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How to Interpret the *Music of Caressing*: Target and Source Assignment in Synaesthetic Genitive Constructions¹

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ABSTRACT

Metaphors have traditionally been defined as mappings between two conceptual domains, the target and the source. A fundamental question here is how people assign the target and source functions in a given metaphorical expression. The present paper proposes that there are two potential mechanisms, a linguistic one and a conceptual one that people might use to assign the target and source functions in a given metaphorical expression (e.g., "a green inspiration"). The linguistic mechanism is based on certain conventions which assigns the target function to certain grammatical categories (e.g., the head noun of a metaphorical noun phrase), and the source function to others (e.g., the modifying adjective). The conceptual preference mechanism favors the assignment of the source function to accessible concepts and the target function to less accessible ones.

Since there are clashing cases, namely, cases where the two mechanisms yield conflicting target/source assignments, the question of interest is which of these two mechanisms, the linguistic or the conceptual one is a better predictor of the way people assign the target and source functions in metaphorical expressions. The major goal of the present paper is to investigate this issue for a specific type of figure – the synaesthetic metaphor.

The paper begins by introducing a conceptual preference principle, according to which terms belonging to lower sensory modalities (e.g., touch and taste) are generally assigned the source function, while terms belonging to higher sensory modalities (e.g., vision and hearing) are generally assigned the target function. We then introduce a linguistic convention for assigning these functions to the linguistic constituents of the Hebrew noun-noun genitive construction. We report the findings of two interpretation generation experiments which support the hypothesis that the conceptual preference principle overrules the linguistic convention in people's assignments of the target and source functions in the synaesthetic genitive construction. The implications of these findings are elaborated in the discussion.

Introduction

Most theories in cognitive linguistics and related areas (e.g., Lakoff & Johnson 1980; Gibbs 1994) have defined metaphor as a mapping between two conceptual domains, the target and the source. A fundamental question with regard to this distinction is how people assign the target and source functions to a given metaphorical expression. For example, given the (novel, and perhaps difficult to understand) metaphorical expression "a green inspiration", how does one determine that this expression is about the domain of "inspiration" rather than the domain of "green" in the absence of a context² that may provide some indication for this functional division.

Arguably, this process involves both linguistic and conceptual factors, as well as the interaction between them. However, despite the centrality of the issue, it has received relatively little attention in the cognitive study of metaphor, especially given the abundance of studies in this area (for some exceptions see Malgady & Johnson 1980; Forceville 1995; 2002; Campbell & Katz, 2006; Chiappe et al. 2003; Glucksberg et al. 1997, and Kogan et al. 1989).

A possible explanation for this neglect is that it was tacitly assumed that the assignment of target and source functions is done in a straightforward manner by applying certain default linguistic conventions. Thus, in the metaphorical noun phrase "a green inspiration", the linguistic convention in the absence of context assigns the target and the source functions to the head noun ("inspiration") and the modifying adjective ("green") respectively. Or take the metaphorical comparison construction, "X is like Y" (e.g., "rage is like a volcano"), in which the default linguistic convention

² Obviously, the context in which a given metaphorical expression is uttered can play an important role in identifying the target and source (see Forceville 2002). Here, however, we will focus on "out-of-context" expressions, and therefore, ignore this aspect of target\source assignment.

assigns the target and source functions to the grammatical subject “X” and the predicate “Y”, respectively.

Clearly, this assignment, which is based on purely grammatical considerations, is assumed to be blind to the semantic content of the concepts comprising the metaphorical expression. So, for example, in “an inspired greenness” (in which the target and source domains of "green inspiration" are inverted), the assignment of target and source functions is also determined by linguistic default convention, that is, the head noun (“greenness”) and the modifier (“inspired”) are assigned the target and source functions, respectively. Presumably, out of context, just **any** concept that will be inserted in the head noun slot will be assigned the target function, while just **any** concept that will be inserted into the modifying adjective slot will be assigned the source function. Similarly, inverting the above comparison construction into a "volcano is like rage" does not affect the assignment of target function to the grammatical subject ('volcano') and the source to the predicate ('rage'), according to the same linguistic convention.

Note that the assignment of target and source functions according to the linguistic convention in the case of "an inspired greenness" is incompatible with a fundamental preference principle for the use of metaphorical language in general, namely, the Directionality of Mapping principle, according to which the source domain tends to represent more concrete concepts than the target. It has thus been suggested that metaphorical expressions conforming to this principle tend to become conventionalized in various languages (Lakoff & Johnson, 1980; Sweetser, 1990). This principle has been also shown to determine the direction of diachronic meaning extension (Sweetser, 1990; Traugott, 1974; Fleischman, 1982). In addition, there have been a number of psycholinguistic experiments indicating that structures consistent with the directionality

principle are consistently viewed as more natural and comprehensible as well as being easier to recall (Tversky, 1977; Ortony, 1979; Ortony, Vondruska, Foss & Jones, 1985; Malgady & Johnson 1980; Johnson & Malgady, 1979; Shen, 1992).

Arguably, then, there are two potential mechanisms people might use to assign the target and source functions for a given metaphorical expression: a linguistic mechanism based on default linguistic conventions, and a conceptual preference mechanism that favors more concrete and less concrete concepts for the source and target functions, respectively.

The question of interest, raised by clashing cases (such as "a green inspiration", or "volcano is like rage") which of these two mechanisms, the linguistic or the conceptual one, is a better predictor of the way people assign the target and source functions for metaphorical expressions.

As previously mentioned very few studies have (directly or indirectly) addressed the issue (notably, Chiappe et al. 2003 and Glucksberg et al. 1997). Although those theories have not explicitly formulated the issue of the target \ source assignment in terms of the two mechanisms proposed above, their findings may be taken to suggest that the conceptual mechanism may, in some cases, override the linguistic one. Thus, it was found that when people generate a paraphrase for a clashing metaphorical comparison (e.g., "a passport is like beauty") people would tend to 're-reverse' the target \ source functions, as in the following paraphrase: "beauty can grant you lots of wonderful opportunities" (see Chiappe et al., p. 94).

These studies, however, have been limited in (at least) three respects. Firstly, they were limited to a specific linguistic construction, namely, nominal metaphors (in either the "X is like Y" or the "X is Y" form); hence, it is not clear to what extent their findings can be generalized to other linguistic constructions. Secondly, they were

limited to metaphors that map from concrete to abstract concepts (e.g., from 'volcano' to 'rage') or from more salient to less salient concepts (e.g., from the domain of 'time bomb' to the domain of 'cigarettes' as in "a cigarette is like a time bomb"). Thirdly, some of them (e.g., Glucksberg et al. 1997) have used source terms that were metaphorically conventional, that is, terms that are strongly associated with a certain figurative meaning (e.g., 'lawyers are (like) sharks'). One might argue (as indeed suggested by Gentner & Wolff 1997) that conventional terms differ from novel terms in the comprehension process they produce, and, therefore, novel expressions should be examined as well (see, e.g., Chiappe et al. 2003).

The major goal of the present paper is to extend past research by examining a different type of linguistic construction – the genitive construction – and a different type of metaphorical mapping - the synaesthetic metaphor, namely, mapping between two sensory modalities. Furthermore, the synaesthetic metaphors we will use as stimuli items are novel expressions.

The outline the paper is as follows. We start by introducing a conceptual preference principle according to which terms belonging to lower sensory modalities (e.g., touch and taste) are most likely to be assigned the source function, while terms belonging to higher sensory modalities (e.g., vision and hearing) are most likely to be assigned the target function. We then introduce a linguistic convention for assigning the target and source functions to the linguistic constituents of the Hebrew noun-noun genitive construction. We use an interpretation-generation experiment to investigate the hypothesis that the conceptual preference principle overrules the linguistic convention in people's assignment of target and source functions in the synaesthetic genitive construction.

Synaesthetic metaphors: The conceptual directionality principle

A synaesthetic metaphor is the description of a perception in one sensory modality in terms of another sensory modality as, for example, the description of a voice as “sweet” or a musical note as “sharp” or certain colors as “cold” or “hot” (see Ullmann, 1945; Tsur, 1992). It has been suggested (e.g., Ullmann, 1945; Tsur, 1992; Shen & Cohen, 1998; Shen, 2002) that there is a graduated scale of sensory modalities ranging from sight - the “highest” modality - followed by sound, smell, taste and, finally, touch - the “lowest” sense. This hierarchy reflects salience, as suggested by Shen and Cohen (1998), in that ‘lower’ sensory terms are more salient, representing more concrete or more immediate sensations. Lower sensory modalities tend to include more experienced-based sensations (i.e., those sensed as a physiological sensation of the experiencer as feeling cold or feeling the roughness of a certain texture) while higher ones tend to represent object-based sensations (sensations attributed to the object being perceived); hence the former are sensed as being more immediate than the latter. (see Shen, in preparation). Furthermore, the lower sensory modalities involve direct contact between the sensory modality and the object of perception, while the higher ones do not require such direct contact.

Taken together, these characteristics of the sensory domain suggest that the ‘lower’ the sensory term, the more immediate and concrete the sensation it represents. Accordingly, we may define the directionality of mapping principle for synaesthetic metaphors:

- (1) **The preferred direction of mapping in synaesthetic metaphors is from lower to higher modalities rather than from higher to lower ones.**

For example in “cold light”, the source is represented by the adjective “cold”, which refers to a concept related to the ‘lower’ sense of touch, while the target belongs to the ‘higher’ sense of sight.

Evidence supporting this directionality-of-mapping principle can be found in various field studies that have investigated synaesthetic metaphors in poetry and prose. Ullmann (1945) noted this tendency in English and French poetry of the nineteenth century. Other research has shown the same tendency in modern Hebrew poetry (Shen and Cohen, 1998), Serbo-Croatian poetry (Arsenik, unpublished manuscript), modern Russian poetry (Chudnovski, unpublished manuscript), Rumanian impressionistic and Hungarian poetry (Dombi, 1974), nineteenth and twentieth century prose (Day, 1996) and Biblical and post-Biblical Hebrew (Gadir, 1999).

As far as comprehension is concerned, it has been found that synaesthetic metaphors that conform to the above directionality of mapping principle are cognitively simpler than those that do not. Thus, synaesthetic metaphors that conform to the 'lower-to-higher' mapping are easier to assign meaning to than their inverse counterparts (Shen, 1997; Shen and Cohen, 1998); the former are also judged as more natural (Shen and Cohen, 1998), better recalled, and easier to assign a context to (Shen & Eisenman, in preparation).

An especially interesting phenomenon was observed in an interpretation-generation experiment (Shen & Cohen, 1998). When asked to interpret a given synaesthesia in the 'lower-to-higher' structure (e.g., "a sweet silence") or in its 'higher-to-lower' counterpart (e.g., "a silent sweetness"), participants' responses revealed a tendency to reverse the source with the target more often in the case of the 'higher-to-lower' structure than in the case of the canonical 'lower-to-higher' synaesthesias. So, for example, a possible response for both "a sweet silence" and "a silent sweetness" was *a pleasant silence*; this response maintains the original target for the 'lower-to-higher' structure ("sweet silence") but reverses the source and the target in the 'higher-to-lower' structure ("silent sweetness"). This finding suggests that the conceptual preference for

mapping a ‘lower’ domain onto a ‘higher’ one may, under certain conditions, override the default linguistic convention according to which the noun and adjective of the synaesthetic noun phrase are assigned the target and source positions, respectively.

This finding suggests a surprising observation, namely, that the very assignment of the target and source position may, in some cases, be sensitive to the conceptual directionality principle rather than the linguistic convention, and in cases of a clash between these two factors, it is the conceptual bias that overrides the linguistic convention.

However, the conclusion that the conceptual preference is stronger than the linguistic convention or rule is somewhat far-reaching if it depends only on the results of the aforementioned finding. There are two problems here. First, instances of reversal occurred only in some of the cases and not even the majority of non-canonical cases of synaesthesia (although it appeared almost entirely in cases of non-canonical synaesthesia, and from this point of view supported the claim that we were trying to confirm in that study). This may suggest that in most cases it is the linguistic convention, rather than the conceptual bias which is the factor that determines the target\source assignment.

Second, to establish the claim that (in some cases) a conceptual tendency overrides a linguistic convention or rule, it is necessary to test additional syntactic structures (beyond the nominative structure consisting of a noun and adjective, such as “sweet silence”) in which there might be a conflict between a conceptual bias and a linguistic convention or rule, to see which factor proves to be stronger in those cases.

The main goal of the present study was to extend the study of this issue by investigating another linguistic structure – the (Hebrew) genitive construction.

The Hebrew genitive construction: The linguistic assignment convention

The Hebrew genitive construction is a combination of two nouns, where the first and the second nouns represent the head and modifier, respectively. The modifier typically provides various kinds of information describing the head noun. So, for example, in: “The chair of the teacher” (literal, word-for-word translation from Hebrew), the *chair* is the head noun, characterized by its possession by the *teacher* and the *teacher* modifies it. Now, the default linguistic convention for the genitive construction in Hebrew is the following:

- (2) Assign the head (typically the first noun) and modifier (typically the second noun) as the topic (target) and modifier (source), respectively.**

According to the convention in (2), then, “chair” is the topic of “the chair of the teacher”, while “the teacher” is construed as providing information regarding the possessor of “the chair”³. Here we would like to focus on the **synaesthetic** genitive construction where the two nouns represent concepts belonging to two different sensory modalities, as in “Honey of ice”, or “Mustard of fire”.

Applying the interpretation rule yields the following linguistic assignment convention:

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There are two exceptions to this rule: 1. genitive constructions in which the head noun describes a quantity, as in: “a bunch [*kvuca*] of kids [*yeladim*]”). In such cases the head noun's function is to describe the quantity of the modifying noun, where the latter is the topic of the combination. 2. cases (typically to be found in modern spoken Hebrew and usages of Hebrew in advertisements) in which the head noun expresses an emotional or evaluative attitude, such as “a legend (*agada*) of a place (*makom*)” (where “legend” carries a very positive evaluative meaning, namely, a terrific place).

There is, however, no reason to believe that synaesthetic combinations of the type we will focus on fall within one of those exceptions, since the nouns comprising them do not conventionally carry information regarding quantity or evaluation.

(3) **Assign to the target and source functions, the head noun (e.g., “honey”), and the modifier (e.g., “ice”) respectively of the synaesthetic expression.**

Let us now distinguish between two types of synaesthetic genitive constructions, namely, **compatible** and **incompatible** ones.

A compatible genitive construction is one in which the target and source, according to the linguistic convention in (3), are compatible with the preferred target and source distinction according to the conceptual preference principle in (1). A case in point is "music of caressing". Under the linguistic convention in (3), the target and source terms are “music” and “caressing” respectively, which is compatible with the preferred target and source according to the conceptual preference principle in (1), since they constitute a 'lower-to-higher' mapping (namely, the sense of the source is ‘lower’ than that of the target). In contrast, an incompatible genitive construction is one in which the target and source, according to the linguistic assignment convention in (3), clash with the preferred target and source distinction according to the conceptual preference principle in (1). A case in point is the counterpart of the previous example ("music of caressing"), namely, “caressing of music”.

Imagine a participant who is asked to interpret a synaesthetic genitive construction. His/her response should reflect the way they assign the target and source functions to the expression in question. If the conceptual preference principle in (1) has no influence on the way participants interpret the synaesthetic genitive construction, the only factor influencing them should be the default linguistic convention in (3), according to which the head and modifier nouns always represent the target and source terms, respectively. The expected outcome in this case is that, regardless of whether they read a compatible or a clashing synaesthetic expression, they will identify the head noun as the target and the modifier noun as the source.

If, however, people rely on the conceptual preference principle more than the linguistic convention, then a different pattern is to be expected. The number of cases in which participants reverse the relationship of the target and the source in their answers will be greater in the interpretation of clashing structures than in compatible ones. The interpretations generated by speakers to the two versions of each pair of sensory nouns, then, may indicate which mechanism, the linguistic or the conceptual, is being used by the participants.⁴

The goal of the two experiments reported below was precisely to investigate which of the two mechanisms can better account for the responses generated by participants to compatible and clashing synaesthetic expressions.

⁴ There are also other kinds of metaphoric genitive constructions that are not interpreted according to the grammatical structure of the genitive construction. Apparently these also follow another cognitive principle that overrides the semantic rule. This principle is that the direction of the transference is from the concrete to the general and/or the abstract.

An example is “blood of sunset.” A combination of this sort will generally be interpreted as a ‘red sunset’ and not as ‘blood of a sunset type.’

FIRST AND SECOND EXPERIMENTS

The two experiments used a simple interpretation generation task. Subjects in this task were asked to generate interpretations for synaesthetic genitive expressions, half of which were compatible structures (e.g., "music of caressing"), while the other half were clashing ones (e.g., "ice of honey"). Our goal was to examine whether subjects will tend to generate more reversals for clashing than for compatible constructions.

Note, that expressions were artificially constructed by the authors, and were introduced to the subjects as isolated or de-contextualized expressions (that is, not as part of a larger context). The considerations behind the use of this type of stimuli items are similar to other studies in this area (e.g., Chiappe et al. 2003; or Glucksberg et al. 1977): The use of artificially constructed expressions rather than ones that appear in natural discourse was driven by an attempt to block any potential prior acquaintance on part of the subjects with the stimuli item, which would potentially interfere with the use of the two mechanisms, and will block the possibility of validity testing our hypothesis. In addition it would be very difficult, if not impossible, to find a balanced sample of "real" synaesthetic metaphors.

The motivation for using isolated or de-contextualized expressions was that the potential influence of the context on the comprehension of those expression would destroy the possibility of validity testing our hypothesis. This being said, it is clear that further research is needed in the future that will test the exact influence of contextual factors on the comprehension of those expressions.

The two experiments were identical in procedure and analysis, and differed only the type of nouns used as stimuli. We assumed that different types of nouns can represent sensory features. In the two experiments we used two types of nouns that

represent such features that are highly associated with specific sensory modalities – concrete and abstract nouns. In the first experiment we used concrete nouns, such as 'ice' or 'honey', the relevant sensory modality (Touch and Taste modalities, respectively) is represented via one of their most salient features ('coldness' and 'sweetness', respectively). In the second experiment we used abstract nouns, such as 'coldness' that were derived from sensory adjectives that are highly associated with a specific modality, such as 'sourness' (derived from the adjective 'sour') that represent modality of Taste. Using these two types of nouns then, allowed us to examine the hypothesis that the conceptual preference principle in (1) is the main factor determining people's identification of target and source terms – across noun types.

Except for this difference the procedures of the two experiments and the process of analyzing the results were totally identical. We will therefore describe them together. Later we will present the results of each experiment separately.

Procedure

Participants

In each experiment there were 40 participants (divided into 2 groups of 20 each). The subjects were eleventh and twelfth graders aged 17-18, all born in Israel and native speakers of Hebrew.

Materials

We composed 20 combinations of Hebrew nouns in genitive constructions (see appendices 1 and 2 for experiments 1 and 2, respectively). These were composed as follows. Given that there are five sensory modalities, there are 10 possible combinations of any pair of sensory modalities (vision-hearing, vision-taste etc). Each such pairing

was represented by two combinations, yielding 20 genitive phrases (such as “fire of mustard” in the first experiment, and “coldness of sourness” in the second). It should be emphasized that the combinations were novel, in order to neutralize any possible influence of conventional associations on the participants.

In the second experiment (see appendix 2), the nouns did not include action names (such as “enlightening,” “playing (music)” and “touching” because we wanted to avoid any ambiguity in interpreting the head noun as either the agent or patient of the action. This limitation radically reduced the number of words available. We should also mention that since there are very few words in the ‘smell’ and ‘taste’ domains, there was no way to avoid repeating some of them.

The 20 noun combinations appeared in either the compatible structure (structures in which the head noun represents a higher sensory modality than the modifier, as in “mustard of fire”) or in the clashing structure (e.g., “fire of mustard”). These were divided into two booklets, each containing 20 combinations.. Booklet A consisted of 10 combinations in a compatible structure and 10 in a clashing structure, in mixed order. Booklet B was a mirror image of Booklet A. Each combination appeared only once in Booklet A (or Booklet B), in one of the two forms.

Examples:

- A. In the first experiment, “fire of mustard” in Booklet A and “mustard of fire” in Booklet B.
- B. In the second experiment, “coldness of sourness” in Booklet A and “sourness of coldness” in Booklet B.

The general hypothesis was that the central factor in determining the target and source terms in the subjects’ interpretations of the given genitive constructions is the cognitive

principle (the preference for mapping ‘lower’ senses onto ‘higher’ ones rather than the reverse) and that this principle is stronger than the linguistic convention (according to which the head and modifier noun represent the target and the source, respectively). Accordingly, the prediction was that the number of interpretations that conform to synaesthetic directionality would be greater than the number of those that violated it, beyond the differences between the various given genitive constructions (the ‘compatible’ and ‘clashing’ ones.)

Procedure

Each group (20 subjects) was given the 2 booklets in mixed order. The subjects were asked to write their interpretation of the combination next to each given combination. The instructions made it clear that although some of the combinations would seem strange, the subjects were asked to generate an interpretation for them. The subjects were encouraged to ignore as much as they could any poetic or associative interpretation and to try to provide the most plausible interpretation they could generate. The experimenter provided the following example to make the explanation easier:

Expression: "itchiness of buzziness".

Possible interpretations:

1. The sound of buzz that scratches the ear drum
2. A light scratch like a buzz.

RESULTS

Analysis of results

The analysis of the subjects' answers was done in stages. First the target domain of each interpretation was identified. Then, that target was matched with the target of the original synaesthetic genitive construction (to which it was a response). The topic of the original construction was determined simply as its head noun (that is, on the basis of the linguistic convention in (1)). This matching of the two topics was intended to determine the compatibility/ incompatibility of the response to the original expression. This analysis was conducted separately by two judges, who reached an agreement of 98%.

This analysis discarded several interpretations on various grounds: cases where no interpretation was provided by the subjects; interpretations that simply repeated the original genitive construction; responses that consisted of a single noun, so that it was impossible to connect it to one of the sensory domains that made up the original given synaesthesia (e.g., the original combination "taste of stink" produced "vomit" as a response; "vomit" can be considered as representing both the sense of smell and the sense of taste).

We also discarded all the responses generated by two specific combinations. The first combination ("stench of taste") was discarded since it was found that the subjects tended to interpret one of the original nouns as referring to evaluative or emotive associations, and, it was therefore considered one of the exceptions to the linguistic default convention in [3] (see Halevi 1981). These expressions included the word "stench" (which subjects tended in most cases to interpret as referring to something with negative evaluation). The second combination "bleachedness of smelliness" was discarded since we found out that most subjects tended to interpret "bleachedness" as referring to "cleanliness" and not to "whiteness" as we intended. Thus, the total number of responses in each experiment was 760 (rather than 800).

Some interpretations referred to the (conventional) metaphorical rather than to the literal sensory meaning of one of the nouns in the original combinations. In these cases this conventional meaning was analyzed as referring to the sensory domain of the original noun that generated it, and the analysis followed accordingly. So, for example, the combination “jobbing of brightness” was interpreted as “wisdom that has a sting.” In this case, “Wisdom” is associated with “brightness,” which involves sight, while “sting” is associated with “jobbing,” which involves touch.

The responses remaining after the filtering of the above procedure were classified into two types matching and non-matching responses. Matching responses are those whose target domain term is higher in modality than their source domain term. For example, the combination “aromaticity of caressing,” (compatible combination) yielded the response: *the good smell of the lover who provides warmth*. This is a matching interpretation, since its target domain (“smell”) is higher than its source term (“warmth”).

Non-matching responses are those whose target term is lower than their source term. For example, the combination “spiciness of shrieking” was interpreted as *a spicy taste that causes one to shriek*. This was classified as a non-matching response, since its target term belongs to a lower domain (taste) than its source term (sound).

We then counted the number of matching and non-matching responses. Our main prediction was that for both compatible and clashing combinations, there would be more matching responses than non-matching ones. A statistical analysis was performed on the results (see below).

The results are presented in the tables that show the percentage of compatible vs. non-compatible response. A chi-square test was performed on the compatible and non-compatible structures to test the hypothesis that the number of compatible responses is

significantly higher than the number of non-compatible responses. In addition we conducted a t-test on item analysis to test whether the items in the 'compatible' and 'clashing' items were interpreted similarly by the subjects. Note that we hypothesized that there will be no difference between the responses to the two types, that is, both groups of responses will match the conceptual (directionality) principle, regardless of the type of structure (compatible or clashing) that generated them.

Since no difference was found between booklet A and B in each of the experiments we conducted the analysis on the two booklets together.

We will now describe the results of the two experiments in detail. Since the experiments were identical in procedure and analysis (the only difference being the type of nouns used in each experiment) we will start by presenting the combined results of the two experiments (that is, both for concrete and abstract sensory nouns), to get a general picture of the results, and then present the detailed results of each experiment.

The combined results of the two experiments are presented in Table 1.

	Matching responses	Non-Matching responses
Compatible structure	618	112
Clashing structure	641	83

Table 1: Results of both experiments

The number of responses that were analyzed was 1454 out of the total number of 1520 responses that could have been generated by the subjects (after discarding the responses of two pairs, as previously explained). The total number of matching responses (namely, responses that are compatible with the 'lower-to-higher' directionality) was significantly higher than the number of non-matching- responses: 1259 of the 1454 responses that were analyzed – 86.6% were matching responses, while only 13.8% were non-matching ones.

We compared the number of the actual (matching and non-matching) responses generated by the subjects to the number of responses that would have been generated had the subjects applied the default linguistic convention. Thus, while the number of matching responses expected by the application of the linguistic convention was 730, the actual number of matching responses was 1259; in contrast, out of 724 non-

matching responses expected by the linguistic convention only 195 were produced in actuality. These figures are presented in Table 2.

Table 2

Number of responses expected according to the linguistic default convention	Number of actual responses generated by the subjects	
730	1259	Matching responses
724	195	Non-matching responses

A chi-square test between the two columns shows that they differ significantly (chi-square (df=1)=443, $p < 0.0001$).

An analysis of the responses according to the type of the original combination (compatible or clashing combinations) yielded the following results: Compatible combinations generated a total of 730 responses; 84.7% of this total (namely, 618 responses) were matching responses. Clashing combinations generated a total of 724 responses; 88.5% of these (namely, 641 responses) were matching responses.

We then conducted an item analysis on the two combination types. We divided the combinations into two groups - compatible and non-compatible (a group is the independent variable). A t-test analysis was then conducted to examine whether there is a difference in the dependent variable, namely, the responses to each item. According to our hypothesis, no difference is expected to be found between the two groups. The scoring procedure was as follows: A response that matched the directionality received = 1; an interpretation that did not match the directionality received = 0. a response that can be considered as both matching and non-matching) = 0.5. Each item, then, received

a score that represented its 'matching level', namely, the average of the scores of the responses generated for to this item (missing responses were not included).

Table 3 introduces the average scores of the items for both experiments (the scores are between 0 to 1).

Table 3

Group	Number of items	Average	SD
Clashing items	38	0.89	0.13
Compatible items	38	0.84	0.16

A t-test over the two experiments on group (compatible vs. clashing) as the independent variable, and the matching level as the dependent variable, shows that there is no significant difference between the two item groups $t(df=74)=1.4964$, $p=0.14$). That is, the responses generated by the subjects revealed a strong bias to match the conceptual directionality, regardless of the item type (compatible or clashing) that generated them.

Results of the First Experiment

The main results of experiment 1 are summarized in Table 4.

	Matching responses	Non-Matching responses
Compatible structure	338 (92.6%)	27 (7.4%)
Clashing structure	317 (89.8%)	36 (11.2%)

Table 4: Results of experiment 1

The number of responses that were analyzed was 718 out of the total number of 760 responses that could have been generated by the subjects (after discarding the responses of one of the pairs, as previously explained). 655 out of those 718 responses (91.2%) were matching responses, while only 8.8% were non-matching ones.

An analysis of the responses according to the type of the original combination (compatible or clashing) yielded the following results. Compatible combinations generated a total of 365 responses; 92.6% of this total (338 responses) were matching responses. Likewise, clashing combinations generated a total of 353 responses; 89.8% of this total (317 responses) were matching responses.

As can be seen, our main prediction was confirmed. The number of matching responses was significantly higher than the number of non-matching ones, across types, that is, whether the expressions that generated those responses were compatible or ‘clashing’ genitive constructions: 91.2% (655 out of 718 responses) were compatible with the directionality in synaesthesia, while only 8.8% were incompatible with it.

Table 5 introduces the average matching scores of the two item groups, for the items in experiment 1. Here, too, we conducted a t-test on item analysis to show that

there is no difference between the responses generated by subjects for both groups (compatible and clashing).

Table 5

Group	Number of items	Avarage	SD
Clashing items	19	0.90	0.13
Compatible items	19	0.91	0.12

No difference was found between the two groups ($p=0.97$); That is, the responses generated by the subjects revealed a strong bias to match the conceptual directionality, regardless of the item type (compatible or clashing) that generated them.

Note that the same results are obtained for each of the two booklets.

A T-test analysis of dependent variables for Booklet A and B on item (item = an interpretation for a given combination) and on subject revealed a significant effect ($P<0.001$) in the hypothesized direction.

A comparative analysis of the two versions (i.e., the ‘compatible’ and ‘clashing’ versions) of each "opposite" items also supports our prediction. The mean difference for every pair of reversals (for example, “velvet of recorder” and “recorder of velvet” is only 0.42%. A statistical comparison of the reversed items also shows a significant effect.

A T-test for the dependent variables according to booklets (all items in Booklet A compared to those in Booklet B, where the items in Booklet B are the reversals of the items in Booklet A) found no difference between the means ($P<0.65$).

An item-by-item T-test analysis of the dependent variables comparing compatible items in Booklets A and B and non-compatible items in Booklets A and B, found no difference between the means ($P < 0.809$).

The percentage of interpretations that were in accordance with the cognitive directionality principle in (1) is practically identical in both kinds of genitive constructions (compatible and clashing). About 89.8% of the interpretations of clashing genitive constructions and about 92.6% of the interpretations of compatible genitive constructions obeyed synaesthetic directionality. The results indicate that, in effect, the conceptual preference principle in (1) played a determining role in assigning the target and source functions, while the default linguistic convention in (3) did not show any effect at all (we will come back to this point in the discussion).

Results of the Second Experiment

The main results are summarized in Table 6.

	Matching responses	Non-Matching responses
Compatible structure	280 (76.7%)	112 (23.3%)
Clashing structure	324 (87.3%)	83 (13.7%)

Table 6: Results of experiment 2

The number of responses that were analyzed was 736 out of the total number of 760 responses that could have been generated by the subjects (after discarding the responses of one pair as previously explained). 604 out of the 736 responses (82.1%) were matching responses, while only 17.9% were non-matching ones.

An analysis of the responses according to the type of the original combination (compatible or clashing) yielded the following results: there were a total of 365 responses to compatible combinations; 76.7% of this total (280) were matching responses. Likewise, there were a total of 371 responses to clashing combinations; 87.3% of this total (324) were matching responses.

Table 7 introduces the average matching scores of the two item groups, for the items in experiment 2. A t-test on item analysis was conducted on the responses generated by subjects for both groups (compatible and clashing).

TABLE 7

Group	Number of items	Average	SD
Clashing items	19	0.86	0.12
Compatible items	19	0.76	0.15

The t-test analysis shows a significant difference between the groups ($t(df=36)=2.43, p=0.02$): the group of clashing combinations generated more matching responses (responses that matched the directionality principle) than the group of compatible combinations. An analysis of Booklet A and B in separation yielded the same results.

As can be seen, our main prediction was confirmed: the number of matching responses was significantly higher than the number of non-matching ones, regardless of whether the original expressions were compatible or clashing genitive constructions: 82.1% (604 out of 736 responses) were compatible with the directionality of the synaesthesia, while only 17.9% were incompatible with it. A t-test analysis of the dependent variables in Booklets A and B, according to subject and according to item (where each item is the interpretation for a given combination) revealed a significant effect ($P<0.001$) in the hypothesized direction.

A comparative analysis of the two versions (the compatible and clashing ones) of each item “opposite” items also supports our prediction. The mean difference for every pair of reversals (for example, “velvet of flute” and “flute of velvet”) is only 1.1%. The statistical analysis of a comparison of the reversed items also shows a significant effect.

A t-test for the dependent variables according to booklets (all items in Booklet A compared to those in Booklet B where the items in Booklets are the reversals of the items in Booklet A) found no difference between the means ($P < 0.29$).

A t-test analysis of items (between compatible items in both Booklets and non-compatible items in both Booklets) found no difference between the means ($P < 0.17$).

In the second experiment, as in the first, we found that the percentage of interpretations that obeyed synaesthetic directionality were similar for the two kinds of genitive constructions (compatible and clashing). This findings indicates that in this experiment, as in the first, the primary factor that determined the kind of interpretation was actually the conceptual tendency, which favored the more basic structure (where the source domain is lower in modality than the target domain), while the linguistic convention did not influence the form of the interpretation.

Moreover, the number of matching responses generated by clashing structures was even significantly higher than those generated by compatible structures (87.3% and 76.7%, respectively). It is not clear at this point whether this difference should be attributed to a problem with our stimuli, or another factor.

SUMMARY AND DISCUSSION

The results of the present study provide empirical support for the hypothesis that participants' assignment of target and source functions in the Hebrew synaesthetic genitive construction is predominantly determined by the conceptual rather than the linguistic mechanism. Thus, in full accordance with this hypothesis, both compatible and clashing constructions (in both experiments) generated responses that were in accordance with the conceptual preference bias for mapping from lower to higher sensory modalities.

These results are in line with the findings of another study (Shen and Cohen, 1998), previously mentioned, that used another type of linguistic construction - Hebrew noun-adjective synaesthetic metaphors (e.g., “sweet silence”). Taken together, the findings of the previous and the present study suggest the important role played by the conceptual mechanism for target/source assignment in participants' responses, across grammatical types. Similarly, Shen (forthcoming) shows that the conceptual preference principle is a better predictor than the linguistic default convention in the case of another grammatical type - the simile.

A closer comparison between compatible and clashing combinations with respect to the number of matching responses they generated, revealed an unexpected result. One would expect that the linguistic default convention (or strategy) would to some extent at least affect the responses generated by the participants. If this was the case, then one would expect to find a lower percentage of matching responses for clashing combinations than for compatible ones. The reason for this is obvious: In the compatible combinations the linguistic default convention acts in concert with the conceptual preference principle, thus enhancing the bias towards interpreting the head noun as the target domain term. By contrast, in the clashing combinations the linguistic convention clashes with the conceptual bias, and should therefore reduce the percentage of matching responses. However, the findings suggest that that was not the case. In neither experiment was the percentage of matching responses generated by clashing combinations lower than those generated by compatible ones. In fact, in the second experiment this percentage was even higher for clashing combinations than compatible ones (87.3% and 76.7%, respectively). In the first study both types of combinations generated about 91% matching responses (92.6% and 89.8%, for the compatible and clashing combinations, respectively). We may conclude, then, that the findings suggest

that the linguistic default convention did not play any role in determining participants' responses.

Another possibility is that the synaesthetic combinations are one of the exceptions to the above rule, where the opposite rule applies. Previously we discussed two types of exceptions to the interpretation rule, namely, genitive constructions in which the head noun describes a quantity or expresses an emotional or evaluative attitude. In those cases the opposite rule applies, assigning the role of the target to the modifying noun and the role of the source to the head noun (that is, the noun describing the target). Thus, synaesthetic combinations, it might be argued, are merely another type of exception which conforms to their opposite rule. This line of reasoning, however, fails to account for our findings.

There are two versions of this account, a strong and a weak one. Under the strong version, the opposite interpretation rule overrides the conceptual preference rule. Under the weak version, this rule is merely an additional factor. Let us discuss each version separately.

If the strong version applies, then the percentage of responses in which head and modifier nouns represent the source and target terms, respectively, should be higher than the opposite responses, regardless of the type of combination (compatible or clashing). Obviously, the results do not support this prediction, since we saw that the major factor in assigning the target and the source roles was the conceptual preference rule, which sometimes worked in accordance with the interpretation rule and sometimes in accordance with the opposite rule.

Under the weak version, even if the opposite interpretation rule does not override the conceptual preference rule, it is nevertheless one factor in assigning the target and source roles. In such a case, the clashing combinations (which would be

compatible ones according to the opposite rule) should generate a higher percentage of non-matching responses (which are matching responses according to the opposite rule) than our original compatible combinations (which would now be clashing ones). Our results do not support this account either. As we saw in the first experiment, there was practically no difference in the number of matching and non-matching responses generated by the clashing and compatible combination. In the second experiment, although there was a difference, it was rather small, and did not reach significance.

Having ruled out this alternative account, we are left with another possibility. Linguistic default conventions (in either the standard or the opposite form) might simply not be a factor in assigning target and source roles for synaesthetic combinations. That is, when speakers of Hebrew interpret synaesthetic combinations, or even metaphorical combinations in general, the default interpretation rule ceases to apply, and what is left is just the conceptual preference rule that applies to synaesthetic metaphors regardless of the exact synaesthetic form they take.

From this account it follows that in the case of clashing combinations, the conceptual preference principle appeared to be stronger than the linguistic default convention; in neither the clashing and compatible combinations did the linguistic convention affect the interpretation of the combinations, the only effective factor being the conceptual preference principle.

If this is indeed the case, then it is fully compatible with the claim made by various scholars of figurative language (notably Lakoff & Johnson 1980) that figuration is not a linguistic but rather a conceptual mechanism. The common interpretation of this claim is that there are general principles in our conceptual system, in particular principles that involve the cross mapping of conceptual domains; these may account for the distribution of various conventional metaphorical expressions in language, and the

way they are produced and comprehended by their users. The standard argument in this context is, then, that certain characteristics of the occurrence, distribution and use of these figurative expressions in language cannot be accounted for in terms of the rules of the language in question, but only by assuming the existence of deep conceptual structures in the form of conceptual metaphors. This is expressed in the following quotation from Lakoff about various metaphorical expressions comparing love to journey:

Is there a general principle governing how these linguistic expressions about journeys are used to characterize love...?[Yes], but it is a general principle that is neither part of the grammar of English, nor the English lexicon. Rather it is part of the conceptual system underlying English
(1993, p. 306) [!]

The current research further develops this view in a more radical way than has so far been suggested. It proposes that when a metaphorical (in this case synaesthetic) relation is expressed in a linguistic form, at least some normal default linguistic conventions are overruled, leaving the cognitive or conceptual principles the only factors involved.

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Appendices (translated from Hebrew)

Appendix no. 1: Booklets for Experiment No. 1

Experiment No. 1 – Booklet A

1. eye of an arrow
2. jasmine of a voice
3. face of a lemon
4. velvet of a flute
5. form of stench
6. bitter herb of singing
7. odor of velvet
8. sound of darkness
9. stench of taste
10. fire of mustard
11. glue of fog
12. voice of perfume
13. honey of light
14. voice of a pin
15. stench of darkness
16. violin of a bitter herb
17. silk of incense
18. sky blue of sound
19. sugar of perfume
20. mint of ice

Experiment No. 1 – Booklet B

1. ice of mint
2. perfume of sugar
3. sound of sky blue
4. incense of silk
5. bitter herb of a violin
6. darkness of stench
7. pin of a voice
8. light of honey
9. perfume of a voice
10. fog of glue
11. mustard of fire
12. taste of stench
13. darkness of a sound
14. velvet of odor
15. singing of a bitter herb
16. stench of form
17. flute of velvet
18. lemon of a face
19. voice of jasmine
20. arrow of an eye

Appendix No. 2: Booklets for Experiment No. 2

- 1) roughness of tastiness
- 2) fragrance of sourness
- 3) resonance of transparency
- 4) perfumedness of chafing
- 5) spiciness of shrieking
- 6) putridness of formality
- 7) caressing of aromaticity
- 8) tastelessness of colorfulness
- 9) smelliness of snoring
- 10) rigidity of yellowness
- 11) saltiness of ticklishness
- 12) sweetness of stench
- 13) lightness of tunefulness
- 14) slipperiness of shrillness
- 15) hoarseness of sacharinity
- 16) whiteness of fragrance
- 17) raspiness of sharpness
- 18) decorativeness of pepperiness
- 19) noisiness of smelliness
- 20) brightness of jobbing

Experiment No. 2 – Booklet B

- 1) jobbing of brightness
- 2) smelliness of noisiness
- 3) pepperiness of decorativeness
- 4) sharpness of raspiness
- 5) fragrance of whiteness
- 6) sacharinity of hoarseness
- 7) shrillness of slipperiness
- 8) tunefulness of lightness
- 9) stench of sweetness
- 10) tickliness of saltiness
- 11) yellowness of rigidity
- 12) snoring of smelliness
- 13) colorfulness of tastelessness
- 14) aromaticity of caressing
- 15) formality of putridness
- 16) shrieking of spiciness
- 17) chaffing of perfumedness
- 18) transparency of resonance
- 19) sourness of fragrance
- 20) tastiness of roughness

