

Measuring the Domain-Specificity of Creativity

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Abstract

In creativity research, there is a discussion whether creativity is a universal phenomenon, or whether the skills, aptitudes, traits, propensities and motivations that underlie a creative performance achievement must be differentiated as to domains. There are different ways to empirically explore the question of the domain-specificity of creativity, whereby essentially two approaches can be identified: measuring the creative person and product. This paper aims to give a compact overview of the methods and findings of empirical research approaching the question if and how distinct domains of creativity have to be distinguished and discussed methodological issues. As a result, a three-factor model of creativity appears to be most appropriate, although further work is needed to reach clarification here.

1. Introduction

People accomplish creative performances in extremely different domains, including fine art, music, dance, literature, science, advertising, mathematics, business life, teaching, or daily life (Lubart, 1994). In view of these varied and extremely different fields, there is a discussion in research as to whether creativity is a universal phenomenon, or whether the skills, aptitudes, traits, propensities and motivations that underlie a creative performance achievement must be differentiated as to domains — for Baer (2010, p. 321), this “is a key question in creativity research and theory”.

At first, it was assumed that creativity represents a domain-general ability, but from the 1990s on this premise was challenged and discussed in creativity research (Hong and Milgram, 2010), whereby some spoke out in favor of domain-specificity (Baer, 1998; Feist, 2004), others stressed a domain-generality (Plucker, 1998, 2005; Simonton, 2009) and yet others pleaded for a mixed form (Lubart and Guignard, 2004; Plucker and Beghetto, 2004; Baer and Kaufman, 2005; Baer, 2010). It is now generally recognized in research that creativity is at least partially a domain-specific ability (Hong and Milgram, 2010; Baer, 2012; Kaufman, 2012; Baer, 2015; An and Runco, 2016). Plucker and Zabelina (2009, p. 7) argue here that “most scholars acknowledge the weaknesses and inappropriateness of domain general approaches to studying and enhancing creativity. In this sense, the battle has been won by those championing the specificity perspective”. However, the question of which domains are to be differentiated in this context is still largely open, and results from empirical research are quite diverse.

Against this background, this article strives to give a compact overview of the methods and findings of empirical research approaching the question if and how distinct domains of creativity have to be distinguished. The paper is structured as follows. In *chapter 2*, empirical research is framed in order to organize the presentation of empirical findings in *chapter 3*. On an abstract level, approaches measuring the creative person and the creative product can be distinguished. Because evaluation in both cases illuminates different facets of creativity, methodological issues are discussed in *chapter 4*. The article concludes in *chapter 5*.

2. Framing empirical research

To answer the question whether creativity is domain-specific, it must first be defined what is meant by the term *creativity* (Plucker and Beghetto, 2004; Plucker, 2005). Following established opinion, creativity is defined in this paper as the generation of a product that is accepted by a group at a specific point of time as new and valuable (Stein, 1953; MacKinnon, 1962; Amabile, 1996; Zhou and George, 2003; Shin et al., 2012), whereby creativity and creative performance are to be regarded as synonyms (Zhou, 2008). Following this definition, creativity refers both to a creative product and, through the aspect of generation, to a creative process that a creative person runs through and whose result is the product (Barron, 1988; Simonton, 1999). In this context, Kaufman and Baer (2004a, p. 12) speak of creative processes “as go-betweens between the creative people who possess and use the processes and the creative products that result from their use”. Thus, creativity can be approached and assessed via the creative person, the creative process and the creative product.

Regardless of the method of approach, the following applies: if creativity is a domain-general ability, this should influence creativity equally in nearly all activities in extremely different domains. According to this, persons who are more creative than the average in one domain would in general turn out to show above average creativity in other domains as well. Accordingly, for the examination of whether creativity is domain-specific or not, the creativity of a person in various domains must be evaluated and compared. A high correlation between the domains implies domain-general creativity, a low correlation a domain-specific manifestation of creativity (Ivcevic, 2007; Baer, 2010, 2012).

The following chapters provide an overview of empirical studies that pursue the question whether creativity is domain-specific, and if so, which domains are to be differentiated. First of all, studies on the evaluation of the creative person will be introduced in which creativity is usually recorded using self-report-scales. In these, participants provide information on their self-assessment (self-assessed ratings), creative practices (behavioral inventories) or creative successes (accomplishment checklists). In this context, some questionnaires will be introduced

that were in some cases specially constructed to examine the domain-specificity of creativity.

Regarding the creative product, the question of the domain-specificity of creativity was previously investigated through the application of Amabile's *Creative Assessment Technique* (CAT), according to which creative products are evaluated by suitable experts (Amabile, 1982, 1983, 1996). The studies that are relevant for this are introduced.

Apart from the creative person and product, it is also possible to explore the question of domain-specificity via the creative process. The most widely used test to assess the creative process is the *Torrance Test of Creative Thinking* (TTCT) (Torrance, 1966; Kim, 2006; Plucker and Makel, 2010). The TTCT assesses a person's creativity on the basis of various tasks that require divergent thinking skills and is based on five criteria: fluency, originality, abstractness of titles, elaboration and resistance to premature closure. Apart from the problem that creativity cannot be reduced to the application of divergent thinking (Runco, 2008; Kozbelt et al., 2010; Acar and Runco, 2012), the TTCT uses only one measure of divergent thinking, thus assuming domain-generality (Plucker and Zabelina, 2009; Baer, 2010, 2012). Measuring the domain-specificity of creativity using the TTCT (or other tests) would therefore at least require to allow multiple (i. e., domain-specific) measures of divergent thinking as well (Simonton, 1999; Baer, 2012). For the stated reasons, studies assessing the creative process are not considered in the following overview of empirical research.

3. Overview of empirical research

3.1. Measuring the creative person

The simplest way to evaluate creativity is direct questioning by means of self-report questionnaires. Those taking part are to provide information on their own creativity in different domains in each case (Baer, 1999). There is then an examination, using explorative or confirmatory factor analysis of measures of creativity, of whether the domains can be reduced to a single factor (domain-general) or whether several factors emerge (domain-specificity) (Silvia et al., 2009).

Kaufman and Baer (2004b) had 241 students assess their own creativity with their *Creativity Scale for Diverse Domains* (CSDD) generally at first and then in nine different domains (communication, interpersonal relationships, solving personal problems, writing, crafts, art, bodily/physical, math, science). An explorative factor analysis resulted in three factors: Creativity in empathy/communication (interpersonal relationships, solving personal problems, writing), “hands on” creativity (art, crafts, bodily/physical), and math/science creativity (math, science).

Rawlings and Locarnini (2007) were able to replicate this structure by using the CSDD to survey 31 professional artists, 28 professional academics and 67 first-year psychology students. In a survey of 575 Turkish undergraduates with the CSDD, Oral et al. (2007) were also able to determine three factors that are essentially consistent with the findings of Kaufman and Baer (2004b). The only inconsistent or deviating findings are that writing was loaded together with art and crafts, and that it was not possible to assign bodily/kinesthetic (i.e. bodily/physical) to any factor.

An interesting parallel can be drawn between the three factors identified by Kaufman and Baer (2004b) and the three factors writing, art and problem solving that were identified by Ruscio et al. (1998) in their study of student motivation (Kaufman et al., 2009a; Kaufman, 2012).

The *Creative Domain Questionnaire* (CDQ) was introduced for the first time by Kaufman (2006) and represents a further development of the CSDD, because the latter's items did not adequately cover the different domains of human cre-

ativity (see also Silvia et al., 2012). The questionnaire covers a total of 56 different domains. In a survey of 3,553 participants (the majority of whom were students), Kaufman was able to identify five factors: science, social-communications, visual-artistic, verbal-artistic and sports. The factor science contained all the elements from the domains math and science, as well as general analytical thinking. The factor social-communications comprised domains such as emotions and interactions with other people. The factor visual-artistic contained elements not only from handicrafts (such as crafts and textiles), but also from traditional art (such as painting or photography). The factor verbal-artistic consisted of the three writing elements as well as related domains. The sports factor was described only by two elements assigned directly to the sport domain.

Kaufman et al. (2009a) used the same population to test seven factors: artistic-verbal, artistic-visual, entrepreneur, interpersonal, math/science, performance and problem-solving. The choice of the factors was based on a synthesis of earlier models, including, for example, Gardner's eight intelligences (Gardner, 1993, 1999). The findings suggested interpreting the seven domains as second-order hierarchical factors (with a general first-order creativity factor).

The *Revised Creative Domain Questionnaire* (CDQ-R) represents a revision and abridgement of the CDQ (from 56 to 21 items) and was developed and tested by Kaufman et al. (2009c). In a pilot study ($n = 1,232$), a four-factor model resulted by means of explorative factor analysis: math/science (algebra, chemistry, computer science, biology, logic, mechanical), drama (acting, literature, blogging, singing, dancing, writing), interaction (leadership, money, playing with children, selling, problem solving, teaching) and arts (crafts, decorating, painting). This model was subjected to a confirmatory check by interviewing 182 students and 60 warehouse employees and was confirmed.

The *Creative Achievement Questionnaire* (CAQ) developed by Carson et al. (2005) inquires about creative achievements in ten different domains (visual arts, writing, humor, dance, drama, music, invention, science, culinary, architecture). A total of 847 persons (mostly students) took part in the study (study 5). Three factors were determined: expressive (visual arts, writing, humor), performance

(dance, drama, music), scientific (invention, science, culinary). It was not possible to load architecture to a factor. In addition, a two-factor solution was tested that led to an interpretable solution. It was possible to assign writing, humor, dance, drama, music to the first factor (arts), and invention, science and culinary to the second factor (science). However, the three-factor solution represented the best solution for the tested data.

The CAQ is used frequently and possesses a high level of validity and reliability (Silvia et al., 2012). In their own survey using the CAQ (1,304 participants), Silvia et al. (2012) tested both the two- and the three-factor solution in a confirmatory factor analysis, according to which the three-factor solution is more plausible, even though it could not be confirmed.

Both the two- and the three-factor solution are not satisfactory, since the domain of architecture could not be assigned and the classification of the domain culinary in scientific appears to be constraintuitive. According to Silvia et al. (2012), the reason for this could lie, among other things, in the great differences of the variants between the evaluations of the ten domains and the extreme imbalance in each evaluation.

Ivcevic and Mayer (2009) investigated the question of the domain-specificity of creativity based on their own *Life-Report Questionnaire* (LRQ), in which participants were asked about their creative activities. The questionnaire encompassed 13 areas, which were assigned conceptually to three domains: Everyday creativity (crafts, cultural refinement, self-expressive, interpersonal, sophisticated media use), artistic creativity (visual art, music, dance, drama, writing) and intellectual creativity (science, teaching, technology). In one study, 416 students were surveyed, whereby three second-order factors were determined: Creative life-style (crafts, visual arts, cultural refinement, self-expressive, interpersonal, writing, sophisticated media use), intellectual achievement (science, teaching, technology) and performing arts (music, dance, drama). In another study, 295 professional adults were surveyed. The findings basically represent a replication of the first study, whereby it was now possible to assign visual arts and crafts in addition to the factor performing arts.

The *Kaufman Domains of Creativity Scale* (K-DOCS) was developed by Kaufman (2012) and contains a list of 94 creative behaviors. The questionnaire represents a synthesis of all three versions of the CDQ (CSDD, CDQ, CDQ-R) and of the CAQ and the LRQ. Five factors (with eigenvalues > 2 ; eigenvalues > 1 resulted in 18 factors) were determined from a survey of 2,318 college students: self/everyday, scholarly, performance, mechanical/scientific and artistic. Writing was divided in the study into nonfiction and fiction, which could be assigned to the factors scholarly (nonfiction) and performance (fiction). Analogously, problem solving can be found both in scholarly and in mechanical/scientific.

3.2. Measuring the creative product

A common technique for evaluating creativity consists of having test persons create a product and to have this product evaluated by a group of experts in the relevant field with regard to its creativity (Hennessey and Amabile, 1999; Kaufman et al., 2009a). This *Consensual Assessment Technique* (CAT) was developed by Amabile (1982) and has since been applied in numerous studies (e. g., Amabile, 1983, 1996; Baer, 1994; Sternberg and Lubart, 1995; Hickey, 2001; Chen et al., 2002; Kaufman et al., 2010). The CAT can be applied in nearly all domains and is even referred to in some cases as the “gold standard” of creativity evaluation (Kaufman et al., 2009a; Baer and McKool, 2014). In general, the evaluations by experts show a very high interreliability ranging from 0.80 to 0.90 (Amabile, 1983, 1996; Kaufman et al., 2009a; Baer, 2010). Besides the CAT, other measures like the *Creative Product Semantic Scale* (CPSS) (O’Quin and Besemer, 1989) or the *Product Creativity Measurement Instrument* (PCMI) (Horn and Salvendy, 2009) may be applied as well in this context. In the study by Lu and Luh (2012), for example, the PCMI showed higher explanatory power for the creativity scores than the CAT.

One of the few studies that examines the question of the domain-specificity of creativity measuring the creative product with the CAT is the study by Chen et al. (2006), in which 158 undergraduates went through various creativity tests: three types of verbal tests (poems, storytelling, titles), three types of artistic tests

(geometric drawing task, non-geometric drawing task, design task) and two types of mathematics tests (cutting rectangles, nine-dot areas). The results of the tests were assessed by trained undergraduate research assistants. It was possible to determine three factors: artistic creativity, verbal creativity and mathematical creativity. However, Baer (2010) criticizes that the necessary requirements for applying the CAT were not fulfilled, because the products were not assessed by experts but by trained undergraduate research assistants.

Conti et al. (1996) carried out a secondary analysis of three earlier studies whose population of 90 young adults overlapped, so that comparability was possible. In two of the studies short stories were evaluated (three in the first, one in the second study), and in one three various art activities. The correlations of the different short stories within the first study were positive and significant; furthermore, the correlations between the three short stories of the first and the short story of the second study were positive. The correlations within the study with the art activities were also positive. However, the key finding with regard to the question of domain-specificity was that none of the correlations between the verbal and the artistic tasks was statistically significant. Thus, the study suggests that verbal and artistic tasks are to be assigned to different domains. This finding is consistent with the findings of Chen et al. (2006), as well as with the differentiation carried out by Amabile (1983, 1996) in her studies of tasks that “can be grouped into three broad domains: verbal creativity (stories and other prose passages), artistic creativity (line drawings, paintings, still-life sketches, and a variety of artistic media), and problem-solving creativity (computer programming, desert island survival problems, ideas for new high-tech services, and construction of a structure out of ordinary household materials)” (Amabile, 1996, p. 69). Furthermore, the conclusion that these three groups belong to different domains is suggested by Ruscio et al. (1998).

In this context, mention should also be given to the studies by Baer (1993), who was unable to determine any significant correlation between writing a poem and a story in the domain of verbal creativity.

4. Bias measuring person and product

The assessment of creativity through self-report scales and through assessment of the creative product by experts are different methods of approach, which themselves are linked to methodological issues. Critiques of self-report scales refer basically to two issues: on the one hand, their questionable validity is criticized and, on the other, response-set bias is referred to, through which participants systematically overestimate or underestimate their own creativity (Baer, 1999).

Comparing the different self-report scales, studies show that there is a high correlation between scales that use behavioral inventories, self-assessed ratings or accomplishment checklists to assess creativity (Fleenor and Taylor, 1994; Kaufman, 2012; Reiter-Palmon et al., 2012; Silvia et al., 2012). Accordingly, in their review of reliability, validity and structure in four self-report scales of creativity (including CAQ and CDQ), Silvia et al. (2012, p. 19) come to the conclusion: “Based on the latest generation of tools, self-report creativity assessment is probably much better than creativity researchers think it is”.

A different picture can be seen if self-report scales of creativity are compared with the assessment of creative products. Kaufman et al. (2010) compared the self-assessments of 78 fourth-grade students with experts assessments in accordance with the CAT in four different domains (math, science, writing, art) and were unable to detect a positive relationship between self-assessments and experts assessments in any of the domains. The authors summarize their findings with the statement that “this study does indicate that self-assessed creativity shows poor connection to actual creative abilities across domains” (p. 12). Other studies also find slight correlations between self-assessments of creativity and experts assessments (Lee et al., 2002; Priest, 2006; Reiter-Palmon et al., 2012). Reiter-Palmon et al. (2012, p. 107) conclude “that although self-perceptions of creativity may provide some information about creativity, researchers should be cautious when using this measure as a criterion”.

However, creativity assessments by experts, as in the CAT, are also not free from methodological issues. What is discussable in particular is the determination of suitable experts. The question of the level of expertise that is necessary for

an appropriate evaluation of creative products has not yet been answered conclusively (Plucker and Makel, 2010), whereby it is also not clear whether different domains of creativity need different levels of expertise to judge creativity in the related domain (Baer, 2015). The weighting that the experts carry out in each case with regard to the aspects "new" and "valuable" is also not clear (Kaufman and Baer, 2004a; Montag et al., 2012). It is also questionable whether the best experts in a field are also the best judges when the creativity of children or teenagers is evaluated (Kaufman et al., 2009a). The question whether experts and novices evaluate the creativity of products differently, or whether novices are also suitable for evaluating creative products, has received different answers in studies. Some studies were able to detect a significant difference (e. g., Amabile, 1996; Kaufman et al., 2008, 2009a), and others were unable to do so (e. g., Runco et al., 1994; Dollinger and Shafran, 2005; Kaufman et al., 2005; Cropley and Kaufman, 2012). The different results can be explained in part by the variant line-up of non-expert raters, taking different domains into account, or minor modifications of the CAT (for a review see Kaufman et al., 2009b).

Both the evaluation of the creative person and of the creative product ignore certain creativity-relevant aspects. Evaluation of the creative person tends to take account of the creative potential instead of its realization in the form of a creative product that is necessary for creativity (Ivcevic, 2009; Montag et al., 2012). On the other hand, evaluation of the creative product says little about the creative person (Sternberg, 1988; Kozbelt et al., 2010). Apart from this, creative products can come into being by accident or luck (e.g., Flemings discovery of penicillin, Csikszentmihalyi, 1988), without a person having run through a creative process, so that a creative product may be a necessary criterion of creativity, but it is not a sufficient one. A product can therefore be regarded as less creative if it is created by accident. In addition, a product will be evaluated differently with regard to its creativity at varying times or by other expert groups (Lubart, 1994), and there are numerous examples of this in the history of art (Csikszentmihalyi, 1988).

Furthermore, the type of approach appears to influence the answer to the question of the domain-specificity of creativity. The focus on the creative product

lets creativity appear more domain-specific, while, in contrast, the focus on the creative person makes it appear more domain-general (Baer, 1998; Plucker, 1998; Lubart and Guignard, 2004; Silvia et al., 2009; Kaufman, 2012).

5. Conclusion

No test for measuring creativity is free of distortions, because actual creativity is not measured, “only some limited range of its surrogates that are believed to be correlated with creativity” (Baer, 2010, p. 325). However, some important findings can be derived from the studies introduced here. In the first place, they suggest that creativity does not represent a perfectly domain-general ability, so that a tendency can be ascertained in research to understand creativity as a domain-specific ability (Baer, 2012). A further central finding is that there is a math/science domain that differs from the other domains. In terms of these other domains, the situation is less clear with regard to both the number and to the allocation. In spite of this, consistent patterns can be detected in the studies here as well.

There are general indications that creativity can be divided into three domains that correspond to the factors “hands on” creativity, empathy/communication and math/science identified by Kaufman and Baer (2004b). Firstly, these factors can be reconciled in large part with the findings of other studies (Conti et al., 1996; Ruscio et al., 1998; Chen et al., 2006; Rawlings and Locarnini, 2007), so that there is some validity in the presumption of these three domains. Furthermore, there is also theoretical evidence for such a three-factor structure. In their work, Julmi and Scherm (2015) suggest that creativity is a domain-specific ability with three different domains on the uppermost level: corporeal creativity as the ability to present atmospheres, hermeneutical creativity as the ability to adapt to and to create situations, and analytical creativity as the ability to deal with constellations. This differentiation, which is rooted in the *new phenomenology* developed by philosopher Hermann Schmitz (Schmitz, 1964, 2005, 2010, 2013), resembles the three aforementioned domains: Corporeal creativity reflects “hands on” creativity, hermeneutical creativity reflects creativity in empathy/communication,

and analytical creativity reflects creativity in math/science.

In sum, it is suggested to further dig into the outlined three-factor structure of creativity, both empirically and theoretically. However, this should not exclude the possibility that creativity can also be represented via other structures, so further empirical and theoretical work is encouraged here as well.

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