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Proceedings of the Annual Meeting of the Cognitive Science Society

Title

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Permalink

Journal

ISSN

Authors

Keane, Mark T.
Lynott, Dermot

Publication Date

2005

Peer reviewed

Familiarity and Creativity in Novel Compound Production

Dermot Lynott (dermot.lynott@northumbria.ac.uk)
Division of Psychology, Northumbria University
Newcastle-upon-Tyne, NE1 8ST, UK

Mark Keane (mark.keane@ucd.ie)
Department of Computer Science, University College Dublin
Belfield, Dublin 4, Ireland

Abstract

In two experiments we investigated creativity and familiarity in the production of novel noun-noun compounds. In the first experiment, people created compounds as labels referring to given entity descriptions that had been classified as either Familiar or Unfamiliar, and they also provided confidence ratings for these compounds. We found that people were less creative when creating compounds for Familiar entities compared to Unfamiliar ones, with greater variation evident in the compounds produced for Unfamiliar descriptions. In the second experiment, participants were required to rate the creativity of compounds created in Experiment 1. We observed a relationship between a compound's frequency of production and the creativity ratings people gave. However, the direction of this relationship was dependent on the Familiarity of the original description. We discuss how these results highlight the roles of familiarity as a constraint in creativity.

Introduction

In everyday life, people create novel compounds, so-called concept combinations, to describe events and objects they encounter. In some cases, these new compounds are created on the fly for use in a specific context, like referring to a "daisy cup" as "a cup with a daisy pattern on it". In other cases, these compounds survive to become permanent fixtures of the language used everyday by the wider language community (e.g., "soccer mom", "laptop computer"). Some, like "junk bond", enter the language for a time, and then fall out of use. These novel compounds reflect a fundamental aspect of language generativity accounting for between 30% and 60% of new terms in English (Cannon, 1987; McFedries, 2004). These novel noun-noun compounds are commonplace in the everyday understanding of tabloid headlines, advertisements, newspapers and novels (e.g., "wrap rage", "tunnel advertising", "latte factor"; McFedries, *op cit*). It is clear that these compounds also reflect the creativity inherent in combining concepts in new ways, with many examples employing juxtaposition, metaphor (e.g., "butcher surgeon") or analogy (e.g., "soccer dad") in order to create a novel way of labelling a particular entity.

Over the past 25 years, most of the research effort in the concept combination literature has focussed on the comprehension of novel, noun-noun compounds (e.g., Clark & Hecht, 1983; Costello & Keane, 2000; Gagné & Shoben, 1997; Hampton, 1987; Levi; 1978; Wisniewski & Love, 1998). By contrast, there exists a much sparser literature on the production of novel compounds. Indeed, the production literature has concentrated more on child language development than on adult usage (e.g., Clark & Baron, 1988; Clark & Berman, 1984; Clark & Hecht, 1982; Elbers, 1988; Windsor, 1993). The work on adult compound creation has advanced taxonomies for produced compounds (e.g., Levi, 1978) and examined syntactic aspects of morphological processing (Gordon, 1985; Ramscar, Pearson & Ali, 2003). However, despite creativity being a fundamental aspect of conceptual combination (see Costello & Keane, 2000; Estes, & Ward 2002), this literature has had little to say on what factors might influence people's creativity in producing such compounds. In this paper, we address this deficiency, by examining the effects of familiarity on the production and creativity of novel compounds.

People have always had strong intuitions concerning the role of knowledge, or familiarity with a topic area, in creative acts. Many suggest that we need at least some knowledge of a subject in order to create something new, while at the same time, too much familiarity with an area might stifle creativity (Frensch & Sternberg, 1989; James, 1880; cf. Weisberg, 1995, 1999). According to Weisberg, this view of creativity, describes an inverted U-shape (curvilinear) between knowledge and creativity, indicating maximal creativity will occur with some "middle" amount of knowledge. This view has been termed the "tension" view of creativity. An alternative few suggests a positive correlation between creativity and knowledge, meaning the more familiar someone is with something the more creative they are likely to be. This view has been termed the "foundation" view. These positions on creativity express quite contrasting views, and make divergent predictions concerning a person's familiarity with something and the propensity for creative acts to occur.

Thus, in this study, we consider the effect familiarity in a specific domain, namely on the production of novel noun-noun compounds. We consider whether increased familiarity with particular entities will lead people to be more creative when producing labels for them. Alternatively, will people actually converge on particular labels for more familiar entities, thereby exhibiting an

overall reduced level of creativity? We call this the *convergence* test and this is the focus of Experiment 1. The concepts of convergence and divergence have long been associated with reduced and enhanced creativity respectively, and have formed important components of several views of intelligence and creativity (e.g., Guilford, 1967).

From Experiment 1, we will have a set of novel compounds and also the frequencies with which they were produced. We then consider whether compounds that have been produced more frequently are considered less creative. In other words, is the uniqueness of a label what defines its creativity, or will the level of familiarity impact on the perception of creativity in some way?

We investigated these issues, using a paradigm that elicits novel compounds from participants (see Costello, 2002; Lynott & Keane, 2003). This allows us to first examine whether entities that people are more familiar with converge on particular labels. From this, we also see how often particular compounds are produced which allows to compare these frequencies to creativity ratings. We can then examine if more commonly produced compounds are considered less creative, or whether familiarity will also influence this relationship. Based on the contrasting views of creativity we outline some predictions for the following experiments.

Concerning the convergence test, a tension view of creativity would lead us to predict that people will be less creative when responding to more familiar items. This will lead to increased convergence in the compounds that people produce. In other words, fewer unique compounds will be produced for the familiar items. This reduced creativity will arise because people's increased familiarity will act as a constraint on the compounds they produce.

In addition to creating a compound for each description, participants also provided a rating of their confidence in the compound they produced and how well that compound conveyed the information in the description. We call this the *confidence* prediction. We feel that where people are being less creative, they will feel more confident about what they are producing as they are sticking with what they know. So, if we observe reduced creativity in response to Familiar descriptions, then we would expect increased confidence in people's ratings.

In Experiment 2 we examine first whether compounds created for familiar items are considered more creative, and second whether the frequency with which a compound has been produced is an indicator of its perceived creativity. For example, are compounds that are produced very frequently considered less creative? In keeping with the tension view, people should be more creative when producing compounds for Unfamiliar descriptions, and so creativity ratings should be higher. On an intuitive level, we would expect that compounds that are produced less frequently will be perceived as being more creative, but neither the tension view nor the foundation view makes strong claims on this point.

In Experiment 1, we presented people with Familiar and Unfamiliar entity descriptions and ask them to produce labels for them. Table 1 provides some examples of the type of descriptions used. From this, we analysed the number of unique compounds produced for both sets of materials, giving us a measure of the convergence / divergence in each case. In Experiment 2, we present people with compounds produced in Experiment 1 and ask them to rate their creativity. We first analyse the creativity ratings for differences between those produced for Familiar and Unfamiliar descriptions. Then we compare the frequency with which items were produced to their creativity rates to consider whether the "uniqueness" of a compound is indicative of its perceived creativity.

Materials Pre-test

An independent group of participants were given the entity descriptions to be used in the experiments and asked to rate them for familiarity. Forty-four pairs of descriptions were constructed, with each pair consisting of a Familiar (e.g., A box that contains files belonging to lawyers) and an Unfamiliar (e.g., A box that contains sandwiches belonging to lawyers) description. This distinction was achieved by changing a single word in each pair (see Table 1). Each description consisted of a subject followed by two objects, using a variety of relations (e.g., made from, used for, causes). All descriptions followed this general form, though they did not have identical syntactic structures.

Two lists of descriptions were randomly selected from the 44, with Familiar and Unfamiliar versions being assigned to separate lists. Each list also contained 15 filler descriptions that were of similar form but were tautological in nature (e.g., a bicycle that has two wheels and a saddle). These items were rated by 24 UCD undergraduates for familiarity using a 7-point scale ranging from 1 ("Not at all familiar") to 7 ("Completely familiar").

Table 1 Example descriptions used in Experiment 1

Example	Entity Description	Familiarity
1	A bed in a surgery used by patients	Familiar
	A bed in a surgery used by visitors	Unfamiliar
2	A game played by children on a street	Familiar
	A game played by children on a roof	Unfamiliar

Results

Participants' ratings confirmed the experimenters' prior classification; the Familiar descriptions were indeed rated as being more familiar (M = 5.035) than the Unfamiliar items (M = 2.821). This difference was reliable treating both participants and items as random factors - $F1(1, 25) =$

483.564, MSe = 3.315, p < 0.0001; F2(1, 43) = 108.837, MSe = 2.438, p < 0.0001. In the subsequent experiments, we only used materials where the mean familiarity ratings for Familiar and Unfamiliar descriptions had a difference greater than 1 point on the rating scale. Eight materials were excluded on this criterion, leaving 36 pairs of descriptions in total.

Experiment 1

Method

Participants Twenty-four native English-speaking undergraduates at UCD participated. Two participants' responses were removed prior to analysis as they failed to complete the questionnaires.

Design The experiment had a single factor design with Familiarity as an independent within-subjects variable, confidence rating and number of unique compounds per description as dependent variables.

Materials Thirty-six pairs of descriptions were used, with each pair consisting of one Familiar and one Unfamiliar description. The pairs were randomly split to create two lists of materials, along with 15 fillers, with neither list containing both versions of a description-pair, but with all items occurring equally often. The filler descriptions could be adequately described using only one word (e.g., bicycle), whereas test items could not easily be described by a single word.

Procedure Participants were given instructions to "provide a shortened phrase that conveys the same information as each description", making sure that they wrote down what they thought was the "best" phrase for each. They were also asked to rate their confidence in the compound; how well they thought their label conveyed the information in the object description. The rating scale ranged from 1 to 7, with 1 being "very good" and 7 being "very poor" (i.e., the lower the score, the better they considered their compound). The instructions provided some examples (noun-noun compounds), though people were not asked specifically to produce noun-noun compounds.

Table 2 Summary of responses from Experiment 1

	Experiment 1
Total Responses	805
Total Noun-Noun Compounds	742 (75.5%)
Total Lexicalised Compounds	2 (0.6%)
Total Unique Compounds	340

Scoring The phrases produced were categorised either as "Noun-Noun Compounds" or as "Other". The "Other" category included adjective-noun labels (e.g., "strange monkey"), verb-noun labels (e.g., pecking bird), single-word labels (e.g., "beach"), blends of two or more words and non-words (e.g., "binmenitis"). Of the 340 unique

noun-noun compounds created by participants less than 1% were lexicalised, demonstrating that participants did not feel restricted when required to produce novel compounds. Compounds were considered lexicalised if they appeared in Collins 21st Century Dictionary. Both authors agreed 100% in their independent classifications of responses. Table 2 provides a summary of the responses for Experiment 1.

Results

People created 805 phrases, of which a high percentage were noun-noun compounds (>75%, see Table 2). Of the unique noun-noun compounds coined (N = 340), the majority were based on selecting both words from the description (61%). Furthermore, over 90% of compounds used at least one word from the description. When people did not use the exact words in the description they often used near-synonyms (e.g., "educator" for "teacher"), semantically-related terms (e.g., "army" in place of "war", "sun" in place of "desert") or nominalised verbs from the description (e.g., "jumper" from "jumps", "pecker" from "pecks"). Overall, there was a greater tendency for people to use new words in response to Unfamiliar entities – F1(1, 21) = 7.98, MSe = 1.519, p < 0.01; F2(1, 35) = 3.464, MSe = 2.045, p = 0.073.

The convergence prediction was tested by noting the total number of unique compounds produced for Familiar and Unfamiliar entities. The prediction was confirmed by a one-tailed, pairwise t-test showing that fewer unique compounds were produced in response to Familiar entities (M = 3.01) compared to Unfamiliar entities (M = 4.056) - t(35) = 3.263, p < 0.001. The same pattern of results is evident when we include all responses (i.e., not just noun-noun responses).

The confidence prediction was tested using a one-way repeated measures ANOVA to analyse participants' confidence ratings, with Familiarity as a within-subjects factor. This analysis revealed a main effect of Familiarity on participants' confidence ratings, with participants rating their compounds from the Familiar descriptions (M = 2.945) as being better than those from Unfamiliar descriptions (M = 3.598). This finding was reliable, treating both participants and items as random factors - F1(1, 21) = 28.224, MSe = 1.583, p < 0.0001; F2(1, 35) = 26.091, MSe = 2.192, p < 0.0001.

We also considered people's confidence ratings when their compound was based directly on words in the descriptions or on new words. Interestingly, people judged their compounds to be better when they contained these new words (M = 3.083), rather than the ones in the description (M = 3.385) - F1(1, 21) = 4.572, MSe = 1.519, p < 0.001; F2(1, 35) = 0.385, MSe = 2.045, p = 0.538. Though this result is not reliable in the by-items analysis, it does suggest that when people selected new words for their compounds, they may have been driven by a need to find terms that more accurately conveyed the meaning of the description.

Discussion

We found that the extent to which people are familiar with something affects how creative they are when producing new labels for it. People were less creative when referring

to Familiar entities, with participants converging on fewer labels than when they were referring to Unfamiliar entities. Furthermore, when responding to Unfamiliar items people were more likely to choose new words that were not contained in the original description. This suggests that Familiarity is acting as a constraint on people's creativity. This result is certainly more in line with the tension view of creativity, which considers increased levels of familiarity an inhibitor of creative processes. So, what we have seen is that increased familiarity of an entity had the impact of limiting creativity in people's responses, while decreased familiarity resulted in a greater variety of responses. It would appear that for creativity in language production, reduced familiarity does facilitate increased creativity.

In Experiment 2 we look at this in more detail. Taking the compounds produced in Experiment 1, participants were asked to rate the creativity of those compounds as labels for the entities in the descriptions. Since we observed people being more creative when producing compounds for Unfamiliar items, we would expect that creativity ratings for those compounds to be higher. Additionally, we consider whether there is a relationship between the frequency with which a compound is produced and its resulting creativity ratings. Intuitively, we might expect compounds that were produced with higher frequency to be perceived as less creative. However, a priori it is not clear what the effect of familiarity will be on this relationship.

Table 3 Responses for Familiar and Unfamiliar Items in Experiment 1

Measure	Familiarity	
	Familiar	Unfamiliar
Mean Confidence Ratings	2.945	3.598
Mean No. of Unique Compounds	3.01	4.05
% Noun-Noun Compounds	70.6	81.8

Experiment 2

Method

Participants 31 native-English speakers took part in this experiment. The data from 3 participants was removed as they either failed to complete the booklet or failed follow the instructions.
Design Familiarity was a within-participant factor, with participants' creativity ratings as the dependent variable.
Materials Materials were selected from those compounds produced in Experiment 1. To avoid using very odd compounds, only those that were produced more than once were selected. This left 115 compounds for rating for Experiment 2. Materials were arranged in groups so that each participant would only rate one compound for each description, and would never see both the Familiar and Unfamiliar versions of the entity descriptions. This meant that each participant rated the creativity of 36 compounds for 36 entity descriptions.

Procedure A fresh group of participants was given a set of compounds paired with their entity descriptions and asked to rate the creativity of the compound in each case. Participants were not given an explicit definition of creativity as we wanted ratings in response to people's intuitions concerning creativity, and not with respect to an experimenter-derived definition. Instead participants were asked to base their answers on their own opinion. If participants were unsure about what was meant by "creativity" it was simply reiterated that they should base their rating on their own opinion of creativity.

Results

We observed no main effect of familiarity on participants' ratings - $F1_{(1, 27)} = 2.235$, $p = 0.147$, $MSe = 1.876$; $F2_{(1, 36)} = 2.816$, $p = 0.103$), although there was a slight tendency for Familiar items to be rated as more creative, with mean ratings of 3.997 for Familiar items and 3.77 for Unfamiliar items. However, when we take into account the frequencies of production of the original compounds (classifying compounds produced 3 times or less as Low, and compounds produced 5 times or more as High), we find a significant interaction between description familiarity and frequency of production – $F_{(1, 98)} = 10.761$, $MSe = 0.699$, $p < 0.001$.
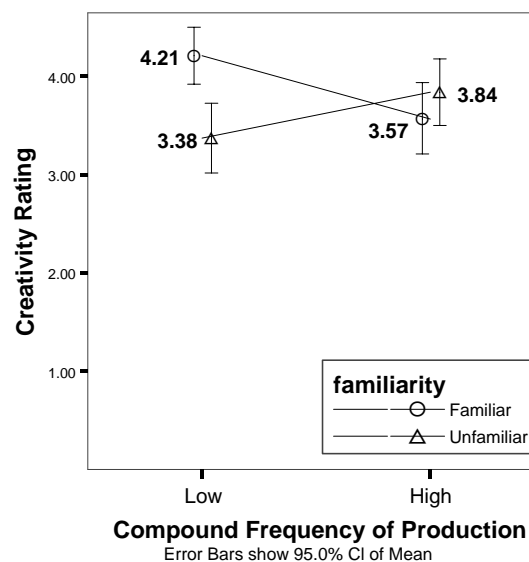

Figure 1 Mean creativity ratings for compounds produced with High or Low frequency in response to Familiar or Unfamiliar descriptions

Post-hoc Bonferonni comparisons reveal a significant difference between creativity ratings for Familiar and Unfamiliar descriptions for compounds with low frequencies of production ($p < 0.001$), but not for compounds with high frequencies of production ($p = 0.268$). In other words, for Familiar items, the more frequently a

compound was produced the lower people judged its level of creativity. On the other hand, for Unfamiliar items, compounds that were frequently produced more frequently were judged as being more creative (see Figure 1). Additionally, the differences between ratings for High and Low frequency compounds in the Familiar condition (p = 0.006) and Unfamiliar condition (p = 0.066) were significant and marginal respectively.

Discussion

The finding that there is no difference between the perceived creativity of compounds produced for Familiar and Unfamiliar entities does not fit neatly with either the tension or the formation views of creativity. A tension view would have predicted that compounds produced for Unfamiliar items would be rated as more creative, with the opposite being true of a formation view.

It is interesting to observe the interaction between familiarity and the frequency of production for a compound. At the very least, it appears that people's assessment of creativity is affected in quantitatively different ways depending on their familiarity with a particular entity. We return to these points in the General Discussion below.

General Discussion

We have examined the role of familiarity in the production and creativity of novel compounds. Firstly, we found that Familiarity influenced the extent to which people were creative in the compounds they produced, with people's responses to Familiar object descriptions being less creative. Secondly, we found no difference between the perceived creativity of compounds produced and the Familiarity of the original entity description. Thirdly, we observed a relationship between a compound's frequency of production and its perceived creativity. However, the direction of this relationship was dependent on the Familiarity of the entity description.

From these results it is clear that there is a relationship between a person's level of familiarity with something and the proclivity for creative behaviour. Where there is increased familiarity with an entity description we observed reduced creativity. This reduction was evident in two principal ways. In the first instance, there was reduced variance in the compounds people produced, resulting in a significantly lower number of unique compounds being produced. Secondly, for familiar descriptions people were less likely to stray from the words in the description. On the other hand, for Unfamiliar description people used more "new" words.

These results are both consistent with the tension view of creativity in general, but they also coincide with recent research in the domain of language creativity. Grimes & Keane (2004) have observed that where people are creative in language production they are still bound by their knowledge of familiar events. They observed that even where people were instructed to be creative in a sentence creation task, they were still constrained by their existing knowledge of the events they were describing. This and our current finding points to the role of familiarity as a constraint on creative behaviour. With this in mind, we feel these findings are at odds with recent accounts on the role of constraints in creativity.

Johnson-Laird (1991, 2002; Haught & Johnson-Laird, 2002) has argued that increasing the constraints under which people operate will enhance their creative output. Such predictions have been borne out in areas such as jazz improvisation and the production of novel sentences. This research has shown that increasing the constraints on the task people perform results in more creative behaviour. Our findings suggest that this may not always be the case. When faced with the knowledge constraint of increased familiarity, people's behaviour was overall less creative with less variation evident in people's responses. It may be that there are different types of constraint at work here, with knowledge-based constraints pushing creativity in one direction while task-based constraints work in the opposite direction. Such speculation will require further research to ascertain if this is the case.

This view of the role of knowledge and familiarity in language production finds echoes in existing theories of language comprehension. People's understanding of events and causal sequences are often constrained by their familiarity with these situations and of their knowledge of their possible outcomes (e.g., Halldorsen & Singer, 2002).

In our second experiment we observed no difference between people's creativity ratings of compounds produced for Familiar and Unfamiliar descriptions. This may point to a possible distinction between people's actual creative behaviour and the perception of creativity. Such a distinction has been highlighted in the literature, particularly with reference to the development of formalised models of creativity assessment (e.g., Gervas, 2002; Wiggins, 2001).

However, the observed interaction between the familiarity of a description and the frequency of production of a compound poses additional questions for existing views of creativity. While it appears intuitive to see that compounds produced infrequently judged more creative, this was only true for Familiar descriptions, with Unfamiliar descriptions displaying an opposing pattern. This means that it is not enough for something to be produced infrequently to be creative, but it must be in the context of something that is already familiar. This underscores the importance of taking into account prior knowledge in both the production and assessment of linguistic creativity.

From the work of Johnson-Laird and others, we have seen that some constraints can act as a driving force behind creativity, whereas we have shown that other constraints may act to stifle it. While there are many factors that have been shown to influence the propensity for creativity in thought and language, such as emotional state, or environmental and cultural conditions (see e.g., Johnson & Hackman, 1995), it is clear that increased knowledge and familiarity can have a negative impact. Future research will need to further examine the extent of familiarity effects in

creativity while also considering the distinction between different types of constraints (e.g., task versus knowledge) as alluded to above.

From the current evidence it appears that a generic view of the impact of constraints on creativity way is not tenable. While researchers have often noted the importance of the creative aspects of novel word combinations in both language production and comprehension, few have addressed the issue directly. The present study goes some way towards addressing this deficit by bringing to centre stage the nature of creativity in conceptual combination research and at the same time highlighting the issues of familiarity and constraints in general.

Acknowledgments

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