Cornering the Muses: A Multifaceted Approach to Measuring Creativity

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Abstract

Creativity is far from a straightforward construct within the field of psychology, and this paper attempts to uncover some of the complexity and uncertainty around it. The paper first provides a brief overview of creativity, it's importance in society, various stereotypes and contradictory assumptions attached to it, and the search for a working definition of what the terms actually means. It then focuses on a multi-dimensional approach to measuring creativity in order to grasp the many different aspects of it. Ways to measure the creative process using the highly popular divergent thinking tests, the creative product and subsequent assessment, and the creative personality both from a personality trait perspective, as well as, from a biographical inventory of creative behavior and accomplishments are all examined. Though all the methods are rather standard within the field, they are most often administered in isolation. Bringing them together into one study can broaden the concept of creativity and add understanding to how the different aspects relate to each other. The creative process appears to be one area that can be developed and expanded, especially by utilizing creative metaphors, as a further instrument for measuring how people combine and connect highly dissonant concepts in new and insightful ways.

Introduction

Research into creativity is very much an interdisciplinary endeavor spreading across such diverse fields as business (Amabile, Conti, Coon, Lazenby, & Herron, 1996) (Amabile, 1996) (Andriopoulos, 2001), linguistics and language education (Carter, 2004) (Albert, 2006) (Maybin, 2007), psychology (Eysenck, 1993), and naturally the fine arts (Mace & Ward, 2002) just to name a few. Creativity has also been widely studied from a cross-cultural perspective (Lubart, 1990) (Lubart, 1999) (Lubart, 2010) (Kaufman & Sternberg, 2006) (Morris & Leung, 2010), analyzed historically (Simonton, 1999), and examined to find what kind of relationship it has with intelligence and personality (Barron & Harrington, 1981) (Batey & Furnham, 2006). In addition, creativity has a broad and all-inclusive lure, as something essential to the well being of society. As Toynbee (1964) states, giving "a fair chance to potential creativity is a matter of life and death for a society" (p. 4). Florida (2002) describes it as the most important resource of the 21st century, and this importance is quite visible in the European Commission's declaring 2009 to be the "Year of Creativity and Innovation" (European Commission, 2008). This view is not restricted to the West, as the Singaporean government, too, has described creativity as a necessity for the advancement of the nation's economy, technology, and education (Tan, 2000).

The Many Sides of Creativity

Creativity, though, is bound by numerous stereotypes and misperceptions and often people believe that to be creative one needs to be "mad, weird, neurotic or at least unusual" (Isaken, 1987, p. 2). Many researchers label this the "mad-genius stereotype" (Kaufman, Bromley, & Cole, 2006) or the "lone nut" stereotype (Plucker, Beghetto, & Dow, 2004). Despite those who are trying to disentangle creativity from this lone genius myth (Montuori & Purser, 1995), these stereotypes still seem to be part of the common folk belief in society and popularized by the media, which often writes about linking madness and depression to genius and creativity (Adams, 2014). Most research that looks at the connection between madness and creativity (Andreasen, 1987) (Jamison, 1993), however tends to focus on eminent creators, those whom have made a significant impact in their field. On the other hand, everyday creativity has actually been shown to be an important part of the mental health of the individual for it involves important characteristics such as having a willingness to take risks, being open to new ideas, and being flexible (Cropley, 1990).

Another area with contradicting views towards creativity is its association with a certain naiveté popularized by Picasso's famous quote, "Every child is an artist. The problem is how to remain an artist once we grow up." Gardner (1993) also details the blend of childlike and adultlike characteristics in many of the leading creative minds of this past century noting how Einstein tried to preserve such childlike features as curiosity and defiance of convention. Following in Einstein's proclivity towards childlike features for enhancing creativity, it is believed that "When Richard Feynman faced a problem he was unusually good at going back to being like a child, ignoring what everyone else thinks and saying, 'Now, what have we got here?'" (Feynman, 1995). Yet at the same time creativity requires a certain amount of cognitive complexity. This cognitive complexity enables one "to integrate conflicting, ambiguous or novel information" (Charlton & Bakan, 1988, p. 318), which is also essential to avoiding functional fixedness. Avoiding functional fixedness is the ability

to see multiple responses to a question or alternative solutions to a problem and not being fixed in seeing only one single answer. So the concept of creativity seems to be terribly loaded with contradictions and myths, with science and popular media, viewing it either as a mental process that regresses to some primordial state or a highly evolved process that pushes the boundaries of complexity.

The actual word creativity is commonly used in such broad contexts from describing Picasso's Guernica to a wordplay in a daily tabloid that the critic and historian, Jacques Barzun stated, "… in contemporary culture, no idea is so appealing, no word put to more frequent and varied use, than creativity." He goes on to say that creativity "extends over all of art and science, naturally, and it takes us beyond these to the basic conditions of modern society, to education, to our view of the human mind and what we conceive to be the goal of life itself" (Barzun, 1989, p. 338). To better differentiate this wide-ranging use of the term creativity, researchers distinguish between the magnitude of creativity by calling the work of geniuses on one side of the cline, eminent creativity, and the other side, everyday creativity (Richards, 1990). Often these will be expressed as "Big-C" creativity and "little-c" creativity, respectively. Though helpful in distinguishing the wide contrast that the word creativity can exemplify, it does not clarify what creativity actually is.

Framing Creativity in a Definition

Defining creativity may seem straightforward on the surface, but in reality it has been one of the more difficult and tumultuous undertakings within the field of creativity research. A decade after Guilford (1950) advocated a call to arms for more researchers to look at the neglected subject of creativity, a place where many psychologists "have feared to tread" (p. 444), Rhodes (1961) stated that the "The profusion (of definitions) was enough to give one the impression that creativity is a province for pseudo-intellectuals" (p. 306). This outpouring of definitions for creativity, which some have estimated to number close to 60 that can be found in the psychological literature (Taylor, 1988 in Furnham, Batey, Anand, & Manfield, 2008), has left the term rather ill-defined and unformed. As Sternberg (1988) further states, "Few psychological constructs have proved move elusive to define" (p. 126). Such is the elusiveness of this term that one of the leading scientists of the time, David Bohm, along with the physicist David Peat (2010), reinforces its ambivalent nature by stating that "something relevant may be said about creativity, provided it is realized that whatever we say it is, there is also something more and something different" (p. 226). Though slippery as this construct may appear, recently researchers have narrowed down this medley of definitions and have shown some accord in reaching an agreed upon description of this term. Stein (1953) provides one of the earlier working frameworks for a definition of it, as he states, "The creative work is a novel work that is accepted as tenable or useful or satisfying by a group in some point in time" (p. 311). Novelty without being useful is simply something bizarre and odd, while something useful without being novel is something common, everyday and conventional. These two concepts must come together for something to be considered creative. Later the word "appropriate" and useful" replaced the words "tenable" and "satisfying." Sternberg and Lubart (1995) describe novelty as being statistically unusual, original, unpredictable, with the power to surprise, which Bruner (1962) calls an "effective surprise" and states that it is a distinctive feature of creativity. This element of surprise has also been labeled the "nonobvious" (Simonton, 2011). Boden

(2004) further elaborates on the meaning of surprise, which is either the state of seeing this creative product, such as an innovative idea, as fitting into a way of thinking that you already had, but failed to ever realize or, as seeing the idea as an impossibility and yet contrary to this impossibility someone has come up with it. Others have added one other key element to creativity and that is "adaptability," which is the "ability to respond adaptively to the needs for new approaches and new products" (Barron, 1988, p. 80).

Recently, the definition has emphasized the interaction of domain specific knowledge, the overall creative process, and the importance the environment has on the individual (or group) in the creation of this "creative product." There is also the influence of the social context in determining the novelty and usefulness of this creative product. The following definition is one of the more thorough and all encompassing definitions of creativity and will be used as the working definition of creativity in this paper.

"Creativity is the interaction among aptitude, process, and environment by which an individual or group produces a perceptible product that is both novel and useful as defined within a social context" (Plucker et al., 2004, p.90).

A Multifaceted Approach

Creative insight into a problem is often said to occur through an "Aha experience" or "eureka effect," something that Poincaré wrote about happening to him while waiting for a bus or for Archimedes while sitting in a bathtub. A new creative idea or thought that has never occurred to one before will metaphorically be compared to some kind of illumination, as can be viewed in the numerous light bulb visual metaphors that are often associated with a creative idea. The thought that one could actually measure such a thing as creativity has often been clouded with doubt and suspicion for how would one go about measuring the "disordering of all the senses"[1] or the "impenetrable aspect of human existence" (Hausman, 1976, p. 3) and from these perceptions of creativity; it was often assumed to be something immeasurable (Khatena, 1982). The early attempts to measure it were often approached with some skepticism, and the complexity of undertaking such a task has been reviewed extensively and critiqued (Hocevar, 1981).

Despite the suspicion surrounding the measurement of creativity, research into this trait continues to grow and thrive in many different academic disciplines. A developing consensus among researchers views creativity as being made up of multiple components (Amabile, 1996) (Batey et al., 2006) and therefore a multi-faceted approach is the best method for trying to measure it. Rhodes (1961) described the four dimensions of creativity to be person, process, product, and press. This has been labeled the four P's of creativity. Using these various dimensions of creativity may provide the researcher a blueprint to better understand what it means to be creative. In the following sections, I will first look at the historically enduring measurement of Divergent Thinking tests, which aim to measure creative potential and part of the creative process; then look at the creative product and ways to measure such products; and finally the creative person.

1.1 Divergent Thinking Tests

Guilford (1968) emphasized the importance of divergent thinking where "the thinker must do much searching around, and often a number of answers will do or are wanted" (p. 8). The divergent thinking tasks he developed in his SOI (structure of intellect) Model (Guilford, 1967) looked to measure ideational fluency or the ability to come up with many different ideas to solve a problem, which is an important part of the creative process. Divergent thinking can be contrasted against the more standard IQ tests or convergent thinking tests, which require the test taker to provide one right answer to the question. Due to the pervasiveness of this latter style of test in the environmental setting, E. Paul Torrance (1970, p. 86) stated, "Children are so accustomed to the one correct or best answer that they may be reluctant to think of other possibilities." Torrance (1966) (2008) developed these divergent thinking tasks into what he called The Torrance Test of Creative Thinking (TTCT), which became one of the most widely used tests to measure creativity (Baer, 1993) (Kim, 2006). Though even Torrance himself was cautious to conflate creativity directly with divergent thinking (Torrance, 1988, p. 46), it became the psychometric template for measuring creativity for many years and still up to the present day seems to be frequently used as the measurement of creativity. Recently, though Runco (2008) reemphasized the point that creativity and divergent thinking are by no means identical terms, and divergent thinking should be seen as just one aspect of a more complex creative process (Runco & Okuda, 1988).

Divergent thinking tasks are usually figural or verbal. Common figural tasks ask the participants to complete an unfinished picture or draw as many pictures as possible from many pairs of circles or lines (for example: "o o" or "x x") on the page. Common verbal tasks ask the participants to list alternative uses to a common everyday objects like a brick, describe possible causes to a situation in a picture, provide possible consequences to an unlikely situation (just suppose everyone in the world only spoke one language), or provide possible improvements to a product like a bicycle (see Kaufman, Plucker, & Baer, 2008 for an outline of such activities). The figural tasks can be scored with such measurements as fluency (the number of pictures), originality (the statistical uniqueness of the picture), elaboration (the amount of detail provided in the picture), and the abstractedness of the title. Verbal tasks can be scored for fluency, originality, and elaboration (Kaufman, et al., 2008). The TTCT, however, recommends training for those who use that test for administrative and scoring purposes, yet many researchers will use their own form of divergent thinking tasks and some have tried to simplify the scoring scales by using a more subjective scoring method (Silvia, et al., 2008).

The model of the creative process, though, is not simply analyzing a problem and then coming up with many ideas, as represented in these divergent thinking tasks. Zeng, Proctor, and Salvendy (2011) show that it also involves evaluation, and thus these types of divergent thinking tests fail to assess the integrated general creative process. Another issue these authors raise concerning these types of tests to measure creativity is the construct validity of them, since divergent thinking tests neglect one important criterion in the working definition of creativity and that is "appropriateness" (Zeng et. al, 2011). Though Kim (2006) provides a detailed review of the TTCT and concludes that if properly administered it has benefits for identifying gifted children, but also encourages everyday creativity, and, most importantly for this paper, she too recommends that any measure of creativity involve multiple measures. Divergent

thinking tests may provide only a small window into a more complex creative process, but can also provide important information about ideational fluency, functional fixedness, and originality seeking, which all are important at some level to creativity. Zeng et al. (2011) bring up another key point concerning these divergent thinking tests and the merits of tailoring them to a specific domain, in their case a professional domain, but also in other educational areas like science or foreign language leaning. Another popular way to look at creativity, which seems rather natural and directly addresses the criticism of the divergent thinking tests and their lack of construct validity, is to focus more on an actual creative product. The next section examines possible ways to get the participants to actually produce such a product and then suggests ways to measure the creativity of the product within a social context.

1.2 Creative Products and Consensual Assessment Technique

There are numerous tasks that one can use to measure a creative product such as writing a story about a picture (Wolfradt & Pretz, 2001), completing a photo essay (Dollinger & Clancy, 1993) (Dollinger, Urban, & James, 2004), designing an invention, making a collage (Baer, 1993), writing a scientific poem (SciFaiku) (Kaufman, Baer, Cole, & Sexton, 2008), and so on. Though creativity, as mentioned earlier, is the production of a "perceivable product" that is defined within some social context as being "novel" and "appropriate" or "useful." The question one might further ask is who determines this social context and decides the novelty and appropriateness of this product? While divergent thinking tests attempt to be more objective in the scoring, the scoring of a creative product tends to be more subjective. The Consensual Assessment Technique, first developed by Amabile (1983) (1996), systematically set forth a way to assess such a creative product by using judges. These judges are to be people "who have at least some formal training and expertise in the target domain" (Amabile, 1996, p. 73). They are not provided any kind of scoring rubrics, but rather are to rely on their own subjective opinions of creativity to rate these products. These judges are supposed to mirror, on a small scale, the group of experts in the real world world who act as gatekeepers, deciding what is considered creative and what is not. Nonetheless, any researcher attempting to study creativity will naturally feel the constraint of finding this group of experts to act as judges for the research.

One will begin to question this rather ambiguous word, "expert." What exactly constitutes an expert? According to Simonton (1997) this would involve over 10 years of purposeful practice in a certain domain. Finding these experts can be a major challenge for the researcher, so Dollinger and Shafran (2005) looked at the reliability of using novice judges and found that novices and experts scored fairly similar to each other. One thing to note about their study is that these novices received some training before they assessed the creative product, so technically it is a little different than using the Consensual Assessment Technique, which rejects the use of such training. Kaufman and Baer (2012) mention the possible use of quasi-experts, an individual that is neither expert nor novice. In one study using psychology graduate students as judges, Kaufman, Lee, Baer, and Lee (2007) found consistency among their scores. So there seems to be a growing amount of data that supports the use of quasi-experts, those who have certain knowledge of the specific domain, but are not considered so-called "experts." Additionally, this will alleviate some of the burden on the researcher in recruiting a group of judges for the study. The following section moves away from

a tangible product and looks more closely at the individual or the creative personality and the importance of the trait labeled "openness to experience."

1.3 ***The Creative Personality***

A commonly used past measurement of the creative personality is the creativity personality scale (Cps) (Gough, 1979), which is a 30-item adjective checklist of personality traits. The respondent checks the items that he/she feels answers the following question, "What kind of person are you?" Eighteen items positively correspond to a creative personality and 12 items negatively correspond to it. Some of the positive items seem rather obvious such as intelligent, wide interests, inventive, original and unconventional while others seem rather dubious such as; informal, sexy, and snobbish. Similarly, a few of the negative traits are also a little puzzling such as; sincere, honest, and suspicious. Many of these positive creative traits, especially the less puzzling ones, are components of one of the broad Big Five personality traits identified as openness to experience (McCrae & Costa, 1985). Current research suggests five high-level traits: openness to experience (O), conscientiousness (C), extraversion (E), agreeableness (A) and neuroticism (N), (McCrae & Costa 1997) which have been found to be prevalent in over 50 different cultures (McCrae & Terracciano, 2005).

Costa and McCrae (1992) developed a 240-item NEO Personality Inventory, Revised (NEO-PI-R) that looks at each of the five personality traits and within each trait further specifies six facets. The six facets for the openness to experience trait are imagination, artistic interests, emotionality, adventurousness, intellect, and liberalism. Utilizing this Big 5 measurement (Costa & McCrae, 1992) to measure individual personality, the trait, openness to experience, is highly related to various measures of creativity such as divergent thinking tests (McCrae, 1987), a life course creativity study spanning 45 years (Soldz & Vaillant, 1999) a creative product based on a photo essay (Dollinger et al., 1993), as well as, a creative product based on the ratings of written stories and creative hobbies (Wolfradt et al., 2001). More recently a public-domain personality measure called the International Personality Item Pool (IPIP) (Goldberg, 1999) (Goldberg, et al., 2006) freely allows researchers to access a personality measure without the constraints of being bound to copyrighted material. Another possible way to look at the creative person is to straightforwardly ask the participants to answer items that correspond to certain creative behaviors and past creative achievements. This sort of self-reflective questionnaire acts as a creative biography for the individual and provides additional insight into one's overall creativity.

1.4 ***The Self-rated Creative Person***

Creative behaviors span quite a wide range of varying domains of experience and there has been much debate as to whether creativity is more specific to these differing domains or if creativity is a more general ability (Baer, 1998) (Plucker & Beghetto, 2004) like Spearman's "g"[2], which could then be called "c" (Kaufman & Baer, 2004). So, for example, if one person were creative in math, like Poincaré, would he also be creative in a completely different discipline like cooking or painting or is his creativity in math specific only to the domain of mathematics? Amabile (1996), in her componential theory of creativity, views it as both general and domain specific, which work together with a third component, task motivation, and it is this convergence that affects the overall creative performance on a specific task. Gardner (2003) divided up

intelligence into multiple intelligences that extend from spatial intelligence to interpersonal intelligence. Could creativity likewise be divided up into multiple creativities? Similar perhaps to Greek mythology, where there were nine muses and each one represented a different form of divine and creative inspiration from epic poetry (Calliope) and tragedy (Melpomene) to astronomy (Urania). Obviously these would not hold in the modern context, but many researchers have attempted to put together a classification of differing domains where one can be creative, which I will go into more detail next, reviewing the development of these self-reported creative inventories.

Hocevar (1980) developed one of the earlier versions of an inventory of creative behavior, which he called the "Creative Behavior Inventory." This inventory is made up of 77 items of creative activities and accomplishments such as "Received an award for acting," "Gave a recital," and "Made jewelry" in which participants respond by using a 6 point scale from "never" to "more than 6 times." These activities and accomplishments range from acting, writing, fine arts, craftwork, science, math, cooking, dance, music, and humor. These differing creative domains, though, are not clearly distinguished, while the Creativity Achievement Questionnaire (CAQ) (Carson, Peterson, & Higgins, 2005), which is also a self-reported measure of creative achievement, clearly distinguishes between 10 differing domains of creativity. These differing domains then are further subsumed into two distinct dimensions. The first dimension, "Arts," has the domains of drama, writing, humor, music, visual arts, and dance, while the other dimension, "Science," has the domains of invention, science, and culinary. The domain of architecture does not fall under either of the two dimensions. In this questionnaire each domain has eight items numbered from "0" to "7" and to score this questionnaire each item is weighed by the corresponding number (the number "0" denotes not having any recognizable talent in this domain). In the domain of "Music," for example, number 1 is "I play one or more musical instruments proficiently" while number 6 is "Recordings of my composition have been sold publicly." From looking at the range of the eight items in each domain, one could naturally assume that this type of measure is more designed for eminently creative people and not very applicable to everyday creativity for use with university students or more adolescent populations. In another study, Kaufman, Cole, and Baer (2009) developed the Creativity Domain Questionnaire (CDQ), consisting of 56 items, which initially was found to have seven factors. A shortened version of this questionnaire, reduced to 21 items revealed four factors namely; 1) Math/ Science (algebra, literature, computer science, biology, logic, mathematical); 2) Drama (acting, literature, blogging, singing, dancing, writing); 3) Interaction (leadership, money, playing with children, selling, problem solving, teaching); and 4) Arts (Craft, decorating, painting) (Kaufman, Waterstreet, Ailabouni, Whitcomb, Roe, & Riggs, 2009). The important point in these questionnaires is to try to capture the broad dimension of creativity in various possible domains rather than restricting it to the typical arts. Batey (2007), specifically investigating everyday creativity, developed his own compact version called "The Biographical Inventory of Creative Behaviors," made up of 34 items. The participants are simply asked to put an "X" in the corresponding box if they have been involved in such an activity in the past 12 months. Some examples of these activities are; "Drawn a cartoon," "Made someone a present," and "Delivered a speech." Most of these inventories rely on the thinking of Hocevar (1981) who stated "Past behavior is generally the best predictor of future behavior" (p. 459).

Another approach to these self-report inventories is not to reflect on past behavior and accomplishments, but to compare oneself to others of the same age on a 5 point scale from "1" "much less creative" to "5" "much more creative" in various creative behaviors. Kaufman (2012) recently designed the Kaufman Domains of Creativity Scale (K-DOCS), which covers a wide range of activities from interpersonal behavior such as , "Helping other people cope with a difficult situation," to computer science, "Figuring out how to fix a frozen or buggy computer," to more traditional domains of creativity like the arts, "Sketching a person or object." (See Silva, Wigert, Reiter-Palmon, & Kaufman, 2012 for a more detailed review of the various self-report scales and their reliability, validity, and structure). Deciding on what measurement to use may be rather troubling to the researcher, for each assessment tool is more specific towards a certain creativity such as; everyday creativity (Batey, 2007) or eminent creativity (Carson et al., 2005), while others expand the domains from the typical arts, math, and sciences to more unconventional creative domains like social relationships and interaction with others (Kaufman et al., 2009). Another issue to consider is the sociocultural environment where these measurements were developed and administered, namely the USA and the UK. Further research is needed to look at their translatability into and applicability to other diverse cultural and linguistic settings.

Conclusion

Utilizing multiple approaches to assess creativity provides the researcher a more holistic representation of what creativity is and the possibility to analyze the relationships between the different components such as process, product, and person. Approaching creativity with a broad array of assessment tools can provide a more complete picture of how individuals differ in respect to creativity, how this trait relates to other variables like intelligence and school achievement, and possible ways to enhance creativity in the classroom or work environment.

Ways to more accurately measure the creative process is the dimension that appears to need the most refinement and development. Divergent thinking tests may have the longest history and perhaps are the most widely used tests, though at the same time they are probably the most misunderstood, in terms of what they are actually measuring (Runco, 2008). This makes it an opportune time to restructure and expand the measurement for assessing creative thinking in order to incorporate a more comprehensive picture of the overall creative process. More research needs to look at ways to measure how individuals are able to form associative elements into new combinations, much like the early work of Mednick (1962) and his remote association tests (Mednick, 1968). In these tests participants are given three words (sore, shoulder, sweat) with seemingly no relationship and are asked to find a fourth word that somehow links them all together (answer: cold). These tests have gone out of fashion in the field of creativity, mostly because they constrain the respondent to come up with only one right answer, relying more on convergent thinking than ideational fluency. One area that could prove to be beneficial is the incorporation of metaphorical thinking and imagery activities into such an assessment, which has begun to be used by some researchers (Silvia & Beaty, 2012). Metaphor, like creativity, combines two seemingly disparate and unrelated concepts in new and innovative ways, providing insight and deeper understanding. Metaphorical imagery is highly prevalent in the field of advertising (Forceville, 2002) and creative marketing and could possibly be incorporated into creative thinking tasks. Such tasks

could ask the respondents to provide interpretations to metaphorical ads or to provide their own metaphors for a product. Then, these metaphors could be consensually assessed for both novelty and aptness. As Albert Einstein mentioned "combinatory play seems to be the essential feature in productive thought" (West, 1997, p. 26) and tapping into this combinatory play may provide greater insight for the researcher into this complex and often thorny human ability called creativity.

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[1] Arthur Rimbaud
[2] g is the measure of general intelligence developed in 1904 by Spearman see (Spearman, 1904)