

# Individuals' Process of Metaphor Interpretations and Interestingness Cognition

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## Abstract

In this paper, we investigated the process of interestingness cognition in metaphor comprehension. We did this from the point of view that the interestingness of a metaphor (e.g., “*life is like a gamble*”) is related to its interpretative diversity. Two studies were conducted to assess this phenomenon: Study 1 (interpretation-production) and Study 2 (interpretation-presentation study). In Study 1, we observed that a greater number of interpretations were produced from a metaphor that was interesting and easy to understand as compared to one that was less interesting and difficult to understand. In Study 2, we observed that a metaphor was more interesting when more information on simile interpretation was presented. On the basis of these results, we discuss the relationship between the process of metaphor comprehension and metaphor evaluation.

**Keywords:** metaphor/simile comprehension; interpretive diversity; interestingness.

## Introduction

Sentences such as “*life is like a gamble*” and “*marriage is like a refrigerator*” include comparative senses. Such sentences, consisting of a paired topic and vehicle, which we refer to as a “metaphor” (strictly a “simile”), indicates similar points between two words: *life* is like *a gamble* (both unpredictable and implying risk) and *marriage* cools a relationship or keeps it fresh, as does a *refrigerator* for its contents. Similarity is very important for metaphor comprehension. Recent studies have discussed similarity cognition or the factors that affect similarity cognition in metaphor comprehension. In fact, most studies discuss the relationships between similarity cognition and the process of metaphor comprehension (e.g., Gentner, 1983; Ortony, 1979; Tversky, 1977).

## The Process of Metaphor Comprehension

Similarity cognition in metaphor comprehension is described simply as “the similarity between the topic and vehicle.” The question of similarity involves two forms of nuance: the qualitative sense and the quantitative sense. As illustrated in aptness views (e.g., Chiappe & Kennedy, 1999; Chiappe, Kennedy, & Smykowski, 2003; Jones &

Estes, 2006), the former refers to the degree (“goodness” and “adequacy”) to which the topic and vehicle are similar. As defined in Chiappe and Kennedy (2001), goodness and adequacy indicate the extent to which a comparison captures the important features of the topic. For example, *gamble* includes features salient in, and applicable to, the nature of *life*: in gambling’s sense of “unpredictability,” *gamble* adequately represents an important aspect of *life*. Likewise, both *a refrigerator* and *marriage* cool something, but *marriage* is comparatively difficult to express with a *refrigerator*. Previous studies have shown that this type of similarity affects the process of metaphor comprehension. Jones and Estes (2006) experimentally revealed that the strength of metaphor aptness predicts metaphor/simile preference, reading time for a metaphor, and the ease of interpretation of a metaphor. An apt relationship between the topic and vehicle creates a preferential metaphorical (categorical) expression, is read faster, and is rated as easier to understand than a less apt relationship.

According to the quantitative view, similarity cognition is based on the number of features shared by both the topic and the vehicle. If this number is large, similarity cognition between the topic and vehicle is strong. In the process of metaphor comprehension, these shared features are generated as metaphor interpretation: the metaphor with the most shared features is predicted to produce the most interpretations. In previous studies, simulation results have shown reliable evidence that the productivity of metaphor interpretation, such as interpretative diversity (Utsumi & Kuwabara, 2006; Utsumi, 2007), is more closely related to the process of metaphor comprehension than to the goodness of similarity (i.e., metaphor aptness). Thus, the topic-vehicle relationship that produces several interpretations is the preferred metaphor or simile.

## The Process of Metaphor Evaluation

As described above, the similarity cognition of a metaphor plays an important role in the process of metaphor comprehension. On the other hand, some previous studies have suggested that similarity cognition is also related to the process of metaphor evaluation, such as the rhetoric effect and how funny and interesting a metaphor is.

A metaphor is understood through its cognitive effect, which is not only the enhancement of word meaning (Blasko & Connine, 1993; Gernsbacher, Keyser, Robertson, & Werner, 2001; Taira & Kusumi, 2011) but also its pragmatic effect (Sperber & Wilson, 1994). The former has been revealed to be affected by the strength of the similarity cognition, such as aptness (Blasko & Connine, 1993; Taira & Kusumi, 2011); the latter appears to be related to similarity cognition. For example, Roberts and Kreuz (1994) show that all figurative expressions have some discourse goal. Among them, a metaphor (e.g., “*life is a gamble*”) and a simile (e.g., “*life is like a gamble*”) have different pragmatic goals. One difference is that the simile is used as a humorous expression, while the metaphor is not. Previous studies have shown that the simile is a comparative expression based on similarity cognition, unlike the metaphor (Bowdle & Gentner, 2005; Jones & Estes, 2006) so that similarity cognition is related to humor.

In consideration of the above, we examined the relationship between the simile comprehension process and its evaluation process in a previous study (Taira, Nakamoto, & Kusumi, 2006). The aim of that study was to examine the process of interestingness cognition through correlations between factors affecting the process of simile comprehension. We studied 75 undergraduate native Japanese speakers and employed 30 Japanese similes (e.g., “*life is like a gamble*,” “*marriage is like a refrigerator*”). Through a simple rating task, the ease of comprehension, similarity, familiarity, unpredictability, and interestingness of each simile were measured. In addition to these ratings, the number of interpretations for each simile was collected in another study where participants were required to write out their interpretations of the simile.

Table 1: Correlations between the factors of metaphor comprehension in Taira, Nakamoto, and Kusumi (2006)

Factors	2	3	4	5	6
1. Ease of Comprehension	.960	.947	.938	.740	.347
2. Similarity	-	.933	.927	.705	.382
3. Familiarity	-	-	.967	.696	.302
4. Unpredictability	-	-	-	.712	.300
5. Interestingness	-	-	-	-	.533
6. Number of Interpretations	-	-	-	-	-

$N = 30$

Correlations between the metaphor factors are shown in Table 1, and the results of a path analysis based on the correlation data are shown in Figure 1. The results indicate that both similarity and familiarity, considered factors related to similarity cognition (Chiappe & Kennedy, 2001), are related directly to ease of comprehension. Furthermore, the ease of comprehension and the number of interpretations directly affect simile interestingness: the more easily the simile is understood and the more interpretations the simile produces, the simile is interpreted as more interesting.

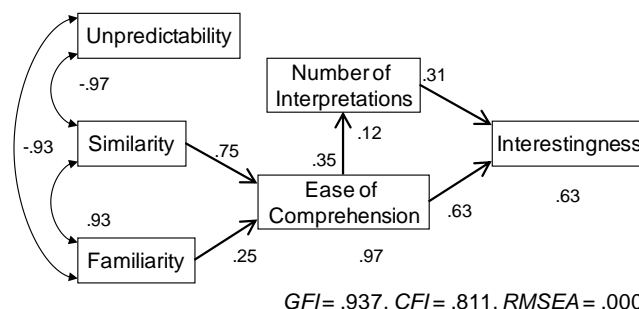


Figure 1: The process of interestingness cognition (Taira, Nakamoto, & Kusumi, 2006)

## The aim of our research

Our previous studies suggest that the similarity cognition of a metaphor, especially quantitative similarity, is related not only to the process of metaphor comprehension but also to the process of metaphor evaluation (i.e., interestingness cognition). However, such results are only suggested by correlational data; it is unknown whether a metaphor that is interesting and easy to understand really produces several interpretations and whether metaphor interpretation directly affects interestingness cognition. It is unclear whether the interestingness of a metaphor is based on the metaphor’s properties or an individual’s action. In this paper, we investigated the process of interestingness cognition in metaphor comprehension.

In Study 1, we examined the number of interpretations for a simile. Our previous study did not reveal the process of interpretation production in simile comprehension; thus, we did not determine whether an individual could produce several interpretations from a simile that is interesting and easy to understand. In Study 1, we examined the number of interpretations for various metaphors with different levels of interestingness and ease of comprehension.

In Study 2, we examined whether the interpretation itself increases the interestingness cognition. As in Study 1, interestingness cognition is inferred through correlational relationships. If this prediction is correct, a metaphor will be judged more interesting when more interpretations of the metaphor are presented. For Study 2, we provide experimental data on the relationship between the interpretation and the interestingness of metaphors.

## Study 1

The aim of Study 1 was to confirm that an individual produces more interpretations for a more comprehensive and interesting metaphor, and vice versa.

## Method

**Participants** 800 participants were recruited from an internet research company. All were native Japanese speakers.

**Materials** Thirty-six Japanese similes were selected from the materials used in Taira and Kusumi (2009); some were also selected from materials used in our previous study

(Taira, Nakamoto & Kusumi, 2006). For these similes, Taira and Kusumi (2009) examined interestingness and ease of comprehension using 5-point scales (1 = “not at all interesting or easy to understand” to 5 = “very interesting or easy to understand”). They were clustered within three simile types: 12 similes that were seen as highly interesting and very easy to understand (e.g., “*life is like a gamble*.” interestingness,  $M = 3.21$ , ease of comprehension,  $M = 4.04$ ), 12 similes seen as moderately interesting and easy to understand (e.g., “*a husband is like jewelry*.” interestingness,  $M = 2.81$ , ease of comprehension,  $M = 3.38$ ), and 12 similes seen as less interesting and difficult to understand (e.g., “*marriage is like a refrigerator*.” interestingness,  $M = 2.38$ , ease of comprehension,  $M = 2.36$ ). The correlation between interestingness and ease of comprehension was very strong ( $r(36) = .88$ ). This result is similar to results obtained in Taira, Nakamoto, and Kusumi (2006); thus, the material selection in Study 1 was appropriate. In this paper, we defined each type of simile within a high-, middle-, and low-rating group.

**Procedures** This study was part of an omnibus internet survey that measured higher-order literacy. The monitors participated in the survey on the internet. They were required to access the website described by the internet research institute and to answer questions relevant to our study. Three similes had been selected from each category. Participants were required to provide as many interpretations of each simile as possible. The interpretations were typed into a textbox on the webpage.

## Results and Discussion

Between 57 and 86 participants produced interpretations for each simile. Data were coded and clustered. Through this procedure, the number of interpretation units for each simile was examined. We defined an interpretation unit as the component included within the participant’s text with an independently important sense for the metaphor’s interpretation. For example, if one participant produces the interpretation “it is unpredictable and followed with any risk. It does not describe what will happen next” for “*life is like a gamble*,” two interpretation units are produced because the second sentence includes the same unit that appears in the first sentence.

Table 2: Mean number of interpretation units

	low-rating	middle-rating	high-rating
interpretation	1.25	1.37	1.51
unit (SD)	(.73)	(.73)	(.92)

$N=800$

There were strong correlations between the interpretation unit and ease of comprehension ( $r(800) = .498$ ) and interestingness ( $r(800) = .404$ ) in Taira and Kusumi (2009). These results suggest that participants produced more interpretations for similes that were more interesting and easy to understand. In addition, the mean of the interpretation unit per participant is shown in Table 2. The

mean data were analyzed through one-way ANOVAs with participants ( $F_p$ ) and items ( $F_i$ ).

The main effect of rating group was significant ( $F_p(2, 1598) = 36.86$ ,  $\eta^2 = .02$ ;  $F_i(2, 22) = 5.14$ ,  $\eta^2 = .24$ ;  $ps < .001$ ). Multiple comparisons revealed significant differences between the low and middle rating groups ( $t(1598) = 4.00$ ,  $r = .15$ ), low and high rating groups ( $t(1598) = 8.58$ ,  $r = .28$ ), and middle and high rating groups ( $t(1598) = 4.58$ ,  $r = .16$ ).

The results show that participants produced different numbers of interpretations according to their ease of comprehension and interestingness. This is somewhat consistent with results from Taira, Nakamoto, and Kusumi (2006). However, both ease of comprehension and interestingness in Study 1 were defined through data from our previous studies (Taira & Kusumi, 2009). Results from Study 1 did not indicate whether participants really conceived the metaphor as interesting and easy to understand. This problem was addressed in Study 2.

## Study 2

Study 1 revealed relationships between the ease of comprehension/interestingness of a metaphor and its number of interpretations. From these results, however, we cannot ascertain whether interestingness cognition is followed by metaphor interpretation or whether interestingness cognition follows metaphor interpretation. In Study 2, we controlled the number of metaphor interpretations and investigated the effect of interpretation on interestingness cognition.

## Method

**Participants** Fifty-four participants took part in Study 2. All were native Japanese speakers and had not participated in Study 1.

**Materials** From Study 1, the 12 similes that were defined within the high-rating group (e.g., “*life is like a gamble*”) and the 12 similes that were defined within the low-rating group (e.g., “*marriage is like a refrigerator*”) were selected. For each simile, three relevant simile features (e.g., for “*life is like a gamble*,” “*unpredictable*,” “*followed with any risk*,” and “*needing strategy*”) were applied. The three relevant features were selected from the first, second, and third most popular interpretation units produced in Study 1.

**Procedure** Study 2 was composed of three tasks: a rating task, a reading span task (RST), and a re-rating task. These tasks were performed in aforementioned order.

The rating task was a simple rating task in which participants were required to rate the ease of comprehension, interestingness, and unpredictability of the similes. Each factor was rated on 7-point scales (1 = “very difficult to understand,” “not at all interesting,” and “very predictable” to 7 = “very easy to understand,” “very interesting,” and “very unpredictable”).

For the RST, a standardized procedure of the Japanese RST (Osaka & Osaka, 1994) was performed. For this task, 2 to 5 sentences with one word underlined were presented in order; participants were required to read aloud each

sentence. After all the sentences were presented and read, participants were required to read all the underlined words without the sentence. The task included 22 trials: the first two were practice trials and the remaining 20, true trials. The RST was used only as a filler task between the rating and re-rating tasks.

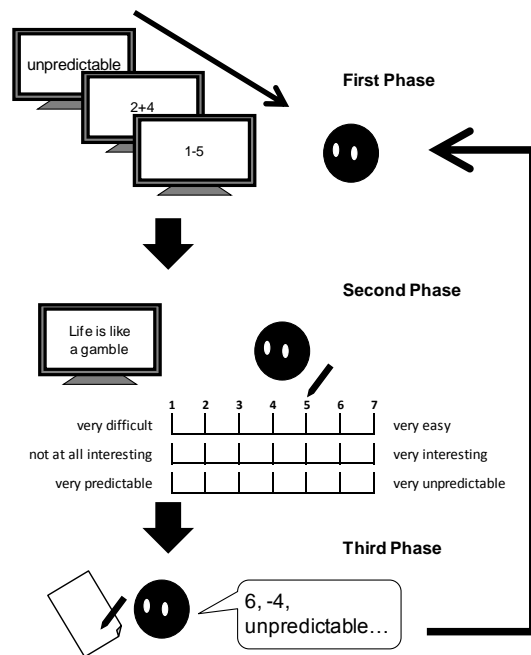


Figure 2: Design of the re-rating task in Study 2

The re-rating task was composed of three phases (see Figure 2). During the first phase, three information units were presented to participants. The information unit was either the feature (e.g., “unpredictable,” “followed with any risk,” or “needing strategy”) relevant to the simile (e.g., “life is like a gamble”) or a simple addition-subtraction calculation formula (e.g., “2 + 4” or “1 - 5”). The composition of the information units included three features without a calculation formula, one feature and two calculation formulas, and no features and three calculation formulas. Participants were required to comprehend the information units because they would perform a recall task after this phase. During the second phase, participants were required to rate the ease of comprehension, interestingness, and unpredictability of the similes in the same manner as during the rating task. Participants were instructed to re-rate the similes based on their current impression (not based on their previous rating). During the third phase, participants were required to recall features and calculation formulas learned during the first phase. After participants finished the third phase, the next trial began. This task included 26 trials: the first two were practice trials.

## Results and Discussion

The scores for ease of comprehension, interestingness, and unpredictability in the rating and re-rating tasks were examined. Mean scores for ease of comprehension,

interestingness, and unpredictability for the high rating group are shown in Figure 3, and the scores for the low rating group are shown in Figure 4.

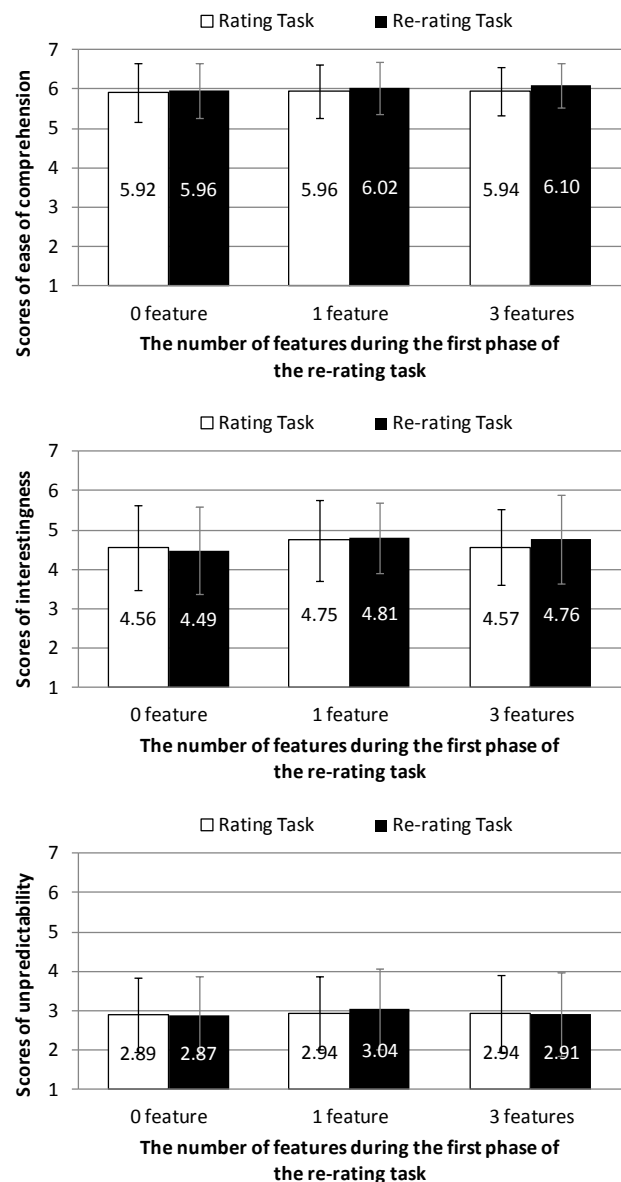


Figure 3: The mean scores (SD) of the high-rating group

**High-rating group’s results** For the high-rating group, the ease of comprehension score was very high, and a series of 2 (task type: rating/re-rating) x 3 (the number of feature: 0/1/3) repeated-measures ANOVAs revealed a significant main effect of task type ( $F(1, 53) = 4.53, p < .005, \eta^2 = .00$ ) but no main effect of the number of features ( $F(2, 106) = .47, \eta^2 = .00$ ) or any interactions ( $F(2, 106) = .87, \eta^2 = .00$ ). Likewise, ANOVAs were conducted on the interestingness and unpredictability scores. The unpredictability result revealed no significant main effects of task type ( $F(1, 53) = .06, \eta^2 = .00$ ), the number of features ( $F(2, 106) = .51, \eta^2 = .00$ ), or any interactions ( $F(2, 106) = .51, \eta^2 = .00$ ). The

result of interestingness also showed no significant main effects of task type ( $F(1, 53) = .50, \eta^2 = .00$ ) and the number of features ( $F(2, 106) = 2.96, p < .10, \eta^2 = .01$ ), and no significant interaction ( $F(2, 106) = 1.48, \eta^2 = .00$ ).

If the prediction that metaphor interpretation directly affects and increases interestingness cognition is correct, the results from the high rating group suggest that the simile of the high rating group originally produced several interpretations (from Study 1); thus, the scores for each rating task factor were the same as the scores in the re-rating task where interpretations were presented.

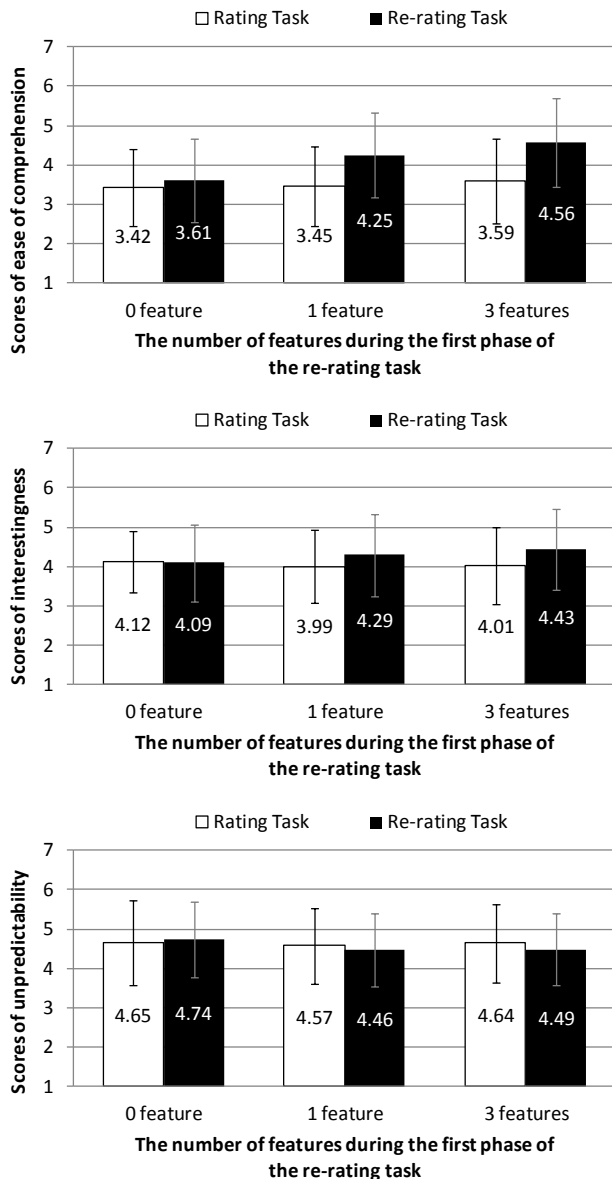


Figure 4: The mean scores (SD) of the low-rating group

**Low-rating group's results** For the low-rating group, a series of 2 (task type: rating/re-rating) x 3 (the number of features: 0/1/3) repeated-measures ANOVAs revealed significant main effects of task type ( $F(1, 53) = 56.89, p$

$< .001, \eta^2 = .08$ ) and the number of features ( $F(2, 106) = 9.46, p < .001, \eta^2 = .04$ ) in the ease of comprehension scores, as well as a significant interaction ( $F(2, 106) = 15.05, p < .001, \eta^2 = .02$ ). To deconstruct the interaction, Ryan's multiple comparisons test indicated simple main effects of task type on both the 1-feature and 3-feature conditions ( $F_s(1, 159) = 42.79, 63.04, p_s < .001, \eta^2 = .06, .08$ ). Simple main effects of the number of features on the re-rating task were also significant ( $F(2, 212) = 20.96, p < .001, \eta^2 = .07$ ): in the re-rating task, the scores in both the 1-feature and 3-feature conditions were higher than the 0-feature condition ( $t_s(106) = 2.59, 4.32, p_s < .05, .001, r = .28, .40$ ). On the other hand, scores for the 3-feature condition were not significantly higher than the 1-feature condition ( $t(106) = 2.08, r = .14$ ).

For the interestingness scores, there were also significant main effects of task type ( $F(1, 53) = 8.74, p < .005, \eta^2 = .01$ ) and interactions ( $F(2, 106) = 3.39, p < .05, \eta^2 = .01$ ) but no significant effects for the number of features ( $F(2, 106) = .50, \eta^2 = .00$ ). Ryan's multiple comparisons test also indicated simple main effects of task type in both the 1-feature and 3-feature conditions ( $F_s(1, 159) = 5.54, 10.62, p_s < .05, .005, \eta^2 = .01, .02$ ), but no simple main effect of the number of features for the re-rating task ( $F(2, 212) = 2.58, p < .10, \eta^2 = .01$ ). Conversely, for the unpredictability scores, there were no significant main effects (task type:  $F_s(1, 53) = .51, \eta^2 = .00$ ; number of features:  $F_s(2, 106) = 1.06, \eta^2 = .01$ ), or interactions ( $F_s(2, 106) = 1.80, \eta^2 = .00$ ).

These results suggest that the presentation of metaphor interpretation, which is related to similarity cognition, affects the process of metaphor comprehension: the interestingness of a metaphor might be increased through interpretations. This is consistent with the prediction that interpretative action significantly affects interestingness cognition. Our results also confirm previous studies suggesting that metaphor appreciation is based on the resolution of incongruity (Utsumi, 2002; Utsumi, 2005). However, the solution of unpredictability was not detected by results from Study 2. One possible interpretation is that unpredictability might be attributed not to the simile but to the interpretation itself. The low-rating similes are generally difficult to comprehend and produce its interpretations (from Study 1) so that the presented interpretations in Study 2 can be also unexpected to the participants. If some participants confounded this cognitive process with the task judgment that required the evaluation of the simile itself, results from the low-rating group are probable. This problem needs to be addressed in future research by using more strict instructions and experimental paradigms.

## General Discussion

The current studies have provided experimental evidence of metaphor comprehension/evaluation. Previous studies have only revealed relationships between these constructs and were unable to fully determine whether evaluation results are based on the metaphors' properties or individuals' inner processes.

Our results suggest that metaphor evaluation is based on interpretative action. Moreover, our results indicate that metaphor comprehension is strongly affected by whether the connection between two different concepts is discovered. Thus, our results support the quantitative view of metaphor comprehension (Utsumi, 2007). However, our results do not fully discount the qualitative view given that the number of interpretations observed depends on the context, the saliency of interpretation, and an individual's cognitive ability. Our task paradigm, especially that of Study 2, shows incongruence between the interpretation during the task and the interpretation that the individual produces. We usually produce metaphor interpretations when reading or listening to them and unaided by any relevant information. We typically are unable to refer to adequate interpretations, as were participants in Study 2. In future research, we will examine the relationship between metaphor interpretation and metaphor evaluation through a task requiring participants to produce interpretations of metaphors.

Previous studies have discussed the relationship between the process of comprehension and an individual's cognitive ability, such as working memory (e.g., Chiappe & Chiappe, 2007; Pierce & Chiappe, 2009; Pierce, McLaren, & Chiappe, 2010). However, there are few studies examining the relationship between evaluation processes, such as interestingness, and working memory. Future research will need to examine the working memory factor, which is predicted to affect the process of both comprehension and evaluation.

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