

The APA 2009 Division 10 Debate: Are the Torrance Tests of Creative Thinking Still Relevant in the 21st Century?

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The Torrance Tests of Creative Thinking (TTCT) are measures of creative potential and interpreted as domain-general measures of creativity. They have been translated into over 35 languages and are the most researched measures of creativity. Research has found that the TTCT have the highest predictive validity among many measures of creativity. Torrance conducted longitudinal studies with the TTCT over 40 years and the results indicated that the scores on the TTCT predict children's later creative achievement better than IQ scores. The TTCT are the most referenced and widely used measures of creativity and are especially useful for identifying gifted and talented students. The TTCT are used for admission to gifted programs and have broadened the acceptance of students into such programs, including increasing the numbers of minority students and of students who may not show their creative potential in any other standardized manner. Therefore, the importance of the TTCT in the 21st century will continue in the identification of highly creative students and in the development of creative thinking skills in them.

Whether creativity is a generalized ability or is task specific is one of the major disagreements in the study of creativity. The Guilford Tests, Torrance Tests, or personality measures are measures of creative potential that are reflected by domain generality of creativity and assume that creativity can be measured as a way of thinking or way of being that is generalizable (Root-Bernstein & Root-Bernstein, 1999). In other words, while an individual's creativity may only be expressed in a certain area or areas, creativity can be measured as a general way of thinking. However, some researchers (e.g., Baer, 1991, 1994a, 1991; Kaufman & Baer, 2004) contend that creativity is domain-specific (cf. Gardner, 1997) and believe that measures of aptitude in specific areas or assessment of specific products are more appropriate assessments of creativity.

Chen, Himsel, Kasof, Greenberger, and Dmitrieva (2006) concluded that the main evidence for domain specificity of creativity is from: i) the low correlations among measures on creative performance in different domains; and ii) the low correlations between creative performances in specific domain and on measures of creativity. However, Chen et al. argued that the low correlations across different domains can be explained by the poor psychometric properties of existing measures of creativity. He argued that most of domains consist of a single item or single task, and larger numbers of item increases reliability. Further, Chen et al. showed that when a measure of creativity includes variables known to be related to creativity, domain generality of creativity is increased. In addition, Chen et al. found that when test takers are specifically instructed to be creative, more creative responses are elicited. They

further found that explicit instructions to be creative increase the domain-general component of creative performance. Chand and Runco (1993) also found that divergent thinking test scores are related to self-reported creative activities and accomplishments with explicit instructions, but not related to those without explicit instructions.

Torrance indicated that the differences in predictive validity between the TTCT and the Guilford measures might be because Guilford's instructions do not motivate test takers (Shaughnessy, 1998). When Torrance developed the TTCT, he disagreed with Guilford in that Guilford did not want to give clues concerning desired responses during the test. Guilford's instructions did not motivate the subjects for divergent thinking, whereas the TTCT include directions intended to specifically motivate the test taker for fluency, originality, and elaboration. Torrance explained that we would never attempt to measure jumping ability by measuring how high or far individuals just happened to be jumping at a particular time; rather, we would try to motivate them to jump as high or as far as they can (Torrance, 1994).

Difference in atmosphere while taking creativity tests is another factor that may influence correlations among measures of creativity. Kaufman and Baer (2003) concluded that creativity tests are often administered as serious tests under a timed condition, which leads to low relationships among creativity test scores. Some studies (e.g., Iscoe & Pierce-Jones, 1964; Wallach & Kogan, 1965) indicated that the correlations between creativity and IQ measures are significantly increased when creativity tests are administered as serious tests rather than as a fun activity, especially for kindergarten or children in the early elementary years. In fact, Kim (2005)'s meta-analysis found that scores on the Wallach and Kogan Divergent Thinking Tasks have a weaker relationship with intelligence than any other measures of creativity have, which might be because the Wallach and Kogan Divergent Thinking Tasks are administered as non-test-like and untimed, a common and positive aspect of creativity testing.

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Difference in participants' age is another factor that may influence correlations among measures of creativity. Kim (2005) found that the relationship between creativity and intelligence for younger children is weaker than for any other age groups, which might be because their cognitive abilities have been less affected by education.

Difference in personality is another factor that may influence correlations among measures of creativity. Silvia (2008) indicated that personality may be a part of the creative process. Some personality such as openness to experience and independence appear to be related to creativity, which might support domain generality of creativity. However, some personality such as neuroticism is positively related to one domain (e.g., artistic creativity) but negatively related to another domain (e.g., scientific creativity), which might support domain specificity of creativity (Götz & Götz, 1979).

Openness to experience is found to be the most influential factor on creativity (Feist, 1998; McCarthy, 1987; Miller & Tal, 2007). After an extensive literature review, Batey and Furnham (2006) concluded that the most common personality traits that are related to creativity are openness to new ideas, independence, and confidence. Feist's (1998) meta-analysis also concluded that creative people tend to be open to new experiences, autonomous, self-confident, norm-doubting, self-accepting, driven, ambitious, dominant, introverted, hostile, and impulsive. However, extraversion is also found to be strongly positively related to measures of creativity (Furnham & Bachtiar, 2008). Feist found that extraversion and openness to experience are the most strongly distinguishing characteristics of creative from noncreative scientists. Additionally, conscientiousness is found to be negatively related to creativity (Feist, 1998; Furnham & Chamorro-Premuzic, 2006).

Finally, there is a curvilinear relationship between knowledge and creativity. Eminent creators need a certain level of knowledge to advance in a field; however, indications are that too much knowledge leads to entrenchment and an inability to conceive of the field in a radically different light (Batey & Furnham, 2006; Sternberg & Lubart, 1995).

If creativity is a way of thinking, creativity might have a hierarchical structure, similar to the idea for g as a general intellectual ability (Gottfredson, 1997). A general measure of creativity is like a general measure of intelligence, Spearman's g , which is more of an aptitude measure than one of accomplished creativity. Historically, the creative *Renaissance* individuals are exemplary, for example: Leonardo da Vinci was a polymath, scientist, mathematician, engineer, inventor, anatomist, painter, sculptor, architect, botanist, musician, and writer (Wikipedia, 2010). Today such Renaissance individuals are rarer than before. However, that is not because creativity is limited in modern man, but because fields are more limiting and specialization is required. Regardless, there is still evidence that creative individuals often express their creativity in more than one area, often in avocations, even if their work is in one area. Specialization is required because so much time and specialized knowledge is required to be outstanding in an area.

This question of whether creativity should be assessed as a general or task-specific ability is connected to issues of development and aptitude versus achievement. Young children and those who have had fewer opportunities to develop their talents may not have focused interests and abilities in particular areas. Therefore,

domain-specific assessments of creativity may be more useful for older individuals.

Generalized creativity measurements raise the concern of bandwidth versus fidelity (Cronbach, 1970). Cronbach contended that the wider the area measured (bandwidth) the less precise the measurement (fidelity). One might think of a flashlight with a variable width beam of light, that is, the wider beam casts light so that more area can be seen, but the dimmer the light. Narrowing the beam allows a sharper view but obscures things that are outside of the light. Thus, a test of general creativity would have a wider bandwidth resulting in lower fidelity, whereas a specific test will have greater fidelity; however, it will have less bandwidth.

Are TTCT Measures of Divergent Thinking or Creativity?

The TTCT were developed by Torrance in 1966. The TTCT have been renormed five times: in 1974, 1984, 1990, 1998, and 2008 (Torrance, 1966, 1974, 1990, 1998, 2008; Torrance & Ball, 1984). They have two different versions: the TTCT-Verbal and TTCT-Figural (see Kim's 2006a for detailed information). Baer (2009) argued that the very little correlation ($r = .06$) between performance on the TTCT-Verbal and -Figural disprove the claim of the domain generality of creativity of the TTCT. Baer also claimed that it would be like two IQ tests are not related to each other. However, Torrance intended that the two forms of the TTCT are parts of a complete battery for measuring creative potential and that they measure different cognitive abilities.

In 1984 for the TTCT-Figural, Torrance also added the two norm-referenced measures of creative potential, Abstractness of Titles and Resistance to Premature Closure, to the original measures of Fluency, Originality, and Elaboration (Hébert, Cramond, Neumeister, Millar, & Silvian, 2002). The measure of Flexibility (scored by a variety of categories of relevant responses) was eliminated in the 1984 edition because it correlated very highly with Fluency (Hébert et al., 2002). The five subscales remaining are below (Ball & Torrance, 1984; Torrance, 1990):

- Fluency (the number of relevant ideas), which shows an ability to produce a number of figural images.
- Originality (the number of statistically infrequent ideas), which shows an ability to produce uncommon or unique responses. The scoring procedure counts the most common responses as 0, and all other legitimate responses as 1. The Originality Lists have been prepared for each item on the basis of normative data, which are readily memorized by scorers.
- Elaboration (the number of added ideas), which shows a test-taker's ability to develop and elaborate upon ideas.
- Abstractness of Titles (the degree beyond labeling), which is based on the idea that creativity requires an abstraction of thought. It measures the degree to which a title moves beyond concrete labeling of drawn pictures.
- Resistance to Premature Closure (the degree of psychological openness), which is based upon the belief that creative behavior requires a person to consider a variety of information when processing information and to keep an *open mind*.

Torrance also added the Creative Strengths subscales (13 criterion-referenced measures) to the scoring in 1984 (Ball & Torrance, 1984; Torrance, 1990). The Creative Strengths are Emotional Expressiveness, Storytelling Articulateness, Movement or

Action, Expressiveness of Titles, Synthesis of Incomplete Figures, Synthesis of Lines or Circles, Unusual Visualization, Internal Visualization, Extending or Breaking Boundaries, Humor, Richness of Imagery, Colorfulness of Imagery, and Fantasy.

Divergent thinking refers for fluency, flexibility, and originality (Runco, 2008). Torrance added the two norm-referenced subscales and the 13 criterion-referenced check list, which he did because of his concern that the original norm-referenced score was not measuring the breadth of creativity manifestations that he had observed (Hébert et al., 2002; Torrance, 1979). Torrance continued his research and used other relevant literature to expand the tests including studies of the creative genius, investigations on personality traits of creative people, and creativity-training guides. Torrance (1979, 1988, 1994; Ball & Torrance, 1984) provided evidence to show that his new subscales predicted creative achievement and that they improved the test's validity. According to Johnson and Fishkin (1999), the TTCT's revised scoring system supports Torrance's (1988) definition of creativity. The 1984 revisions made the TTCT true creativity tests, and not only tests of divergent thinking (Ball & Torrance, 1984).

Adaptive Creative Type, Innovative Creative Type, and Creative Strengths

Kirton (1976) defined creativity as a continuum of styles, ranging from Adaptive preferences for decision-making and problem solving to Innovative preferences, indicating that individuals tend to have relative preferences for solving problems independent of their creative ability. According to Kirton, the primary difference between Adaptors and Innovators is their approach to change: Adaptors try to do their best to do things better, whereas innovators try to do things differently. Adaptors create original ideas, which are more likely to fit the existing paradigm, whereas innovators create original ideas, which are more likely to challenge the existing paradigm (Kirton, 1976). These two different creativity preferences show different result patterns in measuring creativity. Researchers (Isaksen & Puccio, 1988; Puccio, Treffinger, & Talbot, 1995) have found that Innovators are more fluent, more original, more drawn to risk taking, and more creatively motivated than Adaptors. Kim (2006b; Cheng, Kim, & Hull, 2010; Kim, Cramond, & Bandalos, 2006) suggested that one's creative styles as well as creative potential can be measured by using the TTCT. Kim reported that creative potential, measured by the TTCT, consists of two factors, which correspond to Kirton's Innovative and Adaptive styles. The Innovative factor is associated with Fluency, Originality, and Resistance to Premature Closure, whereas the Adaptive factor is associated with Elaboration, Abstractness of Titles, and Resistance to Premature Closure on the scores of the TTCT. Resistance to Premature Closure is double-loaded on both factors, which is based on Torrance's (1998) theoretical assumption that psychological openness is a prerequisite for creativity in general. Kim added Creative Strengths in addition to the two creative styles. Kim (2006b; Kim et al., 2006) found that Innovators tend to be more fluent and original than Adaptors, which is consistent with the findings of the previous studies (e.g., Isaksen & Puccio, 1988; Torrance & Horng, 1980).

Kim has consistently found that both Adaptive creative style and Creative Strengths have relationships with other measures (e.g., personality types, Confucianism, bilingualism, people from differ-

ent cultures, people's age and gender, etc.), whereas Innovative creative style has either no relationships, or different relationships, with the above measures. Kim (Kim, 2009; Kim & Lee, 2007) found that Confucianism has strong negative relationships with both Adaptive creative style and Creative Strengths, but no relationship with Innovative creative style. Additionally, Kim and Lee (2007) found that American educators perform better than Korean educators on Adaptive creative style and Creative Strengths, whereas Korean educators perform better than American educators on Innovative creative style. Similarly, Cheng, Kim, and Hull (2010) found that American college students perform better than Taiwanese college students on Adaptive creative style.

Kim and Lee (2007) found that age has significant negative relationships with both Adaptive creative style and Creative Strengths, but no relationship with Innovative creative style. Additionally, Kim (2009; Kim & Lee, 2007) found that females perform better than males on Adaptive creative style and Creative Strengths, whereas there is no gender difference on Innovative creative style. This is consistent with Torrance (1974) in that females tend to score higher in the area of Elaboration than males although the measures of Abstractness of Titles and Creative Strengths had not been developed at that time.

Cheng et al. (2010) investigated the relationship between personality types and creative styles and found that Intuition is highly related to both Adaptive creative style and Creative Strengths and that Perceiving is highly related to Creative Strengths. This is consistent with previous studies in that Intuitive and/or Perceiving individuals are more creative than Sensing and Judging individuals (Buchanan & Bandy, 1984; Buchanan & Taylor, 1986; Carter, Nelson, & Duncombe, 1983; Fisher & Scheib, 1971; Hall, 1969; Myers & McCaulley, 1985; Richter & Winter, 1966) and that people in vocations requiring creativity also tend to be more Intuitive or Perceiving than other people (e.g., Agor, 1991; Burley & Handler, 1997; Hartzell, 2000; Pope, 1997). Further, the results are also consistent with Myers and McCaulley's claim (1985) that Intuition and Perceiving are related to creativity, especially when both of them are found together in one person, which has been confirmed by previous studies (e.g., Buchanan & Bandy, 1984; Buchanan & Taylor, 1986; Carter, Nelson, & Duncombe, 1983; Fisher & Scheib, 1971; Hall, 1969; Helson, 1965; Richter & Winter, 1966).

Lee and Kim (2009; in press) found that bilingualism measured by the Word Association Test (WAT) has positive relationships with both Adaptive creative style and Creative Strengths, but no relationship with Innovative creative style. This is consistent with previous studies (e.g., Lasagabaster, 2000; Ricciardelli, 1992) in that bilingual children tend to be more creative than monolingual children.

Therefore, the results of Kim (2009); Kim and Lee (2007); Lee and Kim (2009; in press), and Cheng et al. (2010) may indicate that both Adaptive creative style and Creative Strengths may operate as a part of, and be more influenced by, society and thus gender, language, age, and so forth, whereas Innovative creative style may always be creative, regardless of social constructs and less influenced by society and thus gender, language, age, and so forth. Further, because divergent thinking refers to fluency, flexibility, and originality (Runco, 2008), Innovative creative style (e.g., fluency and originality) might be related to divergent thinking, whereas Adaptive creative style and Creative Strengths are

more than divergent thinking, which make the TTCT to be measures of creative potential.

Predictive Validity of the TTCT

Baer (1993/1994, 1994b) has argued that the predictive validity of the TTCT is so low it is hard to be very optimistic. However, the TTCT are known for having one of the largest norming samples with valuable longitudinal validations and high predictive validity over a very wide age range (for more information, see Kim, 2006). According to Kim's meta-analysis (2008), divergent thinking or creativity test scores predict creative achievement ($r = .22$) better than IQs ($r = .17$) do. Further, the TTCT predict ($r = .33, p < .0001$) creative achievement better than other measures of divergent thinking or creative potential (e.g., Wallach & Kogan Divergent Thinking Tasks, Guilford Divergent Thinking Tasks, Sounds and Images, Word Association Tests, etc.). In this meta-analysis, creative achievements in different domains such as art, music, writing, science (including mathematics, medicine, and engineering), leadership, and social skills were used. Among these creative achievements in different domains, musical achievement is predicted better by IQ than by measures of divergent thinking or creativity, whereas art, science, writing, and social skills are predicted better by measures of divergent thinking or creativity than by IQ. This finding is consistent with previous studies such as: Plucker's conclusion (1999) based on a reanalysis of Torrance's data that the best predictor for adult creative achievements is TTCT scores; and Torrance's conclusion (2002) that TTCT scores are good predictors of creative accomplishments later in life based on the 40-year-longitudinal study. Torrance also warned that motivation and opportunity are two other important factors that influence individuals' creative achievement in addition to their creative potential (Cramond, 1994).

Does the Use of the TTCT Lead to the Two Dangerous Ideas?

Baer (2009) argued that the use of the TTCT leads to the two potentially *dangerous ideas*: (1) creativity is all about coming up with wild ideas and (2) creativity is one thing, so if you're not creative in one area, you probably won't be in others.

However, believing the two dangerous ideas is misunderstanding about the TTCT scoring procedures. (1) Wild ideas on the TTCT are not scored because these are not appropriate. Evaluative processes are important parts of creative thinking because divergent thinking without evaluation might lead to high originality that lacks fit and effectiveness (Runco, 2008). Divergent thinking is necessary but not sufficient for creative thinking. Divergent thinking often leads to highly original ideas, but creative things must be both original and effective (Runco, 2008). Thus, while Innovative creative style might contribute to producing original ideas, Adaptive creative style and Creative Strengths might contribute to evaluations of the original ideas by elaborating and adding deep thoughts.

(2) The very opposite is true. It is domain specific measures of creativity, which would lead to say that if one is not creative in that one area, one is not creative. The TTCT are much broader and never appropriately interpreted to indicate that one is not creative in any area. Torrance (1966, 1974) discouraged the use of com-

posite scores when interpreting the TTCT and warned that using a single score may be misleading because each subscale score has an independent meaning. Additionally, some might be creative adaptively, some might be creative innovatively, and others might be high in creative strengths. Therefore, the TTCT should be used to affirm creativity, but never to disconfirm it.

Are Scores on the TTCT Easily Improved With Minimal Training?

Baer (2009) argued that scores on the TTCT are easily improved with minimal training, and this makes them problematic for many purposes, such as selection to gifted and talented programs. However, the TTCT scorers who have been training teachers and students for scoring the TTCT have not seen the evidence that the scores on the TTCT are easily improved with minimal training (Kim, 2006). There is evidence of the Mozart Effect and the Flynn Effect, which both suggest that IQ scores are changed through minimal or extended interventions and experiences. Therefore, while creativity may be improved through training, the same can be said of intelligence as measured by IQ tests. Does that mean that IQ tests are just as problematic for such purposes?

Is Using the TTCT Inappropriate?

Baer (2009) argued that using the TTCT for identifying students for gifted and talented programs is inappropriate. Baer (1993/1994) expressed concern that creativity or divergent thinking assessments have become a major category of educational testing, and test scores are used widely to select students for gifted and talented programs. His concern is that such sections are a waste of educational resources as well as unfair basis for making placement decisions. Baer also argued that creative performance on one task is not predictive of creative performance on other tasks. In contrast, IQ tests are known to be affected by socioeconomic factors, that is, they favor middle or upper class nonminority students who have already benefited from adequate educational resources (Rothstein, 1995). The entire reason for adding creativity assessments to identify students for gifted and talented programs is to broaden the acceptance of students and to eliminate the reliance on standardized tests that have known ethnic group differences and still maintain test validity.

The use of the TTCT for admission to gifted programs has broadened the acceptance of students into such programs rather than narrowed it. Because achievement tests in school settings assess rote knowledge and skills and do not measure higher-level executive functions including abstract thinking, creative thinking, and problem-solving (Delis et al., 2007; Gardner, 1993; Sternberg, 1985), it is important to consider value-added assessment approaches that provide data on how students process information at high levels. Sternberg, Grigorenko, and Jarvin, (2006) argued that one important goal for future study should be creating standardized tests that reduce ethnic group differences but still maintain test validity. Sternberg et al. (2006) argued that analytical abilities are necessary but not sufficient for college success, and that creative and practical skills are needed for success in school and life. Sternberg et al. developed a supplementary assessment for analytical, practical, and creative skills to augment the role of the Scholastic Aptitude Test (SAT) in predicting students' college

success and found that the measure enhanced predictive validity for college grade point average (GPA) and substantially reduced ethnic group differences compared to high school GPA and the SAT.

Evidence from data collected statewide in Georgia supports the effectiveness of adding creativity assessments for identifying gifted students, especially those from underserved populations (Williams, 2000). The addition of a creativity assessment as an option to meet the standards for identification has significantly increased the number of students from underserved populations for gifted and talented programs (Krisel & Cowan, 1997). Although the TTCT are not the only assessment that Georgia used for creativity assessment, because Georgia requires at least one standardized creativity test score, the TTCT have been used for most creativity assessments. For students who would not score highly on an IQ or achievement test, the TTCT have opened doors for them, not shut them. The TTCT should be used to help find more students whose abilities are not usually found on traditional IQ or achievement tests. They are more culture-fair than most tests. It should be noted that especially the TTCT-Figural is unbiased in terms of race, culture, socioeconomic status, gender, and language (Cramond, 1993; Torrance, 1971, 1977; Torrance & Torrance, 1972). Creativity tests will yield additional information on many children who do not show their achievement academically. Their creative potential might otherwise go unnoticed, especially in children from culturally diverse and lower socioeconomic backgrounds (Cramond, 1994). More important, there is a positive relationship among creative underachievers, behavior problems, and creativity (Kim & VanTassel-Baska, 2010). Thus, creativity tests can highlight strengths in children who previously have been viewed as school problems (Cramond & Gollmar, 1993).

Therefore, in contrast to Baer's criticisms that creativity assessments are inappropriate and somehow unfair to measure giftedness, it is likely that overreliance on IQ tests and previous academic achievement to identify individuals for gifted programs are unfair. Gifted students are typically the recipients of substantial extra educational resources. As such the inclusion of the TTCT, and other creative measures, as standards for giftedness have broadened the pool of students eligible, regardless of ethnic group or socioeconomic factors.

Conclusion

It is clear that the relevance and importance of the TTCT, and other domain general creativity measures, in the 21st century will continue to be useful in the identification of highly creative students and in the nurture and development of creative thinking skills.

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