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Emotional Implications of Metaphor: Consequences of Metaphor Framing for Mindset about Hardship

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Abstract

Do metaphors shape people's emotional states and mindsets for dealing with hardship? Natural language metaphors may act as frames that encourage people to reappraise an emotional situation, changing the way they respond to it. Recovery from cancer is one type of adversity that many people face, and it can be mediated by the mindset people adopt. We investigate whether two common metaphors for describing a cancer experience – the battle and the journey – encourage people to make different inferences about the patient's emotional state. After being exposed to the battle metaphor participants inferred that the patient would feel more guilt if he didn't recover, while after being exposed to the journey metaphor participants felt that he had a better chance of making peace with his situation. We discuss implications of this work for investigations of metaphor and emotion, mindsets, and recovery.

Keywords: metaphor; framing; emotion; adversity; cancer; battle; journey; mindset; recovery

Introduction

Linguistic metaphor influences the way we reason about social problems (Thibodeau & Boroditsky, 2011, 2013), physical phenomena (Dolscheid & Casasanto, 2013), and scientific concepts (Gentner & Gentner, 1983). These examples demonstrate that metaphor influences rational and deliberate decision-making. Can metaphor also influence emotion?

Metaphor evokes more emotion-related brain activity than literal terms (Citron & Goldberg, 2014), and emotion-laden metaphorical sentences encourage more mental simulation than less emotional metaphorical sentences (Samur et al., 2015). In addition, people who read about a character in a passage that used metaphors felt a greater sense of intimacy with that character than people who read about the character in the absence of metaphor (Bowes & Katz, 2015).

Most of the work on metaphor and emotion has detailed the ways that emotions are described metaphorically (Fainsilber & Ortony, 1987; Kövecses, 2000). For example, anger is described as seeing red, and participants who thought about anger or became angry perceived the color red more than people who didn't (Fetterman et al., 2011). Anger can also be metaphorically described in terms of heat, and people associate anger-related words and angry faces with heat (Wilkowski et al., 2009). Additional evidence suggests that these metaphorical ways of describing emotions (for example, anger as being contained in a bounded space, as opposed to being a fluid) influence the

way people reason about those emotional states (Reali & Arciniegas, 2014). Whether a metaphorical framing can influence people's emotional states remains an open question.

Metaphor is often used in difficult situations. Here, we look at metaphors for overcoming adversity in the context of cancer. We compare the emotional inferences that people make about an individual with cancer after reading about his situation framed as either a battle or a journey, and we find that these metaphors give rise to different emotional inferences related to coping.

Adversity & Coping

The world presents diverse opportunities for dealing with adversity, and the way we think about that adversity matters. In a seminal work, Lipowski (1970) suggested that there are 8 prevalent ways that people attribute meaning to illness. These categories include seeing illness as a challenge, enemy, punishment, weakness, irreparable loss, relief, strategy, or a value. He further suggested that the meaning we attribute to our disease influences our coping abilities, in turn affecting recovery.

One way of coping is by reconceptualizing our experiences. This process of reappraisal allows us to change the way we feel about something by changing the way we think about it. At the neural level, reappraisal involves interactions between the prefrontal control systems that implement reappraisal strategies and emotional appraisal systems like the amygdala that generate an affective response (Ochsner & Gross, 2005). Similar work has shown that physical health improves when health concerns like stress are framed in more positive ways (Crum et al., 2013).

Can we alter our mindset about a difficult situation by invoking different metaphors? Can metaphor facilitate reappraisal of hardship to improve coping and health outcomes?

Language about Cancer

Over 1.6 million people are diagnosed with cancer each year. Upon diagnosis, are they beginning a battle or a journey with the disease? Psychological variables can affect recovery. For example, mental states like chronic stress, depression, and social isolation are linked with the biological pathways involved in cancer's progression, compromising functions like immune response and cancer cell death (Lutgendorf & Sood, 2011). Women with breast cancer who had more optimistic expectations of their

surgeries experienced less pain, nausea, and fatigue one week after surgery than those with negative expectations (Montgomery et al., 2010). Further, breast cancer patients with greater social support and a tendency to minimize the importance of their disease experienced better prognoses, while those demonstrating depression and constraint of emotions had lower levels of survival (Falagas et al., 2007).

Metaphors are pervasive in language about cancer. Casarett and colleagues found that oncologists used metaphors in roughly two thirds of their conversations with patients (2010). Patients also rated physicians who used more metaphors as better communicators and easier to understand than those who used fewer.

The predominant metaphor when discussing cancer is that of a battle (Reisfield & Wilson, 2004; Penson et al., 2004). This metaphor seems so deeply ingrained in our culture that a “fighting spirit” is one of the five categories in the Mental Adjustment to Cancer (MAC) scale, which is frequently used to assess patients’ mentalities about their disease (Greer et al., 1989). On this scale, someone with a fighting spirit “fully accepts the diagnosis, uses the word ‘cancer’, is determined to fight the illness, tries to obtain as much information as possible about it and adopts an optimistic attitude; may see the illness as a challenge” (p. 374). The other four states – helplessness/hopelessness, anxious preoccupation, fatalism, and denial – are all negative. Because the only positive adjustment state involves conceptualizing cancer as a battle, this scale demonstrates that not only do we think of cancer as a battle, but those who designed and use the scale assume that patients *should* think of it that way. On the other hand, in one study women with metastatic cancer tended to associate their disease with the concepts of enemy, punishment, weakness, and irreparable loss more than patients with earlier stage cancer, suggesting that the battle metaphor seems more appropriate to the sickest people (Wallberg et al., 2009).

Our societal belief in the battle metaphor is also evident in interventions like the game Re-Mission, touted on its website (www.re-mission.net) as “the original cancer-fighting game.” In the game, players fire treatments at growing tumors, drop chemo bombs on cancer cells, and collect healthy cells to earn points. Cancer patients aged 13-29 who regularly played Re-Mission showed greater adherence to their treatments, self-efficacy, and knowledge about the disease than those who did not (Kato et al., 2008).

Despite the prevalence of the battle metaphor, some researchers, patients, and physicians intuit that a battle, inherently violent, masculine, and power-based, may not be a productive framing for cancer. It may suggest that someone wins (recovers) if they try hard enough, a message that disregards more social and emotional aspects of healing (Reisfield & Wilson, 2004). A battle mindset may encourage suppressing negative feelings and imply the importance of treatment at all costs (Harrington, 2012). Further, it is conceptually inaccurate because cancer does not involve enemy invaders; instead, one’s own cells are the enemies (Reisfield & Wilson, 2004). In one study, cancer

patients perceived their clinicians as promoting a positive attitude and a “fighting spirit,” which they then internalized as encouragement to conceal their emotional distress (Byrne et al., 2002).

One alternative is to describe cancer as a journey. There is no winning, losing, or failing on a journey; the emphasis is instead on a variety of possibilities and a larger process, since life itself is often compared to a journey (Reisfield & Wilson, 2004). One’s experience with cancer is therefore just one part of a larger narrative (Harrington, 2012).

Despite the prevailing intuition that battle metaphors may do more harm than good, there is likely no perfect metaphor to talk about cancer. Different metaphors are likely to help different patients experiencing widely different circumstances (Reisfield & Wilson, 2004; Penson et al., 2004). In fact, a corpus analysis of online support forums and blogs written by patients and health professionals demonstrated that the battle was not inherently bad, nor was the journey inherently good (Semino et al., 2015). Both patients and health professionals used each of the metaphors in both empowering and disempowering contexts.

Metaphor & Reasoning

Metaphors often allow us to think about complex ideas by drawing on domains we have experience with. For example, when people used an analogy comparing the flow of electricity in a circuit to that of water through pipes, they made different inferences about the flow of electricity than people who use compared it to crowds of mice running along a track (Gentner & Gentner, 1983). The students made metaphor-consistent inferences, both correct and incorrect, because they mapped elements of the metaphorical domain onto their conceptualization of electrical circuits, when such a mapping was warranted and when it was not.

Can learning a new metaphor shape the way people think about complex concepts? Dutch speakers who learned to talk about musical pitches as thick and thin (as opposed to their conventional way of describing them as low or high) began to think of pitches in the new way, even in a non-linguistic task (Dolscheid & Casasanto, 2013). Similarly, people who learned to talk about the past as heavy judged an older book to be heavier than a new book, while those that learned to talk about the present as heavy judged the newer book as heavier than the older one, even though the book weights were identical (Slepian & Ambady, 2014). English speakers who learned to talk about time in terms of vertical space (with either earlier events either above or below later ones) also showed a corresponding shift in their nonlinguistic mental representations of time, consistent with their newly learned systems of metaphors (Hendricks & Boroditsky, 2015).

Some prior work has examined the effect of linguistic metaphor when more than one metaphor could be used to describe a social problem. In a series of experiments, people who read about crime as either a virus or a beast offered solutions for dealing with the crime that were consistent with the metaphor they had read (Thibodeau & Boroditsky,

2011, 2013). When people read that crime was a beast, they were more likely to offer solutions like increasing law enforcement and punishments for criminals than did virus readers. This is in line with what people would likely do if a literal beast were ravaging the town, which suggests that they reasoned in systematic metaphor-consistent ways.

One question that remains is whether metaphors have consequences for emotion. Can linguistic metaphor shape people's affect and mindset about a difficult situation?

In this paper, we explore the role of metaphor for framing the experience of having cancer. We investigated two common metaphors for an experience with cancer – a battle and a journey. After people were exposed to one of these metaphors in the context of a fictional character's disease, we measured the inferences they made about that person's guilt and ability to make peace with his situation.

According to the intuitions shared by a number of researchers and physicians, if the journey metaphor leads to more productive conceptualizations of a person's experience with the disease, people who read about it as such should think that the character will have better chances of making peace with the disease and will feel less guilty if he does not recover than people who read about his experience as a battle. Our results confirmed these predictions, suggesting that metaphors do influence the emotional mindsets that people adopt toward adversity. This work opens the door for future investigations of the mechanisms underlying a metaphor's influence on emotion.

Methods

Participants

We recruited and paid 528 participants through Amazon's Mechanical Turk. We restricted participants to those whose IP addresses were in the United States, had completed at least 500 tasks, and had an overall approval rate of at least 95%. Data from 25 participants were excluded because they did not finish the survey, resulting in 503 participants for analysis.

This sample included 295 males and 208 females. Most (84%) had completed at least some college. Twelve participants reported having been treated for cancer in the past, and the rest reported never having been diagnosed with cancer. Four of those participants read about the battle, and 8 read about the journey.

Materials & Procedure

We created two passages about an individual's experience with cancer. These passages were identical except in the metaphor used to describe cancer. One used a *battle* framing (n = 249), while the other used a *journey* (n = 254). Each participant read one of the following (boldface added to emphasize differences; no text was bolded in the actual materials):

*Joe was just diagnosed with cancer. He knows that for the foreseeable future, every day will be a **battle against the disease**. The **battle** he has to **fight** will not always be an*

*easy one. Many people have written about their experiences on the **battlefield**, and he can turn to those for consolation. His friends and family want him to know that he will not be alone in his **battle**. Even though sometimes he might not feel like talking, other times he may want to share stories of his **battle** with others, and they will be there for those moments.*

*Joe was just diagnosed with cancer. He knows that for the foreseeable future, every day will be a **journey with the disease**. The **road** he has to **travel** will not always be an easy one. Many people have written about their experiences on the **path**, and he can turn to those for consolation. His friends and family want him to know that he will not be alone on his **journey**. Even though sometimes he might not feel like talking, other times he may want to share stories of his **journey** with others, and they will be there for those moments.*

On the following page, participants rated the extent to which two separate statements described Joe's experience based on the information they had read. Options for agreement with each statement ranged from 1 (not at all) to 7 (very much). The following were presented in a random order:

a) He will feel guilty that he hasn't done enough if he does not recover.

b) He can make peace with his experience.

After responding to the two statements, the next page stated: "Please give any additional information about Joe's experience that you can imagine based on the passage that you read previously." The experiment concluded by asking participants about their personal experience with cancer, gender, highest level of education, and languages they speak.

After reading all of the responses, we noticed that people mentioned Joe's social support and his mindset about his disease often, so we decided to code for these elements. To do so, we read all the responses, blind to participants' metaphor conditions, and noted the presence of comments about social support and positive mindset. We also coded for uses of both battle- and journey-associated language and whether the participant explicitly commented on the metaphor they had read.

Results

The metaphor framing influenced people's emotional inferences about Joe's guilt and his ability to make peace with his situation. Figure 1 shows these main results.

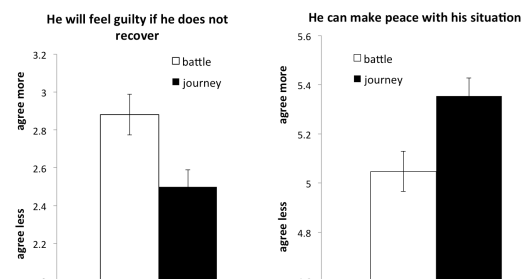


Figure 1: Main results. Agreement scales ranged from 1 (not at all) to 7 (very much).

Guilt

As predicted, people who read about the battle agreed more with the statement that Joe “will feel guilty if he does not recover,” ($M=2.87$, $SD=1.69$) than did people who read about the journey ($M=2.50$, $SD=1.42$). A 2 (metaphor) \times 2 (gender) ANOVA confirmed this difference by a main effect of metaphor ($F(1,498) = 7.07$, $p = .008$, $d = .24$). Gender was included because the masculinity inherent in the battle metaphor has been emphasized by previous work (Reisfield & Wilson, 2004; Penson et al., 2004; Harrington, 2012). Men reported that Joe would feel more guilty ($M=2.88$, $SD=1.59$) than women did ($M=2.40$, $SD=1.50$), confirmed by a main effect of gender ($F(1,498) = 11.1$, $p = .0009$, $d = .31$). The metaphors did not sway men’s and women’s responses to different extents, as there was no interaction between metaphor and gender ($F(1,498) = 0.16$, $p = .69$). Figure 2 shows the results for the statement about Joe’s guilt.

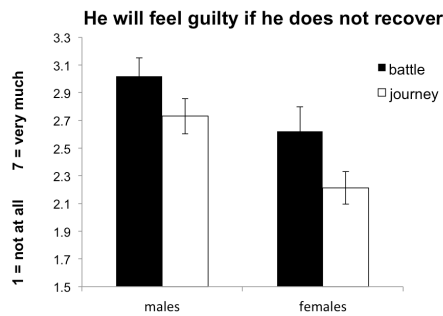


Figure 2: Responses to how guilty Joe will feel.

Making Peace

There was again a main effect of metaphor ($F(1,498) = 7.96$, $p = .005$, $d = .25$), but no main effect of gender ($F(1,498) = 0.33$, $p = .56$) or interaction between metaphor and gender ($F(1,498) = 0.15$, $p = .70$). Figure 3 shows the results for this statement.

People who read the journey metaphor agreed more with the statement that Joe “can make peace with his situation,” ($M=5.35$, $SD=1.16$) than the group who read the battle metaphor ($M=5.05$, $SD=1.29$). There was no main effect of gender ($p = .68$) or interaction between metaphor and gender ($p = .95$). Figure 3 shows the results for this statement.

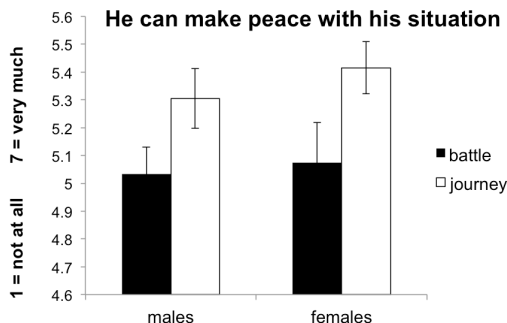


Figure 3: Responses to whether Joe can make peace.

Other Information Imagined

When writing additional information about Joe’s experience, people who read about the battle used battle metaphors (42%) more than those who read about the journey (18%; $\chi^2 = 23.04$, $p < .0001$). Similarly, people who read about the journey used journey metaphors (17%) more than those who read about the battle did (5%; $\chi^2 = 18.13$, $p < .0001$). Overall battle metaphors were more common (29%) than journey metaphors (11%; $\chi^2 = 43.46$, $p < .0001$). These results are shown in Figure 4.

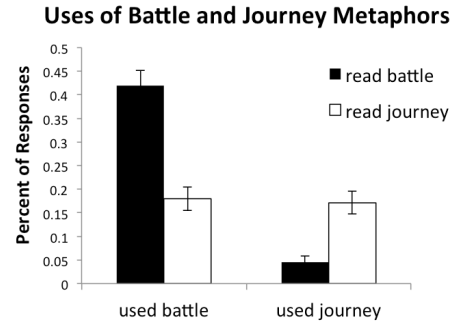


Figure 4: Use of battle and journey metaphors

Many people commented on the mindset they imagined Joe would have after his diagnosis. Examples reflecting the belief that Joe had a positive mindset include:

I imagine that he has a pretty positive mindset, he has people to consult with and people to lean on. I think he would be as positive as he could be because he has support. He’s probably scared, but assured that he can make it.

Joe has come to terms with his situation. He knows just how hard the battle he has to face will be, and is prepared for it.

Because we coded for two types of information mentioned (social support and positive mindset), we used Bonferroni adjusted alpha levels of .025 per test. People who read about the journey were numerically, but not significantly, more likely to write about his positive mindset than those who read about it as a battle, $\chi^2 = 3.24$, $p = .07$.

Many participants also mentioned that Joe would receive good social support throughout his experience. These were comments such as:

Joe is lucky to have support from the people that love him. This can help him tremendously.

There was no difference in frequency of mentioning social support between the groups, $\chi^2 = 1.44$, $p = .23$.

There was also no difference in the response length between the two metaphor groups, $t(484.6) = 0.67$, $p = .50$.

Discussion

In this study, we considered the role that metaphor has on emotion about a difficult situation. People made different emotional inferences about recovery when they received different metaphors. Specifically, reading about someone’s experience with cancer as a battle encouraged people to infer that the individual would feel more guilt if he did not

recover than reading about the same experience as a journey did. On the other hand, the journey framing encouraged people to believe this person could make peace with his situation more than the battle did.

People were more likely to use metaphors consistent with the one they read than the alternative. This is notable because if metaphors are perpetuated, either in a single person's mind or in conversations, their effects on emotion may also be perpetuated over time. This emotional contagion phenomenon has been observed for social media posts (Kramer et al., 2014).

Social support is important for health outcomes in cancer patients (Lutgendorf & Sood, 2011; Falagas et al., 2007), and there was no difference in the frequency with which this feature of Joe's situation was mentioned between people who read the different metaphors. This suggests that the differences we do observe in inferences about the guilt Joe will feel and his ability to make peace with his situation are not driven by underlying assumptions about Joe's social support. Because both journeys and battles can be experienced with others for support, the comparable frequencies with which the two groups mentioned social support show that not *all* emotional inferences were influenced by the battle and journey metaphors; instead, only aspects that were systematically related to the metaphors were impacted.

Future Work

Do battle and journey metaphors have the same affective influence when you reason about yourself or someone you know well, instead of a hypothetical person?

Are there real-world observable consequences of these metaphors for cancer behaviors or outcomes?

What are the individual differences that affect how people respond to metaphors? Does extensive experience with the metaphorical domain (i.e., battle) make a person more or less susceptible to being swayed by the metaphor than a lack of experience?

Do trait differences mediate a metaphor's emotional influence? For example, people who are competitive, thrive under stress, or are hesitant to ask for help from others may respond to the battle metaphor differently than those who are not. Do people's emotional processing skills mediate the effect that metaphor has on their affective reasoning?

What is the impact of mixing metaphors? A number of participants naturally mixed metaphors in their free responses (for example: *Based on the passage, I can tell that Joe's battle with cancer will be as difficult as those who experienced war on the battlefield. I can imagine that Joe will feel furious and hopeless about his predicament as the war vets did back on the battlefield. I'm glad that he'll have a solid supporting system to rely on throughout his journey.*) When metaphors are combined, do effects on inferences become diminished? Amplified? Are both metaphors' inferences co-activated?

Similarly, does a metaphor's influence on emotion change as it gets repeated and transmitted from one person to the

next? Could its effects snowball, gaining power as the metaphor is perpetuated, or might its impact become watered down?

Do the metaphors influence the information that people seek out? Are people conscious of these metaphors' presence or their role in shaping emotion? Do people's preferences for different metaphors mediate the inferences that they make as a result of encountering different metaphors?

Finally, do novel metaphors for the cancer experience encourage different emotional inferences? Since new metaphors do alter conceptual representations of the things they describe (Dolscheid & Casasanto, 2013; Hendricks & Boroditsky, 2015), perhaps novel metaphors can help cancer patients see the disease in a new light, one without as much societal baggage as the current metaphors have.

Limitations

Limitations of this work can be addressed in future iterations. For one, the character that participants read about was always a male. This may have caused males to identify with Joe more than the females, which could at least in part explain males' stronger belief that Joe will feel guilty if he does not recover than females'. In addition, we do not know whether participants have had close friends or family members who have had the disease, which may mediate metaphor's role in shaping their emotions.

Conclusion

Because cancer is a complicated and multi-faceted disease, metaphor will likely always be present in the way we talk about it. This work demonstrates the affective consequences of two common metaphors for discussing cancer – as a battle and as a journey. It paves the way for further consideration of the mechanisms underlying role in shaping our emotions about adversity.

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References

- Bowes, A., & Katz, A. (2015). Metaphor creates intimacy and temporarily enhances theory of mind. *Memory & Cognition, 43*(6), 953–963.
- Byrne, A., Ellershaw, J., Holcombe, C., & Salmon, P. (2002). Patients' experience of cancer: evidence of the role of "fighting" in collusive clinical communication. *Patient Education and Counseling, 48*(1), 15–21.
- Casarett, D., Pickard, A., Fishman, J. M., Alexander, S. C., Arnold, R. M., Pollak, K. I., & Tulskey, J. A. (2010). Can metaphors and analogies improve communication with

- seriously ill patients? *Journal of Palliative Medicine*, 13(3), 255–260.
- Citron, F. M. M., & Goldberg, A. E. (2014). Metaphorical Sentences Are More Emotionally Engaging than Their Literal Counterparts. *Journal of Cognitive Neuroscience*, 26(11), 2585–2595.
- Crum, A. J., Salovey, P., & Achor, S. (2013). Rethinking stress: The role of mindsets in determining the stress response. *Journal of Personality and Social Psychology*, 104(4), 716–733.
- Dolscheid, S., Shayan, S., Majid, A., & Casasanto, D. (2013). The Thickness of Musical Pitch: Psychophysical Evidence for Linguistic Relativity. *Psychological Science*, 24(5), 613–621.
- Fainsilber, L., & Ortony, A. (1987). Metaphorical Uses of Language in the Expression of Emotions. *Metaphor and Symbolic Activity*, 2(4), 239–250.
- Falagas, M. E., Zarkadoulia, E. A., Ioannidou, E. N., Peppas, G., Christodoulou, C., & Rafailidis, P. I. (2007). The effect of psychosocial factors on breast cancer outcome: a systematic review. *Breast Cancer Res*, 9(4), R44.
- Fetterman, A. K., Robinson, M. D., Gordon, R. D., & Elliot, A. J. (2011). Anger as Seeing Red: Perceptual Sources of Evidence. *Social Psychological and Personality Science*, 2(3), 311–316.
- Gentner, D., & Gentner, D. R. (1983). Flowing waters or teeming crowds: Mental models of electricity. *Mental Models*, 99–129.
- Greer, S., Moorey, S., & Watson, M. (1989). Patients' adjustment to cancer: The mental adjustment to cancer (MAC) scale versus clinical ratings. *J Psychosomatic Research*, 33(3), 373–377.
- Harrington, K. J. (2012). The Use of Metaphor in Discourse About Cancer: A Review of the Literature. *Clinical Journal of Oncology Nursing*, 16(4), 408–412.
- Hendricks, R. K., & Boroditsky, L. (2015). New space-time metaphors foster new mental representations of time. *Proceedings of the 37th Annual Conference of the Cognitive Science Society*. Austin, TX: Cognitive Science Society.
- Kato, P. M., Cole, S. W., Bradlyn, A. S., & Pollock, B. H. (2008). A Video Game Improves Behavioral Outcomes in Adolescents and Young Adults With Cancer: A Randomized Trial. *PEDIATRICS*, 122(2), e305–e317.
- Kramer, A. D., Guillory, J. E., & Hancock, J. T. (2014). Experimental evidence of massive-scale emotional contagion through social networks. *PNAS*, 111(29), 10779.
- Lipowski, Z.J. (1970). Physical illness, the individual, and the coping process. *Int J Psychiatry Med*, 1(2), 91–102.
- Lutgendorf, S. K., & Sood, A. K. (2011). Biobehavioral Factors and Cancer Progression: Physiological Pathways and Mechanisms. *Psychosomatic Medicine*, 73(9), 724–730.
- Montgomery, G. H., Schnur, J. B., Erblich, J., Diefenbach, M. A., & Bovbjerg, D. H. (2010). Presurgery Psychological Factors Predict Pain, Nausea, and Fatigue One Week After Breast Cancer Surgery. *Journal of Pain and Symptom Management*, 39(6), 1043–1052.
- Ochsner, K., & Gross, J. (2005). The cognitive control of emotion. *Trends in Cognitive Sciences*, 9(5), 242–249.
- Penson, R. T., Schapira, L., Daniels, K.J., Chabner, B.A. & Lynch, T.J. (2004). Cancer as Metaphor. *The Oncologist*, 9(6), 708–716.
- Realí, F., & Arciniegas, C. (2014). Metaphorical Framing Influences How We Think about Emotions: Some Evidence from Spanish. *Proceedings of the 36th Annual Conference of the Cognitive Science Society*. Austin, TX: Cognitive Science Society.
- Reisfield, G. M. (2004). Use of Metaphor in the Discourse on Cancer. *Journal of Clinical Oncology*, 22(19), 4024–4027.
- Samur, D., Lai, V. T., Hagoort, P., & Willems, R. M. (2015). Emotional context modulates embodied metaphor comprehension. *Neuropsychologia*, 78, 108–114.
- Semino, E., Demjen, Z., Demmen, J., Koller, V., Payne, S., Hardie, A., & Rayson, P. (2015). The online use of “violence” and “journey” metaphors by cancer patients, as compared with health professionals: a mixed methods study. *BMJ Supportive and Palliative Care*.
- Slepian, M. L., & Ambady, N. (2014). Simulating sensorimotor metaphors: Novel metaphors influence sensory judgments. *Cognition*, 130(3), 309–314.
- Thibodeau, P. H., & Boroditsky, L. (2011). Metaphors we think with: The role of metaphor in reasoning. *PLoS One*, 6(2), e16782.
- Thibodeau, P. H., & Boroditsky, L. (2013). Natural language metaphors covertly influence reasoning. *PloS One*, 8(1), e52961.
- Wallberg, B., Michelson, H., Nystedt, M., Bolund, C., Degner, L. & Wilking, N. (2009). The Meaning of Breast Cancer. *Acta Oncologica*, 42(1), 30–35.
- Wilkowski, B. M., Meier, B. P., Robinson, M. D., Carter, M. S., & Feltman, R. (2009). “Hot-headed” is more than an expression: The embodied representation of anger in terms of heat. *Emotion*, 9(4), 464–477.