

# A Corpus-Based Study of Semantics of English and Chinese Pressure Antonyms "Light/Heavy"

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**Abstract.** This study delves into the antonymous pair "light/heavy," commonly used in everyday interpersonal discourse, focusing on a comprehensive comparative analysis of the Chinese and English pressure antonyms "light/heavy." To learn more about this language phenomena, data taken from the Center for Chinese Linguistics PKU Corpus and the British National Corpus are analyzed. The analysis follows the framework of conceptual metaphor theory and is based on a semantic approach. The study reveals that, when analyzed under the prism of conceptual metaphor, the definitions of "light" and "heavy" embrace 14 other categories in addition to the weight domain. Notably, in the Chinese language, "light" and "heavy" take on connotations related to attitudes and social statuses, symbolizing contempt and respect, respectively. These nuanced connotations are absent in their English counterparts. The implications of these findings carry significance for Chinese-English translation and the field of second language acquisition, particularly concerning pressure antonyms.

**Keywords:** Corpus; "light-*qing*"; "heavy-*zhong*"; semantics; conceptual metaphor.

## 1. Introduction

Human language is a powerful tool for expressing sensory experiences, offering a rich vocabulary to describe the intricate range of perceptions in our environment. English adjectives like "hot," "heavy," "hard," and "soft" belong to the category of perceptual adjectives. These adjectives are closely tied to human psychological and physiological interpretations of relevant stimuli. This category can be further subdivided into four primary classes: temperature adjectives, which include terms like "hot," "cold," "cool," and "warm"; tactile adjectives, such as "soft" and "hard"; pressure adjectives, exemplified by "heavy" and "light"; and pain-related adjectives, notably "painful." [1] Furthermore, scholarly research has continuously focused on antonymy, a basic type of semantic interaction [2,3]. The most powerful type of lexical-semantic links is acknowledged to be antonyms, which are essential to the cognitive structure of vocabulary and discourse coherence [4,5].

Within the domain of pressure antonyms, the "light/heavy" antonym pair is widely used in everyday interpersonal communication. However, in practical language use, it is observed that this antonym pair is not limited to denoting the weight of physical objects but is also used to convey abstract concepts [6,7]. Thus, people's perceptions of the "light/heavy" antonym pair go beyond its prototypical meaning in both English and Chinese. In the framework of earlier analyses of English perceptual adjectives, tactile interaction has been investigated as the source domain for verbalization, semantic extension, subjectification, and metaphoric extensions; additionally, the polysemy of English adjectives has been examined [8-10]. On the other hand, comprehensive investigations comparing English and Chinese perceptual adjectives include the studies of the incorporation of cultural factors in comprehending or translating the derived meanings of such adjectives; while the two language systems exhibit congruence, there are also notable distinctions in the conventional tactile metaphors between English and Chinese due to their distinctive cultural contexts [11,12].

From the previous review, it is evident that scholars have thoroughly analyzed perceptual adjectival antonyms, with limited attention given to pressure adjectival antonyms like "light/heavy." After consulting relevant literature and references, the following provides a synthesis of the relevant studies on "light" and "heavy." A comprehensive comparison and analysis of all instances where

"qing" ('light') and "zhong" ('heavy') are collocated in the dictionary. Their findings revealed that "qing" ('light') features a greater number of word formations compared to "zhong" ('heavy') only when they convey the meaning of an object's weight. Based on the Center for Chinese Linguistics Corpus, the previous study systematically dissected the evolution of the compound word "qing/zhong" and elucidated the motivations underpinning its lexicalization [13,14]. The evolutionary trajectory of "qing/zhong" reflects a transformation from a concrete to an abstract stage of lexicalization, driven by metaphors, metonymy, and conceptual blending theory.

Research on the semantics of Chinese and English pressure antonyms, in particular "light/heavy," using real corpora has been conspicuously lacking from a cognitive linguistics standpoint. The purpose of this study is to examine the semantic utilization of Chinese and English pressure antonyms, "Light-qing" and "Heavy-zhong," by drawing on corpus data. This inquiry aims to explore the similarities and differences in the usage of these antonyms between the English and Chinese languages.

## 2. Methodology

This study relies on corpus data collected from two primary sources: the British National Corpus (BNC Corpus) and the Center for Chinese Linguistics PKU Corpus (CCL Corpus). The initial phase of the research involved the extraction of a total of 120 instances from these two corpora, focusing on the pressure antonyms "light/heavy" and their Chinese counterparts, "qing/zhong." These instances were meticulously recorded in an Excel format, establishing the foundational dataset for subsequent analysis.

Annotating these occurrences is the second stage of the investigation, with a focus on their metaphorical applications. The conceptual metaphor theory put forward by Lakoff and Johnson serves as the foundation for this annotation [15]. In essence, one must grasp a term's metaphorical connotations in order to comprehend it. As a result, it is crucial to get a thorough grasp of the concept's related domains. In the framework of metaphorical mappings, these domains include both the source domain and the target domain. The mapping scope is defined as the relationship between the source and target domains. Authoritative dictionaries are examined in order to ascertain the expanded meanings, and the contextual information offered by the BNC and CCL Corpus is used to augment this knowledge. Consequently, the domains of "light/heavy" and "qing/zhong" undergo manual annotation. In addition to the weight domain, 14 other domains are annotated, including psychology, force, disease, auditory, olfactory, taste, industry, speed, weather, color, traffic, quantity, attitude, and social status. The final stage of the research will involve calculating the frequency of each category. Subsequently, an in-depth analysis will be conducted to identify both the similarities and differences across these domains.

## 3. Result and Discussion

### 3.1. Semantic Analysis of "Light" in English and Chinese

In the initial phase, manual annotation was employed to analyze the lexical item "light" extracted from the BNC Corpus and CCL Corpus, resulting in a comprehensive representation of the broad semantic domains of "light" as presented in Table 1. It's important to emphasize that this study does not explore the interpretation of "light" in the context of "bright or shining." In the subsequent sections, the study will focus on the semantic extensions of "light" in both English and Chinese, highlighting the similarities between them.

**Table 1** Comparison between Domains of Meaning Extension of “Light” in English and Chinese

		Light (%)	qing (%)
Similarities	Weight	26.7%	26.7%
	Psychology	6.7%	10%
	Force	6.7%	10%
	Disease	3.3%	3.3%
	Auditory	3.3%	3.3%
	Olfactory	3.3%	3.3%
	Taste	6.7%	3.3%
	Industry	10%	6.7%
	Speed	3.3%	6.7%
	Weather	10%	3.3%
	Traffic	3.3%	3.3%
	Quantity	0%	0%
Differences	Colour	16.7%	0%
	Attitude	0%	16.7%
	Social status	0%	3.3%

After a thorough review of the findings presented in Table 1, it becomes evident that 26.7% of instances in both English and Chinese languages are used to connote the weight of an object. For instance, in example 1 where it's stated, "In India too the focus is on small and light vehicles," the emphasis is on compact and lightweight vehicles. "Light" in this context signifies the mass of the vehicles and assumes a prototypical meaning, implying that the vehicles are not heavy.

As language evolves, the semantics of "light" have diversified to encompass various other domains through conceptual metaphors. This study proceeds to explore these extended meanings, each supported by illustrative examples.

An intriguing expansion of the meaning of "light" is observed as it transitions from the domain of weight to the realm of psychology. Notably, 6.7% of English instances and 10% of Chinese instances, as per Table 1, undergo an extension to the psychology domain through conceptual metaphors. In example 2 where it's mentioned, "We took the risk that he did light work," "light" conveys the notion of feeling relaxed in a psychological context. Compared to the burden of carrying something heavy, individuals tend to experience greater comfort when handling something light. In essence, the common thread between the psychology domain and the weight domain is the sensation of relaxation. Furthermore, consider the example 2, where the metaphorical extension of "light" is evident. In this context, "light" signifies a state of ease and relaxation when performing effortless tasks. When an activity is effortless, it invariably leads to a sense of relaxation. Therefore, when "light" extends into the realm of psychology, it denotes the absence of hardship or fatigue, underscoring the parallel emotional state of relaxation shared between the psychology domain and the weight domain.

"Light" has importance not just in the weight domain but also in the weather domain. Table 1 makes clear that 10% of English instances and 3.3% of Chinese examples extend this use of conceptual metaphors into the weather realm. "Light" indicates excellent weather conditions for humans when it crosses into this realm. The idea of good conditions for individuals is what unites the weather domain and the weight domain. In example 3, the sentence "The river sound was soft, and the light breeze made a sighing in the evergreens around us" illustrates this shift, where "light breeze" no longer signifies an entity's weight but rather transitions from its prototypical meaning to a weather-related context. Here, "light" characterizes the breeze as gentle, indicating that the conditions are welcoming to people.

Furthermore, the auditory domain is reached by the semantic reach of "light" from the weight domain, with only 3.3% of the English and Chinese occurrences utilizing conceptual analogies from Table 1 to reach this domain. The idea that the sound is delicate and soft is communicated when

"light" crosses over into the auditory domain. The following line serves as an example 4 of this transformation: "They were playing relatively happy, light music when suddenly, right in the middle of the song, we heard the air raid sirens." In this context, "light" characterizes the music as joyful and soothing.

Similarly, "light" expands from the weight domain to the olfactory domain. In the corpus, only 3.3% of English and Chinese instances make this extension through conceptual metaphors. When "light" is applied to the olfactory domain, it suggests that a particular smell is pleasant and comforting. As shown in the example 5 "They were playing relatively happy, light music when suddenly, right in the middle of the song, we heard the air raid sirens," "light" transitions from the weight domain to the olfactory domain, indicating that the cream emits a pleasant and gentle fragrance, signifying its quality and the comfort it provides.

Moreover, "light" experiences an extension from the weight domain to the domain of taste. Notably, 6.7% of English instances and 3.3% of Chinese instances can be extended to the taste domain through conceptual metaphors detailed in Table 1. When "light" is applied to the taste domain, it denotes a delicately mild flavor. In the example 6 "SoBro Self Storage is providing light food options and drinks of water and soda," "light" refers to food or beverages that lack a strong taste and do not induce a feeling of fullness due to a low content of fat, sugar, or alcohol.

Ten percent of English cases and six percent of Chinese instances show that the semantic range of "light" expands from the weight domain into the industrial domain through conceptual metaphors shown in Table 1. In the industry domain, "light" designates the kind or classification of industry. As exemplified in the example 7 "Sectors like tourism, agriculture, small and medium-sized enterprises, light industry, and services are crying out for good leadership," "light" in this context signifies the type of industry, and it commonly collocates with terms like "industry" or "manufacture" when employed in an industrial context.

The semantics of "light" extend from the weight domain to the force domain, with 6.7% of English instances and 10% of Chinese instances undergoing expansion into the force domain through conceptual metaphors as delineated in Table 1. When "light" transitions into the force domain, it signifies that an action is gentle and doesn't require much force. In the example 8 "About 20 minutes into the ride, I felt a light tap on my shoulder," "light tap" conveys a gentle and soft touch, aligning with the meaning of "light" in the force domain as gentle or soft, sharing similarities with the prototypical "light" meaning of lacking significant force.

Additionally, the semantics of "light" expand from the weight domain to the speed domain, with 3.3% of English instances and 6.7% of Chinese instances extending into the speed domain through conceptual metaphors from Table 1, indicating the rapid operation of machinery. When "light" is used in conjunction with terms related to machinery, it denotes the speed of the machine. As demonstrated in the example 9 "In 2015, they rolled out a modern light railway in Addis Ababa –the first fully electric tram in sub-Saharan Africa," "light railway" consistently collocates with the word "railway" when extended to the speed domain, signifying the rapid speed of the subway, not its weight.

Furthermore, "light" extends from the weight domain to the disease domain, with only 3.3% of both English and Chinese instances finding an extension to the disease domain through conceptual metaphors as detailed in Table 1. In example 10, it's stated, "Karl had taken up everything with the most strenuous attentiveness in a few moments, and with a light headache he quietly followed the head porter who continued in front of him." In this context, "light" shifts from its typical weight domain to describe the intensity of a headache.

Similarly, "light" expands from the weight domain to the traffic domain, with only 3.3% of both English and Chinese instances extending to the traffic domain via conceptual metaphors. This signifies favorable traffic conditions that lead to reduced commute time. In the context of example 11, "Karl had taken up everything with the most strenuous attentiveness in a few moments, and with a light headache he quietly followed the head porter who continued in front of him." Here, "light" indicates the presence of fewer cars on the road and a smoother flow of traffic, rather than describing the weight of traffic.

The meaning connotations of the word "light" differ significantly between Chinese and English. To be more precise, "light" in English moves from the weight domain into the color domain, where 16.7% of cases expand to the color domain via conceptual analogies, as Table 1 shows. In this context, when "light" migrates to the color domain, it signifies that the color of something is not dark but rather pale. In the example 12, "You'll notice in your course red, orange, light green, and dark green gauges next to your course files" extends "light" to the color domain, indicating a pale and not dark shade. Furthermore, when "light" is extended to the color domain in English, it is commonly used to modify color terms.

However, in Chinese, "light" can be extended to the attitude domain, conveying meanings related to contempt rather than the weight of an entity. The Chinese language utilizes "轻" to describe such attitudes as "轻视" (contempt), "轻敌" (underestimating the enemy), and "掉以轻心" (taking things lightly). Additionally, "qing" can be applied to describe a person's social status, as in "人微言轻," indicating that the individual holds a low social status and lacks the right to express their opinions. This attitude-related extension is distinct from the English usage of "light." In summary, the semantic metaphors of "light" vary between English and Chinese, with English extending "light" to the color domain and Chinese extending it to the attitude and social status domains, leading to differences in their usage and connotations.

### 3.2. Semantic Analysis of "Heavy" in English and Chinese

This section primarily delineates the diverse meanings of "heavy." In the following domains, the semantic extension of "heavy" in English and Chinese exhibits similarities.

**Table 2** Comparison between Domains of Meaning Extension of "Heavy" in English and Chinese

		heavy (%)	zhong (%)
Similarities	Weight	23.3%	26.7%
	Psychology	6.7%	6.7%
	Force	10%	10%
	Disease	10%	3.3%
	Auditory	3.3%	3.3%
	Olfactory	3.3%	3.3%
	Taste	3.3%	3.3%
	Industry	16.7%	6.7%
	Speed	0%	0%
	Quantity	13.3%	6.7%
	Colour	0%	0%
	Traffic	3.3%	3.3%
Differences	Weather	6.7%	0%
	Attitude	0%	20%
	Social status	0%	6.7%

After looking over Table 2's results, it's clear that 26.7% of Chinese and 23.3% of English cases correspond to the weight domain of "heavy," which represents an entity's weight. In example 13, "I tried to catch him, but I had two heavy suitcases, and I was wearing high heels," "heavy" is utilized to convey the weight of the "suitcases," signifying that the suitcases possess significant weight. This represents the prototypical meaning of "heavy" pertaining to the weight of an entity.

With conceptual metaphors, the remaining uses of "heavy" can be expanded to other domains. The weight domain and the psychology domain both share "heavy" semantics. According to Table 2, 6.7% of English and Chinese instances can be extended to the auditory domain via conceptual metaphors. Similar to "light," "heavy" can also be extended to the psychology domain. In this context, "heavy" conveys that someone feels busy or experiences profound sadness. In example 14, "Busy lives and heavy working schedules can often put on the blinkers and our awareness of these blessings",

heavy indicates a state of busyness in terms of one's psychological well-being. When "heavy" is applied to describe someone's psychological state, it signifies a sense of fatigue, akin to the weariness one might feel when carrying something heavy.

The auditory domain also receives the meaning of "heavy" in addition to the weight domain. Table 2 shows that 3.3% of the English and Chinese examples use conceptual metaphors to get into the auditory domain. The term "heavy" denotes a loud or deep sound in the auditory domain. In example 15, "Obstructive Sleep Apnoea (OSA) is characterized by heavy snoring, irregular breathing patterns at night, and excessive daytime sleepiness", "heavy snoring" denotes a deep, resonant snoring sound.

The semantics of "heavy" are further extended from the weight domain to the olfactory domain. Approximately 3.3% of English and Chinese instances find extension to the olfactory domain through conceptual metaphors. In this context, "heavy" signifies a strong smell. In example 16, "The sound echoes throughout the drafty brick room, the heavy smell of gunpowder fills our lungs.", the "heavy smell of gunpowder" implies a potent and stimulating aroma. The sensation of stimulation is shared when carrying something heavy, akin to the stimulation of the nose when encountering a strong smell.

Additionally, "heavy" is extended from the weight domain to the taste domain. Conceptual metaphors expand the meaning of "heavy" into the taste domain in about 3.3% of cases in both English and Chinese. The adjective "heavy" in this sense describes something that makes one's stomach hurt and makes them feel full. In example 17, "If you had heavy lunch in the afternoon, go light on dinner." This usage of "heavy lunch" indicates that the meal is difficult to digest and results in a sense of fullness. The process of extension in this domain is akin to the extension to the olfactory domain.

From the weight domain to the industrial domain, "heavy" has semantics. It is noteworthy that conceptual metaphors are used to extend 16.7% of English cases and 6.7% of Chinese instances to the industry domain. "Heavy" refers to an industry's type or category in this sector. In example 18, "How will the world's energy systems, supply chains, and heavy industries overcome what is often described as an addiction to fossil fuels?" In this case, "heavy industries" implies industries of a certain type, showcasing that "heavy" has extended to the industry domain, where it signifies the industry's category or classification.

Observing the data presented in Table 2, it is evident that 10% of English instances and 3.3% of Chinese instances are extended to the disease domain through conceptual metaphors. In example 19, "The patient feels a dull, heavy headache with a profusion of tears", "heavy" implies the severity of a patient's illness. It indicates a severe and debilitating headache, denoting the patient's condition. This represents a shift in the meaning of "heavy" from weight to illness severity.

Additionally, "heavy" extends from the weight domain to the force domain. It is notable that 10% of both English and Chinese instances experience extension to the force domain, as detailed in Table 2. Within the example 20, "Despite being obviously hurt, she maintained her calm and managed to throw the ball into the net after taking a hard knock to the body", "heavy" denotes something involving a strong impact or requiring a significant amount of physical strength and effort. The term "heavy blow" connotes a strong blow that requires a lot of physical exertion. This shows that "heavy" has expanded from weight to force.

Moreover, the weight domain semantics of "heavy" are extended to the quantity domain. Approximately 13.3% of English instances and 6.7% of Chinese instances are extended to the quantity domain, as detailed in Table 2. In example 21, "The regulations extensively reform data privacy and protection and can result in heavy fines for companies that fail to protect customer data.", "heavy" signifies a significant quantity or amount of something. "Heavy fines" in conveys substantial financial penalties, denoting a large number of fines. This transformation reflects a shift in the meaning of "heavy" from weight to quantity.

The meaning of "heavy" also extends from the weight domain to the traffic domain. It is evident that only 3.3% of both English and Chinese instances are extended to the traffic domain through conceptual metaphors, as shown in example 22, "This is my favorite junk food that I slowly eat during super heavy traffic jams." In this context, "heavy traffic" refers to a situation where there is a high

volume of vehicles on the road, leading to prolonged traffic jams. This extension highlights that "heavy" in the traffic domain is not used to describe the weight of traffic but rather to emphasize the substantial volume of vehicles and the associated traffic congestion.

Notably, there are some differences in the semantic metaphors of "heavy" between English and Chinese. Specifically, in English, "heavy" extends from the weight domain to the weather domain. It is clear that 6.7% of English instances can be extended to the weather domain through conceptual metaphors, as exemplified in example 23 "Recent heavy rain and floods meant that this footbridge was about to be covered with rising water." In this context, "heavy" conveys the idea of unfavorable weather conditions, such as intense and persistent rainfall. "Heavy rain" implies that the weather conditions are severe and characterized by substantial precipitation. This extension in English signifies the similarity between strenuous tasks and adverse weather conditions, both being described as "heavy." While in Chinese people are not used to using heavy-"zhong" to describe weather, people tend to use "da" to describe the heavy degree of weather conditions.

However, in Chinese, "heavy" can be extended to the attitude domain, conveying meanings related to respect and importance for somebody rather than the weight of an entity. Chinese uses "zhong" to describe such attitudes as "重视" (to attach importance to), "敬重" (to respect), and "看重" (to consider important). "zhong" can also be employed to describe a person's social status, as in "位高权重" (a high position with influence) or "德高望重" (high moral and social standing), indicating an individual's elevated social status and influence. These meanings are distinct from the English usage of "heavy." In summary, "heavy" demonstrates various extensions across different domains in both English and Chinese, with some distinctions in the semantic metaphors. While English extends "heavy" to the weather domain, Chinese extends it to attitudes and social statuses.

#### 4. Conclusion

Based on corpus data, this paper fulfills two objectives. First of all, it clarifies the areas in which the pressure antonyms "light/heavy" and "qing/zhong" have meanings. Second, it reveals the differences and similarities in semantics between the English and Chinese languages. The following is a summary of the main conclusions. First, the primary relationship between "light" and "heavy" is the weight of an entity. The domains of psychology, force, sickness, auditory, olfactory, taste, industry, speed, weather, color, traffic, quantity, attitude, and social standing are among the areas into which these concepts are metaphorically expanded. Second, whereas "heavy" does not have a metaphorical extension to the speed domain, "light" can, signifying the speed of a machine. "Light" can also be projected into the color domain, representing the intensity or shade of a color, which "heavy" does not encompass. "Heavy," in contrast, can be metaphorically projected into the quantity domain, signifying a large number, while "light" does not extend to this domain in terms of amount. Thirdly, notably, in Chinese, "light" and "heavy" can be metaphorically extended to denote attitudes and social statuses, symbolizing contempt and respect, respectively. English equivalents lack these connotations. The disparities in these metaphors are closely tied to the cultural backgrounds and living habits of both nations.

However, it is essential to acknowledge certain limitations within this study. First, the analysis may be subject to a degree of subjectivity. To enhance the credibility of the results, future research could involve multiple annotators for corpus data. Secondly, the sample size of data may not be sufficiently large to comprehensively analyze the usage of these antonyms. Collecting a more extensive and randomly selected dataset is recommended. Thirdly, future research could explore a comparative analysis of the English and Chinese antonym pair "light/heavy" from a syntactic perspective.

The research findings of this study offer valuable insights for Chinese-English translation involving perceptual adjectives and aim to address related issues in the context of second language acquisition.

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