Creativity Research Journal

ISSN: 1040-0419 (Print) 1532-6934 (Online) Journal homepage: https://www.tandfonline.com/loi/hcrj20

Preference for Complexity and Asymmetry Contributes to Elaboration in Divergent Thinking

Anatoliy V. Kharkhurin & Sergey R. Yagolkovskiy

To cite this article: Anatoliy V. Kharkhurin & Sergey R. Yagolkovskiy (2019) Preference for Complexity and Asymmetry Contributes to Elaboration in Divergent Thinking, Creativity Research Journal, 31:3, 342-348, DOI: 10.1080/10400419.2019.1641687

To link to this article: https://doi.org/10.1080/10400419.2019.1641687

CREATIVITY RESEARCH JOURNAL, *31*(3), 342–348, 2019

ISSN: 1040-0419 print/1532-6934 online
DOI: https://doi.org/10.1080/10400419.2019.1641687

Taylor & Francis
Taylor & Francis Group

RESEARCH NOTE

Preference for Complexity and Asymmetry Contributes to Elaboration in Divergent Thinking

Anatoliy V. Kharkhurin and Sergey R. Yagolkovskiy
National Research University Higher School of Economics

The study continues the exploration of the contribution of creative perception to creative potential. Creative potential was operationalized as divergent thinking and measured by the Abbreviated Torrance Test for Adults. Creative perception was operationalized as a preference for complexity and asymmetry and was assessed by a standard Barron-Welsh Art Scale. Sixty-five undergraduate college students participated in the study. Preference for complexity and asymmetry was found to make a measurable contribution to the elaboration trait of divergent thinking. This finding suggests that in addition to the process, product, person, place, persuasion, and potential perspectives, creativity construct can be evaluated from the standpoint of creative perception.

INTRODUCTION

The present work continues a project investigating contributors of creative perception to creative potential. Creative perception paradigm promises to add a new perspective on the multifaceted construct of creativity. Presently, this construct is approached from the perspective of a creative person, a creative process, a product of creative activity, environment or place in which creative activity occurs, persuasion of others in plausibility of creative outcome, and potential to engage in creative activity (Rhodes, 1961; Runco, 2003; Simonton, 1990). The current creative perception paradigm expands the 6Ps approach with a study of various aspects of individuals' perception, which potentially prompt their creative engagement. Thus, in addition to process, product, person, place, persuasion, and potential perspectives, it suggests that creativity construct can be evaluated from the standpoint of creative perception.

The first study in the project (Kharkhurin, 2017) looked at the creative perception of the self. It was operationalized as creative self-efficacy, which refers to creative people's ability to identify their creative potential (Tierney & Farmer, 2002). The study revealed that creative self-efficacy makes a measurable contribution to creative potential. Evidently, creative self-perception is a mode of perception directing inwards, toward a person's self. The present study considered an opposite mode of creative perception, the one directing outwards, toward the environment. The study proposed that creative people's ability to identify creative elements in the environment contributes to their creative potential.

Creative perception of the environment addresses the extent to which an individual is able to distinguish between creative and non-creative elements of objects or scenes. The meaningfulness of this perspective on creative perception can be inferred from the perceptual/cognitive approaches to aesthetics in visual art (Gibson, 1954, 1971; Hochberg, 1978, 1979), which in turn are derived from cognitive theories considering how art is created out of experience (Lockhart & Craik, 1990; Lockhart, Craik, & Jacoby, 1976). Gibson and Hochberg claimed that aesthetic activities appear from everyday cognitive and perceptual processes. Gibson (1971) differentiated between "invariants" and "aspects" to relate the interpretation and production of creative work to everyday perception. Invariants are constructed from stable or constant characteristics, which are necessary and sufficient to identify an object. Aspects represent impermanent features and determined by the unique temporal-spatial location of the observer in relation to an object. One way in which everyday perception differs from aesthetic perception

Address correspondence to Anatoliy V. Kharkhurin 20 Myasnitskaya Ulitsa, Moscow 101000, Russia. E-mail: tovyharhur@gmail.com

The authors have no conflicts of interest to report and confirm that the data used for this article have not been used in any previous reports.

constitutes the habit of attending to invariants and disregarding aspects. It also distinguishes between artists and people with a limited aesthetic sensitivity. The latter perceive a work of art in terms of invariant (identifiable) objects and themes, whereas the former perceive a constellation of an infinite number of aspects. Artists notice aspects in the world around them, use their knowledge and expectations to attend to highly informative ones, and transform their own perceptual experiences into aesthetically valuable work (Cupchik, 1992). Hence, the aesthetic perception of the world may influence aesthetic activity. In terms of the present study, perceptual/cognitive perspective on aesthetic activity suggests a possibility that the degree of the creative experience of the environmental cues may instruct an individual's potential for creative activity.

One aspect of this experience appears to be an individual's preference for complexity in the perceptual input. This assumption is derived from Gibson's (1971) distinction between everyday perception and aesthetic perception, the latter being characterized by a preference for a complex constellation of aspects. This account corresponds to various theories of aesthetics (Arnheim, 1977; Kharkhurin, 2014; Vygotsky, 1925/1971) emphasizing the essential role of complexity and contradiction in creative work. For example, Vygotsky postulated that the aesthetical reaction increases as a result of a complication of creative work. He asserted that additional (parallel) interpretations complicate the plot, elicit curiosity, arouse conjectures, and divide attention. Arnheim also accentuated the substantial role of complexity in creative work: "because meaning is often complex, the work of art must admit tension and complexity as intrinsic to its structural wholeness" (Levine, 2002, p. 272). Hence, preference for complexity might instruct aesthetic perception and therefore could be regarded as a constituent of creative perception of the environment.

Thus, the preference for complexity could be considered as one of the predictors of creative potential. Empirical studies provided evidence for this relationship (e.g., Barron, 1955; Eisenman, 1990; Jamieson, 1974). For example, Barron found a positive relationship between preference for complexity and originality. Indirect evidence also hints in that direction. These studies considered personality characteristics of creative individuals, such as tolerance for disarray and inconsistency (e.g., Ehrenzweig, 1967; Hentschel & Schneider, 1986), which could be related to preference for complexity.

Barron and Welsh (1952) developed an empirically derived metric assessing an individual's preference for complexity and asymmetry. Over 60 years of empirical research demonstrated that this tool successfully differentiated between more and less creative persons in various scientific, literary, and artistic fields (Barron, 1972; Gough, Hall, & Bradley, 1996; Welsh, 1976). Creative people tend to prefer more complex and asymmetrical figures to more simple and symmetrical ones. The present study operationalized creative perception of the environment as the preference for complexity and asymmetry assessed by this instrument. The preference for more complex and asymmetrical objects signified a greater degree of creative perception of the environment.

The preference for complexity may be one of the constituents of creative potential. That is, individuals who prefer more complex perceptual input may have greater potential for creative behavior. In scientific literature, creative potential is closely associated with divergent thinking (e.g., Guilford, 1950, 1968; Runco, 2013; Runco & Acar, 2012). Guilford (1967) identified four divergent thinking traits: originality (the tendency to produce ideas different from those of most other people); fluency (the ability to rapidly produce a large number of ideas or solutions to a problem); flexibility (the capacity to consider a variety of approaches to a problem simultaneously); and elaboration (the ability to think through the details of an idea and carry it out). Greater performance on divergent thinking test signified the greater potential for creative behavior.

The present study investigates the contribution of creative perception of the environment to creative potential. It hypothesizes that preference for complexity and asymmetry predicts performance on divergent thinking traits.

METHOD

Participants

Sixty-five Higher School of Economics (Moscow, Russia) undergraduate students (22 males and 43 females) 17 to 21 (M = 18.09, SD = .70) years old participated in the study. They received course credits for their participation. This sample's size was larger than a minimal size (N = 53 as calculated by *G*Power*; Faul, Erdfelder, Buchner, & Lang, 2009) required for one predictor in the linear regression model, with the probability level .01, medium effect size (Cohen's f^2 = .24), and the statistical power of .80.

Instruments and procedure

All participants signed consent forms. After that, they received a divergent thinking test and the test of preference for complexity and asymmetry.

The test of divergent thinking

Participants' divergent thinking traits were measured by the Abbreviated Torrance Test for Adults (ATTA; Goff & Torrance, 2002). The ATTA was developed on the basis of the Torrance Tests of Creative Thinking (Torrance, 1966). It consists of activities utilizing the same rationale as activities in the original test, but in abbreviated form and requires considerably less testing time, which is particularly

beneficial when administering it to adults. The ATTA was used in the studies on multilingual creative cognition (review in Kharkhurin, 2018) and demonstrated a good assessment of an individual's divergent thinking.

The standard ATTA has three paper and pencil activities preceded by written instruction that explains general guidelines and encourages participants to use their imagination and thinking abilities. In Activity 1, participants were asked to suppose that they could walk on air or fly, and then to identify the troubles that they might encounter. This activity provided verbal fluency and originality scores. In Activity 2, participants were presented with two incomplete figures and were asked to draw pictures with these figures and to attempt to make these pictures as unusual as possible. This activity provided nonverbal fluency, originality, and elaboration scores. In Activity 3, the participants were presented with a group of nine triangles arranged in a 3 × 3 matrix and were asked to draw as many pictures or objects as they could with those triangles. This activity provided nonverbal fluency, originality, elaboration, and flexibility scores.

The standard ATTA procedure assessed four divergent thinking traits: originality, fluency, flexibility, and elaboration. Originality measures the ability to produce uncommon ideas or ideas that are totally new or unique. The sum of originality scores in all three activities provided an originality raw score. Fluency measures the ability to produce quantities of ideas, which are relevant to the task instructions. The sum of fluency scores in all three activities provided a fluency raw score. Elaboration measures the ability to embellish ideas with details. The sum of elaboration scores in Activities 2 and 3 provided an elaboration raw score. Finally, flexibility measures the ability to process information or objects in different ways, given the same stimulus. A flexibility raw score was obtained from Activity 3. The raw scores for fluency, originality, elaboration, and flexibility obtained in the test were subsequently transformed into scaled norm-referenced scores by the recommended procedure (Goff & Torrance, 2002) which took age-related norms into account. The ATTA manual reports the Kuder–Richardson (KR21) reliability coefficient for the total raw score for the four traits measured by the ATTA as .84.

In addition, a verbal criterion-referenced creativity indicators score was computed as a sum of five verbal responses in Activity 1; and a nonverbal criterion-referenced creativity indicators score was computed as a sum of 10 nonverbal responses in Activities 2 and 3. Each of these 15 responses was given a rating of 0 if the indicator does not occur, 1 if the indicator appears once, or 2 if the indicator appears more than once.

Further, a creativity index (CI) was computed as a sum of four norm-referenced and two criterion-referenced creativity indicators scores. The index represented a composite measure of overall creativity.

Two independent raters assessed participants' divergent thinking abilities using the standard ATTA assessment procedure (Goff & Torrance, 2002). The consistency of the assessments of the composite creativity indexes obtained from two raters was $\rho = .70$ ($p < .001$). It showed that the raters used the same rationale, and their ratings were comparable. The ratings of both raters for norm-referenced and composite ATTA scores were averaged to produce fluency, originality, elaboration, flexibility, and CI scores.

The test of preference for complexity and asymmetry

Participants' preference for complexity and asymmetry was measured by a standard Barron-Welsh Art Scale (BWAS; Barron & Welsh, 2005). It is an empirically derived metric consisting of 86 black and white figures of varying complexity and symmetry. These figures were selected from 400 figures comprising the Welsh Figure Preference Test (Welsh, 1980). The BWAS consists of 24 complex and/or asymmetrical figures liked by artists and 38 simple and/or symmetrical figures disliked by artists (together these 62 figures best discriminate artists from control subjects), and 24 figures that are not scored. Participants are asked to rate the figures as "like" or "dislike." The scoring procedure gives one point for liking complex and asymmetrical designs or disliking simple and symmetrical. Hence, the BWAS score reflects the preference for more complex and asymmetrical figures over more simple and symmetrical figures. The score is computed as a sum of the scores given to 62 figures; it ranges from 0 to 62.

The BWAS converged significantly with other methods identifying creative talent (Barron & Welsh, 2005; Eysenck & Furnham, 1993; Rosen, 1955). The responses to the pictures are consistent within non-clinical samples with reliability at or above .90 (Gough et al., 1996).

RESULTS

Table 1 presents descriptive statistics for BWAS, CI, and four norm-referenced ATTA scores, and Table 2 presents the correlation between those variables. The CI and elaboration were found to correlate significantly with BWAS.

To determine whether a preference for complexity and asymmetry predicts overall divergent thinking performance, a simple linear regression was calculated to predict CI based on BWAS score. A significant regression equation was found (see the first row of Table 3). The analysis revealed that BWAS contributed significantly and positively to the prediction of the CI.

To determine which divergent thinking trait can be predicted by a preference for complexity and asymmetry, simple linear regressions were calculated to predict

TABLE 1
Descriptive statistics for Barron-Welsh art scale (BWAS), creativity index (CI) and four norm-referenced ATTA scores, *N* = 65

	Min	*Max*	*Mean*	*SD*
BWAS	10.00	52.00	34.66	9.23
CI	51.50	82.50	70.17	6.58
Fluency	11.50	19.00	16.35	2.07
Originality	11.00	18.50	15.66	1.76
Elaboration	10.00	24.00	16.53	2.45
Flexibility	12.00	18.00	15.12	1.36

four norm-referenced ATTA scores based on BWAS score. As the fourth row of Table 3 indicates, a significant regression equation was found only for elaboration. The analysis revealed that BWAS contributed significantly and positively to the prediction of elaboration.

DISCUSSION

This study continued the exploration of a potential contribution of creative perception to creative potential. Preference for complexity and asymmetry was found to make a measurable contribution to elaboration in divergent thinking. However, this finding should be interpreted merely as a tendency due to the relatively low coefficient of determination. Gibson (1971) characterized aesthetic perception by a preference for a complex constellation of aspects. Our study demonstrated that preference for complexity in the environmental input encourages an individual to embellish ideas with details. Details could complicate the creative work. Kharkhurin's (2014) definition of creativity construct specified that aesthetics attribute, among others, stipulates that a creative work is satisfactorily complex. Hence, our finding hints at the possibility that the aesthetic value of creative work can benefit from a creative person's ability to perceive complexity in the environmental input. We could push it a little further and suppose that creative perception could influence not only creative potential but also creative behavior.

Further, the finding of the positive correlation between the BWAS and the CI supplied evidence for the construct validity of the BWAS. The BWAS manual (Barron & Welsh, 2005) reported that "scores on the BWAS were shown to relate significantly to ratings of creativity, whether based on observable products and performance or on personal style and expressive behavior" (p. 22). The manual reported a range of studies in which the BWAS correlated with ratings of creativity in 22 samples of students and creative and non-creative professionals. Our findings suggested that in addition to determining whether an individual has a predisposition for artistic or non-artistic perception, the BWAS could predict divergent thinking performance of this individual. Furnham and Bachtiar (2008) also found a significant positive correlation (relatively low though, r = .22) between the BWAS and a variation of Guilford's (1967) unusual uses test (to list as many unusual uses of a paperclip, blanket, and pencil case) among British private school students.

TABLE 2
Correlations between BWAS, CI and four norm-referenced ATTA scores, *N* = 65

	Fluency	*Originality*	*Elaboration*	*Flexibility*	*CI*	*BWAS*
Fluency		.50***	.12	.38**	.66***	.22
Originality			.02	.18	.62***	.19
Elaboration				.05	.59***	.43***
Flexibility					.39**	−.06
CI						.48***

*** p< .001, ** p< .01

TABLE 3
Linear regression analyses for BWAS predicting CI and four norm-referenced ATTA scores, respectively, *N* = 65

BWAS predicts	F*(1, 63)*	p	R^2	adjusted-R^2	b	SE	ß	t
CI	18.49	.000	.23	.22	.34	.08	.48	4.30
Fluency	3.10	.083	.05	.03	.05	.03	.22	1.76
Originality	2.29	.135	.04	.02	.04	.02	.19	1.51
Elaboration	14.34	.000	.19	.17	.11	.03	.43	3.79
Flexibility	.21	.650	.00	−.01	−.01	.02	−.06	−.46

FUTURE DIRECTIONS

The finding of the study laid one more brick into the construct of creative perception. The study of creativity from a perspective of creative perception promises an interesting direction in creativity research. In this regard, Rhodes's (1961) classical 4Ps model (process, product, person, and place) discussed in the introduction, which was extended to 6Ps by Simonton's (1990) persuasion and Runco's (2003) potential, might receive one more P for creative perception.

Needless to say that we cannot make any far-reaching conclusions based on only two studies. Future research in creative perception can advance in at least four directions.

First, Kharkhurin's (2017) study and the present work demonstrated that creative perception predicted creative potential. Although departing from these findings we supposed in the discussion that creative perception could influence creative behavior, this last statement needs to be empirically validated. For example, we can employ Ward's (1994) structured imagination paradigm. When people try to come up with a novel idea, their imagination is generally limited by a particular set of properties characterizing a category to which this innovation should belong. They tend to select the most common set of properties of a category as a starting point for their creations (Smith, Ward, & Finke, 1995; Ward, Smith, & Vaid, 1997). A number of studies in various domains of creative production show that the semantic structure of a category has a substantial influence on what people produce (e.g., Purcell & Gero, 1996; Smith, Ward, & Schumacher, 1993; Ward, Patterson, Sifonis, Dodds, & Saunders, 2002). The "structured imagination" limits individuals' thinking outside the box; that is, people have difficulties violating the conceptual boundaries of a standard category when creating a new exemplar of that category. In the structured imagination paradigm, the drawings of invented alien creatures produced by participants are traditionally coded on three invariants, the features that commonly appear in most participants' responses. The drawings of the creatures that revealed more violations of invariants were rated as more creative by other people (e.g., Kozbelt & Durmysheva, 2007; Marsh, Landau, & Hicks, 1996). This idea of invariants parallels Gibson's (1971) distinction between invariants and aspects presented in the introduction. This distinction informs the difference between everyday perception and aesthetic perception. Hence, we can expect that creative perception would predict participants' performance on the alien creature invention task.

Second, so far we identified only two aspects of creative perception. We can continue identifying other aspects of creative perception contributing to creative behavior. For example, Kharkhurin's (2014) definition of aesthetics stipulated that a creative work "efficiently presents the essence of the phenomenal reality" (p. 338). The preference for essential elements in the environmental input seems, therefore, to be another aspect of creative perception. The essential elements could be operationalized in terms of defining features of a category (cf., theoretical approaches to semantic memory; Smith, Shoben, & Rips, 1974), keywords or meta-statements for a given text or necessary patterns in a drawing.

Third, creative perception can trigger novelty seeking and exploratory activity (Hirschman, 1980). An individual's ability to attend to semantically heterogeneous stimuli in the environmental input coincides with a preference for complexity investigated in the present study. Empirical evidence demonstrates a relationship between creativity, novelty seeking, and personal innovativeness as an ability to deal effectively with new ideas (e.g., Yagolkovskiy, 2019).

Fourth, cultural values and norms appear to determine and shape the concept of creativity, which in turn may influence the manner in which creative potential is apprehended and incarnated (e.g., Lubart, 2010; Rudowicz, 2003; Westwood & Low, 2003). There is even a radical opinion that "no account of creativity can be satisfactory unless it is culture-inclusive" (Glăveanu, 2010, p. 151). If creative perception influences creative behavior, culture-specific differences in creative perception may also play out in variations in creative behavior (e.g., Glăveanu & Tanggaard, 2014; Kharkhurin & Samadpour Motalleebi, 2008). Therefore, it is plausible to evaluate the effect of creative perception on creative behavior in different sociocultural settings.

ACKNOWLEDGMENT

We thank Valeria M. Khromova and students of the National Research University Higher School of Economics for assistance in data collection and coding. This research was implemented in the framework of the Basic Research Program at the National Research University Higher School of Economics (HSE) in 2018.

DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

ORCID

Anatoliy V. Kharkhurin http://orcid.org/0000-0001-5970-5003
Sergey R. Yagolkovskiy http://orcid.org/0000-0002-1851-0725

REFERENCES

Arnheim, R. (1977). *The dynamics of architectural form*. Berkeley: University of California Press.

Barron, F. (1955). The disposition toward originality. *The Journal of Abnormal and Social Psychology*, *51*(3), 478–485. doi:10.1037/h0048073

Barron, F. (1972). *Artists in the making*. New York, NY: Seminar Press.

Barron, F., & Welsh, G. S. (1952). Artistic perception as a possible factor in personality style: Its measurement by a figure preference test. *Journal of Psychology*, *33*, 199–203. doi:10.1080/00223980.1952.9712830

Barron, F., & Welsh, G. S. (2005). *Barron–Welsh art scale*. Menlo Park, CA: Mind Garden.

Cupchik, G. C. (1992). From perception to production: A multilevel analysis of the aesthetic process. In G. C. Cupchik & J. László (Eds.), *Emerging visions of the aesthetic process: Psychology, semiology, and philosophy* (pp. 83–99). New York, NY: Cambridge University Press.

Ehrenzweig, A. (1967). *The hidden order of art: A study in the psychology of artistic imagination*. Berkeley: University of California Press.

Eisenman, R. (1990). Creativity, preference for complexity, and physical and mental illness. *Creativity Research Journal*, *3*(3), 231-236. doi:10.1080/10400419009534355

Eysenck, H. J., & Furnham, A. (1993). Personality and the Barron–Welsh art scale. *Perceptual and Motor Skills*, *76*, 837–838. doi:10.2466/pms.1993.76.3.837

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, *41*, 1149–1160. doi:10.3758/brm.41.4.1149

Furnham, A., & Bachtiar, V. (2008). Personality and intelligence as predictors of creativity. *Personality and Individual Differences*, *45*, 613–617. doi:10.1016/j.paid.2008.06.023

Gibson, J. J. (1954). A theory of pictorial perception. *Audio Visual Communication Review*, *2*, 3–23.

Gibson, J. J. (1971). The information available in pictures. *Leonardo*, *4*, 27–35. doi:10.2307/1572228

Glăveanu, V. P., & Tanggaard, L. (2014). Creativity, identity, and representation: Towards a socio-cultural theory of creative identity. *New Ideas in Psychology*, *34*, 12–21. doi:10.1016/j.newideapsych.2014.02.002

Glăveanu, V.-P. (2010). Principles for a cultural psychology of creativity. *Culture & Psychology*, *16*, 147–163. doi:10.1177/1354067x10361394

Goff, K., & Torrance, E. P. (2002). *Abbreviated torrance test for adults*. Bensenville, IL: Scholastic Testing Service.

Gough, H. G., Hall, W., & Bradley, P. (1996). Forty years ofexperience with the Barron–Welsh Art Scale. In A. Montuori (Ed.),Unusual associates: A festchrift for Frank Barron (pp. 252-301).Cresskill, NJ: Hampton Press, Inc.

Guilford, J. P. (1950). Creativity. *American Psychologist*, *5*, 444–454.

Guilford, J. P. (1967). *The nature of human intelligence*. New York, NY: McGraw-Hill.

Guilford, J. P. (1968). *Intelligence, creativity, and their educational implications*. San Diego, CA: R. R. Knapp.

Hentschel, U., & Schneider, U. (1986). Psychodynamic personality correlates of creativity. *Advances in Psychology*, *38*, 249–275. doi:10.1016/S0166-4115(08)62413-9

Hirschman, E. C. (1980). Innovativeness, novelty seeking, and consumer creativity. *Journal of Consumer Research*, *7*, 283–295. doi:10.1086/jcr.1980.7.issue-3

Hochberg, J. (1978). Art and perception. In E. C. Carterette & M. P. Friedman (Eds.), *Handbook of perception: Perceptual ecology* (Vol. 10, pp. 225–258). New York, NY: Academic Press.

Hochberg, J. (1979). Some of the things that paintings are. In C. F. Nodine & D. F. Fisher (Eds.), *Perception and pictorial representation* (pp. 17–41). New York, NY: Praeger.

Jamieson, S. E. (1974). An examination of preference for complexity and its relation to creativity (University of Durham, UK).Retrieved from https://search.proquest.com/docview/301244820?accountid=45451

Kharkhurin, A. V. (2014). Creativity.4in1: Four-criterion construct of creativity. *Creativity Research Journal*, *26*, 338–352. doi:10.1080/10400419.2014.929424

Kharkhurin, A. V. (2017). Does the eye of the beholder construct beauty? Contributions of self-efficacy factors to divergent thinking traits. *Creativity Research Journal*, *29*, 370–376. doi:10.1080/10400419.2017.1376493

Kharkhurin, A. V. (2018). Bilingualism and creativity. In J. Altarriba & R. R. Heredia (Eds.), *An introduction to bilingualism: Principles and processes* (2nd ed., pp. 159–189). New York, NY: Psychology Press.

Kharkhurin, A. V., & Samadpour Motalleebi, S. N. (2008). The impact of culture on the creative potential of American, Russian, and Iranian college students. *Creativity Research Journal*, *20*, 404–411. doi:10.1080/10400410802391835

Kozbelt, A., & Durmysheva, Y. (2007). Understanding creativity judgments of invented alien creatures: The roles of invariants and other predictors. *Journal of Creative Behavior*, *41*, 223–248. doi:10.1002/j.2162-6057.2007.tb01072.x

Levine, S. K. (2002). Chaos and order: Rudolph Arnheim's gestalt psychology of art. *Gestalt Theory*, *24*, 266–282.

Lockhart, R. S., Craik, F. I., & Jacoby, L. (1976). Depth of processing, recognition and recall. In J. Brown (Ed.), *Recall and recognition* (pp. 75–102). Oxford, England: John Wiley & Sons.

Lockhart, R. S., & Craik, F. I. (1990). Levels of processing: A retrospective commentary on a framework for memory research. *Canadian Journal of Psychology/Revue Canadienne De Psychologie*, *44*, 87–112. doi:10.1037/h0084237

Lubart, T. (2010). Cross-cultural perspectives on creativity. In J. C. Kaufman & R. J. Sternberg (Eds.), *The Cambridge handbook of creativity* (pp. 265–278). New York, NY: Cambridge University Press.

Marsh, R. L., Landau, J. D., & Hicks, J. L. (1996). How examples may (and may not) constrain creativity. *Memory & Cognition*, *24*, 669–680. doi:10.3758/BF03201091

Purcell, A. T., & Gero, J. S. (1996). Design and other types of fixation. *Design Studies*, *17*, 363–383. doi:10.1016/S0142-694X(96)00023-3

Rhodes, M. (1961). An analysis of creativity. *The Phi Delta Kappan*, *42*, 305–310.

Rosen, J. C. (1955). The Barron-Welsh art scale as a predictor of originality and level of ability among artists. *Journal of Applied Psychology*, *39*, 366–367. doi:10.1037/h0042340

Rudowicz, E. (2003). Creativity and culture: A two way interaction. *Scandinavian Journal of Educational Research*, *47*, 273–290. doi:10.1080/00313830308602

Runco, M. A. (2003). Education for creative potential. *Scandinavian Journal of Educational Research*, *47*, 318–324. doi:10.1080/00313830308598

Runco, M. A. (Ed.). (2013). *Divergent thinking and creative potential*. New York, NY: Hampton Press.

Runco, M. A., & Acar, S. (2012). Divergent thinking as an indicator of creative potential. *Creativity Research Journal*, *24*, 66–75. doi:10.1080/10400419.2012.652929

Simonton, D. K. (1990). History, chemistry, psychology, and genius: An intellectual autobiography of historiometry. In M. A. Runco & R. S. Albert (Eds.), *Theories of creativity* (pp. 92–115). Thousand Oaks, CA: Sage Publications, Inc.

Smith, E. E., Shoben, E. J., & Rips, L. J. (1974). Structure and process in semantic memory: A featural model for semantic decisions. *Psychological Review*, *81*, 214–241. doi:10.1037/h0036351

Smith, S. M., Ward, T. B., & Finke, R. A. (1995). *The creative cognition approach*. Cambridge, MA: The MIT Press.

Smith, S. M., Ward, T. B., & Schumacher, J. S. (1993). Constraining effects of examples in a creative generations task. *Memory & Cognition*, *21*, 837–845. doi:10.3758/BF03202751

Tierney, P., & Farmer, S. M. (2002). Creative self-efficacy: Its potential antecedents and relationship to creative performance. *Academy of Management Journal*, *45*, 1137–1148. doi:10.2307/3069429

Torrance, E. P. (1966). *Torrance test of creative thinking*. Princeton, NJ: Personnel Press.

Vygotsky, L. S. (1925/1971). *Psychology of art*. Cambridge, MA: MIT Press.

Ward, T. B. (1994). Structured imagination: The role of category structure in exemplar generation. *Cognitive Psychology*, *27*, 1–40. doi:10.1006/cogp.1994.1010

Ward, T. B., Patterson, M. J., Sifonis, C. M., Dodds, R. A., & Saunders, K. N. (2002). The role of graded category structure in imaginative thought. *Memory & Cognition*, *30*, 199–216. doi:10.3758/BF03195281

Ward, T. B., Smith, S. M., & Vaid, J. (1997). *Creative thought: An investigation of conceptual structures and processes*. Washington, D. C.: American Psychological Association.

Welsh, G. S. (1976). Personality correlates of intelligence and creativity in gifted adolescents. *Gifted Child Quarterly*, *20*, 295–296. doi:10.1177/001698627602000322

Welsh, G. S. (1980). *Manual for the Welsh figure preference test*. Palo Alto, CA: Consulting Psychologists Press.

Westwood, R., & Low, D. R. (2003). The multicultural muse: Culture, creativity and innovation. *International Journal of Cross Cultural Management*, *3*, 235–259. doi:10.1177/14705958030032006

Yagolkovskiy, S. (2019). Relationships among individual-level correlates of innovation. *International Journal of Innovation Science*, *11*(2), 196–207. doi:10.1108/IJIS-12-2017-0133