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Structural Complexity and Saliency in Interpretation of Familiar Metaphors

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***Abstract*—Metaphors are argued as being a sub-species of analogy. Processing of metaphor interpretation, on the other hand, is postulated as being based on *structure mapping*. A principle underlying this proposition that raises question is *systematicity* which regulates that "alignments that form deeply interconnected structures, in which higher order relations constrain lower order relations, are preferred". The current research investigates the empirical basis of this proposition which implicates that interpretations of familiar metaphors that have a higher level of complexity and consistent with the base domains receive priority treatment and are thus predicted by the Graded Salience Hypothesis to result in faster speed of processing. Interpretations of metaphors were gathered through a survey and two interpretations for each metaphor were selected and prepared as experiment lexical targets; one representing targets with more complex relational structure and the other representing targets having less complex structure. A lexical decision task experiment was conducted to test reaction time by three groups of subjects to these targets after each corresponding metaphor was presented on a computer screen. Results showed that mean reaction time for targets with more complex underlying relational structure was fastest with 450.83ms (SD = 60.588) compared to less complex targets and unrelated targets. A one-way between subjects ANOVA showed significance in differences of mean times among the three categories. A post hoc Holm analysis showed that mean RT for the more complex targets was significantly different from the less complex targets at $p<.05$. We conclude that maximally consistent structures are the basis of metaphor processing. It is also a factor motivating saliency of certain interpretations among alternative interpretations of familiar metaphors.**

***Index Terms*—structure mapping, systematicity, familiar metaphors, Graded Salience Hypothesis, relational structure**

I. Introduction

Metaphors have been theorized as mapping of conceptual components (Lakoff and Johnson, 1980), alignments of structural relations (Gentner, 1983), and category-inclusion statements (Glucksberg and Keysar, 2003), among others. *Structure-mapping theory* (Gentner, 1983, Gentner and Bowdle, 2001) is an effective account of how the metaphorical process works. The strength of this theory is that it explains a central element in the interaction between domains in a metaphor, namely, the interaction between conceptual systems (Gentner and Bowdle, 2001, p. 226). The theory follows the principle of *systematicity* which implicates that among alternative interpretations of metaphors, those which reflect maximal structural consistency ("maximal structurally consistent match") are preferred.

There has been no well-established empirical basis for Gentner and Bowdle's claim of the systematicity principle. Nevertheless, Gentner's (1983) and Gentner and Bowdle's (2001) theory remains a useful tool for further investigations into mental processing of metaphors. The current research aims to study the empirical basis of the theory for metaphors that are categorically familiar. The rationale for this is that structure mapping theory seems more appropriate in explaining processing of novel metaphors than familiar metaphors. This is because the theory looks at metaphors in terms of domain comparison through a two-stage process of *alignment* and *projection*. It seems quite unlikely for same stages of processing to take place in interpretation of familiar metaphors. The current study implements an experimental method to find out whether or not the systematicity principle is relevant in interpretation familiar metaphors.

II. Theoretical Background

In response to the intensely growing metaphor research at the time, Gentner and Bowdle (2001) expressed the need to go back to the question of how metaphors are processed in the human mind. They state that,

"Indeed, it has recently been claimed that metaphors may be the primary … mechanism for reasoning with abstract concepts- metaphors allow us to structure vague or ambiguous ideas in terms of more concrete realms of experience (e.g., Gibbs, 1994; Lakoff & Johnson, 1980; Lakoff & Turner, 1989). Given such claims, the question of how metaphors are processed has taken a central place in the cognitive sciences" (p. 223-224).

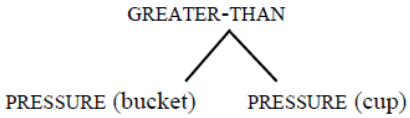
In a previous work, Gentner (1983) posits that metaphors are essentially a sub-species of analogy, involving a process of matching structures between two conceptual systems, during which links are subsequently aligned by way of analogical connectivity. Gentner and Bowdle (2001, p. 226) postulates metaphor processing as being based on what they refer to as *structure mapping*, i.e., the highlighting of existing systematic structural commonality between domains. This principle rules out the possibility of mapping of random aspects between the base and target domains.

One aspect of Gentner dan Bowdle's (2001) proposition that raises question is the notion of systematicity which regulates that "alignments that form deeply interconnected structures, in which higher order relations constrain lower order relations, are preferred". This principle implicates that among alternative interpretations of metaphors, those which reflect maximal structural consistency or a "maximal structurally consistent match" (Fallkenhainer, Forbus, & Gentner 1989) are prioritized over less consistent ones. Interpretations that have both higher level of complexity and consistency with the base domain receive priority treatment during processing, resulting in faster speed of processing predicted by the Graded Salience Hypothesis (Giora 1997).

In order to test the validity of this proposition, there are several reasons why it is appropriate to resort to Giora's (2003) notion of *graded salience*. First, Giora (2003) maintains that, "lexical access mechanism is ordered: more salient meanings…are accessed faster than and reach sufficient levels of activation before less salient ones" (2003: 43). Secondly, in supporting her proposition, Giora (1997) also makes use of findings by researchers in the area of literal meaning processing, particularly metaphors. Thirdly, in suggesting the usefulness of the lexical decision experiment method for studying the mental representation of language, Hason and Giora (2007) make mention of research on metaphor processing, i.e., Blasko and Connine's (1993) study which implemented lexical decision experiment as a method to find out how quickly people responded to metaphoric meaning in comparison to literal meaning of metaphor expressions and also to determine which existing models of metaphor processing can empirically hold. Apart from referring to other researchers using the lexical decision task, Giora et al. (2005) had also implemented the same method in an investigation aiming at modeling linguistic representation.

Based on the above reasoning, this research implements the lexical decision experimental method to test whether the principle of systematicity holds in metaphor interpretation. In order to do this, it is necessary to have a well grounded principle to determine degree of structural complexity underlying the interpretations.

The analysis used to determine degree of complexity of relational structures is based on the notion that system of relations can be understood as structural properties or interrelationships between facts (Falkenhaner, Forbus and Gentner, 1989), i.e., as a propositional statement, e.g. "Pressure in the bucket is greater than pressure in the cup" can be expressed as GREATER-THAN (PRESSURE (bucket), PRESSURE (cup)) or as a tree diagram shown below. This is with the exception that propositional statements which only contain a predicate, therefore being attributive in nature, cannot be represented diagrammatically in tree form.



Gentner (1983) identified types of relational structures based on their degree of complexity. Type 1 are structures in which the predicate structure expresses attributes, e.g. LARGE (X). Type 2 are structures in which the predicate structure expresses relations, e.g. COLLIDE (X, Y). While Type 3 are structures in which the predicate structure expresses *higher-order* relations, e.g. CAUSE [COLLIDE(X, Y), STRIKE (Y, Z)].

To determine the degree of complexity of relational structure between a metaphor and a particular interpretation, an analysis of conditional necessity and sufficiency (necessary and sufficient conditions) is implemented. Fine (2002, p. 254) mentions a variety of necessities by saying that,

"There are the necessary truths of logic, mathematics and metaphysics, the necessary connections among events in the natural world, the necessary or unconditional principles of ethics, and many other forms of necessary truth or connection".

The philosophical notion above corresponds with Jackendoff's (1987) *mentalist postulate* that, "meaning in natural language is an information structure that is mentally encoded by human beings" (p. 122). Saeed (2003) explains this position as "meaning of a sentence is a conceptual structure" (p. 266). The notion to exemplify this principle is *necessary semantic entailment* as shown in the following example.

George killed the dragon

The dragon died.

From an entailment point of view, the above expressions can be taken to relate two events:
x killed y entails y died.
Jackendoff (1987) argues that there is a semantic element underwriting this statement namely:
x cause E to occur (E=event)
This is applicable to other statements:

1) He lifted the cup.	x cause the cup to rise
2) Alex persuaded John that that the blue car is better.	y came to believe that the blue car is better.

Therefore, through semantic decomposition analysis, entailment relations can be seen in lexical items, as in the case of the words "kill", "raise", and "persuade" which all possess underlying entailment relations bound by causation relationship.

To analyze these relations, the following steps are implemented:
1. Define the propositional meaning of the metaphor.
2. Analyze any existing antecedent or consequent underlying the concept
3. Determine whether existing antecedent or consequence is structurally componential in the meaning of the interpretation based on necessary and sufficient condition analysis.

e.g.

	Necessary	**Sufficient**
A died	: A not alive (necessary)	caused by event (not necessarily)
X killed Y	: Y not alive (necessary)	caused A (necessarily)

III. Experiment

A. Method

The aim is to investigate the whether the reading of familiar metaphors facilitate faster retrieval of higher-order (more complex relational structure) related targets than retrieval of lower-order (less complex relational structure) related targets by implementing a lexical decision task (LDT). For this purpose, unrelated targets are used as control, namely, words which are semantically unrelated to the metaphor.

The LDT is used to verify that the prediction of the theory that the reaction time for non words and unrelated targets should be higher, meaning that it takes more time for individuals to make their decisions because they still need to access the words (unrelated words). Faster reaction time in making the correct decision in this case signifies that certain relevant features had already been preaccessed when subjects listened to and read the familiar metaphor (priming effect). A difference in reaction time between words shows the effect of priming by related metaphor expressions.

Giora argued (2003) that access to information, including lexical meanings, is dominated by salience; the mechanism of retrieval of lexical information (lexical access) operates in an ordered manner, causing meanings that are foremost to be accessed faster as compared to less salient meanings (Graded Salience Hypothesis). Lexical access is viewed as "reaching sufficient levels of activation". The procedure goes that after a prestimulus momentarily appear on the screen, a few moments later the stimuli appears. For this, subjects had been instructed to respond, deciding whether that string is a word in their language or not. For example, in the experiment by Meyer and Schvaneveldt (1971) subjects were on average faster in giving response that *butter* is a word (in English) when it was preceded by the word *bread* than when it was preceded by the word *nurse*.

	Prestimuli	**Stimuli**	**Correct Response**	**Mean RT**
Group A:	bread	butter	"yes"	300ms
Group B:	nurse	butter	"yes"	750ms

As a hypothetical example, subjects are predicted to respond slower to *butter* after having read *knife* than having read *bread*, but faster than having read *nurse*.

e.g.

Group C:	knife	butter	"yes"	500ms

The difference in response times is accounted to the likelihood that lexical access of BUTTER occurred during prestimulus. When the subject was reading *bread* the concept *butter* and *knife* were automatically accessed. However, although related, *knife* was less salient to the interpretation of the concept, indicating the prevailing networking arrangement between concepts in the mind. In contrast, it took more time to access *nurse* because of an absence of conceptual relatedness with *butter*.

B. Norming Survey (Preparaton of Metaphor Interpretations as Experiment Targets)

Twenty two Metaphors were collected from magazines (targeted for adult readership, adult female-specific readership, and younger age group readership). The survey involved 77 native Indonesian respondents, ages ranging between 20 and 50 years old. A survey of familiarity was conducted with the result showing all metaphors qualified as "familiar" (>5.5 on a scale of 1-7).

In the survey, respondents were also asked to give their interpretation of the metaphor by answering using a maximum of four words. The interpretations were gathered and dominant interpretations can be determined. For example, for the metaphor *Bisnis salon menjamur* 'Salon business "mushrooms"', the three most dominant interpretations were *membanyak* 'increase in quantity', *berkembang* 'develop', and *menyebar* 'spread'.

TABLE 1:
METAPHOR INTERPRETATIONSGATHERED THROUGH SURVEY

Data	Interpretation	Glos	Freq.	%
1	***membanyak***	**increase in quantity**	**25**	**32.47**
2	*berkembang*	develop	23	29.87
3	***menyebar***	**spread**	**14**	**18.18**
4	*meledak*	explode	4	5.20
5	*menyeluruh*	comprehensive	4	5.20
6	*menjalar*	to vine	3	3.90
7	*tidak beroperasi*	not operating	2	2.60
8	*bercabang*	branch out	2	2.60

C. Degree of Complexity of Interpretations

As mentioned earlier degrees of complexity can be determined by analysis of necessary and sufficient conditions which corresponds to the principle of necessary semantic entailment (Jackendoff (1987). In the sentence Salon business mushrooms, for example, "increase in quantity" was one of the dominant interpretations (32.47%). Its propositional expression is INCREASE IN QUANTITY (Salon Business). In this case, the interpretation INCREASE IN QUANTITY (Salon business) does not unambiguously entail a particular consequent or antecedent (see analysis below).

Context: Salon business "mushrooms".

Interpretation (1): INCREASE IN QUANTITY (SALON BUSINESS)

Antecedents/consequence: Possible antecedents: 1) Static area: the number of salons increases but occupying a static area; 2) Increasing quantity: the number of salons increases occupying a larger area.

Conclusion: Ambiguous antecedents and not necessary

Linguistic propositon:	MUSHROOM (SALON BUSINESS)
Underlying structure:	INCREASE IN QUANTITY (SALON BUSINESS)

Another relatively dominant interpretation gathered was SPREAD (18.18%). The metaphorical interaction of domains is TO SPREAD IS TO MUSHROOM. The interpretation can be expressed propositionally as SPREAD (SALON BUSINESS).

Multiplication of unbounded entities logically entails SPREAD. It is an understood knowledge when a person gives the interpretation INCREASE IN QUANTITY. This meaning component is considered a necessary substructure of the interpretation's schema.

Context: Salon business "mushrooms".

Interpretation (2): SPREAD (SALON BUSINESS)

Antecedents/Consequences: Since salon business is a bounded entity, therefore in order to spread it must multiply.

Conclusion: INCREASE IN QUANTITY is an antecedent of SPREAD.

Type of Relation: CAUSAL

Linguistic propositon:	MUSHROOM (SALON BUSINESS)
Underlying structure:	CAUSAL INCREASE IN QUANTITY (SALON BUSINESS) SPREAD (SALON BUSINESS)

Based on the above analysis, it is concluded that the interpretation "spread" is of a higher degree of structural complexity compared to the interpretation "increase in quantity".

The sentence *Bisnis salon menjamur* does not explicitly present an X IS Y statement. Lakoff and Johnson's (1980) model of mapping is implemented to bring out the relevant interacting of domains. For the interpretation "increase in quantity" (32.47%), the mapping is TO INCREASE IN QUANTITY IS TO MUSHROOM. The interpretation can be expressed propositionally as INCREASE IN QUANTITY (SALON BUSINESS).

Based on this method of analysis, among dominant interpretations, two interpretations can be prepared that represent the independent variable in the experiment, namely, complexity which vary in degree. Accordingly, the two types of experimental targets are:

1) Lexical Targets (metaphor interpretations) having more complex relational structure
2) Lexical Targets (metaphor interpretations) having less complex relational structure.
Unrelated targets were prepared as the experiment control.

TABLE 2:
METAPHORS AND EXPERIMENT TARGETS

METAPHORS		TARGETS		
		UNRELATED	HIGHER ORDER	LOWER ORDER
M1	*Bisnis salon menjamur* 'Salon businesses "mushroom"'	*bernyanyi* 'sing'	*menyebar* 'spread'	*membanyak* 'increase quantity'
M2	*Ia mengejar impian itu* 'She "chases" her dream'	*saudara mereka* 'their relative'	*berusaha keras* 'endeavor'	*memperoleh* 'obtain'
M3	*Bencana mencabut nyawa* 'Disaster "plucks" life'	*kemeja* 'shirt'	*mengeluarkan* 'take out'	*mengakhiri* 'end'
M4	*Dia menggali bakatnya* 'She "digs" her talent'	*memandikan* 'to shower'	*mengeluarkan* 'take out'	*memunculkan* 'uncover'
M5	*Mereka kebanjiran pesanan* 'They are flooded with orders'	*melemparkan* 'throw'	*kelebihan* 'overload'	*sangat banyak* 'plenty'
M6	*Modernisasi dan tradisi sering berbenturan* 'Modernization and tradition often collide'	*peristiwa* 'event'	*bertabrakan* 'crash'	*bertentangan* 'contradict'
M7	*Dia melaju ke final* 'She advances to the finals'	*tidak menulis* 'not write'	*tidak terhalang* 'unobstructed'	*tidak berhenti* 'not stop'
M8	*Kasus investasi menimpa ratusan orang* 'Investment case descends on hundreds of people'	*tunggu* 'wait'	*jatuh ke* 'fall'	*kena* 'hit'
M9	*Komentar dari publik berdatangan* 'Comments from the public are "arriving"'	*selimut* 'blanket'	*bermunculan* 'emerging'	*menuju* 'directed'
M10	*Menonton drama membuat kita terhanyut.* 'Watching drama make us drowned'	*bola lampu mati* 'dead bulb'	*tidak bisa menahan* 'could not withold'	*terbawa perasaan* 'carried by emotion'
M11	*Persiapan mereka MATANG sebelum liburan.* 'Their preparation was "ripe" before the break'	*tukar tambah* 'trade in'	*sangat siap* 'very ready'	*sangat baik* 'very good'
M12	*Tampilan layar smartphone ini tajam* 'This smartphone's screen display is sharp'.	*pikiran* 'thought'	*jelas* 'clear'	*bagus* 'good'
M13	*Dia adalah seorang bintang* 'She is a star'	*kemampuan* 'ability'	*menonjol* 'salient'	*menarik* 'attractive'
M14	*Dia bekerja dengan pikiran jernih* 'She works with a "water-clear" mind'	*kuat* 'strong'	*jelas* 'clear'	*bersih* 'clean'
M15	*Dia tulang punggung keluarga* 'He is the backbone of the family'.	*bersyukur saja* 'just thankful'	*pemikul beban* 'burden bearer'	*sumber utama* 'main source'
M16	*Sikap Positif tertanam* 'Positive attitude is "planted"'.	*temani* 'accompany'	*sudah masuk* 'already entered'	*di dalam* 'inside'
M17	*Pak Andin menutup pembicaraan* 'Mr. Andin closed the discussion'.	*tidak mengenal* ''not recognize'	*sudah selesai* already over'	*tidak terbuka* 'not open'
M18	*Dia terserang penyakit* 'She is "attacked" by disease'.	main 'play'	*kalah* 'defeat'	*terkena* 'contracted'
M19	*Hal itu tercermin dalam semboyan bangsa* 'That idea is "mirrored" in the nation's motto'	*mengoleskan* 'rub'	*dipantulkan* 'reflected'	*digambarkan* 'illustrate'
M20	Targets for *Tarian daerah mengandung arti* 'Local dance "contains" meaning'	*menggoreng* 'fry'	*memiliki* 'possess'	*di dalam* 'inside'
M21	*Tarian daerah mengandung arti* 'Local dance "contains" meaning'.	*meja belajar* 'study desk'	*tidak bisa lepas* 'inseparable'	*menjadi bagian* 'be part of'
M22	*Kebiasaan itu melekat pada kita* 'The custom is "affixed" to us'.	*bukan kesalahan* ''not a mistake'	*tidak nampak lagi* 'no longer seen'	*tidak ada* 'not exist'

In order for content of the task to be consistent with the instructions given to the subjects, a number metaphors were included which were followed by nonwords (see example below) comprising to approximately one third of the whole task. Related and unrelated targets are distributed relatively evenly across Group A, B and C.

e.g.,

Metaphor	**Nonword Target**
Dia membantah ada dana mengalir kepadanya. He denied there were funds "flowing" to him.	menafri
Dia berupaya menjauhkan pikiran itu. He tried to distant the thought.	kamulz

D. Materials

The experiment was coducted in the Language and Multimedia Laboratory at the Methodist University of Indonesia. The lab facilitated *Acer Aspire Z1650* all-in-one computers and headsets suitable and necessary for the experiement. The experiment used 15 sets of computers to allow for better control of the running of the experiment. The computers were installed with psycholinguistics experimentation program. Specially marked keyboards were used for the computers, with the "L" marked with green color and the "M" marked with red color.

E. Participants

Ninety students from 2nd, 4th and 6th semester English Major Students at the Methodist University of Indonesia participated. This is considered sufficient as the basic aim is to produce a description of the pattern of semantic processing, in which individuals are predicted to have insignificant degrees of differences in the semantic networking of concepts (Edwards, 1960).

Following the micro-cosmos principle of universality, a relatively small sample size is considered adequate in a study of semantics such as the current research. In a study by Newman et al. (2009) at Indiana University, examining the influence of lexical processing on sentence comprehension processing, 17 people from the university community took part as subjects. In the study, Newman et al. concluded that facilitation of lexical access facilitated sentence comprehension. A native speaker is considered to have to have a representation of the system of the language in his mind. Furthermore, it is common to involve university students as subjects in psycholinguistic experimentations (Edwards, 1960). Thibodeau and Boroditsky (2011) as well as Blasko and Connine (1993) used university students as subjects in experimental semantics research..

F. Procedure

The experiment was run for 3-12 subjects at a time in order to ensure a well controlled operation. This allowed the subjects to be properly prepared in terms of information about what the experiment was going to be like. For the 12 computers used during each run, 4 computers were installed with Group-A targets, 4 with Group-B targets and the other 4 with Group-C targets.

A separate test set was prepared to be used in a practice run so that subjects can be fully oriented with the task. They were informed that the experiment is conducted for the purpose of studying word meaning and that it lasts approximately 20. The instructions were that, "1) a sentence will appear on the screen for a few seconds and that simultaneously they will hear the exact sentence on the headphones; 2) after the sentence dissapear from the screen, a few seconds later a word or a phrase will appear on the screen; 3) decide if the word is a real word in or not; 4) to response, press either the red key for *no* or the green key for *yes*".

Subjects were all asked to repeat the practice set once. This was to ensure that they were comfortable with the procedure and have no confusion about which button to press to give their response.

G. Design

The results were analyzed using a one-way analysis of variance (ANOVA) to evaluate the significance of differences. The significance of the different mean times above can be assessed by an single-factor ANOVA analysis using Microsoft Excel Data Analysis. A post hoc Holm test is carried out for pair wise comparison of the settings.

IV. Results and Discussion

The fastest mean reaction time (RT) was for higher-order targets (more complex relational structures) with 452.97ms (SD = 61.22). Next was the mean RT for lower-order targets (less complex relational structures) with 498.11ms (SD = 76.29). While unrelated targets had the slowest mean RT with 548.55ms (SD = 87.923) (see Figure 1).

Figure 1: Mean reaction times for experiment targets

A one-way between subjects analysis of variance (ANOVA) showed a significance in differences of mean times among the three categories at the $p<.01$ level for the three conditions [$F(2, 63) = 7.74$, $p = 0.001$]. The post hoc comparisons using the Holm Analysis showed that mean RT for higher-order targets was significantly different from lower-order targets (Group B targets vs C targets) at $p<.05$.

Among the metaphors tested, there were 14 metaphors in which higher-order relations (more complex relational structures) were fastest while there were 2 others in which higher-order relations were not the fastest among the targets, but were faster than lower-order relations (less complex relational structures). Mean RT for higher-order targets was significantly faster than mean RT for lower-order ones. Overall, 16 out of the 22 metaphors (73%) had faster RTs for higher-order relations compared to lower-order relations.

Giora (2003) suggests that in metaphor comprehension, saliency plays a dominant role in the initial access and subsequent selection of relevant information and that saliency can be measured in terms of relatively faster RT's in a

lexical decision setting. Hasson and Giora (2007) argue that comprehension begins with initial activation of lexical information. Based on this, access to information, including lexical meanings, is dominated by salience. According to the graded salience hypothesis, the mechanism of retrieval of lexical information (lexical access) operates in an ordered manner, causing meanings that are foremost to be accessed faster as compared to less salient meanings.

The speed of lexical access can be explained as shorter time needed for a meaning to reach sufficient levels of activation. In contrast, less salient information takes more time to access or may not even be activated at all. Giora (2003) maintains that salient interpretations of metaphors are more likely to be activated while less salient meanings have less likelihood of activation. Giora (2003) explains that one of the factors why certain meanings are foremost in the mind allowing them to reach activation levels faster than other meanings, is the prototypical effect.

The fact that higher-order targets are accessed faster than lower-order targets during metaphor meaning processing indicates that the interpretation of familiar metaphors are grounded on relational structure, particularly more complex ones.

V. Conclusions and Suggestions

The research provides empirical evidence that for familiar metaphors, interpretations that have more complex underlying relational structures are accessed faster than less complex ones. Interpretation of familiar metaphors therefore is grounded on maximally consistent structures. We conclude that complexity of relational structures is a significant factor in the saliency of interpretations of familiar metaphor as more complex structures are processed faster.

Despite the effectiveness of structure mapping theory in explaining metaphor processing, it remains a question whether familiar metaphors have any need to go through the sequential processes of alignment and projection on the basis of the fact that meaning of familiar metaphors is unlikely to remain permanently based on comparison of conceptual domains. There is a possibility that it may, at some point, become an independent schematic concept, ruling out the need for domain comparison.

Having empirically demonstrated that more maximally consistent structures are prioritized over less complex ones, an alternative explanation to Gentner and Bowdle's (2001) sequential stages of alignment and projection is needed to account for the faster processing of structurally more complex relations in familiar metaphor interpretation.

Appendix

Table:
Reaction time comparison for different targets

	REACTION TIME (ms)		
	UNRELATED	**HIGHER-ORDER**	**LOWER-ORDER**
1	488.61	486.53	575.05
2	622.60	446.57	575.82
3	515.16	529.88	506.58
4	678.18	436.63	545.95
5	553.05	447.46	407.61
6	438.55	425.91	553.47
7	570.24	629.63	600.27
8	467.40	506.06	478.09
9	413.05	471.00	494.00
10	576.84	583.72	565.78
11	686.85	372.25	357.25
12	472.58	358.91	405.53
13	415.14	401.52	632.09
14	481.21	333.82	374.36
15	671.21	382.38	498.14
16	506.77	465.89	521.00
17	646.90	476.36	519.61
18	484.55	461.27	514.26
19	551.29	459.67	587.39
20	691.80	413.92	462.35
21	552.46	439.84	577.79
22	576.56	508.46	482.68
***M*:**	**548.23**	**456.26**	**510.69**
***SD*:**	**88.49**	**69.73**	**74.42**

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