The Effect of Image Stimulus on Conceptual Combination in the Design Idea Generation Process

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Abstract

In our experiences of teaching design students and working with design professionals, we have often observed the great importance of inspiration even if students and professionals approach design in various ways. Moreover, we often find that presenting a designer with stimuli at the initial stages of a design inspires the generation of new ideas. This paper aims to discover the relationship between the similarity of visual stimuli and the creativity generated by visual stimuli in the conceptual synthesizing process. This represents the most frequently employed design idea generation technique.

The results showed that the concept pairs from different categories had a lower level of similarity than the concept pairs from the same category. In regards to the creativity of the design idea sketches, the concept pairs from different categories obtained higher creativity scores than the concept pairs in the same category. However, there was no significant correlation between similarity and creativity, and the mode of representation of the concept pairs did not affect their perceived level of similarity. However, visual stimuli fostered more creativity than textual stimuli for concept pairs in different categories.

In summary, the results of the study suggested an effective way to promote design idea generation and fostering creativity by presenting similar concept images selected from different categories.

Keywords Stimuli, Conceptual Synthesizing Process, Design Creativity

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1. Introduction

The importance of inspiration can frequently be observed in the design education process or while working on an actual design project. Moreover, the presentation of stimuli to design students and professionals at the initial stages of design inspires the generation of new ideas. (Georgiev, Taura, Chakrabarti, & Nagai, 2008; Liu, Bligh, & Chakrabarti, 2003).
The use of stimuli in design problem-solving has been widely discussed in a variety of fields. Malaga (2000) for instance reported on the use of textual, pictorial, or textual-pictorial stimuli combinations when tackling ill-defined problems. In Malaga's study, pictorial stimuli prompted the generation of more creative ideas than textual or textual-pictorial ones. The author explained this with reference to the associative and coding theories and suggested that word stimuli might contribute to a type of design fixation. In another study, Casakin (2005) demonstrated that a rich collection of pictorial representations could help students and expert architects deal with ill-defined problems.

Contrary to these findings on the positive effects of image stimuli, the studies conducted by Jansson (1991), Purcell (1996), and Perttula (2006) showed that the use of pictorial representations of existing examples could hinder the generation of creative ideas. Thus, whilst visual stimuli can sometimes enhance creativity, images can also generate a particular mind-set in which previously seen ideas are incorporated into new design solutions, with poor creative results.
These findings suggest that the effects of stimuli are contingent on the type of design problem being solved. This has highlighted the need for an explorative experiment based on the general hypotheses that visual stimuli do indeed influence designers' performance, and that this influence is dissimilar for different types of design problems.

This study therefore aims to examine the effect of image stimuli on designers' inspiration during the idea conception process, which is the most determinant stage for the creativity of the design product. This will be assessed through a conceptual synthesis task, an idea conception technique used by many designers to solve design problems. According to existing research, in the Conceptual Synthesis process, the strategy for connecting the two concepts differs according to how similar the two concept pairs are to one another. Depending on which strategy is chosen, the creativity of the newly-combined concept varies. Based on these research results, we will present two concept pairs as image and text and examine how the creativity of the design idea product differs according to the perceived similarity of the two concept pairs. This will give us a hint as to how designers form ideas with images, and how this differs from text stimuli. Furthermore, it will provide an insight into the role of images for the conception of design ideas.

2. Theoretical background

2.1. Conceptual Synthesis

Conceptual Synthesis is a process by which two basic ideas are synthesized, which serves as a framework for new concept generation during the design process. It is the most effective process and is frequently employed in the workplace. According to Lubart (1994) and Rothenberg (1979), it is the simplest and most essential process for new concept generation, and Nagai (2009) found that it paralleled the Conceptual Combination Process in that it also represents a process by which basic concepts are synthesized to generate a complex concept.
The importance of concept combinations to creativity has been intensively studied by cognitive psychology research. Indeed, the concept combination process is a result of various human cognitive processes working together in synthesis. Therefore, exploring the mechanism by which these concepts are combined is critical to the generation of new ideas allowing the understanding and uncovering of human cognitive flexibility and productivity so as to expand existing knowledge systems. According to Wisniewski (1996), Lagne (2000), and Wisniewski & Love (1998), concept combination strategies include property mapping, concept blending, and relational linking. The creativity of the newly-created concept depends on the chosen strategy. Furthermore, our choice of strategy is determined by a variety of factors, such as the salience of concept features, and the similarity and abstraction level of combined concepts.

Nagai et al. (2009; 2005) found that the outputs produced from property mapping are limited in terms of their creativity as they are confined within the boundaries of the given concept. On the other hand, Nagai argued that concept blending generated more novel concepts as the newly-created concepts did not fall under the categories of either of the two original basic concepts. This finding echoes the results of Wilkenfeld and Ward (2001) and Wisniewski (1996; 1997), which found that people tended to utilize property mapping as their interpretation strategy when encountering a new word (noun) created by combining two separate nouns with highly similar concepts, while they tended to employ a relational linking strategy when the pair of nouns presented highly dissimilar concepts. In this context, the authors further asserted that relational thinking was the most effective strategy among the conceptual combination strategies, in that it produces the most creative output.
In combining concepts, the similarity between the two concepts can be seen to affect the creativity of the design product. The discussion structure can be organized as per Table 1.

Table 1 Similarity in Conceptual Synthesis

Concept Pair Classification	Perceived Similarity Between Concept Pairs	Creativity of Idea Generation Results
Same Category	High	Low
Different Category	Low	High

2. 2. Image Stimuli

Since design deals with the production and refinement of pictorial representations with the aim to generate new forms, it is suggested that designers make frequent use of visual thinking. According to Katz (1983), individuals with a natural ability to generate and

manipulate mental images may prefer to use pictorial stimuli in problem-solving tasks.
This matches the general assumption (Hanington, 2003; Henderson, 1998; Muller, 1989; Tovey, 1992) that designers have a preference for the use of visual stimuli in the design process. Additionally, according to Sarkar & Chakrabarti (2008), images are considered to be the most effective representation modality for designers, which the latter opportunistically use at the idea generation stage (Casakin & Goldschmidt, 2000; Goldschmidt & Smolkov, 2006). This has been highlighted by Lugt's study, in which the author examined whether sketches would affect idea generation as a visual stimulus during design group meetings. Lugt (2005) argued that sketching stimulates creativity by supporting the re-interpretation of an idea, providing new directions for the idea generation process, and facilitating a more integrated group process.
In this way, visual stimuli have played the role of most important information provider in design activity. Out of all types of visual stimuli, sketches have been dealt with most frequently in previous design research. However, designers form, comprehend, and transform images through new interpretations using not only sketches as a thinking tool but all the visual stimuli they encounter.

Despite the extensive use of visual displays in design practice, few empirical studies have been conducted to examine the way visual displays are utilized in design. In particular, there has been no research on the role of image stimuli in a designer's conceptual synthesis process. Previous studies have offered results from experiments on the process of combining concepts using text. Therefore, this research aims to gain an insight into the thinking process of designers using images by enabling the designer to form new ideas using the two images presented to them.
The present study therefore sets out to answer the following question: What kind of impact does the similarity of images expressed in specific shapes have on the conception of design ideas? In other words, this paper aims to discover the relationship between the similarity of visual stimuli and the creativity produced by the visual stimuli in the conceptual synthesizing process, which represents the most frequently employed design idea generation technique.

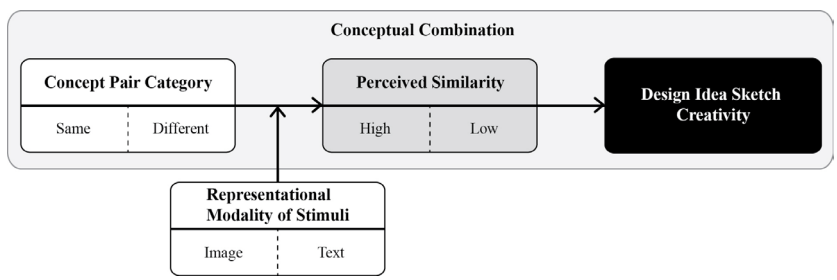


Figure 1 Research Model

3. Methodology

3.1. Experimental design

For the Conceptual Synthesis, we selected nouns presented in "A Standardized Set of

260 Picture for Conceptual Synthesis: Norms for Name Agreement, Image Agreement, Familiarity, and Visual Complexity" by Snodgrass and Vanderwart (1980), a standard picture set that is traditionally used in experimental psychology. We then grouped and selected the nouns according to the Battig and Montague Category Norms classification (Battig & Montague, 1969), as follows: ① Four-footed animal ② Kitchen utensil ③ Article of furniture ④ Part of human body ⑤ Fruit ⑥ Carpenter's tool ⑦ Articles of clothing ⑧ Part of building ⑨ Musical Instrument ⑩ Type of vehicle ⑪ Toy ⑫ Vegetable ⑬ Insect . We chose 7 nouns from each category to be utilized in the experiment. The selected examples from the 13 categories and their corresponding nouns are shown in Figure 1. As can be seen, the noun pairs from the same category and noun pairs from different categories were randomly selected and presented from a total of 91 nouns.

The Battig and Montague Category Norms categorize the nouns into the following: ① Four-footed animal ② Kitchen utensil ③ Article of furniture ④ Part of human body ⑤ Fruit ⑥ Weapon ⑦ Carpenter's tool ⑧ Articles of clothing ⑨ Part of building ⑩ Musical Instrument ⑪ Bird ⑫ Type of vehicle ⑬ Toy ⑭ Vegetable ⑮ Insect. The Category Norms classification of Battig and Montague has been quoted and used 2569 times as a standard for concept category in research such as memory retrieval and cross-cultural categorical memory. We examined and reviewed these 15 noun categories to ensure that the nouns and categorization system were still relevant to us and appropriate for design projects. As a result, only 13 category nouns were used as Weapon and Bird were excluded.

Figure 2 Examples of concept images

In order to compare the similarity and creativity of a text stimulus and image stimulus in a concept pair, one concept pair in each category was presented as a text stimulus as well as an image stimulus. This was conducted as a between-subjects experiment.

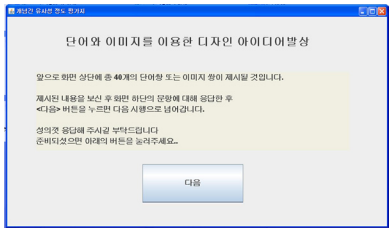
Table 2 Example of experimental conditions

	1	2	3	4	5	6
Group A	…	Clock, Pumpkin (Different Category)			Spoon, Glass (Same Category)	…
Group B			Scissor, Pencil (Same Category)	Kettle, Grasshopper (Different Category)		

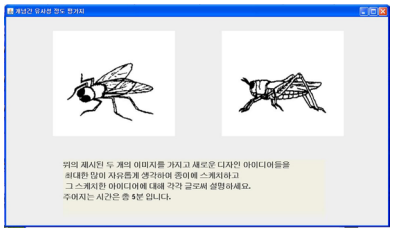
The participants were 77 design freshmen. The 77 design freshmen were students learning basic design before pursuing a detailed major in design. They were relatively untrained in specific design idea conception techniques compared to students in other years, allowing us to observe the results in the case of ideas formed more naturally.

For the similarity assessment task (Screenshot C, D), the similarity of 40 randomly presented pairs of concepts was assessed on a 7-score scale. There was no time limit for the similarity rating. 5 minutes were given for the idea sketch task (Screenshot B). In the design idea sketch

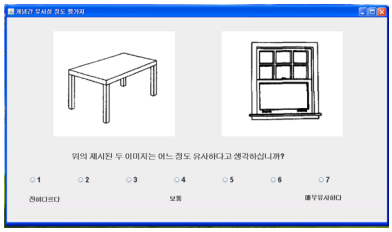
task, the same number of cases was presented before and after the similarity assessment.



A. Introduction



B. Design idea generation task



C. Similarity ratings of visual stimuli

D. Similarity ratings of text stimuli

Figure 3 Screenshots

3. 2. Creativity Assessment

The creativity of the design idea sketch was assessed with "the Korean version of the assessment tool for creative products" (Kim & Lee, 2004; Lee & Kim, 2007). The Korean version of the assessment tool for creative products was formed on the basis of numerous studies on the three-factor Creative Product Analysis Matrix by Besemer & Treffinger: Novelty, Resolution, and Elaboration and Synthesis. Besemer & Treffinger (1981) reviewed data from more than 90 research papers to draw more than 125 components of creativity. Following this, the author analyzed the similarities among these components and classified them, systematizing the evaluation criteria. The current structure results from over 20 years of continual validation and modification, and has proved applicable in many countries. The Korean version was modified so as to reflect the distinct characteristics of Korean culture in order to effectively assess the creativity of the outputs.

Table 3 Items for assessment of creativity of design idea sketches

Novelty			
Original	평범한	①--⑦	독창적인
	범상한	①--⑦	독특한
	모범적인	①--⑦	창조적인
	새롭지 않은	①--⑦	새로운
	획기적이지 않은	①--⑦	획기적인
	기발하지 않은	①--⑦	기발한
	답습하는	①--⑦	혁신적인
Surprise	보잘 것 없는	①--⑦	굉장한
	경이롭지 않은	①--⑦	경이로운

Valuable	가치없는	①--⑦	소중한
	사소한	①--⑦	중요한
	대수롭지 않은	①--⑦	귀중한
	미미한	①--⑦	가치 있는
Resolution			
Logical	직관적인	①--⑦	논리적인
	조리 없는	①--⑦	조리 있는
Useful	무용한	①--⑦	유용한
	쓸모 없는	①--⑦	쓸모 있는
	비실용적인	①--⑦	실용적인
Understandable	난해한	①--⑦	이해가 가는
	납득이 안 가는	①--⑦	납득이 가는
	수긍이 안 가는	①--⑦	수긍이 가는
	알 수 없는	①--⑦	알 수 있는
	해석이 어려운	①--⑦	해석가능한
	판단이 안 되는	①--⑦	판단가능한
Elaboration and Synthesis			
Elegant	미운	①--⑦	우아한
	저속한	①--⑦	고상한
	볼숩없는	①--⑦	기품있는
	추한	①--⑦	아름다운
Well Crafted	잘 못 만들어진	①--⑦	잘 만들어진
	잘 못 이루어진	①--⑦	잘 이루어진
	잘 못 꾸며진	①--⑦	잘 꾸며진
Sub-components	Items		

4. Results

4. 1. Reliability of Creativity Assessors

A team of three experts including two design professors and one PhD student subjectively evaluated the creativity of the idea sketches utilizing the Korean version of the assessment tool for creative products. All three assessors were design majors with at least a master's degree in design and more than three years' working experience in the field. The assessors did not consult one another in the course of their evaluations. The sketches for the same stimulus were shown to all three assessors simultaneously. They were first asked to relatively assess the sketches overall, and then to perform a specific assessment of the sketches in random order. The sketches were evaluated using the items presented above on a scale from 1 to 7, and the average of the scores from the three assessors was defined as the 'creativity value'. The inter-rater reliability of the overall creativity assessments proved high, with an alpha coefficient of 0.635.

Table 4 Reliability of creativity assessors

	Mean	Min	Max	Range	Cronbach's α
Novelty	26.946	24.009	29.884	5.875	.668
Resolution	49.696	45.357	54.036	8.679	.627
Elaboration &Synthesis	22.348	21.448	23.248	1.800	.480
Creativity	98.991	90.814	107.168	16.354	.635

4. 2. Concept pair selection

The objective of the present study was to probe the effects of the categories, representational modality, and level of similarity on creativity. A concept pair drawing a greater inter-participant variability in terms of creativity score than the average standard deviation for all the concept pairs meant that the participants' creativity scores for this particular concept pair varied considerably. Hence, among the 23 randomly presented concept pairs, we eliminated the ones for which the inter-participant variability in the creativity scores was greater than the average standard deviation for all the concept pairs. Our final model consisted of a total of 12 concept pairs.

Table 5 Concept pairs and mean creativity scores

Concept pairs		Mean of creativity		
		Mean	N	Standard deviation
1	Scissors_Pencil	29.7179	26	11.37519
2	Grasshopper_Kettle	31.9275	23	9.30852
3	Watering can_Lamp	32.3768	23	10.94721
4	Broom_Wine glass	30.5652	23	8.13021
5	Lettuce_Finger	30.5833	26	8.89198
6	Spoon_Wine glass	27.2536	23	7.84941
7	Clock_Pumpkin	37.2460	21	10.59253
8	Kangaroo_Strawberry	35.9936	26	11.88841
9	Tennis racket_Table	37.1923	26	10.78998
10	Bell pepper_Pumpkin	24.3913	23	11.02804
11	Helicopter_Bicycle	33.5897	26	10.54053
12	Pumpkin_Nose	34.6474	26	10.54054
	Total	32.9970	560	12.17148

4. 3. Difference in Similarity and Creativity by Category

From our examination of the similarities and differences in creativity among the 12 selected concept pairs, we found that the mean similarity for items within the same category was 4.4, the mean similarity for items in different categories was 2.8, the mean difference test statistic was 7.897, and the corresponding p-value was lower than the significance level (α =0.05). Moreover, the difference tests for the creativity items and the means of creativity among various categories indicated a higher creativity score for items from different categories, which was found to be statistically significant.

Table 6 Difference in similarity and creativity by category

	Cl	N	Mean	Std. D	Sig.
Si	SC	121	4.4	1.85	7.897 .000
	DC	171	2.8	1.60	
No	SC	121	22.7	10.15	−3.915 .000
	DC	171	27.8	11.70	
Re	SC	121	44.7	16.60	−3.290 .001
	DC	171	51.3	16.98	
E&S	SC	121	20.2	7.40	−4.029 .000
	DC	171	23.7	7.27	
Cr	SC	121	29.2	10.27	−4.057 .000
	DC	171	34.3	10.58	

4. 4. Correlation Between Similarity and Creativity

Hypothesis 1. In design idea generation through conceptual combination, the creativity scores for idea sketches generated from concept pairs of low similarity is higher than the creativity scores for those generated from concept pairs of high similarity. In other words, a low similarity induces high creativity scores.

Table 7 Correlation between similarity and creativity

		Si	No	Re	E&S	Cr	
Si	PearsonCC	1	−0.005	−0.02	0.046	−0.002	*. Correlation coefficient is significant on the level of 0.05 (both).
	Sig.(both)		0.927	0.735	0.433	0.976	
No	PearsonCC	−0.005	1	.755**	.607**	.895**	**. Correlation coefficient is significant on the level of 0.01(both).
	Sig.(both)	0.927		.000	.000	.000	
Re	PearsonCC	0.927	.755**	1	.629**	.944**	
	Sig.(both)	0.735	.000		.000	.000	
E&S	PearsonCC	0.046	.607**	.629**	1	.782**	

Examining the correlation between the similarity and creativity scores and the mean of creativity for the 12 concept pairs, we found that there was no correlation between similarity and novelty, similarity and resolution, or similarity and elaboration and synthesis. Therefore, hypothesis 1 was rejected: there was no correlation between similarity and creativity.

This led us to formulate a new hypothesis. The concept pairs in different categories had low similarities but high creativities. However, if no correlation existed between similarity and creativity across the concept pairs, we could assume that there would be high creativity when the similarity was low for concept pairs in the same category, which usually have high similarities. Likewise, we could also predict that there would be high creativity in cases of high similarity for concept pairs in different categories, which usually have low similarities.

Hypothesis 2-1. For concept pairs in the same category, the lower the similarity, the higher the creativity.

Hypothesis 2-2. For concept pairs in different categories, the higher the similar ity, the higher the creativity.

[2] No=Novelty, Re=Resolution, E&S=Elaboration & Synthesis Cr=Creativity, Si=Similarity, Cl=Classification, SC=Same Category, DC=Difference Category

Table 8 Correlation between similarity and creativity for concept pairs in same category and different categories

Same Category		Si	No	Re	E&S	Cr	Different		Si	No	Re	E&S	Cr
Si	PearsonCC	1	−0.009	−0.043	.951**	−0.001	Si	PearsonCC	1	.175*	.156*	.211**	.196*
	Sig.(both)		0.923	0.636	0.258	0.988		Sig.(both)		0.022	0.042	0.006	0.010
No	PearsonCC	−0.009	1	.758**	.626**	.888**	No	PearsonCC	.175*	1	.739**	.564**	.893**
	Sig.(both)	0.923		.000	.000	.000		Sig.(both)	0.022		.000	.000	.000
Re	PearsonCC	−0.043	.758**	1	.679**	.951**	Re	PearsonCC	.156*	.739**	1	.566**	.937**
	Sig.(both)	0.636	.000		.000	.000		Sig.(both)	0.042	.000		.000	.000
E&S	PearsonCC	0.104	.626**	.679**	1	.812**	E&S	PearsonCC	.211**	.564**	.566**	1	.740**
	Sig.(both)	0.258	.000	.000		.000		Sig.(both)	0.006	.000	.000		.000
Cr	PearsonCC	−0.001	.888**	.951**	.812**	1	Cr	PearsonCC	.196*	.893**	.937**	.740**	1
	Sig.(both)	0.988	.000	.000	.000	.000		Sig.(both)	0.01	.000	.000	.000	
	N	121	121	121	121	121		N	171	171	171	171	171

There was no correlation between similarity and creativity for concept pairs in the same category. Thus, hypothesis 2 was rejected. However, we found that there was a significant correlation between the similarity and the mean of creativity for concept pairs in different categories. Therefore, hypothesis 2-2 was supported. In other words, for concept pairs in different categories, the higher the similarity, the higher the creativity (see Figure 4.)

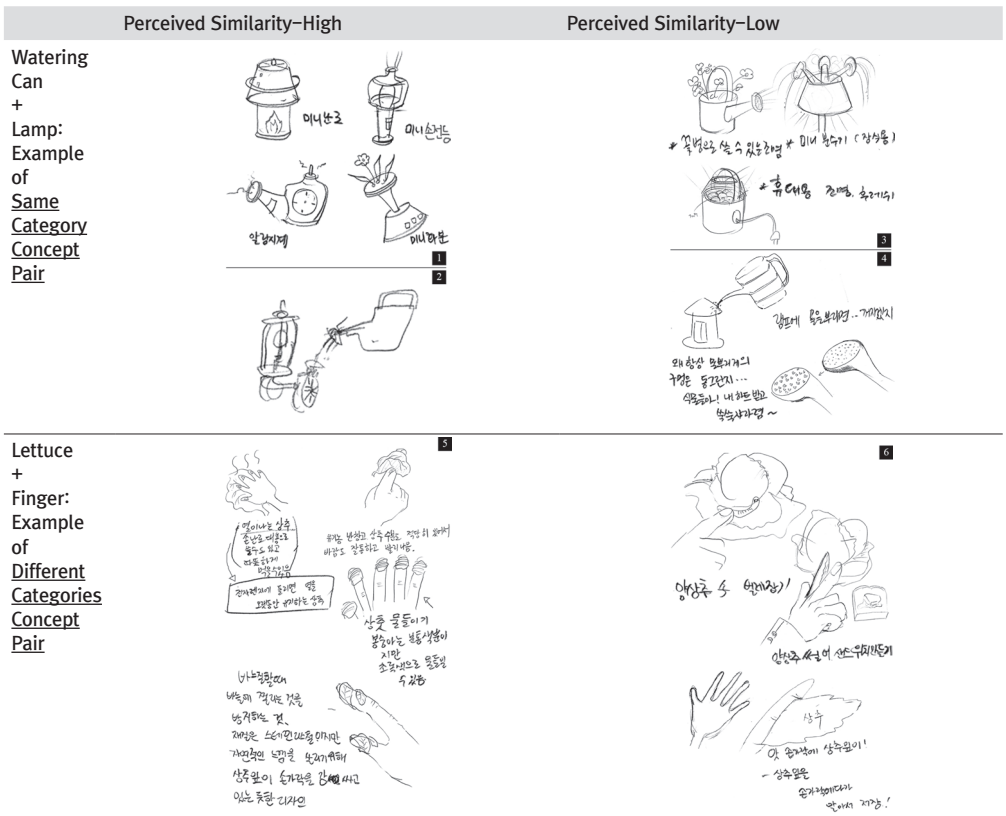


Figure 4 Idea sketch results according to perceived similarity and concept categories

4. 5. Correlation Between Creativity and Similarity According to Presentation Mode

Hypothesis 3-1. The creativity scores for design idea sketches inspired by concept pairs in the same category are higher when the stimuli are presented as images than when presented as text.

Hypothesis 3-2. The creativity scores for design idea sketches inspired by concept pairs in different categories are higher when the stimuli are presented as images than when presented as text.

Table 9 Comparison of similarity and creativity according to representational modalities for concept pairs in same category and different categories

Same Category	Mode	N	Mean	SD	Sig.	Different Category	Mode	N	Mean	SD	Sig.
No	Text	60	22.5	10.46	−.216 .829	No	Text	87	26.2	11.34	−1.825 .070
	Image	61	22.9	9.92			Image	84	29.4	11.91	
Re	Text	60	45.3	17.11	.402 .688	Re	Text	87	48.9	17.31	−1.915 .057
	Image	61	44.1	16.21			Image	84	53.8	16.36	
E&S	Text	60	19.7	7.25	−.800 .425	E&S	Text	87	22.5	7.94	−2.379 .018
	Image	61	20.8	7.57			Image	84	25.1	6.28	
Cr	Text	60	29.2	10.43	−.046 .963	Cr	Text	87	32.5	10.89	−2.249 .026
	Image	61	29.3	10.20			Image	84	36.1	9.99	
Si	Text	60	4.5	1.91	.410 .682	Si	Text	87	2.8	1.69	.032 .975
	Image	61	4.3	1.80			Image	84	2.8	1.51	

For concept pairs in the same category, the difference test for the similarity and creativity relative to the presentational mode indicated a 0.1 point higher creativity score for image stimuli. The statistics for this difference were -0.046 with a p-value of 0.963, which was not statistically significant. Therefore, hypothesis 3-1 was rejected. However, the difference test for the similarity and creativity relative to different representational modalities for concept pairs in different categories indicated a 3.6 point higher creativity score for image stimuli. The statistics for this difference were -2.249 with a p-value of 0.026, which was statistically significant. Thus, hypothesis 3-2, which predicted a higher creativity for image stimuli, was supported.

Our hypothesis that creativity scores are higher for visual stimuli can therefore be supported (See Figure 5). Regarding similarity, there was no difference between the different modes of presentation. The hypothesis that the level of similarity is higher when concept pairs are presented as images must therefore be rejected.

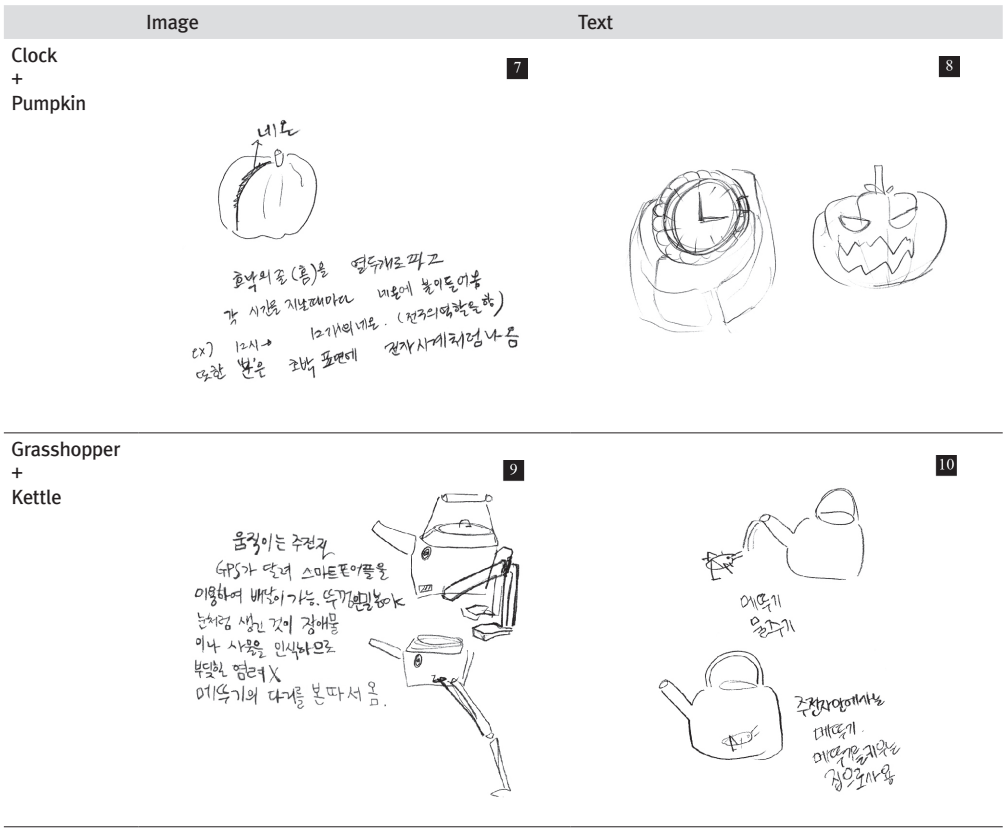


Figure 5 Idea sketch results according to presentational mode and concept categories

5. Conclusion and Discussion

This research aimed to find out how images could be utilized in everyday life creative activities. More specifically, the present study offers basic research towards the development of methods to support designers' idea generation in the initial steps of the design process.

Among the various conditions shaping output creativity, this study probed the effect of the level of similarity between two items in a concept pair on the creativity of idea sketches, elaborating on the study results of Nagai and Wilkenfeld and Ward. We also aimed to assess the influence of the mode of presentation of the provided stimuli in the process of conceptual combination.

The results showed that concept pairs from different categories presented a lower level of similarity than concept pairs in the same category. As regards the creativity of the design idea sketches, concept pairs from different categories sparked higher creativity scores than concept pairs in the same category. In other words, the design idea sketches stemming from concept pairs in different categories presented higher creativity scores. Therefore, we examined whether the idea sketches inspired by concept pairs with low similarity were more creative – in short, whether there was a correlation between the level of similarity and creativity. However, there was no significant correlation between the two properties – that

is, the idea sketches inspired by concept pairs with low similarity were not necessarily more creative.

On that account, we further examined the effects of similarity for concept pairs with items from different categories. Although there was no correlation between the similarity and creativity for concept pairs in the same category, we found that for concept pairs from different categories, the higher the similarity, the higher the creativity of the idea sketches.

The mode of representation of the concept pairs was shown not to affect their perceived level of similarity. More specifically, the perceived similarity of a concept pair was not contingent on whether the stimulus was presented as an image or text. This stemmed from the use of standardized image stimuli, in an attempt to control the effects of techniques of expressions such as perspective and texture on the outputs. There was no difference in the creativity of the idea sketches generated from concept pairs in the same category, regardless of the representational modality (either visual or textual stimuli). However, for concept pairs from different categories, visual stimuli fostered more creativity than textual stimuli. Nevertheless, presenting the stimuli as images did not increase the perception of similarity between the pair items: there was no difference in the perception of similarity whether the stimuli were presented as images or text. Hence, we were able to confirm that the higher creativity that resulted from the image stimuli for concept pairs from different categories was not a result of the higher similarity of the images.

In conclusion, the results of the present study predict that the most effective way to promote design idea generation and to foster creativity would be to present similar image concepts issued from different categories.

We hope that enhancing our understanding of inspirational sources and mechanisms will provide a basis for further investigation into how designers can be better supported at the front-end of product/service design and development, where ideation is likely to greatly influence the design outcomes. In theoretical aspects, this research concerns the thinking process of designers using not only sketches but images as universal visual stimuli, and the research results are anticipated to inform new detailed conception strategies to form more creative ideas in the design field.

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