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## AN EXPLORATORY STUDY OF METAPHORS TYPES AND TASKS

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- **ABSTRACT:** How do people interpret metaphors? The goal of this paper is to acknowledge metaphors' complexity beyond the scope of any specific theory of metaphors. Instead of ignoring contradictory findings, we propose to highlight and analyze regularities and irregularities in our findings, using insights from complex systems science to guide our discussions. In this exploratory study, participants were asked to substitute a metaphor vehicle for a word with a similar meaning and to explain the analogical motivation of the metaphor. There were three types of metaphors: primary, complex, and predicative. This is the first study to compare these three types of metaphors across two different tasks. Results show how metaphors cluster according to its type, but not uniformly. In this quantitative and qualitative analysis, we also show that multiple sources of experiences are available during metaphor interpretation. In conclusion, we highlight that no current theory can accommodate and predict all types of metaphoric behavior different people display in different contexts, but we understand some of the major biases and factors that are involved in metaphor interpretation.
- **KEYWORDS:** Metaphor; analogy; conceptual metaphor; primary metaphor; attributive metaphor.

The complexity of different variables shaping how figures of speech are interpreted may itself need to be explained and incorporated into a general theory of figurative meaning, rather than explained away to create simple empirical tests. (GIBBS; COLSTON, 2012, p.291)

### Introduction

Metaphors have been a disputed topic in cognitive sciences, particularly since the 1980s, when Conceptual Metaphor Theory (CMT) was proposed by Lakoff and

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Johnson (1980). Lakoff and Johnson's theory raised criticism and skepticism (GIBBS, 2017) because it so clearly distinguished itself from previous accounts of metaphors for suggesting that metaphors were embodied, formed systems of structural systematic correspondences, and were processed automatically and unconsciously by cross-domain mappings. Lakoff and Johnson's theory contrasted with many others, like Gentner's (1983) Structure Mapping Theory (SMT), and Glucksberg's (2003) Attributive-Interactive Theory (AIT), which emphasized synchronous and disembodied aspects of online processing.

It has been 40 years of different theoretical developments and learning from experiments and other empirical methods. CMT has been developed further, in different ways, by authors, such as Gibbs's (2019), Kövecses (2017), and Steen (2017). The goal of this paper is to acknowledge metaphors' complexity beyond any individual theory of metaphors (instead of declaring any of them "more plausible" than the other), that is, we take the stance that many theories contribute equally to the current understanding of metaphors: particularly, CMT, SMT, and AIT. We offer a Dynamic Systems account (GIBBS; COLSTON, 2012; GIBBS, 2017, 2019) of the findings, highlighting both regularities and irregularities in metaphors' interpretation. We assume that all theories are ontologically implausible because there is no knowledge independent of the human perspective (MASSIMI; McCOY, 2020). Thus, instead of adopting an eliminative perspective on theories and findings, we focus on explaining what conditions lead to the different types of rich metaphoric behavior humans exhibit. Complex/Dynamic systems accounts of metaphors are useful as a meta-theory because they propose that behavior is self-organized<sup>1</sup> contextually, which allow us to deal with different types (even rare types) of behavior. However, we are also not ontologically committed to the Complex/Dynamic system perspective, for many reasons, as it is also a human perspective, not a unified field, and has limits as all approaches to science have (MITCHELL, 2009; TRANQUILLO, 2019). The question that underlies all theories, approaches, and methods are: to what extent it is justified to keep its provisory claims/tools, and what aspects of them should be overcome in our attempt to improve our understanding or predictions of phenomenon in the world? This is an ongoing question that never has a final answer in our scientific endeavor.

For achieving our goal of dealing with metaphor regardless of the scope of any single theory, we propose a new study, inspired by McGlone's (1996). McGlone's experiment's goal was to falsify CMT by asking participants to paraphrase conceptual metaphors. The results showed that most of the responses were inconsistent with CMT's claims (this result was discussed by Gibbs (2011, 2017). The most striking feature of McGlone's study was that responses were diverse: some of them were consistent with

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<sup>1</sup> A behavior (e.g., a metaphoric utterance) is self-organized contextually because it does not depend on central commands (e.g., rules) and are not abstract entities in the mind that gets accessed upon demand. They are emergent from the combination of different factors, such as previous knowledge, experiences, beliefs, personal characteristics, recent information available in the context, the social interactions a person is engaged in, etc. (it is impossible to list all possible factors that might be involved, in non-deterministic ways, on metaphoric behavior).

CMT and others not. For example, “Our relationship is a rollercoaster” did not simply evoke journey-consistent responses (e.g., “there are obstacles in our pathway”), as CMT would predict. Nor did it evoke only attributive responses (e.g., “the relationship is exciting”), as AIT would predict. It also evoked “good is up” metaphors, which is not typically consistent with “love is a journey” as a whole, but is a conceptual metaphor nonetheless. McGlone’s interpretation of the results favored AIT (because the responses more often than not reflected attributive choices), instead of CMT.

The goal of the present study is not to favor or falsify any theory. Instead, we consider that metaphors are a complex phenomenon, thus, we propose a quantitative and qualitative study to explore how different metaphors are better - but not completely - explained by different theories. In our study, we presented participants with 30 metaphors: 10 primary, 10 complex, and 10 attributive (A is B) metaphors, and asked them to (i) substitute the metaphor vehicle for a word similar in meaning and (ii) to explain the analogy or motivation behind the metaphor. By coding participants’ responses to these three types of metaphors and two questions, we expected to show that these metaphors have different profiles that justify their being prototypical cases for different theories. That is, attributive metaphors (e.g. Robert is a lion) are prototypical cases analyzed by AIT, whereas complex metaphors (e.g. Life is a journey) are prototypical cases analyzed by CMT, and primary metaphors (e.g., John is a cold person) are currently referred to as metonymies, being a more specific case also analyzed by CMT. We present, in this paper, quantitative and qualitative analyses, highlighting different types of responses, instead of generalizing by ignoring the differences between metaphors. Thus, this exploratory study points out some aspects of metaphors that are not fully explored, emphasizing how different theories can contribute to our understanding of metaphor.

In the first section, we introduce the theories of metaphors that we consider relevant for this study. In the second section, we present the experiment and methods. In the third section, we present the main results, analyzing how primary, complex, and attributive metaphors cluster as different types. We also single out the most interesting responses from the participants, which provides further clues on the relationship between metaphors and cognition. In the last section, we make our final considerations.

## **Theoretical Background**

In this section, we present the theoretical background that we use to analyze and discuss experiment results.

### **Conceptual Metaphor Theory**

Conceptual Metaphor Theory proposes metaphors are organized and processed by making use of systematic structures that comprises primary metaphors and other

culturally-driven correspondences (LAKOFF, 2008). The systematic structures were proposed to account for the fact that many linguistic expressions, although different, seem to imply the same general concepts. For instance, (i) “we are at a crossroads”, (ii) “our relationship isn’t going anywhere”, (iii) “our relationship is going in the wrong direction” all seem to imply that RELATIONSHIPS ARE JOURNEYS. This system comprises correspondences between Lovers and Travelers, Relationships and Vehicles, Difficulty and Obstacles, etc. For Lakoff and Johnson (1980), the similarities across the linguistic metaphoric expressions (i)-(iii) are not a historical accident: the authors claim that modern speakers are endowed with a conceptual system of cross-domain mappings that gets activated automatically and unconsciously when processing conceptual metaphors. Thus, metaphor is primarily a conceptual phenomenon, and secondarily a linguistic one.

Lakoff (1993, 2008) claimed that there are hundreds of systems of conceptual metaphors in the mind and that they are accessed every time one encounters a conceptual metaphor, effortlessly. Currently, there are other theories that develop the idea of conceptual metaphors in different ways. For example, Gibbs’s (2017, 2019) dynamic account of metaphors proposes conceptual metaphors are used probabilistically, instead of being a fixed system of cross-domain mappings which should be fully instantiated in the mind. Ritchie<sup>2</sup> takes the stance that conceptual metaphors are very abstract and not a fixed “code”. Kovecses’ (2017) multi-level approach to metaphors considers metaphors dynamic in the sense that processing can happen at different levels of granularity.

There is evidence for the general idea of conceptual metaphors. Thibodeau and Durgin (2008) show that novel and conventional metaphors are read faster when preceded by other conceptual metaphors of the same “family”/system as opposed to when they are preceded by the same general idea (stated without metaphors). There is also evidence that conceptual metaphor affects reasoning (ELMORE; LUNA-LUCERO, 2017), biasing participants to derive metaphorically consistent conclusions. Moreover, participants prefer metaphoric consistent conclusions for a text, as opposed to metaphoric inconsistent ones (NAYAK; GIBBS, 1990). See more evidence for CMT in Gibbs (2017).

Importantly, CMT proposes that metaphors are embodied. The notion of primary metaphor has become very important for the theory. Primary metaphors are a cognitive relationship between two types of basic experience that frequently co-occur. For example, the co-occurrence of AFFECTION and WARMTH as a child is held affectionately by an adult should result in a cognitive mapping between these domains. There are hundreds of primary metaphors in mind (and some authors even propose they are innate, (DOLSCHEID *et al.*, 2014). There is much evidence for primary metaphors (GIBBS, 2017; LANDAU, 2016), but there are issues in establishing what is the nature of these connections. Whereas Lakoff proposed these connections were

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<sup>2</sup> David Ritchie, available at: <https://www.youtube.com/watch?v=vX5tzavVn9s&t=935s>. Access in: May 30, 2022.

metaphoric (unidirectional cross-domain mappings), there is evidence of bidirectionality in these mappings, and some authors propose a more complex explanation for the phenomenon (IJZERMAN *et al.*, 2018; IJZERMAN, SEMIN, 2010). Linguists (see KOVECSES, 2013) also claim these connections are metonymies because they are relationships established within one domain of experience (i.e. warmth is a feature of affection). Primary metaphors are different from complex metaphors that usually establish connections between two distinct experiences (e.g. love and journeys). There is a difference between primary and complex metaphor which is relevant for this paper and lies in the relative weight of different types of information that a concept comprises. Both primary and complex metaphors involve concepts that have motor, affective and other types of higher level of information that we commonly refer to as scripts, models, and frames (BARSALOU, 2020, 1992). The difference is that, for primary metaphors, the expected bias should lie in the sensory-motor and affective components of meaning, and for complex metaphor, the bias should lie in other types of information (thus, we will say they are more abstract).

### **Attributive-Interactive Theory**

Glucksberg (2003) explain metaphors by taking into account what metaphors look like, consistently with its prototypical grammatical structure: class inclusion statements of type X is a Y (e.g. “My lawyer is a *shark*” should be processed similarly to “Lime is a citrus fruit”). Glucksberg claimed that when we process a metaphoric sentence such as “my lawyer is a shark”, we create an *ad hoc* category, such as “things that are cruel”. In this theory, metaphors are not analogies; they are processed by creating (when novel) or accessing (when conventional) an *ad hoc* category.

Within this perspective, metaphor’s base and vehicles interact. The first suggests metaphoric categories, and the second suggested dimensions of applicability. The result would be a superordinate category in the lexicon. The notion of dimensions of applicability is similar to the notion of relevance used in the conceptual combination literature (MURPHY, 1990). This is an important theory and there are a lot of evidence that metaphors are processed in a more “superficial” fashion (superficial in comparison with the systematic correspondences expected under CMT perspective on metaphors). For example, when exposed to properties like “cold”, participants process novel metaphoric sentences as “Marriages are iceboxes” faster than when they are not exposed to a relevant property (GILDEA; GLUCKSBERG, 1983).

### **Structure Mapping and Analogies**

The most straightforward claim to make about metaphors is that they are analogies. There are many theories about analogies, but here we present only two important

perspectives on analogies. For Gentner and Markman (1997) analogies are a syntactic process that operates with rules and principles on representations. For the authors, the process of structure mapping (analogy) is comprised of (i) alignment of relational structures (as the first procedure); (ii) relational focus (mapping between commonalities); (iii) systematicity (systematic and hierarchical correspondences are mapped). Analogies can be attributive (when attributes similar in two domains are mapped); perceptual (when perceptual similarities between two domains are mapped); or structural (when the knowledge structure between two domains are mapped).

For Gentner (1983), metaphors are distributed in a *continuum* from pure analogies (mappings between relational structures) to mappings between attributes. This proposal assumes that non-identical elements are put in correspondence because of the similar roles they play in knowledge structures. Thus, in “Socrates is a Midwife”, Socrates and Midwives are not similar to one another except for the fact that both play a similar role in helping Students/Mothers externalize their Ideas/Babies. Bowdle and Gentner (2005) later proposed the Career of the Metaphor Theory which states that metaphors are processed as analogies when they are novel and categorization when they are conventional, all the way into being lexicalized when they are dead, i.e., when modern speakers do not recognize the metaphoric vehicle anymore. There is plenty of evidence that novel metaphors are processed differently from conventional metaphors (BOWDLE; GENTNER, 2005).

We must also add that analogy is proposed to be the core of cognition by Hofstadter (2001). They are expected to be at work very often, and the mappings are fluid or fuzzy. Besides, Hofstadter claims that categorization and analogy are in a continuum, what may shed light in the disputes between those who consider metaphors a matter of categorization and those who consider it analogies (see discussions above).

## Contrasting theories

We have presented three theories of metaphor processing. CMT proposes that conceptual metaphors are embodied and make use of fixed systematic relationships (i.e., cross-domain mappings), but does not focus on attributive metaphors (e.g., “My lawyer is a shark”), and cannot account for the possibility that mappings and processing strategies might vary (other theories were developed to deal with this problem, as Gibbs’ 2019). AIT proposes metaphors are processed by categorization but cannot account for the systematicity across metaphors and embodied information. SMT brings important distinctions between similes and metaphors but also does not account for primary metaphors and the systematicity across metaphors. It is a fact that we need theories that can accommodate important findings from all theories so far. It seems clear that metaphor processing is task-dependent (i.e., one might be skimming through a text or reading for interpretation; different tasks might call for different modes of processing).

Also, there are different types of information that can be recruited during processing, including sensorimotor (BARSALOU, 2020)<sup>3</sup>.

To have a clear sense of how theories contrast in their prediction, for a metaphor like “My job is a jail”, CMT would predict that its processing would recruit conceptual metaphors such as “achieving a purpose is reaching a destination” and “actions are motion” (LAKOFF, 2008, p.27). On the other hand, AIT would predict that an attribute would be enough for processing this metaphor, such as “(things that are) restrictive” or “annoying”. SMT (at least in its classic perspective) would predict an analogy: jobs keep you from enjoying your freedom as prisons keep you from enjoying your freedom.

A different way of seeing the difference between theories’ predictions is that CMT would predict that participants will rely more often on conceptual metaphors from the same “family” in their responses. For instance, when talking about the meaning of “My relationship is a rollercoaster”, participants would rely on other “love is a journey” concepts (e.g., obstacles, pathways, etc.). On the other hand, AIT would predict more attributive descriptions (e.g., scary, exciting). In our study, we consider attributes as plausibly analogical in nature, thus, we do not distinguish AIT from SMT.

## Methods

This is an exploratory study, in which we asked participants different questions about metaphors<sup>4</sup>. Although the experiment had more questions, in this paper we focus on 30 metaphors (10 primary, 10 complex, 10 attributive). Also, for each metaphor, we asked participants to: 1) Substitute the metaphoric word (in bold) with another word that expresses the same meaning; and 2) Explain the analogy/motivation for that metaphor (see the appendix at the end of this paper). The contrast between questions 1 and 2 is interesting because they should highlight different theoretical strategies: question one calls for conventional lexical ways of expressing a metaphoric meaning (giving room for responses consistent with AIT to emerge), whereas question 2 calls for analogy or conceptual metaphors (giving room for responses consistent with CMT and SMT to emerge).

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<sup>3</sup> In fact, for complex systems approaches, metaphor processing is the result of the interaction between multiple factors. The list is never complete, but can involve task, gender, age, framing of questions in experiments, brain/mental characteristics (e.g., autism, down syndrome, etc.), previous knowledge, culture, conversational partner’s characteristics (e.g., what you know about them, what they have just said), metaphor’s type, co-text characteristics, etc.

<sup>4</sup> The experiment as a whole consisted of 40 metaphors (10 primary, 10 complex, 10 attributive, and 10 novel). Also, for each metaphor, we asked participants to: 1) Substitute the metaphoric word (in bold) with another word that expresses the same meaning; 2) Give a list of associated words to the metaphor in bold; 3) Explain in what situation they use that metaphor; 4) Explain the analogy/motivation for that metaphor (see the appendix at the end of this paper). In this paper, we focus only on how participants answered questions 1 and 4 to primary, complex, and attributive metaphor. We excluded novel metaphors and questions 2 and 3 for writing a more concise result.



## Participants

Only 15 participants completed the whole survey (thus, we only have demographic information of these participants). Other 29 participants left the survey incomplete. Incomplete answers mean 6,18 (T=20 items per questionnaire, 40 items total). Participants' age mean is 38 years old. Most participants had a college degree (except for two, who had finished high school). 87% were female. This research was approved by the ethics committee<sup>5</sup>. Participation was voluntary and participants were recruited online using social media, by sharing a call for participation on Facebook (there were no exclusion criteria, thus, all volunteers were welcome). They were allowed to interrupt their participation at any moment (incomplete questionnaires were accepted and used for analysis).

## Materials

The survey was conducted using LimeSurvey in Brazilian Portuguese. Metaphors were distributed into two questionnaires, each list consisted of 5 primary, 5 complex, 5 attributive (T=15 metaphor per list, 30 in two lists). The questions presented were: (i) Rewrite the sentence substituting the word in bold by other word(s) with the same meaning(s); (ii) For you, what is the motivation for the use of the metaphor in this sentence or what is the analogy implied by the sentence? See examples of a metaphor and of responses for the two questions:

As an example of an item, participants saw the following metaphor:

1. A sick person is a **burden**. (Metaphors' vehicle were presented in bold to make sure participants complied to what we asked of them)

Participant's responses for questions (i), which asked for a substitution for the word in bold, and (ii), which asked for an explanation regarding the analogy, were like the examples below show:

(i) *The sick person is a weight/undesirable/inopportune.* (This participant substituted the metaphor "burden" for the words "undesirable", "weight", etc.)

(ii) *The sick person cannot do anything, the person who watches over him is responsible for the basic care of the sick person, so, I believe that tiredness leads to the belief that a sick person is a burden.* (This participant explained the metaphor "burden" by writing that "the sick person cannot do anything [...] tiredness leads to the belief that a sick person is a burden").

Participants were given a list of metaphoric sentences like the above that always contained a metaphor in bold. Almost all sentences were of the type X is Y (e.g. Life

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<sup>5</sup> CAAE: 89298818.0.0000.8142

is a **journey**; Roberto is a **lion**), except for a couple of primary metaphors (i.e. “I am feeling **down**” and “This curriculum has **weight**”), which still keeps the metaphor at the predicative position.

## Procedure

Participants typed in their answers to the questionnaires freely. Metaphors were randomized, but not the order of the questions within metaphorical items (i.e., participants always started by answering a question about substitution, and last, about analogy).

## Coding

The data were manually coded, following the scheme below:

**Analogy:** If participants’ responses presented a word that could be said to independently characterize both domains, it was coded analogy. E.g., for the metaphor “This curriculum has weight”, a participant’s response for question (ii) was: “The idea behind this metaphor is that something that has weight will differentiate itself, it is a differential for being stronger, heavier.” We considered it an analogy between the experience of carrying something heavy which does not go unnoticed, so it “differentiates itself”, and the experience of evaluating a good curriculum that also does not go unnoticed, as it also “differentiates itself” by being better, or “heavier”). The curriculum must not be literally heavy, of course. It is an open question if this analogy would be enough for a task-specific understanding of the metaphor, or if the primary metaphor IMPORTANCE IS WEIGHT needs to be activated. We should keep in mind that the meaning of the metaphor can be different for different speakers or in different tasks.

**Metonymy:** If participants’ responses presented a word that could be said to allude to the same domain of experience, it was coded metonymy. E.g., for the metaphor “My girlfriend is hot”, a participant’s response for question (ii) was: “During sex, the body temperature rises, it motivates the analogy”. This description was coded as a metonymy because it describes the co-occurrence of having sex and having the body temperature rise.

**Complex Metaphor (CM):** If participants’ responses presented a word that could be said to allude to other metaphors as predicted by Lakoff and Johnson, it was coded as CM. E.g., for the metaphor “Cancer is an Enemy”, a participant’s response to question (i) was “Cancer is something to be fought”. This was coded as a complex metaphor because the response makes use of another conceptual metaphor of the same “family”, supporting CMT.

**Conceptual Metaphor from Other Domain (CMOD):** If participant’s answer presented a word that alludes to a conceptual metaphor from a domain (or a family) other than the domain of the metaphor in the question, it was coded CMOD. E.g., for the

metaphor “knowledge is light”, a participant’s response to question (i) was “knowledge is a pathway” (evoking LIFE IS A JOURNEY). If CMs are constraints or biases on thought, a further question would be: why do we change CMs so easily?

Context Derived: If participants’ answers presented a word that could be said to be literal or to be derived from the context of use, not from analogies or conceptual metaphors, it was coded context derived. E.g., For the metaphor “The price of the meat is high”, a participant’s response to question (i) was “The price of the meat is expensive”. Expensive is a literal counterpart to “high”. Not all metaphors have a literal counterpart as conventional as this one, which would be found in a dictionary, but very often participants would find a word that captures the idea of the metaphor. We named this “context derived” because the word chosen by participants makes sense for anyone who understands the recurrent contexts in which the metaphor is used.

The analyzed data and other information can be found on github<sup>6</sup> in Portuguese.

## Methodology

This is a qualitative and quantitative study focused on understanding the regularities and irregularities in the responses participants give to our survey. Since the goal of the study was not to falsify a hypothesis or to test a theory, we have not used any inferential statistic in our analysis. The quantitative part of the study consists in keeping track of the regularities in responses (how similar the responses are, or how often a certain type of response was given). The qualitative part of the work is focused on discussing interesting cases/responses, especially ones that are rarely discussed in the literature.

## Limitations

There are limitations to this study. Some information in the conceptual system is not clearly distinguishable as belonging to one domain and not the other. We can say that “beautiful” is a clear property that both (some) flowers and (some) women have in common, thus an analogy. We can say that “damsel” is a property that women may have but not flowers, thus this is a context derived attribute for the metaphor “Sandy is a flower”. But what about cute/soft (i.e. “fofa”): is this property a part of both the domain of flowers and women independently (thus making it an analogy)? Or is this only a property of women, thus, this is a context derived case? And can we even decide if “fofa” was meant to be a sensation (i.e. “soft”) or if it was meant to be a character evaluation (i.e. nice/cute)? For this situation, we coded as context derived, since a quick search at Google did not show many cases of “*flor fofa*” (*fofa*/cute flower) for Brazilian Portuguese, so we considered that “fofa” is something we generally say about women. But this certainly is not objective. The point of this

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<sup>6</sup> Available at: <https://github.com/josiesiman/researchdata>. Access on: 23 May 2022.

study is not to give a final and objective answer about metaphors (as this might not be possible), but to explore some analytical possibilities. And we believe that there will always be points of discontent with any supposedly “objective” classification of metaphors. Thus, the data will be made available for other scholars to code it differently if the occasion arises.

The second limitation is the classification of metaphors into three categories: primary, complex, and attributive. Metaphors can be understood in different ways, depending on people’s experiences and familiarity with them. Thus, some metaphors we chose were not a good example in their category. Our purpose is to explore differences as well as similarities (we discuss the different metaphors in the next section).

A third limitation is yet more interesting. In this study, we code a linguistic item (either a word or a whole text segment) an “analogy” if this item could be used to refer independently to both domains. For instance, “active” was coded as an analogy in “Irene is a hurricane”, because both people and hurricanes can be said to be active. On the other hand, “nervous” is something that we could say only about a person (if we are not going to personify the hurricane). However, if we consider that there can be patterns of information in both hurricanes and nervous people that are similar (e.g. hurricanes are “shaky”/“not still” just like a nervous person), then, “nervous” would be a word for an underlying analogy!

Our aim in elucidating these coding issues is to highlight something that is recognized as a problem for Conceptual Metaphor Theory but could be considered a problem for other theories if they conducted linguistic analyses. Semantic, cognitive, and even biological limits are difficult to specify (SAPOLSKY, 2017; GIBBS, 2017; SIMAN, 2021).

## **Results**

In 1996, McGlone proposed to test CMT by asking participants to paraphrase conceptual metaphors. He found that only 41% of responses contained conceptual metaphors, which he interpreted as a failure for CMT. Gibbs (2011), on the other hand, suggested that 41% was a good number in favor of CMT since participants are bad at paraphrasing metaphors. In this study, we go a step further and contrast CMT and other theories, especially analogy-based theories, using as stimulus primary, complex, and attributive metaphors. With our code scheme, it is not possible to differentiate categorizations and analogies: we can identify attributes, but attributes might be analogical or categorical.

## **Quantitative analyses**

First, let us consider a few characteristics of our data. We coded all valid responses, even when the same participant gave more than one response for the same item. Since

participants were not forced to answer all questions, it is interesting to notice that they provided more answers to attributive metaphors (38,55%), followed by primary (34,87%), and last, complex metaphors (26,58%), which might suggest that complex metaphors are more “difficult” to explain or substitute for a similar word. At first glance, this could be interpreted as something positive for CMT: CMs are different from other metaphors. However, it is important to have in mind that CMs (or complex metaphors) are more abstract than other metaphors. Whereas attributive metaphors are generally metaphors about people’s attributes (e.g., Roberto is a lion), and primary metaphor is about embodied experiences (e.g., João is a cold person), complex metaphors are about abstract domains such as love, time, life (e.g., Life is a Journey), etc. which might make it difficult to explain (e.g. explaining “time is money” involves explaining “time”, which is a more abstract concept). Moreover, frequency/familiarity was not controlled for. A complex conceptual metaphor such as “Society is a body” seemed rather difficult to elicit responses. This metaphor could be infrequent or unfamiliar for participants.

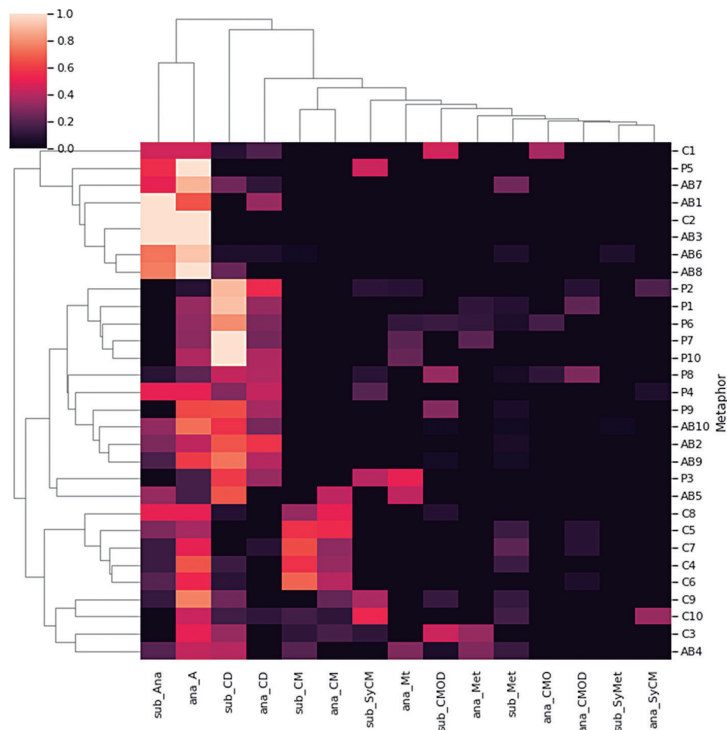
To better understand the relationships between the metaphors and strategies used to respond to question 1 and 2, we performed a cluster analysis of the dataset. Figure 1 shows a heatmap associating metaphors from the questionnaire (vertical axis) and our coding scheme of strategies (horizontal axis). Each of the 30 metaphors is labeled with its type and number (ABs are attributive; Ps are primary; Cs are complex). Our coding scheme is composed as follows: subs (substitution) refer to question 1; anas (analogies) refer to question 2. CDs are context derived; A(na) are analogies; Mt are metonymies, and so on (see methods and appendix).

The colors on the heatmap represent the total responses for each combination of metaphor and strategy. Darker colors represent fewer responses whereas lighter colors represent more responses.

To the left of the heatmap we show a dendrogram that expresses the hierarchical clustering of the metaphors. The clustering algorithm uses single-linkage clustering to iteratively group metaphors according to the frequency of strategies in the responses (EVERITT *et al.*, 2011). Whereas we can see our three types of metaphors generally clustering together, not all of them do. Most primary metaphors cluster in the middle of the heatmap, their main characteristics are their context-derived words in the substitution question (e.g., “expensive” for “high prices”) (CD = 86 and 45, for questions 1 and 2) and they are the only group in which we found metonymies, even if in small amounts (Mt = 8). They also present a fair number of analogies (A= 12 and 53, questions 1 and 2). P3 and P5 are away from their cluster: they contain higher amounts of analogies or of synonyms, and the lowest amounts of context-derived words. The fact that these metaphors did not cluster with others do not make them necessarily less of a primary metaphor; low frequency of use might explain why P3 and P5 do not have “context-derived” meanings. For instance, the metaphor P5 (“A sick person is a burden) elicited the word “weight” as a substitution, which is also a metaphor, not a context-derived (literal) word.

Complex Metaphors cluster in the bottom of the heatmap, they exhibit weaker colors in general. These metaphors rarely exhibit context-derived words. In fact, complex metaphors show many analogies and the highest concentrations of CMs (CM= 31 and 32, for questions 1 and 2), even if the total is not as expressive as other coding categories (e.g. A=24 and 56, for questions 1 and 2). Metaphors C1 and C2 are astray: they are “Our relationship is a rollercoaster”, which exhibits a mix of “ups and downs” (CMOD) as responses and attributes (e.g., “unstable”); and “the society is a body”, which exhibits analogies and fewer responses in general. Some complex metaphors elicited responses that matched CMT’s predictions (see next section).

**Figure 1** – A heatmap of metaphor types and responses patterns. See appendix II for a coding scheme.



**Source:** Author’s elaboration.

Attributive metaphors (ABs) are seen in small clusters in the heatmap. They generally had the highest rates of analogies (or categorizations) (A= 92 and 64, for questions 1 and 2, respectively), so they cluster at the top of the heatmap. Some of them are clustering in the middle, showing that some context-derived words were used, as well.

The heatmap also shows that ABs and Ps are generally closer, since they elicited more context-derived and analogical responses (and more responses in general).

Regarding the difference between questions 1 and 2, we expected that question 1 would generally elicit more context-derived responses, and question 2 should emphasize analogies. This was only true, though, for primary and complex metaphors. Attributive metaphors exhibited the opposite pattern. They presented more analogies in the substitution question: this is because their substituted “analogical” content is reliably conventional. Asking participants to make the analogy explicit made them focus on analogical stories, whereas asking for a substitution elicited a straightforward attributive (analogical) response.

Lastly, for a contrast with McGlone’s (1996) study which asked participants to paraphrase conceptual metaphors, we see in our study, by only looking at question 2 (which asks for an analogy), again, that 63,64% of responses to complex metaphors were analogical, and 36,36% elicited CMs. But, as we stated previously, attributive metaphors would rarely exhibit any CM as a response. Thus, even though CM must not always be interpreted by evoking other CMs, the fact that there is a significant and consistent number of responses as CMT predicts is worth noting. The same is true for primary metaphors that do exhibit large amounts of analogical explanations but are the only ones which exhibit - even if in small amounts - metonymic responses. The fact that metonymy and CMs do not rate high might have different possible explanations: the activity proposed, and the material chosen might have contributed to help elicit analogy over other types of explanations.

## Qualitative analyses

There were some variations in responses within metaphors - but not always. One striking example is THEORIES ARE BUILDINGS, for which all responses were consistent with CMT, except for one analogy (remember that complex metaphors tended to have fewer response entries as compared to other metaphors):

*A- His theory is **a building**.*

1. *His theory is solid.* [CM]
2. *His theory is well structured.* [CM]
3. *His theory is structured.*[CM]
4. *His theory is strong, well-formulated, well structured.* [CM] [CD] [CM]
5. *His theory is solid.* [CM]
6. *His theory is solid.* [CM]
7. *His theory is solid.* [CM]
8. *His theory is big.* [A]

Let's contrast this data with what participants answered for the conceptual metaphor "My relationship is a rollercoaster". In the answers below, there is only one conceptual metaphor consistent with RELATIONSHIPS ARE JOURNEYS ("we do not know where this is going"). Other responses presented a conceptual metaphor from another domain ("ups and downs" and "full") and other analogical attributes (e.g., "unstable"), which is consistent with what McGlone (1996) found for the same metaphor.

1. *Our relationship is intense, full of ups and downs and we do not know where this is going.* [CD] [CMOD] [CMOD] [CM]
2. *Our relationship has ups and downs.* [CMOD]
3. *Our relationship is unstable.* [A]
4. *Our relationship has ups and downs.* [CMOD]
5. *Our relationship is unstable/messy.* [A] [A]
6. *Our relationship is unpredictable.* [A]
7. *Our relationship is an up and down of emotions.* [CMOD]
8. *Our relationship is full of ups and downs.* [CMOD]
9. *Our relationship is complicated.* [CD]

Responses for attributive metaphors were attributive/analogic, as expected. For example, for "Roberto is a Lion", responses include "strong", "leader", "aggressive", and "brave". The most interesting data in this section was referent to the metaphor "My mother-in-law is a snake". Turns out that "snake", for some of the participants, is not merely the animal one would find in nature; it is also the snake from the bible. Some participants clarified that in their analogies. Thus, an attribute like "liar" would be an analogy (even though we could argue over the technicalities of what the serpent from the bible does when it persuades Eve to eat the fruit). For example:

1. *The analogy comes from the bible where a snake "deceives" Adam and Eve making them leave paradise. Besides, the fact that the animal has no members and is poisonous causes repugnance in humans, which avoid the species.*

In the excerpt above, a participant points to three possible analogies that motivate the metaphor: (i) an analogy with the serpent from the bible, which is *deceitful* like some mothers-in-law; (ii) an analogy with the animal, which is *repugnant* like some mother-in-law's behaviors; (iii) an analogy with the behavior of humans (or sons-in-law) regarding snakes (or mothers-in-law), of *avoidance*.

In this study, we also noticed that participants would often rely on metaphors from other domains as they replied to either the substitution or analogy question. For instance, the metaphor "This idea is empty" (IDEAS ARE CONTAINERS) has triggered responses like "This idea has no foundation" (IDEAS ARE BUILDINGS). This type



of response has happened about half of the time for this metaphoric item. This might suggest either that people do not distinguish the “empty” and “foundation” metaphors as belonging to two different domains (i.e., the dead metaphor hypothesis), or simply that “no foundation” is a readily available term to describe bad ideas. These conflictual interpretations can be traced back to Nayak and Gibbs’s (1990) findings, where the authors notice that participants do not always choose the metaphoric consistent sentences to finish a metaphorical text.

One of the most interesting findings in our study was that participants produced analogies for primary metaphors. Primary metaphors are traditionally considered mappings acquired from the frequent co-occurrence of experiences. For example, when a child is held in an adult’s arms, it receives warmth and affection at the same time. This conceptual and embodied connection should license linguistic metaphors, such as “he is a warm person”, “a warm hello”, “a cold stare”, etc. But what about our physiological responses to affective situations? Such as when we feel some parts of our body get warm as someone does something nice for us, like treat you with tenderness (e.g., our faces blush, or we sweat). Damasio (2018) claims that the brain maps our interoceptive bodies, our physiological changes, our “feelings” (which might serve as input to analogies). This expectation about CMT is also present in Gibbs’ (2005) work.

Participants’ responses to primary metaphors included what we called metonymies, which were references to same domain mappings, analogical mappings based on physiological changes, and analogical mappings based on other perceptual experiences. Thus, it shows that our experiences with AFFECTION AND WARMTH (and other primary metaphors) do not end when we are a child acquiring these mappings. We continue our entire lives establishing new connections. This does not mean that these new connections are the default mode of processing, which online experiments try to uncover (if there is any): but it is a part of our knowledge about metaphors, and we might rely on it eventually. For the metaphor “John is a cold person”, participants responses included:

1. *It is associated with the fact that when we get warm we feel closer, physically and emotionally, with our feelings. [Mt]*
2. *In cold environments or the winter, people tend to be less agitated, streets have fewer people moving around, as a way for people to save the energy they have in their bodies. Thus, just like in chemistry, lower temperatures are associated with less molecule movement. A cold person is known for being a less spontaneous person, she does not share her emotions or does not feel much of the effect caused by emotions. [A]*
3. *We think of human interactions as being hot, mainly because in moments of happiness we feel our bodies get warmer, like a wave of heat. Thus, the opposite would be cold, that is, no emotion, no wave of heat. [Mt] [A]*

4. *When a body is taken by emotions, we feel hormonal injections in our bloodstream which bring the sensation of warmth in the body: sweat, agitation, etc. The coldness mentioned is related to people who are not moved by these hormonal and emotional shots and keep calm and sterile in critical or intense situations.* [A]
5. *I don't know, but I think that this is an analogy with things that are "frozen" because what is frozen does not suffer from the "elements". It remains "stagnant".* [A]
6. *Generally, there is little life where it is cold.* [A]

From these responses, we see that participants resort to a variety of experiences to come up with analogies: LACK OF LIFE IS LACK OF EMOTION; LACK OF MOVEMENT IS LACK OF EMOTION; LACK OF RESPONSE TO WHAT HAPPENS OUTSIDE IS LACK OF EMOTION. Also, references to physiological changes are made (PHYSIOLOGICAL CHANGE IS LACK OF EMOTION): "hormonal injections in the bloodstream", "wave of heat". And lastly, metonymic reference also appears (e.g., "in moments of happiness we feel our bodies get warmer"). All of these look a little far from the traditional explanation that affection and warmth correlate in our childhood. However, it is important to acknowledge that we have explicitly asked for an analogical motivation, thus, participants were biased into thinking about analogies. For this reason, we are claiming that the knowledge people have or may derive from metaphors are multiple and might be used in different situations and different tasks.

We believe that analyzing the physiological associations people develop with metaphors also helps establish, as Barsalou suggests, that embodied cognition involves more than action systems:

Embodiment is often equated with action, including motor actions, eye movements, and facial expressions [...] Many other bodily systems, however, are also central to cognition, affect, and behavior, including the autonomic system, the endocrine system, the immune system, the cardiovascular system, the respiratory system, the digestive system, and the integumentary system. Additionally, action wouldn't be possible without the skeletomotor system. Although many of these systems may seem irrelevant to cognition, affect, and behavior, they often contribute to them significantly and in turn are affected by them. (BARSALOU, 2020, p.6).

Since the tasks in our experiment involved asking participants to provide a substitution and to explain the analogy for a given metaphoric word, one might wonder if our results reflect two (or more) processes, and that at some point participants might have processed metaphors uniformly (according to any of the theories), to only later

switched to other strategies. However, there are reasons to suspect that processing is also multifactorial (BORTFELD; MCGLONE, 2001). Moreover, even if participants' responses do not reflect processing, but a secondary strategy, it would be hard to imagine how this strategy could be so completely unaffected by the supposedly homogeneous processing that had just occurred when they read the metaphors, yielding a range of different interpretations, from analogies with physiological processes and attributes to conceptual metaphors.

In fact, the view we hold about conventional metaphors is a different one: we believe that the metaphors have a constellation of information acquired through different uses; the structural elements (i.e., conceptual metaphors) are very frequently secondary. The multidimensional meaning of metaphors involves information from typical instances of use, including who uses the metaphor, for what purposes, and other contextually derived knowledge. The fact that metaphors are also organized around "gestalts" or metaphoric systems/structures is secondary and evident in some contexts/tasks and not others. One way of understanding this is by thinking about the following case of adjacent metaphors: "It was very hard to get here. But I still haven't got anywhere". This sentence was found in a meme, presumably pronounced by a soccer player. The sentence makes perfect sense, and could be paraphrased as: "It was hard to do all that I have done so far. But I still haven't done all that I want to do". On the structural level (which is the level explained by CMT), though, lies the inconsistency: if you got here, then you got somewhere, thus, "I still haven't got anywhere" clashes with the first assertion.

This example is meant to showcase the difference between different kinds of knowledge we have about the meaning of a conventional metaphor and the structure which is the focus of Conceptual Metaphors. This rich information is rarely accounted for by theories of metaphor - especially by Lakoff, who has proposed that Conceptual Metaphors comprised most of our knowledge about abstract concepts (BUNDGAARD, 2019).

Our viewpoint about the tasks and results of this study is that the multidimensional content (SPIVEY, 2006), or the knowledge people have about each conventional metaphor, is distributed with different weights: for predicative metaphors, the weight in some attributes stands out clearly, making up for more consistent attributional responses. Moreover, some metaphors have a literal counterpart, which makes up for an attractor basins<sup>7</sup> in responses (e.g. "The prices are high" can be rephrased as "The prices are expensive", but not every metaphor has such a conventional literal counterpart, especially abstract CMs). CMs, being more abstract and generally lacking conventional literal counterparts, will demand different and more variable strategies to "put into words" something which is multidimensional. Thus we will find the use of structurally similar CMs to explain the meaning of a CM not because people lack

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<sup>7</sup> Attractor basins is a terminology in Dynamic Systems approaches, meaning a region of attraction, which is probabilistic, instead of a structure implemented in bloc, as the computer metaphor of the mind suggests (SPIVEY, 2006).

other types of knowledge, but because expressing this knowledge is something non-conventional and their level of abstraction renders the activity more challenging. We could see that participants would even use CMs from different domains as “synonyms” for other CMs. For example, “This idea is empty” [IDEAS ARE CONTAINERS] was rephrased as “This idea has no foundation” [IDEAS ARE BUILDINGS]. This happens, we propose, because the meaning of both metaphors are highly similar, and the structural components (Containers/Buildings) are secondary. Other cases of using other domain metaphors were less consistent but include rephrasing “This curriculum has weight” [IMPORTANCE IS WEIGHT] by “This curriculum has content” [IDEAS ARE CONTAINERS].

The goal of this study was to capture some of the similarities and differences among different types of metaphors. In future work, in case one finds it necessary to have more regularity in their data, one may control for: (i) frequency, (ii) familiarity, (iii) number of different meanings a metaphor have (e.g. “rat” can mean “coward”, making it an attributive metaphor, or it can mean “amoral” making it a conceptual metaphor), and (iv) level of abstraction of conceptual metaphors (e.g. “time is money” is more abstract than “Life is a Journey” within conceptual metaphor, which makes it more deviant).

In any case, a dynamical view of metaphors will assume that metaphor interpretation is based on many factors, such as the history of who is interpreting, the understanding task/goals, the chosen metaphors, the empirical methods used to access understanding, etc. (GIBBS, 2010, 2013, 2019; GIBBS; COLSTON, 2012).

### **Complex Systems: analyzing regularities and variabilities**

Complex systems are systems “[...] in which large networks of components with no central control and simple rules of operation give rise to complex collective behavior, sophisticated information processing, and adaptation via learning or evolution” (MITCHELL, 2009, p. 4). Complex systems are self-organized (without a central control) by the interaction among multiple factors (no factor is more important than the other) in different timescales (behavior is caused by factors that range from evolutionary biases to developmental, cultural, and neurological biases - among others). In this sense,

[...] conceptual metaphors are not static representational entities existing only at the cognitive level, but are stabilities in experience that are emergent products of the human self-organized system. Thus, each conceptual metaphorical understanding unfolds over time given the specific contingencies that define any specific discourse situation. (GIBBS; SANTA CRUZ, 2012, p. 304).

Other metaphoric behavior (apart from conceptual metaphors) can be characterized as emergent in the same way, from a combination of factors.

Sapolsky and Balt (1996, p. 194) explain that “Intrinsic to reductionism is a view about the nature of variability in data. Some variability is deemed legitimate and interesting, as it reflects as-yet-unrecognized factors in the workings of the system under study”, but “other source of variability is little more than an irritant, a problem of measurement instruments—or the humans who use them—not being sufficiently precise; i.e., the variability is simply ‘noise’ that will decrease with improved instruments.” On the other hand, for a complex systems approach, “variability is not mere noise, but is intrinsic to the component parts of the system; moreover, it is independent of the scale of observation” (SAPOLSKY; BALT, 1996, p.194).

Regarding cognition, we understand that some phenomena happen in predictive ways, they are strong attractors. Other phenomena vary more often contextually. Contrary to reductionist science, complex systems approaches do not need to ignore instabilities. Since cognitive processes result from the interaction of different factors, when results are inconsistent with main theoretical approaches, they are not dismissed as “noise”, they are plausibly accounted for using our knowledge (gained from experiments or other empirical sources) of how factors may have interacted to produce that result. That is, in all experiments, even if the hypothesis is confirmed, there are often several participants that do not conform to the norm. As Gibbs (2010, p.37) says: “When faced with variable data within any experiment [...] psychologists typically explain discrepant findings away as being due to ‘error’, ‘noise’, or ‘individual differences’ without further specifying the nature of these differences”. In the same paper, Gibbs explains both the regularities he encountered in a pragmatic experiment and the irregularities, that is, about 30% of participants did not conform with the general trend. The author proceeded to explain, based on the results of other experiments, what factors may have plausibly accounted for the variation. After all, “Sex, Occupation, IQ, Social status, Language, Culture, Geographic origin, Religion, Political background/beliefs, Ethnicity, Personality, Past and present bodily experiences, Physiological differences (e.g., brain disorders, disease)” (GIBBS, 2010, p.668), etc. may all play a role in how people self-organize when performing a task.

In our study, we draw attention to regularities and irregularities in participant’s responses to the tasks of substituting a metaphoric word for another word and explaining the analogy that motivates the metaphors. The results show that participants can make use of much different knowledge when expressing the interpretation of metaphors, even for the same metaphor (attributes, analogies based on stories, analogies based on physiological experiences, metonymies, etc.). No single theory (CMT, AIT or SMT) predicts or incorporates this amount of variability in their scope of investigation or theorizing.

AIT was important for revealing that attributes and faster processes are relevant in some contexts for metaphor processing. CMT was important for highlighting primary metaphors, schemas that underlie metaphors (e.g., the pathway schema, the container schema, etc.), and connections between metaphors (i.e. “attack” an argument and “defend” an argument might be related in the mind of a modern speaker even if we

cannot a priori know if these concepts are used to instantiate the domain of WAR, GAME, ANIMAL BEHAVIOR or none of the previous). And SMT was important for highlighting and insisting on the analogical basis of metaphors, focusing more frequently on structural analogies. There are still many questions about what mechanisms are involved in metaphor processing – there is no final answer to this question precisely because all we know about cognition is inferred. But we do know, by the diversity of the data collected in this study and many others in the literature that metaphors are affected by a great number of factors in non-deterministic ways (personality, belief systems, previous knowledge, age, psychological states, social interactions, and others we have mentioned previously).

Complex systems science is meant to tackle the probabilistic influence of multiple factors on metaphoric behavior in context. Under this view, we see regularities as “attractors” (e.g., AFFECTION IS WARMTH, the mappings acquired by a child when it is held by its affective mother, is an attractor), instead of fixed modes of representations. By understanding the richness of our conceptual system, we see that we have other types of experience that can motivate the uses of a metaphor like “John is a warm person”, for example, the fact that we notice physiological changes in our bodies when we experience affection or the fact that we when we are in an affective mood we may make more movements (which generates warmth), etc. The importance of a complex system approach to metaphors is that we do not need to propose an essentialist explanation for metaphors, we need to understand how different combinations of factors, in different contexts, lead to one type of emergent meaning or another. We do not need to ignore variability as something that is “idiosyncratic” or “noise”, because variability is produced (in general) by the same principles, albeit in other combinations.

## Conclusion

In this exploratory study, we have analyzed participants’ responses to 30 metaphors (10 primary, 10 complex, and 10 attributive). We were able to notice clear differences across the three types of metaphors, validating their distinctions as suggested by a pluralistic account of metaphors. Primary metaphors tend to be associated with other concepts that are roughly interchangeable very often (“high”, in prices are “high” is associated to “expensive”), followed by attributive metaphors, whereas complex metaphors are rarely associated with other interchangeable concepts. This might be explained either by the fact that complex metaphors are more abstract, or their use is more diverse (i.e., contexts are more diverse) than other metaphors.

Analogical (or attributive) components were high for attributive metaphors, followed by complex, and primary metaphors. There were few metonymic references for primary metaphor; on the other hand, analogic and physiologic explanations were interesting, because it points to the fact that experiences and concepts change over time, and, apparently even primary metaphors can be enriched with experiences

(BARSALOU, 2020). Lastly, we looked at how often complex metaphors elicited conceptually consistent responses (as CMT predicted). We noticed that it did not happen consistently for all complex metaphors, but it did happen more frequently for complex metaphors than to other metaphors.

To sum up some of our findings: all things being equal, attributive metaphors select for attributes; primary metaphors become associated with contextual attributes and they evoke more embodied/physiological experiences; and complex metaphors are so diverse (perhaps for being used in different contexts or for being more abstract) that (more often) allows for different strategies, including those predicted by CMT.

Our findings support McGlone's (1996), study by showing that attributive interpretation is important and might be found in some contexts even for conceptual metaphors, that is: CMT does not account for the possibility that people may interpret "Life is a Journey" by simply conceptualizing it as "difficult", instead of activating cross-domain mappings between Lovers and Travelers, Relationship and Vehicle, etc. Or that "The mind is a computer", in a given context, might simply be interpreted as "fast". On the other hand, other theories of metaphor will not account for the fact that "My relationship is a rollercoaster" might indeed be processed by patterns of information that include "ups and downs" (bad and good) or that "Theory is a building" might indeed evoke conceptual associations, as "foundations", "solid", etc.

We understand that metaphor processing is task-dependent (GIBBS, 2017), thus our findings are not meant to shed light on comprehension or on how metaphoric behavior might happen in other conditions. Especially, a different set of metaphors might have yielded different results. In all cases, individual experiences should be relevant for advancing our understanding of metaphors, if we consider that our conceptual system is never fully formed, and metaphors - as analogies - can draw from it indefinitely (depending on the situational demands). Our study suggests that CMT and Analogy/Categorization-based theories are relevant, even if not sufficient, to explaining metaphors. We have also shown that, by adopting a complex system approach to cognition, we can understand stabilities and variations in behavior as resulting from a combination of different factors, instead of dismissing variation as idiosyncratic or noise.

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SIMAN, J.; SAMPAIO, T. Um estudo exploratório sobre tipos de metáforas e tarefas. **Alfa**, São Paulo, v.66, 2022.

- *RESUMO: Como as pessoas interpretam as metáforas? O objetivo deste artigo é reconhecer a complexidade das metáforas além do escopo de qualquer teoria específica das metáforas. Em vez de ignorar evidências contraditórias, propomos destacar e analisar regularidades*



*e irregularidades em nossos dados, usando insights da ciência de sistemas complexos para orientar nossas discussões. Neste estudo exploratório, os participantes foram convidados a substituir um veículo de metáfora por uma palavra com uma palavra de significado semelhante e a explicar a motivação analógica da metáfora. Havia três tipos de metáforas: primárias, complexas e atributivas. Este é o primeiro estudo a comparar esses três tipos de metáforas em duas tarefas diferentes. Os resultados mostram como as metáforas se agrupam de acordo com seu tipo, mas não uniformemente. Nesta análise quantitativa e qualitativa, também mostramos que múltiplas fontes de experiências estão disponíveis durante a interpretação da metáfora. Em conclusão, destacamos que nenhuma teoria atual pode acomodar e prever todos os tipos de comportamento metafórico que diferentes pessoas apresentam em diferentes contextos, mas entendemos alguns dos principais vieses e fatores que estão envolvidos na interpretação da metáfora.*

- **PALAVRAS-CHAVE:** *Metáfora; analogia; metáfora conceptual; metáfora primária; metáfora atributiva.*

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## APPENDIX I: A sample of the full experiment

Example: Jenny is **a warrior**.

- a) Rewrite the sentence above substituting the word in bold for another with similar meaning.
- b) List other words, expressions, and metaphors that are associated with the metaphor in bold.
- c) Describe a situation in which one can use the metaphor in bold.
- d) For you, what is the motivation (or analogy) for the use of the metaphor in bold?

There were 40 different metaphors, 10 of each type - primary, complex, attributive, novel. All of them were followed by the same 4 questions above. In this paper, we report the results for only questions (a) and (d).

## APPENDIX II: Coding scheme

Since we coded for only two questions, SUB means “substitution”, i.e. the question that asked participants to substitute the metaphor in bold for another word. ANA means “analogy”, i.e. the question that asked participants to explain the analogy/motivation for the metaphor in bold.

Code	Meaning
Sub_CD	Question 1/substitution; CD: literal/context-derived word.
Sub_CM	Question 1/substitution; CM: Conceptual Metaphor
Sub_Ana	Question 1/substitution; Ana: Analogy
Sub_CMOD	Question 1/substitution; CMOD: Conceptual Metaphor from Other Domain
Sub_SyCM	Question 1/substitution; SyCM: Synonym Conceptual Metaphor
Sub_Met	Question 1/substitution; Met: Metaphor (not Conceptual)
Sub_SyMet	Question 1/substitution; SyMet: Synonym Metaphor (not Conceptual)

Ana_CD	Question 2/analogy; CD: literal/context-derived word.
Ana_CM	Question 2/analogy; CM: Conceptual Metaphor
Ana_A	Question 2/analogy; A: Analogy
Ana_CMOD	Question 2/analogy; CMOD: Conceptual Metaphor from Other Domain
Ana_SyCM	Question 2/analogy; SyCM: Synonym Conceptual Metaphor
Ana_Met	Question 2/analogy; Met: Metaphor (not Conceptual)
Ana_Mt	Question 2/analogy; Mt: Metonymy
Ana_CMO	Question 2/analogy; CMO: Opposite Conceptual Metaphor

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