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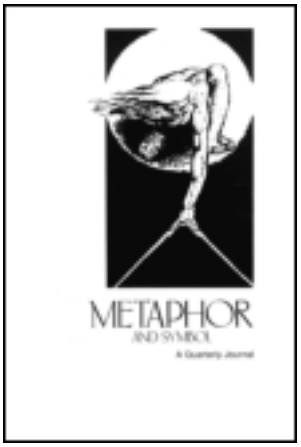

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Element Order in Metaphorical and Literal Phrases

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Element Order in Metaphorical and Literal Phrases

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The present study examines the role of a noun's concreteness in determining the order of nouns within literal and metaphorical conjunction constructions. Two experiments were conducted. In Experiment 1, 45 participants were asked to recall sentences with canonic and non-canonic order. In Experiment 2, 41 participants performed a lexical decision task to the final word of a canonic or non-canonic sentence. The results show that concreteness plays an important role in recalling word order in both literal and metaphorical sentences. In addition, canonic metaphorical sentences were processed faster than were non-canonic metaphorical sentences. Our findings suggest that concreteness affects element order in conjunction constructions but that the effect of concreteness is more pronounced in metaphorical phrases. These findings are discussed in the context of the class inclusion framework (Glucksberg & Keysar, 1990).

The present study examines the role that the level of a noun's concreteness plays in determining the order of nouns within conjunction constructions. Consider, for example the sentence *"She forgot her scarf and love."* The two words in the conjunctive noun phrase *scarf and love* belong to the same syntactic category (nouns) and have the same syntactic role in the sentence (both are direct objects). They differ from one another in that *scarf* is a concrete object while *love* is abstract. We hypothesize that the difference in concreteness affects the order of the two nouns in the conjunction.

Past research has brought to light various factors that affect word order of nouns in sentences or in conjunction noun phrases, including prosodic factors such as length and meter (Cooper & Ross, 1975; McDonald, Bock, & Kelly, 1993), syntactic roles (Keenan & Comrie, 1977), conceptual factors such as animacy and salience (Cooper & Ross, 1975; see Shen & Kotzer, 2014, for a review), as well as pragmatic factors such as the placement of masculine names before feminine ones (Wright, Hay, & Bent, 2005).

Relatively few studies have directly examined the effect that conceptual factors such as prototypicality, salience, and animacy may have on the order of nouns in conjunctive noun phrases, that is, constructions in which two (or more) conjoined nouns have the same syntactic

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role in the sentence (as in *scarf and love* above; Shen & Kotzer, 2014). Previous findings suggest that constructions in which the conceptually prominent noun (i.e., the noun higher in prototypicality, salience, or animacy) preceded the less prominent noun are easier to process in various tasks such as recall or paraphrasing (Osgood & Bock, 1977; Kelly, Bock, & Keil, 1986).

The role of concreteness in determining noun order within conjunctive noun phrases has received even less attention. However, concrete nouns have been described in the past as conceptually more prominent (or salient) than abstract ones (e.g., Bock & Warren, 1985), in that they represent conceptually richer concepts (Keil, 1979), are more accessible, and are easier to recall (Bock & Warren, 1985). Importantly, conceptually prominent terms tend to precede less prominent terms in sentence and phrase structure (Osgood & Bock, 1977) as well as in conjunction constructions (Kelly et al., 1986). Arguably, there is an iconic correspondence between the linear order of the nouns in a conjunctive noun phrase and the conceptual prominence of those nouns. Indeed, Rosch (1999) demonstrated that prominent items are retrieved from memory before less prominent ones. Thus, when a more prominent item precedes a less prominent one in a sentence or a phrase the linguistic structure mirrors this cognitive retrieval precedence (Osgood & Bock, 1977; Kelly et al., 1986).

METAPHORICAL CONJUNCTION CONSTRUCTIONS: ZEUGMA

The issue of linear ordering of noun phrase conjunctions pertains also to metaphorical conjunctive phrases, known as *zeugma* (from the Greek word *yoking*). A zeugma is a type of figurative language in which a word stands in the same relation to two other words, but with two different meanings. The most common form of zeugma is a sentence with a verb that has two direct objects such as *"I've lost my money and my dignity."* This figurative type is commonly used in diverse (poetic and non-poetic) contexts and for different purposes such as humor, surprise (see, e.g., Veale, 2003; Zimmerman, 2009), and satire (e.g., Zimmerman, 2009). Zimmerman (2009) points out the extensive use of zeugma in Irving, Poe, Melville, Nathanael West, Chandler, Hammett, and Dickey:[1] *"He was wearing a pair of women's stockings and a look of considerable embarrassment"* (adapted from Cruse, 1986); *"[They] covered themselves with dust and glory"* (Mark Twain, *The Adventures of Tom Sawyer*); *"Here thou, great Anna! Whom three realms obey, Dost sometimes counsel take and sometimes tea"* (Alexander Pope)*; "California: bordering always on the Pacific and sometimes on the ridiculous"* (taken from Veale, 2003)*; "My apartment is so small I barely have enough room to lay my hat and a few friends"* (Dorothy Parker; taken from Veale, 2003). This figurative type is also used in Hebrew, Russian, and Arabic poetry (Shen, 2008).

A PSYCHOLINGUISTIC STUDY OF METAPHORICAL CONJUNCTION CONSTRUCTION

While several studies in linguistics and rhetoric have focused on zeugma, the psycholinguistic study of metaphor has not paid much attention to this type of figurative language. In a recent

[1]For a more detailed analysis of zeugma from a linguistic perspective, see Croft and Cruse (2004), Lascarides et al. (1996), Solska (2008), Veale (2003), and Zimmerman (2009).

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study Shen and Kotzer (2014; see also Shen, 1998) examined the role of several conceptual factors, including animacy, salience (word frequency), and concreteness in determining noun order in zeugmas. When participants were presented with a non-canonic version of a metaphorical sentence (e.g., *"The farmers sowed their hopes and seeds"*) and were asked to recall the sentence or paraphrase it, they tended to inverse the critical noun pair (*seeds* and *hopes*) to the canonic form, but when presented with a canonic sentence (e.g., *"The farmers sowed their seeds and hopes"*) they did not change the noun pair order in recall tasks. Because in this study concreteness was manipulated together with other factors (animacy, salience), the question still remains as to whether the observed effect on word order is to be attributed to concreteness (that is, to the preference for concrete first ordering) or metaphoricity (that is, to literal-first ordering). If the ordering of nouns is determined by concreteness, then the effect on word order would equally apply to literal sentences; alternatively, if it is determined by metaphoricity, then the effect will be exhibited only in metaphorical sentences.

As previously mentioned, the psycholinguistic study of metaphor has focused primarily on the prominent figurative forms of nominal metaphor (*A is B*) and simile (*A is like B*), and has paid little attention to metaphorical zeugmas (for an exception see Shen, 1998, 2008). Nevertheless, the class inclusion view of metaphor comprehension (Glucksberg & Keysar, 1990; Glucksberg, McGlone, & Manfredi, 1997) can be extended to accommodate this metaphorical structure. According to the class inclusion view, a metaphor represents a class inclusion statement in which the target is said to be a member of the ad-hoc category that is emblemized by the source term. As proposed by Shen (1998), the class inclusion relation can be expressed in various linguistic constructions apart from the *A is B* form (e.g., *a robin is a bird*). Arguably, the (metaphorical) zeugma represents one such construction (see Shen 1997, 1998). Under this view, the verb (e.g., *sowed* in the sentence *"The farmers sowed their seeds and hopes"*) spans the two arguments *seeds* and *hopes*, thus establishing an ad hoc category (i.e., things one *sows)*, of which the two nominal arguments (*seeds* and *hopes*) are members. We further assume (following, e.g., Barsalou, 1983; Glucksberg & Keysar, 1990; Shen, 1998) that these ad hoc categories are structured as prototype categories—certain members are considered more prototypical than others. For example, *seeds* is a more prototypical member of the category *things which may be sown* than is *hopes* (for an elaboration of this view, see Barsalou, 1983; Glucksberg & Keysar, 1990; Shen, 1998). This prototypical structure affects the linear ordering of category members in the zeugma in that there is a preference to place the prototypical member (typically the concrete term; e.g., *seeds*) before the less prototypical one (*hopes*) rather than the other way around. The rationale underlying this assumption is that the preferred (canonic) ordering directly reflects their conceptual accessibility. This assumption relies in turn on findings in the area of categorization research which have already been raised above. Namely, that prototypical members precede less prototypical ones in their retrieval from memory, and this directly affects their linear ordering in sentence production. In other words, *conceptual precedence* in retrieval from memory is reflected in *linear precedence* in sentence structure (see Osgood & Bock, 1977).

Empirical evidence supporting this rational comes from Kelly and colleagues' (1986) study of the relationship between prototypicality and sentence structure using recall and preference ratings. When presented with two sentences such as *"The man bought an orange and a lemon in the grocery store"* and *"The man bought a lemon and an orange in the grocery store,"* most participants judged the first sentence, in which *orange* (the prototypical term in the category *fruit*) preceded *lemon* (the less prototypical term), to be the more natural one of the two. Of particular importance is Kelly et al.'s finding that when recalling conjunction constructions (such as the

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above) which reverse the canonic order, participants consistently inverted the original ordering by positioning the prototypical terms before the non-prototypical ones.

The present study aims to examine the effect of concreteness in determining noun order in both metaphorical (e.g., *"The soldier packed his shirt and sorrow"*) and literal (e.g., *"She forgot her scarf and love"*) sentences. Experiment 1 uses a recall paradigm to examine the effect of the canonic form, in which the concrete noun precedes the abstract noun, on inversion. Experiment 2 uses an on-line lexical decision task to examine whether canonic sentences are processed faster than non-canonic sentences. According to the *concrete first hypothesis*, we expect to find higher recall rates and fewer inversions of canonic forms as compared with non-canonic forms. We also expect to find faster response times for canonic as compared to non-canonic sentences. We have no specific predictions as to whether the concrete first hypothesis applies equally to both literal and metaphorical sentences, since this question has not been addressed before.

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STIMULI CONSTRUCTION

An initial list of 46 metaphorical and 46 literal sentences was created. Sentences were either based on stimuli used in Shen and Kotzer's (2014) study or created by the authors for the present study. Stimuli were chosen if in the form *subject-verb-noun-and-noun*. Canonic and non-canonic forms were given representation within both metaphorical and literal sentences. A canonic metaphorical sentence was defined as a sentence in which (a) the first noun within the direct object was a concrete noun which was literally related to the verb, and (b) the second noun within the direct object was an abstract noun which was metaphorically related to the verb (e.g., *"The soldier packed his shirt and sorrow"*). A non-canonic metaphorical sentence was defined as a sentence in which the direct object nouns were presented in the reverse order (e.g., *"The soldier packed his sorrow and shirt"*).

A canonic literal sentence was defined as a sentence in which (a) the first noun within the direct object was a concrete noun which was literally related to the verb, and (b) the second noun within the direct object was an abstract noun which was literally related to the verb (e.g., *"I thought about my book and longing"*). A non-canonic literal sentence was defined as a sentence in which the nouns were presented in the reverse order (e.g., *"I thought about my longing and book"*). Three judges independently classified each noun as concrete or abstract, depending on whether it referred to an object that could be visually perceived. Inter-rater reliability was 100%.

Next, we conducted two pretests on the stimuli pool. In the first pretest, four undergraduate students were presented with the original 46 canonic metaphorical and 46 canonic literal sentences and were asked to mark sentences that were unnatural in their use of language. Only sentences that were rated natural by three out of the four judges were retained. This procedure resulted in a reduced bank of 40 metaphorical and 40 literal sentences.

In addition to the concreteness rating, we collected subjective imageability ratings for nouns in each sentence. This was done in order to determine whether concreteness ratings match imageability ratings. As each sentence involved two relevant nouns, there were a total of 160 nouns to rate. For this exercise, sentences were divided into two lists based on whether they were metaphorical or literal. Five undergraduate students from the Department of Literature at the Tel Aviv University rated the nouns on each list for their degree of imageability, that is, how easy is it to imagine the noun on a seven-point scale ranging from 1 (low in imageability) to 7 (high

in imageability). For the metaphorical sentences, concrete nouns were rated high in imageability ($M = 6.67$, $SD = .46$) and abstract nouns were rated low in imageability ($M = 2.90$, $SD = .80$). The same pattern of results was obtained for the literal sentences—concrete nouns were high in imageability ($M = 6.46$, $SD = .64$) and abstract nouns were low in imageability ($M = 2.21$, $SD = .68$). These results show that concreteness and imageability ratings match and therefore there is no imageability confound in the study.

Since Hebrew has no extensive database for word-use frequency, in the second pretest we collected subjective frequency ratings in order to determine if relevant nouns in each sentence match in frequency. As each sentence involved two relevant nouns, there were 160 nouns to rate; these were divided into two lists—one for nouns derived from the literal sentences and another for those derived from the metaphorical sentences. Eighteen undergraduate students rated the nouns on each list for their degree of frequency on a five-point scale ranging from 1 (highly infrequent) to 5 (highly frequent). Words were included in the study if they received a rating higher than 3 by at least 75% of the raters. The average rating was 4.97 on the first list and 4.83 on the second list, with no significant difference between the two lists.

EXPERIMENT 1: RECALL OF CANONIC AND NON-CANONIC SENTENCES

The aim of the first experiment was to examine the effect of canonic word order on recall and inversion in metaphorical and literal sentences.

Method

Participants

Participants were 43 undergraduate students (age range = 21–55, $M = 28.7$, $SD = 6.32$) from the Department of Communication Disorders at Haifa University participated in the study. All participants were native Hebrew-speaking volunteers.

Stimuli

The stimuli consisted of 40 sentences, half metaphorical (10 canonic and 10 non-canonic) and half literal (10 canonic and 10 non-canonic). For examples, see Table 1. Two lists were created. Each sentence on the first list (e.g., *"The soldier packed his shirt and sorrow"*) appeared in the reverse form on a second list (e.g., *"The soldier packed his sorrow and shirt"*). Thus, each list consisted of four conditions: canonic metaphorical, non-canonic metaphorical, canonic literal, and non-canonic literal.

Procedure

For this first experiment, 45 students were randomly assigned to two different groups and each person was individually tested in a quiet room. Each group performed a recall task for the first

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TABLE 1
Examples of Canonic and Non-canonic Metaphorical and Literal Sentences Translated From Hebrew

Metaphorical		*Literal*	
Canonic	*Non-canonic*	*Canonic*	*Non-canonic*
The soldier packed his shirt and sorrow.	The soldier packed his sorrow and shirt.	I thought about my book and longing.	I thought about my longing and book.
Dana peeled her wallpaper and memories.	Dana peeled her memories and wallpaper.	Ilana desired his cooking and love.	Ilana desired his love and cooking.

Note. The Hebrew version included the definite determiner *the* instead of *his*/*her*, which sounds just as natural in Hebrew but not in English.

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and the second list, respectively. Stimuli were read out loud by the experimenter and simultaneously presented on a computer screen for 10 seconds, using PowerPoint software. Following presentation of a block of five sentences, participants were asked five questions, one question after the other, in relation to those five sentences. For instance, the question on the sentence *"The soldier packed his shirt and sorrow"* was *What did the soldier pack?* Participants wrote their response to each question prior to proceeding to the next one. The instructions given for this task were, "I will read five sentences in a row. At the same time, the sentences will be presented on a computer screen. Listen carefully. Once the sentences disappear from the screen I will ask you five questions. Write your answers on the sheet of paper in front of you."

Each block consisted of five sentences containing the same stimuli condition. The entire experiment included two blocks of canonic metaphorical sentences, two blocks of non-canonic metaphorical sentences, two blocks of canonic literal sentences, and two blocks of non-canonic literal sentences. Blocks were presented in a random order.

Participants' answers were coded according to three parameters: (a) recall of both words regardless of their order; (b) inversions (i.e., participants correctly recalled both words but in the order opposite to the one in which they were presented); and (c) no-inversions (i.e., participants correctly recalled the words in the order in which they were presented). For example, the answer *shirt and sorrow* in relation to the non-canonic sentence *"The soldier packed his sorrow and shirt"* was coded as 1 for correct recall, 1 for inversion, and 0 for no-inversion. An answer that included *shirt* alone received 0 on recall, 0 on inversion, and 0 on no-inversion. An incorrect answer such as *shirt and memory* received 0 on recall, 0 on inversion, and 0 on no-inversion.

Results

Recall was analyzed separately for the metaphorical and the literal sentences according to the three coding parameters: correct recall of both nouns regardless of the order, inversions, and no inversion. Three participants whose correct recall rates (first parameter) were lower than 10% were excluded from further analysis. Thus, responses from 42 participants were included in the final analysis. The Wilcoxon signed-rank tests was used to compare performance across conditions.

Metaphorical Sentences

We report a subject analysis for the metaphorical sentences followed by an item analysis. No significant difference ($p = .79$) was found between total recall (regardless of noun order) of canonic sentences ($M = 27.86\%$, $SD = 1.88$) and non-canonic sentences ($M = 28.33\%$, $SD = 1.87$). As expected, participants made significantly ($p < .001$) more inversions to non-canonic sentences ($M = 11.19\%$, $SD = .30$) than to canonic sentences ($M = 1.43\%$, $SD = .08$). A significant difference ($p < .001$) was also found for sentences recalled in order of presentation (no-inversion), so that participants correctly recalled more canonic sentences ($M = 26.90\%$, $SD = 1.72$) than non-canonic sentences ($M = 16.43\%$, $SD = 1.19$).

Literal Sentences

No significant difference ($p = .07$) was found between total recall (regardless of noun order) of canonic sentences ($M = 22.86\%$, $SD = 1.47$) and non-canonic sentences ($M = 17.86\%$, $SD = 1.68$). Participants made significantly ($p < .05$) more inversions when recalling non-canonic sentences ($M = 5.71\%$, $SD = .83$) than when recalling canonic sentences ($M = 3.10\%$, $SD = .12$). A significant difference ($p < .01$) was also found for sentences recalled in order of presentation (no-inversion), so that participants recalled correctly more canonic sentences ($M = 19.29\%$, $SD = 1.30$) than non-canonic sentences ($M = 12.14\%$, $SD = 1.39$).

Comparison Between Metaphorical and Literal Sentences

We used the Mann-Whitney Test to compare the three recall parameters (percent total recall, percent of inversions, percent of no-inversions) across metaphorical and literal sentences, for either non-canonic or canonic sentences.

Non-canonic sentences. A significant difference ($p < .01$) was found between the rate of total recall of both nouns (regardless of noun order) for metaphorical ($M = 27.86\%$, $SD = .45$) versus literal ($M = 17.86\%$, $SD = .40$) sentences. It was also found that participants made significantly ($p < .05$) more inversions to metaphorical sentences ($M = 11.19\%$, $SD = .30$) than to literal sentences ($M = 5.71\%$, $SD = .20$). No significant difference ($p = .13$) was observed for the no-inversions parameter when comparing the recall of metaphorical ($M = 16.43\%$, $SD = 1.19$) and literal ($M = 12.14\%$, $SD = 1.39$) sentences. Thus, on non-canonic metaphorical sentences participants recalled both nouns (regardless of noun order) and inverted the noun order more often than they did on non-canonic literal sentences.

Canonic sentences. No significant difference ($p = .10$) was found between the rate of total recall of both nouns (regardless of noun order) for metaphorical ($M = 28.13\%$, $SD = .45$) and literal ($M = 22.86\%$, $SD = .35$) sentences. In addition, no significant difference ($p = .41$) was found between the percent of inversions made on metaphorical sentences ($M = 1.43\%$, $SD = .08$) and literal sentences ($M = 3.10\%$, $SD = .12$). There was however a significant difference ($p < .05$) observed between the percent of no-inversions (i.e., recalling the correct word order) for metaphorical ($M = 26.90\%$, $SD = 1.72$) as compared to literal

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($M = 19.29\%$, $SD = 1.30$) sentences. Thus, for canonic metaphorical sentences participants recalled both nouns in the correct order more often than they did for literal canonic sentences.

Item Analysis

In addition to a subject analyses, an item analysis was also performed on the number of inversions. We calculated the percent of inversions made by all participants out of the total number of possible inversions. Next, the mean percent of inversions was calculated for each condition (canonic, non-canonic, metaphorical and literal). Using the Wilcoxon Signed Ranks Test it was found that significantly ($p < .01$) more non-canonic metaphorical sentences were inverted ($M = 5.89\%$, $SD = .22$) than were canonic metaphorical sentences ($M = 1.38\%$, $SD = .11$), and that significantly ($p < .01$) more non-canonic literal sentences ($M = 3.13\%$, $SD = .68$) were inverted than were canonic literal sentences ($M = .63\%$, $SD = .15$). Figure 1 presents these percentages.

Posttest I: Strength of Association Between the Verb and the Concrete/Abstract Nouns

To examine the possibility that one of the relevant nouns associated more strongly with the main verb, we asked additional participants to rate the strength of the association between the verb and the two nouns in each sentence. Thus, for example, we wanted to see whether the word *shirt* in the metaphorical sentence *"The soldier packed his shirt and sorrow"* is more strongly associated with the verb *packed* than is the word *sorrow*.

Method

Participants. Participants in Posttest I were 34 undergraduate students (aged 21–45, $M = 26.00$, $SD = 4.50$) from Haifa University participated in the posttest. All participants were native Hebrew-speaking volunteers.

Procedure. Each sentence was divided into two parts: a stem that consisted of subject and verb, and a continuation that consisted of the abstract and concrete noun. The stem was followed by both nouns and participants were asked to choose the more natural ending to the sentence.

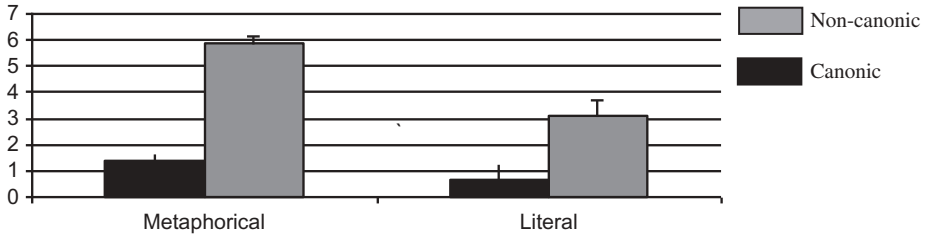

FIGURE 1 Percent of inversions made on metaphorical and literal sentences, by word order (canonic or non-canonic).

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For example, the metaphorical sentence stem *"The soldier packed his . . ."* was followed by two possible completions (a) *shirt* and (b) *sorrow*. Half of the participants were presented with the list of 40 metaphorical sentences and the other half of the participants were presented with the list of 40 literal sentences. In half of the cases, the concrete noun appeared on the right and in the other half it appeared on the left, both nouns being displayed on a single line below the stem. A noun was scored as *natural* if at least 75% of the participants marked it as such.

Results

Metaphorical sentences. In 36 out of the 40 metaphorical sentences (i.e., 90%) there was a clear preference to choose the concrete noun as the most natural continuation. In other words, the canonic metaphorical sentences were rated as more natural than the non-canonic sentences. In the remaining four sentences, the abstract nouns were scored as the more natural ending; that is, the non-canonic order was rated as more natural in only 10% of the sentences.

Literal sentences. In only 13 out of the 40 literal sentences (i.e., 32.5%) there was a clear preference to choose the concrete noun as the natural ending. Thus, in contrast to the metaphorical sentences, canonic literal sentences were no more natural than non-canonic literal sentences. For the remaining sentences, participants did not reach 75% agreement.

Hence, whereas the concrete nouns in the metaphorical sentences were scored as more natural, no such preference was observed in the literal sentences. Despite this observed difference in preferences ratings, more inversions were made for the non-canonic sentences for both the metaphorical and the literal sentences. This finding may suggest that the order of a concrete noun followed by an abstract noun affects recall and inversion regardless of preference judgments of natural endings.

Posttest II: A Qualitative Analysis of Meanings People Attribute to Metaphorical Sentences

The purpose of this second posttest was to examine what meanings people infer when processing metaphorical sentences. Furthermore, we wanted to examine whether the inferences people make when reading an independent abstract noun phrase (e.g., *"The soldier packed his sorrow"*) differs from inferences made when reading a whole combination construction (e.g., *"The soldier packed his shirt and sorrow"*).

Method

Participants. Participants in Posttest 2 were nine undergraduate students (aged 25–39, $M = 28.55$, $SD = 3.13$) from Haifa University participated in the posttest. All participants were native Hebrew-speaking volunteers.

Stimuli. Stimuli in Posttest II included five metaphorical sentences used in Experiment 1 (*"The soldier packed his shirt and sorrow"; "Dana peeled her wallpaper and memories"; "Lillach washed her face and sadness"; "Nilli broke the flowerpot and the dream"; "The young*

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boy strummed on the chord and the dreams"). From each sentence, the *subject-verb-abstract noun* phrase was extracted (e.g., *"The soldier packed his sorrow"* was derived from the sentence *"The soldier packed his shirt and sorrow"*).

Procedure. Participants were first presented with the list of five metaphorical phrases. They were instructed to read the phrases and to write down their personal interpretation of each. After completing and handing in the assignment, participants received a list containing the five corresponding metaphorical sentences, presented in a mixed order. They were again instructed to write down their personal interpretation of each.

Results

The results were analyzed in two stages. First, we qualitatively analyzed the interpretations for each metaphorical sentence. Second, we compared the interpretation of each metaphorical phrase with the interpretation of its corresponding complete sentence.

Qualitative analysis of responses revealed that there were multiple interpretations given for each metaphorical sentence. For example, interpretations given for the sentence *"The soldier packed his shirt and sorrow"* included: "The soldier was sad. He had to go back to his posting. He put his shirt into his bag along with the sorrow he felt, so that it would be closed up inside"; "The soldier left the military post where many of his friends were"; "The soldier got ready and organized his thoughts." Examples of interpretations given for the sentence *"Dana peeled her wallpaper and memories"* were: "While renovating her home, Dana recalled the things she was going through"; "The color of the wall reminded her of someone, so she changed the wallpaper"; "Dana had bought the wallpaper with her grandma, who passed away, so when she peeled the wallpaper she recalled her grandma." The metaphorical sentence *"Lillach washed her face and sadness"* also generated a variety of interpretations. For example, "Lillach was sad and crying. When she washed her face she calmed down," and "Lillach cheered up," and "She washed her face and tears." Overall, each sentence evoked a certain interpretation that describes a different scenario. Participants tended to merge the two nouns, both concrete and abstract, to render a novel, detailed, and sometimes vivid scenario. Theses interpretations usually involved a sequence of events. The variety of interpretations suggests that each participant is able to easily create meaning in accordance with his or her subjective experience and associations.

Next, we compared the interpretation of each metaphorical phrase with the interpretation of its corresponding complete sentence. We found that in 73% of cases participants provided different meanings for a phrase and its associated sentence. For example, one participant interpreted the phrase *"The soldier packed his sorrow"* as "The soldier is trying to get rid of his sadness," whereas the complete sentence *"The soldier packed his shirt and sorrow"* was interpreted as "The soldier packed his shirt in the bag and tried to cheer himself up." Another participant interpreted the same phrase and sentence as "The soldier was not sad anymore," and "Once the soldier packed the shirt it helped him pack his sorrow," respectively. In another example, the interpretations provided for this phrase and sentence were "The soldier prevented himself from showing his sadness," and "The soldier, who had a difficult year, packed his shirt and also his sorrow while anticipating going back home," respectively. Different multiple interpretations were also provided for the phrase *"Dana peeled her memories"* and the sentence *"Dana peeled her wallpaper and memories."* In one example, a participant interpreted the phrase as meaning "Slowly

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and carefully, Dana revealed her memories," and the sentence as "Dana had bought the wallpaper with her grandma, who passed away, so when she peeled the wallpaper she recalled her grandma." In another example, the phrase was interpreted as "Dana tried to recall things, and one memory led to another" while the interpretation rendered for the sentence was "When Dana left home she peeled the wallpaper inside the old house, and together with it she peeled all the memories related to the house." Thus, participants provided different interpretations for a phrase and its corresponding sentence—probably because the second noun in the sentence together with the first noun evoked a specific scenario related to both nouns. The interpretations of the complete sentences as compared with those of the shorter sentences were usually more detailed and describe a sequence of events.

The results of the second posttest therefore show that metaphorical sentences can be interpreted in various ways and that each interpretation probably relies on one's personal experience or associations. When a metaphorical sentence contains two direct objects, it seems that individuals are able to easily conceptualize a rich and detailed scenario which incorporates both nouns, however this interpretation usually differs from one's understanding of the sentence's independent abstract phrase.

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EXPERIMENT 2: LEXICAL DECISION OF CANONIC AND NON-CANONIC SENTENCES

The aim of the second experiment was to test whether canonic sentences are processed faster than non-canonic sentences.

Method

Participants

Participants in Experiment 2 were 41 students (age range = 23–45) from Bar Ilan University and Tel Aviv University (who did not participate in the first experiment) participated in the study. Participants were native Hebrew speakers and right handed according to self-report. Participants received course credit for their participation and signed a consent form.

Stimuli

Stimuli in Experiment 2 consisted of 40 experimental sentences (taken from the first experiment), 40 matching control sentences, and 80 distracter sentences (for a total of 160 sentences). The 40 experimental sentences were comprised of 20 metaphorical sentences (half canonic and half non-canonic) and 20 literal sentences (half canonic and half non-canonic).

For each experimental sentence (metaphorical and literal) a control sentence was created. The verb and second noun of the control sentence remained the same as they appeared in the experimental sentences, but a different noun that matched the second noun in concreteness replaced the first noun. For example, the control sentence for *"The soldier packed his shirt and sorrow"* was *"The soldier packed his grief and sorrow."* In the control sentence both nouns were abstract, and

the verb was metaphorically related to both of them. Control sentences were constructed in order to neutralize the surprise that participants might experience when encountering a metaphor while expecting a literal continuation.

An additional 80 distracter sentences were created that included a non-word in the final position. Non-words matched the final words of the experimental sentences in length and phonological pattern. For example, a distracter sentence for the canonic metaphorical sentence *"The soldier packed his shirt and sorrow"* was *"The soldier folded his shirt and gommow."*

A second list was constructed in which a reversed version of each sentence was presented to prevent participants from responding to the same final word twice. Thus, a canonic sentence from the first list was changed into a non-canonic sentence on the second list and vice versa.

Procedure

Participants were individually tested in a quiet room. Sentences appeared on a computer screen, first the sentence stem and then its ending (target word). The sentence appeared at the center of the screen for 1800 ms, then a fixation cross appeared for 300 ms, and then the target word appeared for 200 ms. Once the target word disappeared, a fixation cross appeared for 2200 ms. Participants were instructed to read the sentence carefully and indicate as quickly as possible whether the target stimulus was a word or a non-word by moving the right index finger from the middle position to the right or the left key. Reaction time was measured between the onset of the target and key press. Assignment of keys to WORD or NON-WORD responses was counterbalanced across participants. The choice of the lexical decision task provides a useful and accurate method to measure the reaction times to the critical final word. As reading times correlates with lexical decision times for words (Forster & Chambers, 1973) other tasks such as reading times of the whole sentence may be useful as well. The experiment was prepared and run with SuperLab software (version 4.0). Stimulus presentation was divided into two blocks that differed randomly across participants, with a break in between. The session began with a practice list of three sentences that were not used in the experiment.

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Results

Reported below is our analysis of reactions times (RTs) for correct responses. RTs were analyzed separately for metaphorical and literal sentences. Four conditions were used in each analysis: experimental canonic, control canonic, experimental non-canonic, control non-canonic. One participant, whose mean reaction time was longer than two standard deviations from the mean RT of all other participants, was excluded from our analysis. Initial analysis indicated no main effect of stimulus list, and therefore responses were collapsed across lists prior to proceeding with all subsequent analysis.

Metaphorical Sentences

A one-way analysis of variance (ANOVA) revealed a significant effect of sentence type (canonic vs. non-canonic), $F(3, 117) = 10.48$, $p < .001$, $\eta^2 = .21$. LSD post-hoc analysis indicated that canonic sentences were processed significantly ($p = .05$) faster ($M = 854$ ms,

$SD = 170$) than were non-canonic sentences ($M = 886$ ms, $SD = 178$). In addition, canonic metaphorical sentences were processed significantly ($p = < .001$) more slowly than their control canonic sentences ($M = 798$ ms, $SD = 161$), and non-canonic metaphorical sentences ($M = 886$ ms, $SD = 175$) were processed significantly ($p = < .01$) more slowly than their control non-canonic sentences ($M = 828$ ms, $SD = 147$). No significant difference ($p = .09$) was observed between RTs for control canonic and control non-canonic sentences.

Literal Sentences

A one-way ANOVA revealed a significant effect of sentence type (canonic vs. non-canonic), $F(3, 117) = 4.34$, $p < .01$, $\eta^2 = .10$. LSD post-hoc analysis found no significant difference ($p = .37$) in processing times between canonic ($M = 774$ ms, $SD = 126$) and non-canonic sentences ($M = 787$ ms, $SD = 148$). Canonic literal sentences were processed significantly ($p < .05$) more slowly than their control canonic sentence ($M = 743$ ms, $SD = 148$), and non-canonic literal sentences were processed significantly ($p < .01$) more slowly than their control non-canonic sentences ($M = 745$ ms, $SD = 134$). No significant difference ($p = .90$) was observed between control canonic and control non-canonic sentences. These results suggest that whereas participants processed canonic metaphorical sentences faster than they processed non-canonic metaphorical sentences, the same preference was not found for literal sentences.

GENERAL DISCUSSION

Our study is the first to show that a major conceptual factor—concreteness—plays an important role in the processing of conjunction constructions. Two types of phrases were used: canonic (in which the concrete noun precedes the abstract noun) and non-canonic (in which the abstract noun precedes the concrete noun). Support for the concrete first hypothesis was obtained for metaphorical sentences in all of three tasks, namely, recall, naturalness judgment, and lexical decision. By manipulating the element order within phrases, we have shown that in a recall task non-canonic metaphorical sentences (e.g., *"He packed his sorrow and shirt"*) were inverted more often than were canonic metaphorical ones (e.g., *"He packed his shirt and sorrow"*). Also, participants recalled the correct (original) order of nouns more often in canonic metaphorical sentences than in non-canonic metaphorical sentences. We also found that canonic metaphorical sentences were rated as more natural than their non-canonic counterparts. A similar pattern of results was observed in the on-line lexical decision task, in that canonic metaphorical sentences were processed faster than were non-canonic metaphorical sentences. Thus, the more natural element order, which involves an initial concrete noun followed by an abstract noun, is associated with better performance on both off-line (i.e., recall and naturalness judgment) and on-line tasks as compared with the alternative non-canonic sentential order.

While the concrete first hypothesis was fully confirmed with regard to metaphorical sentences, results related to literal sentences (e.g., *She forgot her scarf and love*) provided only partial support for this hypothesis—coinciding with the hypothesis on the recall task but not on the naturalness judgment and the lexical decision tasks. Furthermore, even in the recall tasks, metaphorical sentences were associated with better performance than were their literal counterparts. Additional differences between metaphorical and literal phrases emerged on the recall

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task. We found better recall of both nouns (regardless of noun order), better recall of correct noun order, as well as higher rate of inversion in the non-canonic metaphorical sentences relative to non-canonic literal sentences. These results may suggest that the concreteness first effect is amplified in metaphorical conjunctions. How can we account for this difference between literal and metaphorical zeugmas?

We propose that this difference between metaphorical and literal sentences can be accounted for by an extended version of Glucksberg's *class inclusion* model (Glucksberg & Keysar, 1990; Glucksberg et al., 1997; Shen, 1998) that has been previously introduced. Recall, that according to this extension of the class inclusion view, a zeugma represents an ad hoc category (e.g., things one *packs),* of which the two (nominal) arguments (*shirt* and *sorrow*) are members. Under this view, the prototypical structure affects the linear ordering of category members in the zeugma in that there is a preference to place the prototypical member (typically the concrete term; e.g., *shirts*) before the less prototypical one (*sorrow*) rather than the other way around.

The class inclusion model may also account for the finding that the concrete first hypothesis was much stronger for metaphorical rather than literal construction. Consider the literal sentence *She forgot her scarf and love.* In this sentence the verb (*to forget*) is an abstract one, hence its scope is quite large, that is, it can be literally applied to a large array of nouns (both concrete and abstract). The wide scope of the categories represented by abstract verbs (e.g., *things one can think about, things one forgets*) precludes a meaningful prototype structure, in that the concrete nouns that are predicated by these verbs (e.g., *scarf* or *wallpaper*) cannot be regarded as more prototypical members of those categories than are abstract ones (e.g., *love* or *memories*). This may account, under the (extended) class inclusion model, for the lack of a preference for concrete first (or for that matter, abstract first) linear ordering of nouns in literal sentences. Indeed, the post-test analysis we conducted, which examined the strength of association between verbs and concrete and abstract nouns in the stimuli, provides some support for the present proposal. Thus, our analysis clearly showed a very strong association between the verb and the concrete noun in metaphorical sentences (for about 90%); in contrast, this strong association was observed in only 32.5% of the literal sentences. This may suggest that, unlike the concrete nouns in the literal sentences, the concrete nouns in the metaphorical sentences represented more prototypical member of the category in question (e.g., *things one packs*). Interestingly, our imageability ratings for nouns used in the present study suggest that imageability may affect noun order in metaphorical conjunctions, as does concreteness. Thus, our results may be applied to phrases in which the verb is literally related to a noun high in imageability and metaphorically related to a noun low in imageability.

Comparing processing times for experimental sentences (canonic and non-canonic) with control sentences in which the two nouns were congruent in concreteness (i.e., both nouns were either concrete or abstract) revealed that performance was worse for the former. Canonic metaphorical sentences (e.g., *"The soldier packed his shirt and sorrow"*) were processed more slowly than their corresponding control sentences (e.g., *"The soldier packed his grief and sorrow"*), and non-canonic metaphorical sentences (e.g., *"The farmers sowed their hopes and seeds"*) were processed more slowly than their corresponding control ones (e.g., *"The farmers sowed their fields and seeds"*). A similar pattern of results was also found for literal sentences (canonic and non-canonic), with slower processing times observed for experimental sentences relative to their control versions. Moreover, processing times for phrases containing either two concrete or two abstract nouns did not differ from each other. These results indicate that participants processed

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sentence meaning when responding to the final (target) word, since both experimental and control sentences ended with the same word. Thus, congruent concreteness combinations, in which both nouns were either concrete or abstract, were processed faster than incongruent ones in which the nouns did not match in concreteness. This pattern of results is consistent with the assumption that processing a given word in a congruent sentential context is faster than processing the same word in an incongruent one (Biederman, 1981). For example, eye movement studies have reported longer fixation times for low-constraint target words (i.e., unexpected target words) than for high-constraint target words (i.e., highly predictable target words; e.g., Rayner & Well, 1996). It is therefore possible that in the present study participants responded more slowly to target words in the experimental sentences (e.g., *sorrow* after *shirt*) due to an incongruence in concreteness between the relevant nouns, which renders the target word unpredictable. This can be contrasted against the control sentences which contained congruent concreteness combinations (e.g., *sorrow* and *grief*), thus making the target word more predictable and resulting in faster response times.

In summary, although the concreteness of nouns was found to play a certain role in determining the ordering of nouns during recall in non-canonic sentences (both literal and metaphorical), the concrete first effect in all three tasks tested here was stronger for metaphorical sentences than for literal ones. This suggests that metaphorical and literal phrases are not processed in the exact same way.

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