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# Framing Covid-19 reporting in the Macau Daily News using metaphors and gain/loss prospects: a war for collective gains

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This study investigates the use of metaphors and the prospect of gain/loss conveyed in the coverage of the pandemic in a leading conventional news outlet in Macau. We discovered that *WAR* metaphors have predominantly been used in reports in the Macau Daily News, and have identified three sets of lexical expressions used in these metaphors. The main themes conveyed by the *WAR* metaphors include describing the gravity of the situation, communicating anti-pandemic measures, and urging the public to participate in anti-pandemic efforts. In addition, the persuasive messages contained in the appeals for joint action are examined in terms of gain/loss frames and collectivistic versus individualistic appeals. We argue for an analytical framework that encompasses both conceptual metaphors and gain/loss framing in subsequent studies on persuasive messaging.

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## Introduction

During medical crises such as the Covid-19 pandemic, mass media play a key role in persuading the public to adopt anti-pandemic directives. Although social media have been scrutinised in the Covid-19 literature (e.g. Brailovskaia et al. 2021; Shi et al. 2022; Wicke and Bolognesi, 2020), traditional media remain the main channels used by (health) authorities to send out messages and are therefore worth systematic research in their own right (e.g. Mach et al. 2021; Olagoke et al. 2020). Recent research has confirmed that people's trust in news broadcasting positively correlated with their adoption of protective behaviours during the pandemic (Sun et al. 2021), while those over 65, in particular, relied on traditional media to obtain information on preventive measures (Chu et al. 2021). The present research investigates the Macau Daily News (abbreviated as 'MD'), the leading news agency that assisted the local authority to contain Covid-19, with remarkable results – no deaths and only 83 confirmed cases before the Omicron outbreak on 18 June 2022<sup>1</sup>. We examine MD's role in Covid-19 messaging by investigating two framing devices – conceptual metaphors and the gain/loss frames (Tversky and Kahneman, 1981). Our research questions are:

1. What *conceptual metaphors* were used in MD to frame Covid-19 reporting? What lexical items were used to formulate these metaphors?
2. What *themes* did these metaphors deliver?
3. In the messages that sought to persuade the public to adopt anti-pandemic measures, was the prospect of gains or that of losses used more frequently? Did the messages appeal to individual or collective interests?

## Relevant literature

The following review focuses on the use of metaphors in medical contexts and the application of Prospect Theory in health communication.

**WAR metaphors for health crises and their criticisms.** Lakoff and Johnson (1980) observed that people use conceptual metaphors to understand and convey new ideas. The framing power of metaphors has also been experimentally verified, although most hearers were found to be unaware of the impact of metaphors on their decisions (Thibodeau and Boroditsky, 2013). WAR and DISASTER metaphors were often used during global pandemics such as HIV/AIDS (e.g. Wallis and Nerlich, 2005), SARS (Baehr, 2006; Chiang and Duann, 2007), and influenza (Taylor and Kidgell, 2021). In discussions of Covid-19, WAR metaphors were predominantly used in leaders' speeches, in the press, and by the general public (cf. Charteris-Black, 2021; Sowden et al. 2021).

The pervasive use of WAR metaphors in health crises has attracted frequent criticism. Susan Sontag (1978) observed that treating patients as fighters against a disease projects human fantasies. Her reflections led to scrutiny of the purposes and effects of WAR metaphors in health communication, e.g. in the special issues edited by Parsi (2016). Studies reported that such metaphors not only romanticise the situation, but can also be counterproductive, cruel, and harmful to those suffering from terminal diseases (Baehr, 2006; Wackers et al. 2021), even leading to fatalism (Semino, 2021). The use of WAR metaphors potentially amplifies fear and anxiety (Gillis, 2020; Isaacs and Priesz, 2021), escalates nationalistic sentiments that may encourage exclusion (ibid), and increases the propensity to accept authoritarian measures (Semino, 2021). Despite these drawbacks, both Nie et al. (2016) and Castro Seixas (2021) saw a necessity to use WAR metaphors in medical crises, because they are conventionally used

to prepare the public for hard times, persuade them to implement behavioural changes, and foster national unity. The inevitability and persuasiveness of WAR metaphors was supported by Flusberg et al.'s (2018) literature survey and Charteris-Black's (2021) meta-analysis. Semino (2021) found that WAR metaphors were particularly useful in the early stages of a pandemic.

The mechanism of war metaphors is summarised in Ursula Le Guin's (2012, Afterword) familiar quote:

War as a moral metaphor is limited, limiting, and dangerous. By reducing the choices of action to "a war against" whatever-it-is, you divide the world into Me or Us (good) and Them or It (bad) and reduce the ethical complexity and moral richness of our life to Yes/No, On/Off.

Le Guin's description of Us and Them as the two belligerents enables us to synthesise the divergent studies on WAR metaphors in public health discourse referred to above. In war, the goal is victory or at least the survival of the collective Us (versus Them). Individual losses and suffering are considered to be unavoidable and secondary to the needs of the collective Us. While WAR metaphors emphasise collective goals, they also give rise to complaints about the loss or neglect of human values and personal well-being, and the fatalism and/or sense of loss of self that leads to an unresisting 'acceptance' of the worst outcomes (Flusberg et al. 2018; Semino, 2021).

**Framing with the prospect of gain/loss in health communication.** Tversky and Kahneman (1981) discovered that the framing of choices, specifically between gain and loss frames, affected individuals' decision-making. Experiments have shown that when options are presented in a *gain* frame, which highlights increased benefits and reduced losses, people tend to choose the option with a sure gain. By contrast, when the choices are presented in a *loss* frame, depicting potential losses and reduced gains, people tend to make risk-taking choices. Tversky and Kahneman (ibid) developed Prospect Theory to predict people's decisions—that is, risk averting in a gain frame and risk-taking in a loss frame—and this prediction has been confirmed by replication studies, including a recent large-scale multinational study (Ruggeri et al. 2020). Prospect Theory refutes the theoretical position that people make decisions based on objective probability calculations, which has been applied in various fields including economics, social psychology and management, political science, and health communication. Rothman and Salovey (1997) systematically reviewed health communication research on the framing effect and proposed a framework to account for general tendencies. According to this framework, disease *detection* behaviours (e.g. mammography screening) are more effectively promoted using loss-framed messages that highlight increased risks and potential health problems, whereas messages encouraging disease *prevention* measures (e.g. the use of sunscreen) are more appealing when presented in a gain frame that emphasises their health benefits. O'Keefe and Jensen (2007, 2009) observed only a negligible statistical advantage of gain-framed over loss-framed messages for disease prevention in their meta-studies. Despite this, Rothman and Salovey's framework has been widely adopted to guide the framing of health messages for disease detection and prevention (Chen et al. 2022). For example, Toll et al. (2014) found evidence from anti-smoking campaigns that gain-framed messages were more effective than loss-framed ones.

During the Covid-19 outbreak, experiments replicating Tversky and Kahneman's (1981) classic Asian disease problem confirmed the framing effect of risk aversion in a gain frame and

risk-taking in a loss frame, and revealed that this tendency was stronger than before the pandemic (Rachev et al. 2021). The effect of gain-loss framing was also found in health directives on hand washing and social distancing (Gantiva et al. 2021), mask-wearing (Jiang and Doodoo, 2021), and vaccination (Huang and Liu, 2021). In vaccination messages, various mediating factors such as age group and self- or other-oriented concerns were identified—e.g. gain-framing was more persuasive to the elderly and those with a low level of concern about vaccines, whereas loss framing was more effective for young adults, those with a high degree of uncertainty, and those concerned for the lives and safety of others (ibid; Hong and Hashimoto, 2021; Huang et al. 2022).

## Method

**Sample.** Our dataset consists of the reports published in the Macau Daily News (MD, aka Macao Daily), the undisputed leader in the news industry in Macau (cf. the China News Service ranking, <https://www.chinanews.com/gn/2021/08-18/9546045.shtml>), with its circulation accounting for more than 80% of the total circulation of all newspapers in Macau (Lin and Liu, 2019). MD has been found to be generally supportive of the (local) government's initiatives rather than to act as a watchdog (ibid; Li, 2012), although it also reports criticisms and complaints from the public from time to time. MD regularly publishes editorials to guide public opinion on major social issues. Lu Bo, the General Director and Editor-in-Chief of MD, confirmed the pro-China tradition of MD in one of his speeches (Lu, 2018).

MD publishes printed newspapers and has a web portal ([www.macaodaily.com](http://www.macaodaily.com)) with identical content. We accessed the portal to browse article headlines and collected Covid-19-related articles from January to August 2020, which covered major pandemic events, health guidelines, and anti-pandemic measures such as border control, lockdowns, and financial aid. Reprinted articles from other news agencies, such as Xinhua News and Hong Kong China News were excluded. We created the Macau Daily corpus (MDC) with the selected articles, with each entry containing the headline, body text, and date. MDC was uploaded to Sketch Engine (SkE) (<https://app.sketchengine.eu/>) for processing and analysis. It contains 669,887 tokens, 571,598 words, and 19,554 sentences.

**Data analysis method.** Our data analysis consisted of three parts—the identification of metaphors and the corresponding lexis, the discovery of major themes conveyed by metaphors, and the analysis of gain/loss frames in the calls for joint action.

First, we drew on MIPVU (Metaphor Identification Procedure VU University Amsterdam) to identify the use of metaphors. The instances of metaphor were determined based on domain crossing—i.e. a word's contextual meaning being distinct from its basic meaning (cf. Steen et al. 2010, p.33). In the SkE interface, we began by querying the collocates of the character 疫 *yì* 'epidemic' for potential metaphors, because 疫 ( $n = 8432$  in MDC) is by far the most frequently-occurring Chinese character in discussing the pandemic'. We read through the collocates within a five-word-span on both the left and the right of the keyword 疫 and identified metaphorical expressions such as 爆發 *bàofā* 'outbreak' and 衝擊 *chōngjī* 'impact'. Once a metaphor that consisted of more than one Chinese character had been identified, each of the characters was searched for separately in MDC to detect potential metaphors that contained that character. The metaphors were mapped to SUMO (the Suggested Upper Merged Ontology, cf. Niles and Pease, 2001) for classification and interpretation. SUMO is a hierarchically structured ontology concept system through WordNet (Pease and Fellbaum, 2010), useful for metaphor detection and verification (e.g. Ahrens and

Jiang, 2020; Chen et al. 2019). The metaphors identified were cross-checked between the co-investigators for consistency, and only those relating to COVID-19 were counted. We classified the metaphors into major groups based on lexis—e.g. 戰 *zhàn* 'battle', 擊 *jī* 'attack'—and formulated metaphor statements such as THE PANDEMIC IS A BATTLE and THE PANDEMIC IS AN ATTACK.

Second, to identify the *themes* conveyed by WAR metaphors, we built a subcorpus—namely, the 'subcorpus of war and pandemic' (shorthand as SWaP)—from MDC. SWaP consists of all sentences that contain one or more of the five top Chinese characters relating to war—戰, 擊, 防, 抗, and 守—where the five characters were also collocated with the character 疫 in the L5/R5 range. We queried SWaP to generate a list of words of two or more characters and also keywords and multi-word terms, using zhTenTen17 (a Chinese web corpus of billions of words, available at SkE) as the reference corpus. We then examined the high-frequency words ( $n > 25$ ) and their concordance lines to identify recurrent themes.

Third, we interrogated SWaP by focusing on the sentences that contained calls for anti-pandemic action, to obtain the pattern of persuasion in terms of gain/loss frames and the appeal to collective or individual interests.

## Results

This section presents our results regarding the conceptual metaphors used to frame Covid-19 issues in MDC and the lexis used to flesh out the metaphors. It also elaborates on the findings on three major themes conveyed by the metaphors and the use of the prospect of gain or loss in messages that urge the public to cooperate in anti-pandemic actions.

### Conceptualising the pandemic: WAR metaphors and their lexis.

We found that WAR metaphors are by far the most frequently used and dominant metaphors used to discuss Covid-19 topics in MDC. There are some other metaphors—e.g. THE PANDEMIC IS A DISASTER, THE PANDEMIC IS A JOURNEY, and THE PANDEMIC IS A MONSTER—but their frequency and salience are much lower than those of the WAR metaphors in MDC. Three major sets of words emerged from our data to compose WAR metaphors, drawing on the source domains of battle, assault, and defence, respectively to conceptualise the pandemic situation in Macau. The WAR metaphors are therefore composed of three subtypes of metaphors.

*The pandemic is a battle.* The first set of words contains the character 戰, *zhàn* 'battle', hereafter referred to as 'battle-words'. Note that we make an ontological and lexical-semantic distinction between WAR and BATTLE. That is, a BATTLE is a sub-event of a WAR, as in 'winning the battle but losing the war'. In this sense, a WAR consists of several BATTLES, but not vice versa. A BATTLE typically involves continuous fighting within a given timespan (as in the verb 'to battle') and a WAR is composed of one or more BATTLES in different spatiotemporal locations that may or may not happen contiguously and may or may not happen simultaneously. The WAR/BATTLE distinction underlies important conceptual dichotomies such as strategy versus tactics in terms of planning and actions, as well as the expected spatiotemporal span. A BATTLE occurs within the boundary of a contiguous and self-contained spatiotemporal span. Hence a BATTLE ends when the fighting stops. On the other hand, as a WAR spans several potentially disjointed BATTLES, any period of peace without fighting could be either an interlude between two BATTLES or the end of the WAR.

Table 1 displays the most frequent battle-words that collocate with 疫 *yì* 'epidemic' within a span of five words (parsed by SkE) to the left and right. Most of the battle-words collocate predominantly or even exclusively with 疫 since their

**Table 1 Battle-words that collocate with the character 疫 in the L5/R5 range.**

	pinyin	gloss in English	co-occurrences	candidates	T-score <sup>a</sup>	LogDice <sup>b</sup>
戰	zhàn	war, battle	27	33	5.116	6.708
戰疫 /“疫”	zhànyì	fight (the) pandemic	23	23	4.725	6.477
戰勝	zhànshèng	win, overcome	21	22	4.522	6.347
挑戰	tiǎozhàn	challenge	19	87	4.108	6.191
戰略	zhànlüè	strategies	6	19	2.352	4.540
持久戰	chǐjiǔ zhàn	protracted war	7	8	2.608	4.764
保衛戰	bǎowèi zhàn	defensive war	5	5	2.208	4.279
阻擊戰	zǔjī zhàn	blocking battle	5	5	2.208	4.279
戰役	zhànyì	campaign, battle	3	6	1.688	3.542
total			99	191		

<sup>a</sup> T-score measures the frequency of the collocations.

<sup>b</sup> LogDice indicates the typicality of the collocations. (<https://www.sketchengine.eu/documentation/statistics-used-in-sketch-engine/>).

**Table 2 Attack-words that collocate with the character 疫 in the L5/R5 range.**

	pinyin	gloss in English	co-occurrences	candidates	T-score	LogDice
衝擊	chōngjī	‘strike, shock’	60	124	7.544	7.844
打擊	dǎjī	‘hit, batter’	19	120	4.012	6.186
抗擊	kàngjī	‘resist an assault’	33	37	5.663	6.996
重創	zhòngchuāng	‘heavily inflicted’	11	15	3.260	5.415
來襲	lái xí	‘come to attack’	10	11	3.118	5.278
total			112	281		

co-occurrence counts come close to their candidate counts (Table 1). In the SkE environment, the ‘co-occurrence’ count means the frequency of occurrence within the left-five to right-five word span of 疫, while the ‘candidate’ count refers to the frequency in the MDC as a whole.

The battle-words pertain to the overarching metaphor ‘THE PANDEMIC IS WAR’. The pandemic is presented as a series of battles (within a war) faced by Macau residents, while each anti-pandemic measure can be seen as a battle. This is not only a familiar way for the public to conceptualise a situation, but also maintains high vigilance (as winning a battle does not mean winning the war). The collocates of the battle-words in Table 1 indicate that the number one antagonist to combat is 疫情 ( $n = 101$ , in the L5/R5 span of 戰) ‘the development of the pandemic’—e.g. expressed in 戰勝(這場)疫情 ( $n = 21$ ) ‘overcome/defeat (this) pandemic situation’. The pandemic itself, of course, needs to be fought off, as expressed in 戰疫 ( $n = 6$ ) ‘fight (the) pandemic’, also given in the form 戰“疫” ( $n = 17$ ), in which the double quotation marks indicate that it is wordplay. This expression is a homonymic paronomasia based on the frequently-used word 戰役 zhànyì ‘campaign, battle’, in which 役 ‘battle’ is replaced by one of its homophones 疫 yì ‘epidemic’, likening each anti-pandemic campaign to a battle in a long war. The metaphoric uses of 戰勝 and 戰疫 personify the pandemic as an active belligerent that we must defeat.

The words 挑戰 ‘challenge to battle’ and 戰略 ‘strategy’ in Table 1 are used in a wider range of situations. When closely collocated with the character 疫, the instances of 挑戰 indicate that Covid-19 poses challenges to pandemic-prevention work (防疫工作 fángyì gōngzuò), to business operations (經營 jīngyíng), and to the survival (生存 shēngcún) of small- and medium-sized enterprises. When 戰略 collocates with 疫, the message is about securing strategic reserves (儲備 chǔbèi) of anti-pandemic materials (防疫物資 fángyì wùzī), implementing responsive strategies, and keeping calm and steady (平常心態 píngcháng xīntài). The instances of 挑戰 and 戰略 support the PANDEMIC IS A BATTLE metaphor with an emphasis on the preparations in and between battles in the war—material supply, strategic planning, and remaining in the right state of mind.

The battle-words further specify different types of battle that the anti-pandemic war should be conceptualised as—e.g. 持久戰 chǐjiǔ zhàn ‘battle of endurance’, 保衛戰 bǎowèi zhàn ‘defensive battle’, 阻擊戰 zǔjī zhàn ‘blocking battle’, 戰役 zhànyì ‘campaign, a battle’, and even 沒有硝煙的戰爭 méiyōu xiāoyān de zhànzhēng ‘war without the smoke of gunpowder’. The latter is a creative and vivid metaphor that suggests that, since no gunpowder smoke is visible, the antagonists are dangerously elusive and anyone can be attacked by surprise, so there are no ‘bystanders’ (旁觀者 pángguān zhě), as pointed out in one of the examples of 沒有硝煙的戰爭.

In summary, the battle-words situate the anti-pandemic campaign in the context of a battle, highlighting the long and multi-staged effort and specifying the details of the tactics needed to combat the virus.

*The pandemic is an attack.* the attack-words include 擊 - jī ‘to strike’, 襲 - xí ‘to ambush’, and 創 chuàng ‘to inflict (damage)’. This second set of words (see Table 2) conveys the message that the pandemic entails a rapid and forceful assault that aims to inflict damage, just like military attacks do on the battlefield.

We take 擊 - jī ‘to strike’ to illustrate the use of attack-words. The attack-words are mainly used in discussing two topics in MDC—one relating to an attack, an assault, or a blow, and the other to people’s resistance to the attack. The first topic, typically expressed by 衝擊 chōngjī ‘impact’ and 打擊 dǎjī ‘hit, strike’, indicates that the pandemic has inflicted severe damage on Macau’s economy (經濟,  $n = 48$  in the L5/R5 range of 擊) and people’s livelihoods. The second topic, conveyed by 抗擊 kàngjī ‘resist (an) assault’ and similar words, articulates Macau’s response to the pandemic attack.

The impact of the pandemic is mostly described with words containing 擊 (cf. Table 2). The examples containing these words consistently refer to the impact of Covid-19 on the major economic sectors of Macau, such as 博彩業 ‘gaming/gambling’, 觀光旅遊產業 ‘sightseeing and tourism’, 餐飲業 ‘catering’, and 零售業 ‘retail’. Also in great trouble and pushed to the verge of bankruptcy were 中小微企 ‘small, medium, and micro

enterprises'. For many of these the impact was heavy and severe at times—for example, 沉重打擊 'heavy blow', 嚴重衝擊 'severe impact, shock', and 這一波打擊確實致命 'this wave of attack is indeed fatal'. As a traditional 'sunset' industry, Macau's fishery was depicted as under 夾擊 *jiājī* 'a pincer attack', a plight caused by both the fishing off-season and the pandemic. The instances of words containing 擊 tend to convey a sense of the brutality and suddenness of the attack, often explicitly depicting war scenarios using military terms. For example, 新冠肺炎疫情是 [...] 未知病毒對人類發起的突然襲擊 'the Covid-19 pandemic is [...] a sudden ambush launched by an unknown virus on human beings' (keywords bolded for emphasis). Like 擊, the words with 襲- *xí* 'to ambush', and 創 *chuàng* 'to inflict (damage)' (cf. Table 2) denote the heavy assault of the pandemic on Macau's socio-economic sectors—e.g. 疫情突然來襲, 銷情比預期下滑 'the pandemic struck suddenly, sales were lower than expected', and 旅遊業會飽受重創 'the tourism industry has been gravely damaged'.

In relation to the second topic, the word 抗擊 'resist (an) attack' (*n* = 37) collocates almost exclusively with 疫情 'the pandemic situation'. It evokes the frame that the invader's attack has been resisted, a topic we will focus on in the following section.

Ontologically, the attack-words bring focus to the aspect of assault and damage in a war, suggesting that the pandemic has inflicted a brutal blow on Macau across a wide range of economic sectors. The attack and damage metaphor is only used when the agent is the pandemic, never human beings. This metaphor underlines that the pandemic is the aggressor in the war.

*The pandemic is a WAR of defence. The defence-words* include 防 *fáng* 'guard', 抗 *kàng* 'resist', and 守 *shǒu* 'keep safe'. This third set of words denotes people's defensive actions against the aggressor—the Covid-19 pandemic. Table 3 lists the top defence-words that collocate with 疫, which entail various anti-pandemic measures, comparable to defensive battles. The total co-occurrence count of the items in Table 3 (*n* = 665) is several times as many as that in Table 1 (*n* = 99) and Table 2 (*n* = 112), indicating that various aspects of defensive tactics were heavily discussed, whereas, by contrast, lexical expressions relating to offensive actions against the virus were rarely found. 防疫 *fángyì* 'prevention of pandemic', the most frequently-occurring item in Table 3, co-occurs with various military terms, which include nouns such as 前線 *qiánxiàn* '(the) frontline', 崗位 *gǎngwèi* 'post, position', 指揮部 *zhǐhuī bù* 'command post', and verbs such as 堅守 *jiānshǒu* 'strenuously defend' and 嚴守 *yánshǒu* 'strictly

guard'. The 防-words project a situation of positional warfare, or, more specifically, Macau's medical personnel and residents holding fast to their frontline posts against the attack from the virus—for example, (1) and (2). The wording of (1) sounds particularly military—it refers to the medical quarantine stations at the ports both as the frontline and as the battlefield, and portrays a medical officer as a valiant (奮勇) volunteer to join the fight, after holding fast (堅守, 嚴守) to the anti-pandemic position day and night. The metaphors of defensive positional warfare signal the strategic emphasis of Macau's anti-pandemic campaign—to firmly hold position against the attacker's vigorous attempts to break through. Like the 防-words, the WAR metaphors are fleshed out by 抗- and 守-words (Table 2)—e.g. in (1) and (3).

- (1) 副理事長梁珍身為醫務人員, 日夜堅守崗位, 嚴守抗疫防疫陣地的使命 [...], 支持前線關口醫學檢疫站時, 她自告奮勇報名上戰場。(MD20200309) 'As a medical officer, Liang Zhen, Deputy Chair of the board of directors, **held fast to her post** day and night, **holding on** to the mission of the pandemic-prevention **position** [...]; to support the **front-line** medical quarantine station at the port, she **valiantly** volunteered to sign up to enter the **battlefield**.'
- (2) 嚴陣以待, 做好防疫工作 (MD20200128) '**hold fast to the post**, (and) do the pandemic-prevention job well'
- (3) 對抗肺炎, 全面封鎖似乎是迄今最有效的防疫措施 (MD20200709) 'To **combat** the pulmonary disease, a **complete blockade** seems to be the most effective preventive measure to date.'

The words using 防, 抗, and 守 conveyed to the public that the pandemic entailed defensive battles that needed to be fought proactively, vigilantly and persistently.

*Other words and expressions for WAR metaphors.* Apart from the three sets of words above, several lexical items conveyed WAR metaphors, and the frequencies of these are summarised in Table 4.

In summary, WAR metaphors used in the context of Covid-19 mainly consist of three more specified metaphors. The PANDEMIC IS A BATTLE metaphor specifies that the war against Covid-19 will be long and involve many battles at various times in different areas. The PANDEMIC IS AN ATTACK metaphor highlights the role of the pandemic as the aggressor and the damage sustained by Us (Macau residents). Lastly, the PANDEMIC CALLS FOR OUR DEFENCE metaphor stresses that the public are stakeholders and that what they do can help prevent the attack and related damage.

**Table 3** Defence-words that collocate with the character 疫 in the L5/R5 range.

	pinyin	gloss in English	co-occurrences	candidates	T-score	LogDice
防	<i>fáng</i>	'resist, defend'	11	30	3.203	5.413
防疫	<i>fángyì</i>	'defend pandemic'	228	1921	13.498	9.495
嚴防	<i>yánfáng</i>	'tightly guard against'	26	41	4.998	6.652
聯防	<i>liánfáng</i>	'jointly guard against'	21	68	4.396	6.339
防範	<i>fángfàn</i>	'guard against'	18	64	4.053	6.117
防線	<i>fángxiàn</i>	'defence line'	8	28	2.704	4.954
抗	<i>kàng</i>	resist, counter	74	99	8.457	8.151
抗疫	<i>kàng yì</i>	anti-pandemic	168	884	12.103	9.207
對抗	<i>duìkàng</i>	confront	42	45	6.393	7.343
守	<i>shǒu</i>	defend	10	17	3.095	5.277
堅守	<i>jiānshǒu</i>	hold fast	30	60	5.339	6.855
守護	<i>shǒuhù</i>	protect, guard	12	26	3.370	5.539
嚴守	<i>yánshǒu</i>	strictly guard	8	9	2.788	4.957
緊守	<i>jǐn shǒu</i>	tightly defend	6	22	2.336	4.540
駐守	<i>zhùshǒu</i>	station to guard	3	33	1.492	3.538
total			665	3347		

**Table 4 Other lexis on WAR metaphors that collocate with the character 疫 in the L5/R5 range.**

	pinyin	gloss in English	co-occurrences	candidates	T-score	LogDice
打...仗	dǎ...zhàng	'fight (a) battle'	17	18	3.546	5.656
前線	qiánxiàn	'frontline'	91	356	9.070	8.406
最前線	zuì qiánxiàn	'forefront'	4	6	1.962	3.957
嚴陣以待	yánzhèn yǐdài	'hold fast to one's position and wait (on the attacker)'	10	15	3.103	5.278
total			122	395		

From the WAR metaphors expressed in the frequently-used lexical items we identified above, we now proceed to investigate the major themes that were articulated by the lexical items on Covid-19.

**Themes delivered by WAR metaphors.** To answer the second research question on the major themes conveyed by the WAR metaphors, we queried the subcorpus on war and pandemic ('SWaP', cf. Method) and identified three recurrent themes based on the frequency of the topical keywords:

Theme 1: Describing the *gravity* of the situation

Theme 2: Communicating anti-pandemic measures

Theme 3: Calling for a joint effort

In terms of the use of different metaphors, we found that Theme 1 is expressed mainly using the PANDEMIC IS AN ATTACK metaphor. Themes 2 and 3 both employ a mixture of the PANDEMIC IS A SERIES OF BATTLES and PANDEMIC IS A BATTLE OF DEFENCE metaphors.

Table 5 presents the keywords that articulate these themes, each of which will be examined individually in the sections that follow.

*Theme 1: Gravity of the situation under the pandemic attack.* The first theme stresses the gravity of the pandemic situation, both medically and socio-economically. Frequently occurring expressions such as 嚴重的威脅 'serious threat', 嚴重衝擊 'seriously hit', 嚴重影響 'seriously/badly impact', (疫情) 嚴峻 'the pandemic is severe', and 嚴峻挑戰 'tough challenge' (cf. Table 5) convey the message that the health system is under great threat and various economic sectors have also been severely affected. As discussed earlier, attack-words (cf. Table 2) encompass the metaphor 'THE PANDEMIC IS AN ATTACK', outlining the severe and extensive damage caused by the pandemic, and in particular, the major impact on businesses and people's livelihoods. Note that this theme and the main metaphor (PANDEMIC IS AN ATTACK) assign the pandemic the role of the agent/aggressor. Therefore, in addition to underlining the impact, this theme, with its accompanying metaphor, also clearly identifies the pandemic as the enemy (the opposing belligerent).

*Theme 2: Communicating anti-pandemic measures.* The second theme communicates to the public about the work (工作,  $n = 378$ , cf. Table 5) and actions to perform in responding to (應對) this grave situation. This begins with formulating (制訂, 制定) and promulgating anti-pandemic measures (措施,  $n = 325$ ). The government's enactment and enforcement of anti-pandemic policies (政策), guidelines (指引), and mechanisms (機制) was regularly communicated to the public, followed by the implementation (實施) of relevant measures. These measures operated top-down from the authorities to different levels of the community, with considerable emphasis on border-crossing (出入境  $n = 53$ ) restrictions (限制). The government (政府,  $n = 376$  in

**Table 5 Three themes in SWaP delivered by frequently-used words.**

Themes	words with pinyin and English gloss	n=
1. Gravity of the situation	影響 yǐngxiǎng 'influence, affect'	80
	衝擊 chōngjī 'strike, shock'	64
	嚴重 yánzhòng 'serious, grave'	30
	嚴峻 yánjùn 'severe' and attack-words (cf. Table 2)	28
	工作 'work'	378
2. Anti-pandemic measures	政府 'government'	376
	措施 'measure'	325
	當局 'authority'	73
	應對 'in response to'	66
	政策 'policy'	65
	管理 'management'	63
	出入境 'border crossing'	53
	指引 'directions, guidelines'	51
	機制 'mechanism'	51
	實施 'implement, execute'	33
	限制 'limit, restraints'	30
	制訂/制定 'formulate'	26
	3. Call for joint efforts	配合 'cooperate with, in support of'
市民 'citizens, residents'		88
支持 'support'		86
積極 'rigorously, actively'		65
呼籲 'appeal to, call for'		63
共同 'jointly'		60
遵守 'observe, obey'		48
減少 'reduce'		35
避免 'avoid'		30

SWaP, also same below) is presented as the leader of the anti-pandemic campaign, with the relevant authorities (當局,  $n = 73$ ) as the initiators of the various specific measures.

In February 2020, in response to the pandemic, the Macau government proposed a policy of “戰疫情, 穩經濟, 保就業, 促民生” zhàn yìqíng, wěn jīngjì, bǎo jiùyè, cù mínshēng 'fight the pandemic, stabilise the economy, safeguard employment, promote residents' livelihoods'. The WAR IS A SERIES OF BATTLES metaphor depicts the fight as ongoing and episodic (as battles in a war). This, in turn, facilitates the long-term commitments of the citizen as well as their willingness to adopt specific tactics associated with each stage of the war (i.e. different battles). As reported in MD, this policy has been frequently quoted by government officials, members of the legislative assembly, and civil society leaders, who have proposed various ways to deal with the pandemic situation in line with the overall policy.

- (4) 當局現將防疫戰線向前推進, 希望從入境時阻截來自高發地區的可疑病例。(20200312) 'The authorities are now pushing forward the pandemic-prevention **frontline**, hoping to **intercept** the suspicious cases from high-risk areas upon entry.'

- (5) 特區政府要繼續嚴格防控疫情，擬好應對預案，令圍堵疫情政策更完善，打好這場抗戰。(20200310)

‘The SAR government should continue to strictly prevent and contain the pandemic, formulate a response plan, make **policies to confine and block** the pandemic more effectively, and **fight well in the battle** against the pandemic.’

Government policies were discussed in MD using a variety of military terms. Example (4) conveys the words of a medical doctor who coordinated Macau’s quarantine stations, in which he explained the rationale for the government’s imposition of new quarantine restrictions on travellers. He described the defence line against the pandemic as 戰線 *zhànxiàn* ‘a battle line’, which the government decided to move farther away from Macau to more effectively intercept suspected cases coming from high-risk regions. In (5), 夏耘 *Xià Yún*, an MD columnist, drew on the military tactic of *envelopment*—圍堵 *wéidǔ* ‘to contain’—to propose that the government’s policies should be more appropriately tailored to contain the virus, just like besieging and blocking enemy forces. He framed the whole undertaking as 打... 抗戰 *dǎ...kàngyì zhàn* ‘fighting ... (the) anti-pandemic battle’. The defensive-war frame invoked here helps to convey the anti-pandemic measures as defensive battle tactics. The implication is that Macau’s citizens, as soldiers at war, would willingly follow commands and execute orders effectively.

*Theme 3: Call for collective action.* The third theme is about persuading the public to act together (共同,  $n = 60$  in SWaP) against the pandemic. Following the government-initiated policies and measures, MD reports urged various sectors of the community to come together to support (配合 ‘cooperate with’,  $n = 123$ ) the policies and implement the recommended measures, often using military terms and modal verbs such as 要 ‘shall, need to’ in (6) and 需要 ‘need to’ in (7).

- (6) 政府既要繼續做好防疫政策工作，民間的企業營運、個人生活也要端正抗疫心態，謹慎做好防疫措施，[...]，杜絕一放寬即失陷的尷尬局面 (20200715)

‘The government **shall** continue to do well in its work on anti-pandemic policies, while private enterprises’ operations and each individual’s attitude towards their lives **shall** also be appropriate to an anti-pandemic mentality, to carefully implement anti-pandemic measures, [...] to avoid the embarrassing situation in which (the city) **falls** (to the pandemic) as soon as the restrictions are relaxed.’

- (7) 提醒隨著社會活動恢復，社區及活動場所人流聚集增多，各方更需要堅持防疫指引，自覺遵守及配合防疫工作，堅守防疫關口。(20200811)

‘One warns that, with the resumption of social activities and the increase in the flow of people in communities and venues, *all parties shall* adhere to the pandemic-prevention guidelines, and consciously abide by and support the pandemic prevention work, **firmly guarding** the pandemic prevention **passes** (ports).’

Example (6) is taken from an article by 春耕 *Chūn Gēng*, an MD columnist. In the event of the government’s relaxation of travel restrictions in relation to Guangdong province, 春耕 warned that both private enterprises and individuals must remain vigilant, both mentally and in taking anti-pandemic precautions, because otherwise Macau would quickly 失陷 *shīxiàn* ‘fall, be conquered’ by the pandemic. Similarly, in (7), a member of the Macau Legislative Assembly stressed that *all parties* (各方) should take on the responsibility of guarding the passes/ports (關口) against the pandemic, by voluntarily observing the anti-pandemic guidelines and supporting pandemic prevention work. Both (6) and (7) invoke the frame of defensive warfare, in which

the need for enterprises and individuals to support and implement the government’s anti-pandemic policies and measures seems self-evident.

Apart from modal verbs, the performative verb 呼籲 ‘appeal to’ ( $n = 63$  in SWaP) is regularly used to issue a public call for citizens to vigorously (積極,  $n = 65$ ) cooperate with the government to carry out anti-pandemic measures. The pandemic situation required citizens to adopt certain behaviours—e.g. no gatherings, avoiding crowded places, wearing masks, and taking personal preventive measures (PPMs). Calls for action were frequently issued in MD by the medical authorities, the Chief Executive, the Secretary for Social Affairs and Culture, and the heads of the security police and other government agencies, using military terms—for example, in (8). In addition, the leaders of local societies and associations, members of the Legislative Assembly, and columnists for MD were keen to call on the public to observe (遵守,  $n = 48$ ) the government’s directives and guidelines, in the context of an ongoing anti-pandemic war—for example, in (9).

- (8) 社會文化司司長歐陽瑜昨在記者招待會上表示，本澳[...]仍處防控關鍵時刻，再次呼籲市民留在家中，減少不必要外出。“如果不繼續堅守這道防線，可能導致疫情在社區爆發。”(20200214)

‘Ao Ieong U, Secretary for Social Affairs and Culture, stated at the press conference yesterday that Macau [...] is still at a critical moment for prevention and control, and once again she **urged** citizens to stay at home and reduce unnecessary outings. “If this **line of defence** is not continually **held fast**, it may lead to an outbreak of the pandemic in the community.”

- (9) 呼籲全澳市民能夠積極配合特區政府防疫工作，避免外遊，減少聚集，守好小家為大家，齊心協力戰勝這場防疫持久戰。(20200320)

‘We **call** on all Macau citizens to actively cooperate with the SAR government’s pandemic prevention work, avoid travelling outside, reduce gatherings, and **protect** their own homes for the sake of everyone’s homes, working together to win this **protracted battle** against the pandemic.’

Example (8) is an extract from a speech by the Macau Secretary for Social Affairs and Culture, in which she urged the public to stay at home as much as possible to prevent the spread of the virus, comparing this with soldiers’ ‘holding fast’ to the line in *defensive warfare*. Similarly, in (9) the executive chair of the Macau Women’s General Association urged all Macau’s citizens to support the government’s anti-pandemic work by avoiding travelling and reducing the number of gatherings. Her call for action is presented in the frame of defensive battles. In this example, each citizen’s safeguarding of their own home also protected everyone’s home. Like Theme 2, Theme 3 is built upon the combination of the battle metaphor and the defensive metaphor, underlining the specific safeguarding tactics that require the compliance and commitment of all citizens in a prolonged multi-episodic struggle.

**Calls for cooperation are based on the prospect of collective gains.** In this section, we apply the prospect-theoretic framework to examine the persuasiveness of the calls for action in SWaP. Calls for action are frequently and earnestly made in MD by the local government, authorities, and community leaders, inviting and requiring residents and enterprises to act in specific ways to contain the pandemic (cf. Theme 3). The behaviours they promote include using PPMs and social distancing, avoiding outings, gatherings, and travel, keeping mentally vigilant and staying positive and cooperative, and

**Table 6** Calls for action using appeal-word 籲 *yù* in SWaP: gain and loss frames and appeals to collectivism/individualism.

	Gain	Loss	Both	Nil	Total
Collectivism	30	1	3	4	38
Individualism	9				9
Both	3	1	1		5
Nil	8	2		10	20
Total	50	4	4	14	72

adopting government directives. We focused on two lexical items that are almost exclusively used to communicate the calls for action—呼籲 *hūyù* ( $n = 60$ ) and 籲 *yù* ( $n = 31$ ), both meaning ‘appeal to, urge’. We checked all of the sentences that contain 籲 in SWaP to remove duplications, headlines, and noises, and manually coded each instance in terms of whether it is framed as a gain or loss, and whether it appeals to personal or collective interests. The instances that indicate gains, benefits, or reduced losses were coded as the prospect of ‘gain’, while those denoting potential losses or disadvantages were coded as ‘loss’.

Table 6 indicates that, of the 72 instances of 呼籲 and 籲 in SWaP, a large majority ( $n = 50$ ) raises *only* the prospect of gain in the call for action. There are also a few instances in which either the prospect of loss *only* ( $n = 4$ ) or *both* gain and loss ( $n = 4$ ) are indicated. The calls for action that do not mention the prospect of a clear gain/loss constitute a minority ( $n = 14$ )—for example, demanding that residents stay at home or urging fishermen who were returning to Macau to observe the government’s anti-pandemic guidelines.

Contrasting the instances of gain frames with those of loss frames shows that the latter are much simpler than the former in terms of type and content. The losses ( $n = 4$ ) were expressed as stark warnings that, if the defence against the virus was compromised, a community outbreak would occur (example 8), all previous efforts would have been in vain, and plans to reopen the borders would have to be abandoned. Unlike losses, gains ( $n = 50$ ) were expressed using richly varied content, evincing two distinct types with numerous examples. One type ( $n = 13$ ) pertains to *gains from reducing the risk* (abbreviated hereafter as ‘GRR’) of losses, as treated in the health communication literature. For example, one’s risk of being infected is reduced by observing PPMs—a gain frame. The other type of gain frame ( $n = 36$ ) specifies the benefits of performing the desirable acts—for example, defeating the pandemic (example 9), supporting the frontline personnel and Macau’s anti-pandemic work, protecting staff and workplace safety, safeguarding the homeland, revitalising the economy, resuming travel and normal lives, and building a better tomorrow. It marks the gain as increased benefits (abbreviated as ‘GIB’), and this is the most prominent type of gain found in SWaP. There are also a few instances of calls for action in which two types of gain/loss frame are used together—for example, the co-occurrence of GRR and GIB ( $n = 1$ ), that of loss and GIB ( $n = 3$ ), and that of loss and GRR ( $n = 1$ ). For example, both GIB and loss are mentioned in 呼籲全澳市民[...]避免外遊, 減少聚集, 全民齊心合力戰勝疫情否則將功虧一簣 ‘urge every citizen of Macau [...] to avoid outbound travel, reduce gatherings—all the citizens work together to defeat the epidemic (GIB), otherwise, the efforts will fall short (loss)’.

We also investigated whether the gain (or loss) specified in the calls for action was for individuals or the collective. This distinction is needed because wars, in general, aim for gains for the collective but at the expense of the loss of the individuals who fight the battles. We were interested in examining how the conflict between the collective interest/gain and that of

individuals is treated in MD. The results indicate that collective gains are highlighted and promoted, whereas individual losses are downplayed. Losses concern both the instances of the *loss-only* frame ( $n = 4$ ) and those of the *both-gain-and-loss* frame ( $n = 4$ ). Of the eight instances taken together, in only two cases is a loss incurred by individuals referenced—one in which losses for the collective are also expressed, and the other in which both gain and loss for both the individual and the collective are mentioned. The first instance stipulates that individuals who fail to make accurate health declarations will be penalised (individuals’ loss), and this will also negatively impact the general public’s expectations regarding orderly progress toward border reopening (losses for the collective). Absent in the calls for action in SWaP is the scenario of collective gains achieved at the expense of individual losses. Instead of presenting the collective benefits and individual interests as conflicting factors, numerous calls for action attempted to harmonise the two, expressing views such as 為自己、家人及澳門, (不要外出及不要聚集) ‘for oneself, (one’s) family members, and (for) Macau (avoid gatherings and outings)’ and suggesting that protecting one’s household (‘small family’) means protecting everyone (‘larger family’), as in example (9). Similarly, gains are expressed mainly in terms of the collective ( $n = 30$ )—for example, for all residents of Macau (全體市民, 廣大居民), the whole society (全社會, 社會整體), and Macau society (本澳社會). Mentions of *individual* gains were only made in nine instances, which include reducing one’s risk of infection, safeguarding one’s health, and protecting the safety of workers, overseas students, and residents. The appeal to collective gains is, therefore, the most prevalent in the calls for action in SWaP.

Interestingly, MD mainly focuses on collective gains. Individual gains are only mentioned in the context of being leveraged and aggregated to achieve collective gains. Collectivism is brought to life in SWaP through a rich repertoire of lexical items, while individualistic expressions occur occasionally and only alongside collectivistic expressions—e.g. 守好小家為大家 ‘guard well (one’s) small family for the sake of the big family/everyone’ in (9). Some recurring collectivistic expressions are 全城 ‘the whole city (of Macau)’, 社會各界 ‘all sectors/circles of the community’, 整個社會團結一致 ‘the entire society being united’, 攜手 ‘join hands’, 眾志成城 ‘be united and with one mind’, 同心同德 ‘(with) one heart and one mind’, 並肩作戰 ‘fight together shoulder to shoulder’, 共度時艱 ‘live through the difficult time *together*’, 大灣區聯合 ‘the Greater-Bay-area *alliance*’, 內地省份和澳門特區共同抗擊 ‘the provinces of mainland China and Macau *jointly* fight back’, and even the proposed unity of 全球華人 ‘all the Chinese around the globe’.

## Discussion

We have observed that War for Collective Gains (WaCog) is the dominant framing model that MD adopted to persuade readers to perceive the situation as an emergency and to participate in implementing stringent control measures. The persuasiveness of this model derives from two elements—WAR metaphors and collective gains.

First, WAR metaphors are conventional framing devices that facilitate the mobilisation of the public for joint action on the metaphorical “battlefields”. They are versatile and were expressed by mapping from specific concepts in the domain of war—such as ATTACK, BATTLE, and DEFENCE. In MD, the novel coronavirus was depicted as a bellicose adversary, creating a state of war between Us and Them. To combat Them in episodic battles with unity and persistence required Us to devise defensive tactics and strategies. Using WAR metaphors for Covid-19 accorded the highest priority to Our prompt responses.

Second, MD adopts a gain frame by highlighting the hard-won containment of the virus and envisioning a bright future for



Macau where the borders reopen and the economy is restored. Gain-framing induces risk aversion, according to Prospect Theory, and this would arguably reinforce residents' compliance with health directives and lockdown measures. This element potentially enhances the persuasiveness of public health messages.

The two devices—WAR metaphors and gain-framing—work together to deliver a combined persuasive effect. War is about collective gains at the expense of inevitable personal losses, and the former outweighs the latter. The WaCog model introduced this rationale to the pandemic situation—the city's successful containment of the virus outweighs individuals' losses. The gain frame underscores the cause of 'fighting' for the city and lifts its citizens' morale. WaCog aimed to shift citizens' perception from suffering and losses under the pandemic to a frame of achieving victories against the adversary. We argue that it is crucial to integrate both metaphorical and gain/loss framing in an analytic framework to obtain a more gestalt view of the mechanism of persuasive messaging. A distinction between collective and individual gains/losses enables more fine-grained and revealing findings (cf. S. Wang et al. 2022; X. Wang et al. 2022).

WaCog was the prevailing model in MD for more than 2.5 years until the Omicron variant infected the city towards the end of 2022. The course of the pandemic showed that the model became ineffective as time passed. Above all, there are fundamental differences between a pandemic and a war. A pandemic involves the interaction between viruses and humans, in which the human immune system's overreaction can be fatal, whereas war is between human groups who intentionally inflict casualties. Declaring war on the virus may initially mobilise humans, but a pandemic, like natural disasters, has its own dynamics and cannot be completely subdued by human efforts. Using strong military language such as 'annihilate', 'overcome', and 'decisive battle' is likely to be futile if the virus persists. Once it became clear that we will need to live with the virus for the foreseeable future, the continued reliance on the annihilation model ('life or death' between Us and Them) became unrealistic and unconvincing. In addition, collective gains through WaCog are likely to be challenged, particularly after individual rights and freedoms have been restricted for months or years. The years of the pandemic witnessed economic downturn, unemployment, lockdowns, distress and depression, both locally and globally, casting a gloomy outlook on the future. Once both war metaphors and collective-gain-framing lose their appeal for most people, there is an urgent need to develop new (metaphorical) models to conceptualise ways of living with the virus. The transition of Covid-19 from pandemic to endemic disease requires a shift in the conceptual model, probably away from WaCog, to cope more effectively with the new situation.

## Conclusion

This study investigated the use of two framing devices—metaphors and the prospects of gain/loss—in Covid-19 reporting in the Macau Daily News (MD), the most influential conventional news outlet in this Asian context. It found that MD's Covid-19 coverage has been framed predominantly using WAR metaphors and also by the prospect of collective gains. This worked well when the pandemic was under control, although preventive measures still needed to be implemented diligently and with great care. Our study underscores the value of examining the interplay between the two framing devices to better understand how they shape the combined framing effect of persuasive messages in this context.

## Data availability

All articles from the Macau Daily News are accessible at <http://www.macaodaily.com/>. The copyright is owned by the Macau Daily News. The dataset is shared in supplementary information

files, which are available from the corresponding author upon reasonable request.

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## Notes

- 1 Data accessed from <https://www.ssm.gov.mo/apps1/PreventCOVID-19/en.aspx#clg17046>
- 2 Note that 疫 is the original wordform/character for an epidemic in Chinese. It consists of the radical 疒 'disease' and an additional (phonetic) component of 爫, shared and most likely borrowed from the wordform/character 役 'battle'. The component 爫 'holding a weapon' is a good example of the semantic contribution of the non-radical component of a character (traditionally known as the 'phonetic component'), and is indeed the nonvariant part of the two variants of 'battle': 役 and 仗. Given the clear semantic content of the component 爫, also found in 殺 'to kill', 段 'to sever', 擊 'to hit, to strick' etc., its selection as a component of 疫 'epidemic' may also be meaningful. It would be interesting to explore the hypothesis that the encoding of this component is motivated by metaphor.

## References

- Ahrens K, Jiang M (2020) Source domain verification using corpus-based tools. *Metaphor Symb* 35(1):43–55. <https://doi.org/10.1080/10926488.2020.1712783>
- Baehr P (2006) Susan Sontag, battle language and the Hong Kong SARS outbreak of 2003. *Econ Soc* 35(1):42–64. <https://doi.org/10.1080/03085140500465840>
- Brailovskaia J, Miragall M, Margraf J et al (2021) The relationship between social media use, anxiety and burden caused by coronavirus (COVID-19) in Spain. *Curr Psychol*. <https://doi.org/10.1007/s12144-021-01802-8>
- Castro Seixas E (2021) War metaphors in political communication on COVID-19. *Front Sociol* 5:583680. <https://doi.org/10.3389/fsoc.2020.583680>
- Charteris-Black J (2021) Metaphors of coronavirus: invisible enemy or zombie apocalypse? Palgrave Macmillan, Cham
- Chen I-H, Long Y, Lu Q et al. (2019) Metaphor detection: leveraging culturally grounded eventive information. *IEEE Access* 7:10987–10998. <https://doi.org/10.1109/ACCESS.2019.2892042>
- Chen T, Dai M, Xia S et al. (2022) Do messages matter? Investigating the combined effects of framing, outcome uncertainty, and number format on COVID-19 vaccination attitudes and intention. *Health Commun* 37(8):944–951. <https://doi.org/10.1080/10410236.2021.1876814>
- Chiang WY, Duann RF (2007) Conceptual metaphors for SARS: 'war' between whom? *Discourse Soc* 18(5):579–602. <https://doi.org/10.1177/0957926507079631>
- Chu L, Fung HH, Tse DCK et al. (2021) Obtaining information from different sources matters during the COVID-19 pandemic. *Gerontologist* 61(2):187–195. <https://doi.org/10.1093/geront/gnaa222>
- Flusberg SJ, Matlock T, Thibodeau PH (2018) War metaphors in public discourse. *Metaphor Symb* 33(1):1–18. <https://doi.org/10.1080/10926488.2018.1407992>
- Gantiva C, Jiménez-Leal W, Urriago-Rayó J (2021) Framing messages to deal with the COVID-19 crisis: the role of loss/gain frames and content. *Front Psychol* 12:568212. <https://doi.org/10.3389/fpsyg.2021.568212>
- Gillis M (2020) Ventilators, missiles, doctors, troops ... the justification of legislative responses to COVID-19 through military metaphors. *Law Humanit* 14(2):135–159. <https://doi.org/10.1080/17521483.2020.1801950>
- Le Guin UK (2012) *A wizard of earthsea*. Houghton Mifflin Harcourt, Boston
- Hong Y, Hashimoto M (2021) I will get myself vaccinated for others: The interplay of message frame, reference point, and perceived risk on intention for COVID-19 vaccine. *Health Commun*. <https://doi.org/10.1080/10410236.2021.1978668>
- Huang L, Li OZ, Wang B et al. (2022) Individualism and the fight against COVID-19. *Humanit Soc Sci Commun* 9:120. <https://doi.org/10.1057/s41599-022-01124-5>
- Huang Y, Liu W (2021) Promoting COVID-19 vaccination: The interplay of message framing, psychological uncertainty, and public agency as a message source. *Sci Commun* 44(1):3–29. <https://doi.org/10.1177/10755470211048192>
- Isaacs D, Priesz A (2021) COVID-19 and the metaphor of war. *J Paediatr Child Health* 57(1):6–8. <https://doi.org/10.1111/jpc.15164>
- Jiang M, Dodoo NA (2021) Promoting mask-wearing in COVID-19 brand communications: effects of gain-loss frames, self- or other-interest appeals, and perceived risks. *J Advert* 50(3):271–279. <https://doi.org/10.1080/00913367.2021.1925605>
- Lakoff G, Johnson M (1980) Conceptual metaphor in everyday language. *J Philos* 77(8):453–486. <https://doi.org/10.2307/2025464>
- Li X (2012) An analysis of Chinese media performance in Macau: their present situation and the future. In: Hao Y, Wu Z (eds) *Blue book of Macau: annual*

- report on economy and society of Macau (2011–2012). Social Sciences Academic Press, Beijing, pp 242–252. (in Chinese)
- Lin Z, Liu S-D (2019) Evolution of media ecology and practice of internet journalism in Macau. *Twenty-First Century* 176:95–112. (in Chinese)
- Lu B (2018) Let young people be patriotic with confidence. In: *Macau Daily News*. Available via CyberCTM. [https://www.cyberctm.com/zh\\_TW/news/detail/2190032#YW4g5xwRW71](https://www.cyberctm.com/zh_TW/news/detail/2190032#YW4g5xwRW71) (in Chinese) Accessed 07 Mar 2018
- Mach KJ, Reyes RS, Pentz B et al. (2021) News media coverage of COVID-19 public health and policy information. *Humanit Soc Sci Commun* 8:220. <https://doi.org/10.1057/s41599-021-00900-z>
- Nie JB, Gilbertson A, de Roubaix M et al. (2016) Healing without waging war: beyond military metaphors in medicine and HIV cure research. *Am J Bioeth* 16(10):3–11. <https://doi.org/10.1080/15265161.2016.1214305>
- Niles I, Pease A (2001) Towards a standard upper ontology. In: Guarino N, Smith B, Welty C (eds) *Proceedings of the international conference on formal ontology in information systems*. Association for Computing Machinery, New York, pp 2–9. <https://doi.org/10.1145/505168.505170>
- O’Keefe DJ, Jensen JD (2007) The relative persuasiveness of gain-framed and loss-framed messages for encouraging disease prevention behaviors: a meta-analytic review. *J Health Commun* 12(7):623–644. <https://doi.org/10.1080/10810730701615198>
- O’Keefe DJ, Jensen JD (2009) The relative persuasiveness of gain-framed and loss-framed messages for encouraging disease detection behaviors: a meta-analytic review. *J Commun* 59(2):296–316. <https://doi.org/10.1111/j.1460-2466.2009.01417.x>
- Olagoke AA, Olagoke OO, Hughes AM (2020) Exposure to coronavirus news on mainstream media: the role of risk perceptions and depression. *Br J Health Psychol* 25(4):865–874. <https://doi.org/10.1111/bjhp.12427>
- Parsi K (2016) War metaphors in health care: what are they good for. *Am J Bioeth* 16(10):1–2. <https://doi.org/10.1080/15265161.2016.1221245>
- Pease A, Fellbaum C (2010) Formal ontology as interlingua: the SUMO and WordNet linking project and global WordNet. In: Huang CR, Calzolari N, Gangemi A, et al., (eds) *Ontology and the lexicon: a natural language processing perspective*. Cambridge University Press, Cambridge, pp 25–35. <https://doi.org/10.1017/CBO9780511676536.003>
- Rachev NR, Han H, Lacko D et al. (2021) Replicating the disease framing problem during the 2020 COVID-19 pandemic: a study of stress, worry, trust, and choice under risk. *PLoS ONE* 16(9):e0257151. <https://doi.org/10.1371/journal.pone.0257151>
- Rothman AJ, Salovey P (1997) Shaping perceptions to motivate healthy behavior: the role of message framing. *Psychol Bull* 121(1):3–19. <https://doi.org/10.1037/0033-2909.121.1.3>
- Ruggeri K, Ali S, Berge ML et al. (2020) Replicating patterns of prospect theory for decision under risk. *Nat Hum Behav* 4(6):622–633. <https://doi.org/10.1038/s41562-020-0886-x>
- Semino E (2021) “Not soldiers but fire-fighters” - metaphors and COVID-19. *Health Commun* 36(1):50–58. <https://doi.org/10.1080/10410236.2020.1844989>
- Shi W, Zeng F, Zhang A et al. (2022) Online public opinion during the first epidemic wave of COVID-19 in China based on Weibo data. *Humanit Soc Sci Commun* 9:159. <https://doi.org/10.1057/s41599-022-01181-w>
- Sontag S (1978) *Illness as metaphor*. Farrar, Straus and Giroux, New York
- Sowden R, Borgstrom E, Selman LE (2021) ‘It’s like being in a war with an invisible enemy’: a document analysis of bereavement due to COVID-19 in UK newspapers. *PLoS One* 16(3):e0247904. <https://doi.org/10.1371/journal.pone.0247904>
- Steen GJ, Dorst AG, Herrmann JB et al (2010) A method for linguistic metaphor identification: from MIP to MIPVU. *John Benjamins*, Amsterdam
- Sun Y, Hu Q, Grossman S et al. (2021) Comparison of COVID-19 information seeking, trust of information sources, and protective behaviors in China and the US. *J Health Commun* 26(9):657–666. <https://doi.org/10.1080/10810730.2021.1987590>
- Taylor C, Kidgell J (2021) Flu-like pandemics and metaphor pre-covid: a corpus investigation. *Discourse Context Media* 41:100503. <https://doi.org/10.1016/j.dcm.2021.100503>
- Thibodeau PH, Boroditsky L (2013) Natural language metaphors covertly influence reasoning. *PLoS ONE* 8(1):e52961. <https://doi.org/10.1371/journal.pone.0052961>
- Toll BA, Rojewski AM, Duncan LR et al. (2014) “Quitting smoking will benefit your health”: the evolution of clinician messaging to encourage tobacco cessation. *Clin Cancer Res* 20(2):301–309. <https://doi.org/10.1158/1078-0432.Ccr-13-2261>
- Tversky A, Kahneman D (1981) The framing of decisions and the psychology of choice. *Science* 211(4481):453–458. <https://doi.org/10.1126/science.7455683>
- Wackers DYM, Plug HJ, Steen GJ (2021) “For crying out loud, don’t call me a warrior”: standpoints of resistance against violence metaphors for cancer. *J Prag* 174:68–77. <https://doi.org/10.1016/j.pragma.2020.12.021>
- Wallis P, Nerlich B (2005) Disease metaphors in new epidemics: the UK media framing of the 2003 SARS epidemic. *Soc Sci Med* 60(11):2629–2639. <https://doi.org/10.1016/j.socscimed.2004.11.031>
- Wang S, Liu R, Huang CR (2022) Social changes through the lens of language: a big data study of Chinese modal verbs. *PLoS ONE* 17(1):e0260210. <https://doi.org/10.1371/journal.pone.0260210>
- Wang X, Ahrens K, Huang CR (2022) The distance between illocution and perlocution: a tale of different pragmemes to call for social distancing in two cities. *Intercult Pragmat* 19(1):1–33. <https://doi.org/10.1515/ip-2022-0001>
- Wicke P, Bolognesi MM (2020) Framing COVID-19: how we conceptualize and discuss the pandemic on Twitter. *PLoS ONE* 15(9):e0240010. <https://doi.org/10.1371/journal.pone.0240010>

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## Author contributions

VXW, LL and C-RH conceived the study, VXW and XC conducted data collection and analysis, VXW, XC and LL drafted the manuscript, and VXW applied for and received the research grant. XC proposed the idea of building the ‘subcorpus of war and pandemic’ (SWaP) and formatted the references. CRH advised on the whole project, and C-RH and VXW reshaped the paper and rewrote the Discussion and part of the Literature review section during the major revisions. All four authors contributed to the major revisions of the paper for resubmissions.

## Competing interests

The authors declare no competing interests.

## Ethical approval

The study does not involve human or animal subjects and was granted exemption from the requirement for ethics approval.

## Informed consent

This article does not contain any studies with human participants performed by any of the authors.

## Additional information

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