

THE RELATIONSHIP BETWEEN ANALOGICAL REASONING AND CREATIVITY



Kinga Szabó^a, Dana Pop^b, Dan-Ionuț Julean^b, Ștefan Szamosközi^a

^aBabeş-Bolyai University, Faculty of Psychology and Educational Sciences, Department of Applied Psychology, Cluj-Napoca, Romania

^bTechnical University of Cluj-Napoca, Faculty of Architecture and Urban Planning, Cluj-Napoca, Romania



Introduction

Analogical reasoning is a cognitive operation. Creating analogies involves mapping between the current problem and the analogue problem. This helps to create new ideas through *recombination* and *reorganization* of existing knowledge [6].

Many scientific articles (e.g.: [3]) concluded that analogical reasoning can *influence creativity in different ways*. There were several studies which analysed the influence of the visual analogy in design problem solving (e.g.: [1], [2], [7]).

Some of the researches that analyse the relation between analogical reasoning and creative thinking claimed that this way of thinking can induce fixation which has a negative influence on the generation of creative ideas [4]. Furthermore, other studies considered analogical reasoning as a key factor of creative thinking [5].

Objective

Our main purpose was to investigate the relation between figural analogical thinking and creativity in design

Method

Participants

- 93 ($N=93$) participants were assessed, architecture students of Technical University of Cluj-Napoca, with ages between 18 and 25 years ($M= 19.80$, $SD= .91$)

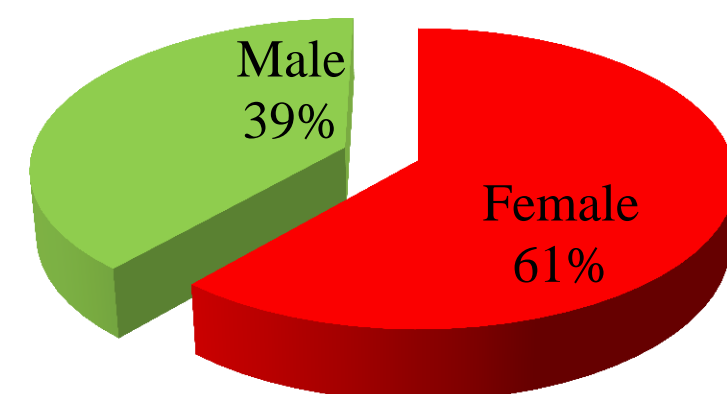


Figure 1. Distribution of the sample by gender

Instruments

- Creative Product Observation Scale**
 - developed by the authors and professional architects
 - 24 item observation rating scale
 - bipolar adjectives assessed on a 7-point Likert-scale
 - higher score implies a high level of creativity
 - includes five factors:
 - Novelty (3 items),
 - Resolution (5 items),
 - Elaboration and Synthesis (5 items),
 - Aesthetics (5 items)
 - Functionality and Applicability (6 items).
- Design Task**
 - temporary pavilion placed in the urban setting for the purpose of organizing cultural or mundane events
- Analogical reasoning tasks**
 - 39 figural tasks
 - draw the fourth shape suitable for the third one based on the relationship identified between the first two geometrics
 - geometrical shapes were selected from Carter and Russel's and O'Hara's collection of tasks

Results

- IBM SPSS Statistics (20.0)
- Descriptive statistics, Pearson correlation, Mann-Whitney U and independent sample t-tests were used for testing our goals. Significance level was set at $p \leq .05$.

Pilot study

- psychometrical characteristics of the analogical reasoning test
- 162 of architecture students
- mean age of 20.70 ($SD=1.47$) years

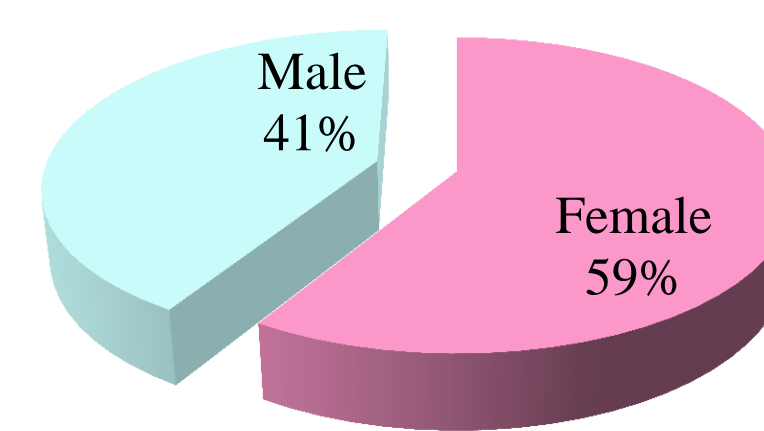


Figure 2. Distribution of the sample of pilot study by gender

We investigated:

- difficulty level of the items
- inter-item correlations
- Cronbach's Alpha



23 items, $\alpha= .72$

Main study

Table 1
Descriptive statistics of the main variables ($N= 87$)

Variable	Min	Max	M	SD
Novelty	1.67	6.33	4.37	.81
Resolution	1.60	6.80	4.32	1.21
Elaboration and Synthesis	1.00	6.80	3.99	1.41
Aesthetics	2.99	6.80	4.33	1.24
Functionality and Applicability	3.00	6.33	4.70	.73
Creativity	2.46	6.50	4.35	.99
Analogical reasoning score	4.00	22.00	14.57	3.72

- 3 groups:** high (from $M+SD$ to Max), medium (between $M-SD$ and $M+SD$) and low (from Min to $M-SD$) creativity groups
- Group with high levels of novelty:** $r(11)=-.54$, ($p < .05$) novelty and figural analogical reasoning

Table 2
Differences between genders on subscales of creativity with normal distribution

Variable	Groups	M	S.D	t(85)	p	d
Resolution	male	4.02	1.08	-1.81	.06	.40
	female	4.50	1.27			
Elaboration	male	3.58	1.24	-2.27	.02	.50
	female	4.27	1.47			
Aesthetics	male	3.95	1.07	-2.36	.02	.53
	female	4.58	1.29			

Conclusion

- non-significant relation** between analogical reasoning and creativity in design
- high levels of novelty** are associated with low levels of analogical thinking
- participants with a **higher level of creativity** solved **more figural analogical** reasoning tasks, than students from the low creativity level group – **not significant**
- projects made by **female** students were **more elaborated and aesthetic** than the ones developed by males

References

- Casakin, H., Visual analogy, Visual displays, and the Nature of Design Problems: the Effect of Expertise. *Environmental Planning and Design: Design B.*, 37, 170-188, 2010.
- Casakin H, & Goldschmidt, G., Reasoning by visual analogy in design problem-solving: The Role of Guidance. *Environment and Planning B: Planning and Design*, 27, 105-119, 2000.
- Casakin, H. & van Timmeren, A., Analogies as Creative Inspiration Sources in the Design Studio: the Teamwork, 4th Annual International Conference on Architecture, Athens, Greece, 2014.
- Çubukçu, E. & Dündar Ş. G., Can creativity be taught? An empirical study on benefits of visual analogy in basic design education. *AJ Z ITU Journal of the Faculty of Architecture* 4, 2, 67-80, 2007.
- Goel, A.K., Design, analogy, and creativity. *IEEE Expert*, 12, 3, 62-70, 1997.
- Mumford, M. D. & Porter, P. P., Analogies. In M. A. Runco, & S. R. Pritzker (Eds.) *Encyclopedia of Creativity*, Volume 1 (pp. 71-77). San Diego: Academic Press, 1999.
- Verstijnen, I., Wagemans, A., Heylighen, A., & Neuckermans, H., Sketching, visual analogies and domain-expertise. In G Goldschmidt and W Porter. *Proceedings of 4th Design Thinking Research Symposium: Design Representation* (pp. II.71), Cambridge, MA : MIT Press, 2000.

Acknowledgements

This paper is a result of a doctoral research made possible by the financial support of the Sectoral Operational Programme for Human Resources Development 2007-2013, co-financed by the European Social Fund, under the project POSDRU/159/1.5/S/132400-“Young successful researchers –professional development in an international and interdisciplinary environment”.