories. As shown in table 2, all DISGUST emotion words are annotated as negative polarity words. Most words in the categories of ANGER, ANXIETY, FEAR, and SADNESS are annotated as negative polarity words. HAPPINESS emotion words are all annotated as positive polarity words. SURPRISE emotion words are annotated as neutral polarity words, with only one annotated as negative polarity words. Emotion intensity and polarity are correlated too. We compared and calculated the mean polarity obtained in current study with emotion intensity obtained in Lin & Yao (2015). Results showed that the correlation coefficient values among the negative polarity and positive polarity words were higher (0.57, 0.35 respectively), whereas the correlation was relatively lower in neutral polarity words (0.16). In other words, for polarity words with high positive or high negative mean polarity, the judgment for the word’s emotion intensity by average language users was more related.

Table 2 Emotion category and polarity distribution

Emotion category in Lin & Yao (2015)	Current results			Polarity distribution (majority)
	Negative	Neutral	Positive	
ANGER	12(66.7%)	6(33.3%)	0(0%)	66.7% negative
ANXIETY	19(52.8%)	17(47.2%)	0(0%)	52.8% negative
DISGUST	21(100%)	0(0%)	0(0%)	All negative
FEAR	8(66.7%)	4(33.3%)	0(0%)	66.7% negative
HAPPINESS	0(0%)	4(7.1%)	52(92.9%)	92.9% positive
SADNESS	52(78.8%)	14(21.2%)	0(0%)	78.8% negative
SURPRISE	1(9.1%)	10(90.9%)	0(0%)	90.9% neutral

5 Conclusion

In this study, we conducted a large-scale survey of average Chinese language users' annotation of polarity in Singapore. This study generated a polarity database based on Singapore Chinese users. The results of this study also indicated some differences and similarities in comparison with past studies. We hope that the current study will serve as an important reference for future research on sentiment analysis in Chinese in a broader context.

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