
JOHN BAER
JAMES C. KAUFMAN

Gender Differences in Creativity

ABSTRACT Research on gender differences in creativity, including creativity test scores, creative achievements, and self-reported creativity is reviewed, as are theories that have been offered to explain such differences and available evidence that supports or refutes such theories. This is a difficult arena in which to conduct research, but there is a consistent lack of gender differences both in creativity test scores and in the creative accomplishments of boys and girls (which if anything tend to favor girls). As a result, it is difficult to show how innate gender differences in creativity could possibly explain later differences in creative accomplishment. At the same time, the large difference in the creative achievement of men and women in many fields make blanket environmental explanations inadequate, and the explanations that have been proposed thus far are at best incomplete. A new theoretical framework (the APT model of creativity) is proposed to allow better understanding of what is known about gender differences in creativity.

INTRODUCTION More than thirty years ago, Kogan (1974) conducted an extensive and then-definitive review of gender differences in creativity. He opened his paper with a point that is as salient today as it was when it was written: Any behavioral scientist who would argue that one gender is more creative than another would face tremendous scrutiny and a row of critics. With some relief, he continued, he found “relative equality” in creativity among males and females.

In this paper, we update and review gender differences in creativity up to the present day and try to understand these differences using a hierarchical model of creativity that looks

at both general factors that influence creativity across many domains and more domain- and task-specific factors that have more limited applicability. There are many new studies of gender differences, some using very different methodologies, techniques, and populations than those reported in Kogan's 1974 review. Yet we find that we share Kogan's relief that although there is considerable evidence of differences in patterns and areas of strengths between the genders, there is *still* relative equality in creative ability.

There has clearly been a greater openness to investigating gender differences in recent years, and some authors, such as Piirto (1991a, 1991b, 2004), have made powerful arguments to explain the observed differences. Yet despite the many studies that have been done, gender differences in creativity has not become an important focus in either the creativity or psychology of women literatures. A few examples of this neglect:

- A handbook on the psychology of women (Denmark & Paludi, 1993) hailed as the most "comprehensive" and "systematic" review of literature available on the psychology of women (Babledelis, 1995, p. 639) made no reference to either creativity or divergent thinking. Neither did Unger's (2001) *Handbook of the Psychology of Women and Gender* or Worrell's (2001) two-volume *Encyclopedia of Women and Gender*.
- Neither creativity nor divergent thinking is mentioned in the third and latest edition of Halpern's (2000) *Sex Differences in Cognitive Abilities*.
- Gender differences were not mentioned as a topic by the 20 authors who contributed to Sternberg's (1988) edited volume *The Nature of Creativity*. In Sternberg's (1999) *Handbook of Creativity*, gender differences are cited once (and tangentially) in the otherwise comprehensive 490-page book.

Why the neglect? Perhaps because the findings have been inconsistent; were there either clear evidence of consistent gender differences or theories that made testable predictions of such differences, there would certainly be more interest among creativity researchers and women's studies faculties.

The largest inconsistency is between scores of tests designed to predict creativity and actual creative accomplishment. Most studies relating to gender differences in creativity have focused

on divergent thinking, and these have not produced clear or consistent gender differences (although there is a relative wealth of data here, in which clever readers might discover more of a pattern than we have been able to find). The differences in real-world creative accomplishment are large and significant (Simonton, 1994); it is here that explanations are most needed. Several have been provided, but none with enough power to push the issue into the mainstream of creativity research or to separate it from other issues in the psychology of women. It is to be hoped that the present review will stimulate theorists and researchers to extend the ideas and findings reported below in ways that will enrich our understanding of why men have been so much more prominent than women among those of the highest creative accomplishment (an understanding that might help us restructure our schools, reconsider the ways accomplishment is typically recognized, or otherwise change the world in ways that lead to less waste of human creative talent).

We have elsewhere presented the APT model of creativity (Baer & Kaufman, 2005a, 2005b; Kaufman & Baer, 2004, 2005a), a hierarchical model with several levels:

1. *Initial Requirements* include things that are necessary (but not sufficient) for *any* type of creative production – notably intelligence, motivation, and suitable environments.
2. In *General Thematic Areas* there are skills, traits, and knowledge that promote creativity across many related fields but not all fields.
3. In *Domains* there are more limited factors that promote creativity only in a specific domain.
4. Finally, even within a domain such as biology there are *Microdomains*, each with its own very specialized knowledge that one must master to make creative contributions.

The APT model's general hierarchical framework will help explain different aspects of the problem women have had in achieving levels of creative productivity comparable to their male counterparts. Familiarity with more detailed aspects of the model is not necessary for the purposes of this paper, but interested readers can find the most complete exposition of this model in Kaufman and Baer, 2005a.

There is at least one over-arching reason at the level of Initial Requirements why women's creative productivity has lagged in almost all fields: the Initial Requirement of a

conducive environment in which to develop expertise and in which one's creative performance is judged have been different for men and women. The relative lack of supporting environments — including the failure to nurture early talent, the demands and expectations of society (and especially of motherhood), and the control of entry into many fields and their resources by men — has hindered women's accomplishments in virtually all domains. There are also limitations that vary from field to field and domain to domain which explain differences in creative achievement by women in different domains (Helson, 1991a, 1992b, 2004; Simonton, 1992, 1994). These issues will be discussed below in the section on Theories of Gender Differences in Creativity.

A note on this paper's organization: The categories provided in the outline of this paper are not mutually exclusive. Some overlap is probably inherent in the topic, and a bit more overlap was caused by an attempt to make it easy for readers to locate in one section of this review the kinds of specific information they are looking for on a particular topic. Because some research reports and theoretical articles are related to different aspects of the general topic of gender differences in creativity, some articles are of necessity cited in more than one section of this review. Because of the large number of studies (especially in the area of divergent thinking test score comparisons), many of the studies listed in the tables are not discussed elsewhere in the paper (see Baer, in press, for more in-depth discussion of the divergent thinking tests).

EVIDENCE OF
GENDER
DIFFERENCES IN
CREATIVITY
OVERVIEW

This section reviews research that touches on or directly addresses the question of gender differences in creativity. We have divided this section based on age (preschool/elementary, middle school, high school, and adults). When participants fell into more than one age category, we used the age of the most participants.

In the first subsection (Gender Differences in Scores on Creativity Tests), differences in scores on creativity tests — mostly divergent thinking tests — are considered. Here is a one-sentence summary of that subsection: While there are research results pointing in various and often contradictory directions, the evidence does not clearly support gender differences in creativity based on test results; however, to the extent that a case for such gender differences can be made, the available evidence suggests that women and girls tend to score higher on creativity tests than men and boys.

The second subsection (Gender Differences in Subjective Assessments) goes into more detail about self-assessments, assessments by others, and personality-style assessments. The third subsection (Gender Differences in Creative Achievement) considers differences in creative accomplishment. This subsection does *not* document differences in achievement across a wide variety of domains. The existence of such differences is widely recognized, but far more research effort has gone into trying to understand the causes of such differences (as described below in the Theories of Gender Differences in Creativity section of this paper) than has gone into trying to document them. The evidence of differences in creative achievement reviewed in this subsection includes just one study of what might be thought of as long-term real-world achievement. (That study is, in fact, an investigation of publication success in the field of creativity research.) The rest of the subsection reviews gender differences in studies of the creativity of actual products (e.g., poems, stories, collages) created by subjects in psychological experiments.

GENDER
DIFFERENCES IN
SCORES ON
CREATIVITY TESTS

Divergent thinking tests have dominated creativity testing, and the various Torrance Tests (Torrance, 1966a, 1966b, 1966c, 1970, 1981, 1988, 1990a, 1990b; Torrance, Khatena, & Cunnington, 1973) have dominated the field of divergent thinking testing. Perhaps most popular are the *Torrance Tests for Creative Thinking* (TTCT; Torrance, 1966c, 1970, 1974, 1990a, 1990b). According to one view of creativity research (Torrance & Presbury, 1984), three-quarters of all published studies used one of the Torrance Tests, and one meta-analytic evaluation of the effects of various creativity training programs (Rose & Lin, 1984) judged the Torrance Tests to be so pervasive that it included only studies which had employed these tests. Add to these studies those that have used one of the Wallach and Kogan (1965) divergent thinking tests and it is easy to see that divergent thinking tests have been ubiquitous as measures of creativity.

For at least 25 years a debate has raged over the validity of these tests as measures of creativity (e.g., Baer, 1993; Barron & Harrington, 1981; Crockenberg, 1972; Kogan, 1983; Oon-Chye & Bridgham, 1971; Runco, 1991a). It is interesting to note in this regard that longitudinal validation studies of the Torrance Tests of Creative Thinking (Torrance, 1966c, 1974) have suggested that these divergent thinking tests are more predictive of creative behavior in males than females (Arnold &

Subotnik, 1994; Cramond, 1994; Howieson, 1981), although these validity studies have themselves been criticized for lacking validity (Anastasi, 1982; Baer, 1993; Crockenberg, 1972; Kogan, 1983). This review of gender differences in creativity will not attempt either to review or to take sides in those controversies; it will likewise remain agnostic regarding the validity of all other measures of creativity. However, to review gender differences in the results of creativity testing means, for better or worse, reviewing mostly studies of gender differences in divergent thinking test scores.

No simple conclusions can be drawn from the empirical evidence on gender differences in creativity test scores; there are studies that report that girls and women score higher than boys and men, and there are studies that report the opposite. The former (that is, studies in which girls and women score higher) are more numerous, so it would be hard to make a case for an overall male advantage. The case for a female advantage is also less than conclusive, however, both because there are many studies pointing in opposite directions and there are many that report no significant gender difference.

Table 1 lists all comparisons in which no gender differences in creativity were found. This list includes 21 studies that used various divergent thinking tests, one that used the Remote Associates Test (RAT; Mednick, 1962; Mednick & Mednick, 1967), and two that assessed evaluative thinking. Table 2 lists all studies in which males scored higher than females. There were just three such studies, all using divergent thinking tests. Table 3 lists all comparisons in which females outscored males, six of which compared divergent thinking test scores. Table 4 lists all studies in which the results were in some way mixed, including 17 studies using divergent thinking tests and two using the RAT. Although a great many studies have looked for gender differences in scores on tests designed to measure and predict creativity, few have found such differences and no consistent pattern has emerged from this research.

GENDER
DIFFERENCES ON
SUBJECTIVE
ASSESSMENTS
Self-Report
Assessments of
Creativity

Goldsmith and Matherly (1988) gave 118 college students three self-report measures of creativity and found no gender differences. The subjects also completed three self-report measures of self-esteem. There was a positive correlation between the self-report measures of creativity and the self-report measures of self-esteem, but the relationship was both stronger and more consistent for women than for men. This gender difference in the relationship between self-esteem and creativity confirmed

TABLE 1. Creativity Measures Where No Gender Differences Found.

| Author and date | Creativity measure | Participants |
|-----------------------------------|--|---|
| Parish and Eads (1977) | Divergent thinking test | 76 college students |
| Jacquish and Ripple (1980) | Adaptation of Cunningham and Torrance's sounds and images (1965) | Caucasian middle-class preadolescent males and females (mean age 10.8) |
| Ziv (1980) | TTCT (Torrance, 1974) | 98 10th grade students |
| Amabile (1983) | Verbal creativity using poetry-writing task | Adult males and females |
| Amabile (1983) | Verbal creativity using story-telling task | Male and female children |
| Amabile (1983) | Verbal creativity using caption-writing task | Adult males and females |
| Runco (1986a) | Wallach and Kogan battery (1965) | 150 5th-8th grade students |
| Runco (1986b) | Wallach and Kogan battery (1965) | 228 5th-8th grade students |
| Runco and Albert (1986) | Wallach and Kogan battery (1965) | 228 gifted (43%) and nongifted (57%) 5th-8th grade students |
| Runco and Bahleda (1986) | Wallach and Kogan battery (1965) | 234 5th-8th grade students with IQs ranging from 97-165 |
| Sajjadi-Bafghi (1986) | Thinking creatively with sounds and words test (Torrance, Khatena, & Cunningham, 1973) | Middle school students in India, grades 7th-9th |
| Shukla and Sharma (1986) | Divergent thinking test to predict scientific creativity | 230 middle school students in India |
| Runco, Okuda, and Thurston (1987) | Wallach and Kogan battery (1965) | 120 students (IQ range 98-165) between 11-13 years old |
| Runco and Okuda (1988) | Three divergent thinking tests | Scientifically and mathematically talented students (19 males and 10 females) |

TABLE 1 (cont.). Creativity Measures Where No Gender Differences Found.

| Author and date | Creativity measure | Participants |
|--|--|--|
| Kelgeri, Khadi, and Phadnis (1989) | Medhi's (1973a) verbal test | 200 randomly selected urban and rural 8th-10th grade students in India |
| Chrisler (1991) | TTCT (Torrance, 1962) | 11 men (mean age 31.6 years) and 20 women (mean age 36.2 years) |
| Runco (1991b) | Evaluative thinking | 4th-6th grade students |
| Gaynor and Runco (1992) | Divergent thinking test | 114 4th-6th grade students |
| Runco and Smith (1992) | Evaluative thinking | 27 male and 31 female university students |
| Sansawal and Sharma (1993) | Scientific creativity test (Madjumar, 1975) | 228 randomly selected students aged 13-16 years in India |
| Barrantes, Caparros, and Obiols (1999) | Divergent thinking test | 59 college students |
| Hakstian and Farrell (2001) | Openness to experience | 2,375 college students and non-management job applicants |
| Saeki, Fan, and Van Duesen (2001) | TTCT | 51 American and 54 Japanese college students |
| Tan (2001) | Methods of fostering classroom creativity | 117 elementary school teachers from Singapore |
| Lee (2002) | Divergent thinking test | 82 college students |
| DeSousa Filho and Alencar (2003) | TTCT (Torrance, 1974) and test of creative divergent production (Urban & Jellen, 1996) | 55 Spanish children |
| Rawashdeh and Al-Qudah (2003) | TTCT (Torrance, 1974) | 139 8th grade students from Ajloun Governorate schools in Jordan |

TABLE 1 (cont.). Creativity Measures Where No Gender Differences Found.

| Author and date | Creativity measure | Participants |
|-----------------------------------|---|--|
| Cheung, Lau, Chan, and Wu (2004) | Wallach-Kogan creativity test (1965) | 1,418 Hong Kong students ranging from 1st-9th grade |
| Harris (2004) | RAT | 404 college students |
| Harris (2004) | Openness to experience | 404 undergraduate students |
| Kaufman, Baer, and Gentile (2004) | Assessment of creative products | 8th graders from 32 states, taken from the 1998 NAEP classroom writing study |
| Chan (2005) | Self-assessments of creativity | 212 gifted Chinese students |
| Charyton (2005) | tests of general, scientific, and artistic creativity | 100 music and 105 engineering college students |
| Donnell (2005) | TTCT, Verbal Form B | gifted middle school students |
| Zachopoulou & Makri (2005) | Divergent Movement Ability Test (Cleland & Gallahue, 1993). | preschool and elementary school children |

TABLE 2. Creativity Measures Where Males Scored Higher.

| Author and date | Creativity measure | Participants |
|-------------------------------|---|---|
| Zheng and Xiao (1983) | Divergent thinking and creativity ratings made by the students' teachers | 812 Chinese high school students |
| Tegano and Moran (1989) | Multidimensional stimulus fluency measure (Moran, Milgram, Sawyers, & Fu, 1983) | Preschool, 1st, and 3rd graders |
| Rajendran and Krishnan (1992) | Mehdi's (1973a) verbal test and Mehdi's (1973b) nonverbal test | 250 secondary students in Madras, India |
| Cox, B. F. (2003). | Khatena Torrance Creative Perception Inventory (1977) | adult community college students |

TABLE 3. Creativity Measures Where Females Scored Higher.

| Author and date | Creativity measure | Participants |
|------------------------------------|--|---|
| Singh (1979) | Divergent thinking abilities and personality traits | Adolescent males and females in India |
| Jaquish and Ripple (1980) | Adaptation of Cunningham and Torrance's sounds and images (1965) | European-American middle class adolescent males and females |
| Kershner and Ledger (1985) | TTCT (Torrance, 1962, 1974) | 30 gifted and 30 average IQ children ages 9 to 11 |
| Hines (1990) | Associational fluency | 52 male and 89 female undergraduates |
| Rejskind, Rapagna, and Gold (1992) | Divergent thinking test | 244 gifted students (152 males and 92 females) |
| Kim and Michael (1995) | TTCT (Torrance, 1990a, 1990b) | Korean 11th grade students |
| McCrae et al. (2002) | Openness to experience | 230 students twice — during 6th grade and four years later |
| McCrae et al. (2002) | Openness to experience | 1,947 high school students |
| Misra (2003) | Openness to experience | 156 Indian students |

TABLE 4. Creativity Measures Where Mixed Scores Found.

| Author and date | Creativity measure | Participants | Mixed results |
|--|---|--|--|
| Bowers (1971) | Eight different divergent thinking tests | 36 women and 36 men | Females outscored males in 6 of 8 tests, but not significantly; females' scores correlated with personality variables, but not males' |
| Kirkland (1974) and Kirkland & Barker (1976) | Torrance repeated figures circle test | undergraduate and graduate students | Females' scores were influenced by pre-testing activities, but not males' |
| Hargreaves (1977) | Circle test (Torrance, 1962) | 10 and 11 year old students | No gender differences in scores, but gender differences in patterns of responses |
| Raina (1980) | Verbal and nonverbal divergent thinking | 110 9th grade science students in India | No significant gender differences (but females scored higher on both) |
| Amabile (1983) | Creativity in art using a collage-making task assessed for creativity by artists, art critics, and art teachers | Children and adult males and females | Females rated higher in creativity in one sample of adults but in several other studies using the same task with both children and adults there were no significant gender differences |
| Bharadwaj (1985). | Fluency | 19 and 21 year old college students in India | Females had higher fluency scores at both ages and higher flexibility scores at age 19, but among 21 year olds males had higher flexibility scores. |
| Richardson (1985) | Divergent thinking test and RAT | 320 Jamaican 16 year old males and females | Females scored higher on RAT but no significant differences on divergent thinking tests (although females scored higher on all four) |

TABLE 4. (cont.) Creativity Measures Where Mixed Scores Found.

| Author and date | Creativity measure | Participants | Mixed results |
|-------------------------------|--|---|---|
| Ruth and Birren (1985) | Verbal and nonverbal divergent thinking tests | 150 young (25-35 years), middle aged (45-55 years), and old (65-75 years) males and females | Both genders scored higher on one of the two verbal and one of the two nonverbal tests |
| Chusmir and Koberg (1986)s | RAT (Mednick, 1962; Mednick & Mednick, 1967) and manifest needs questionnaire (Steers & Braunstein, 1976) 96 male and 69 female managers | 96 male and 69 female managers | No mean gender differences, RAT scores correlated with need achievement for males and need affiliation for females |
| Lewis and Houtz (1986) | Square test (adapted from Circle test; Torrance, 1962) | Kindergarten and 1st grade students | No gender differences in scores, but gender differences in patterns of responses |
| Runco (1986a) | Self-report of creative activities involving scores of quality and quantity | 150 5th-8th grade students with mean IQ of 133 | Of 14 comparisons, the only gender difference was in quantity of creative performance in music |
| Schmidt and Sinor (1986) | Measure of creativity thinking in music (Webster, 1987, 1989) | 34 second grade students | Males scored higher on three levels, no gender difference on fourth level |
| Dhillon and Mehra (1987) | Medhi's verbal and figural divergent thinking tests (1973a, 1973b) | 160 middle and high SES Indian children ages 9 to 11s | High SES females scored higher on both tests, but middle SES children showed no gender differences |
| Goldsmith and Matherly (1988) | Self-report measures of creativity and self-esteem | 118 college studentss | No gender differences in creativity; stronger correlation between creativity and self-esteem for females than males |

TABLE 4. (cont.) Creativity Measures Where Mixed Scores Found.

| Author and date | Creativity measure | Participants | Mixed results |
|-----------------------------------|---|--|---|
| Dudek and Verreault (1989) | TTCT (Torrance, 1974) | 100 high and 100 low scoring males and females from 1,450 5th and 6th grade students | No gender differences in scores, but females had more libidinal primary process and males had more aggressive primary process content |
| Paguio and Hollett (1991) | Torrance's thinking creatively in action and movement and Martin's temperament assessment battery | 38 preschoolers ages three to four years | No gender differences in scores, but temperament had modest relationship to creativity in females, but not in males |
| Gough (1992) | Assessment of creativity of graduate students by their professors | 1,028 graduate students from University of California at Berkeley (623 male, 405 female) between 1950-1981 | Patterns of correlations of creativity ratings with various personality measures were different for females and males |
| Baer (1993) | Assessment of various creative products | 50 academically gifted 8th grade studentss | No gender differences in poems, stories, and mathematical word problems; males scored higher in equations |
| DeMoss, Milich, and DeMers (1993) | TTCT (Torrance, 1990a, 1990b) | 128 high achieving 8th and 9th grade students | Females score higher on verbal, males score higher on figural |
| Dudek, Strobel, and Runco (1993) | Verbal and figural forms of the TTCT (Torrance, 1966c) | 1,445 5th and 6th grade students in 11 English-speaking Montreal schools | Females scored higher in three of four comparisons |
| Feist & Runco (1993) | Publications in creativity journals | All contributors to the <i>Journal of Creative Behavior</i> 1967-1989e | Males contributors out-numbered females 3 to 1, but the ratio decreased over time |
| Sansanwal and Sharma (1993) | Divergent thinking test | Students in India | Females scored higher on verbal and nonverbal creativity, males scored higher on originality |

TABLE 4. (cont.) Creativity Measures Where Mixed Scores Found.

| Author and date | Creativity measure | Participants | Mixed results |
|---|---|---|---|
| Lau and Li (1996)s | Creativity assessment by teachers and peers | 633 Hong Kong 5th grade students and their teachers | Males were regarded as more creative by peers, but no gender differences found in teacher's ratings |
| Ai (1999). | Relationship of creativity to academic achievement | 2,264 high school students aged 13-18 years old in Basque County, Spain | Flexibility and elaboration more important for males, fluency and elaboration more important for females. |
| Averill (1999) | ECI | Males and females | Females scored higher in preparedness and effectiveness/authenticity, no gender differences in novelty |
| Campos, Lopez, Gonzales, and Perez-Fabello (2000) | Figural TTCT | 728 Spanish high school students | Females scored higher on abstractness of title subtest, no gender differences on test of figural form A |
| Chan, Cheung, Lau, Wu, Kwong, and Li (2001) | Wallach-Kogan ideational fluency test (1965) | 462 Hong Kong elementary students | Males scored higher in verbal, no gender differences in figural |
| Costa, Terraciano, and McCrae (2001) | Different components of openness to experience factor | Secondary analysis of 23,031 people from 26 cultures | Females scored higher in aesthetics, feelings, and actions, males scored higher in ideas, no gender differences in fantasy or value |
| Fichnova (2002) | Wallach-Kogan ideational fluency test (1965) | Preschool students ages 3 to 6 years old | Females scored higher in verbal, males scored higher in figural |
| Kaufman (in press) | Self-reports in different domains of creativity | 2,459 high school and college students | Males higher on two of five factors and 28 of 56 domains; females higher on two of five factors and 15 domains |

a prediction based on a study by Forisha (1978), which found that creative production in women was associated with sex-role masculinity (a construct that includes the personality traits of competence and self-reliance).

Runco (1986a) had 150 5th-through-8th grade students with mean IQ of 133 report on their creative activities in seven domains — writing, music, crafts, art, science, performing arts, and public presentation — as part of a study designed to assess the predictive validity of divergent thinking test scores. From these self-reports, scores for both quality and quantity of creative performance in each of the seven areas were computed. Significant gender differences were found only for a self-report of quantity of performance (e.g., “never,” “once or twice,” “three to five times,” “six or more times”) in music performance.

Chan (2005) asked 212 gifted Chinese students to self-assess their creativity, family hardiness, and emotional intelligence, and found no significant gender differences for all constructs. Kaufman (in press) asked 3,553 individuals (mostly high school and college students) to rate themselves in 56 different domains of creativity. Of the five factors derived from the 56 domains, males rated themselves higher than females on the science-analytic and sports factors, females rated themselves higher on social-communication and visual-artistic. There were no differences on the verbal-artistic factor. At the domain level, there were significant gender differences in 43 of 56 domains. Males self-reported creativity higher than females in 28 areas and overall; females self-reported higher creativity in 15 areas. In most cases, self-assessments were consistent with gender stereotypes. It is important to clarify, however, that the discrepancies may easily be a result of internalized gender stereotypes, as opposed to actual differences in creativity.

Henderson (2003) found no gender differences in self-reported creative achievement of 247 inventors working in multinational firms who responded to a 90-question on-line survey. Women in this study did report more publications and conference presentations than men, however. Early environments were important; subjects cited many instances of early family, school, community, and higher education experiences that had influenced their ability to invent.

Gough (1992) looked for correlations between professors' assessments of psychology graduate students' creativity, defined as “The creative quality of the student's thinking and

Assessments of the
Creativity of
Individuals by Others

research in psychology” (p. 228), and various personality and cognitive test scores. This continuing assessment procedure began with graduate students in psychology at the University of California at Berkeley in 1950 and included 1,028 graduate students (623 men, 405 women) between then and 1981, the period covered by Gough’s report.

Gough (1992) found that the Creative Personality scale (Gough, 1979) was the only one of 37 Adjective Check List (Gough & Heilbrun, 1983) scales that was significantly correlated with creativity for both women (.26) and men (.17). There were several Adjective Check List scales correlated with assessments of only women’s or only men’s creativity. Gough (1992) also compared correlations of women and men’s creativity ratings with their scores on California Personality Inventory scales. Overall the patterns showed only minor differences. A new scale, Creative Temperament (CT), was developed using this sample of graduate students and their professors’ ratings of their creativity. Not surprisingly, this CT scale was correlated with the creativity ratings of both women (.33) and men (.25) in this sample.

Another method of creativity assessment is to ask teachers or peers to rate a person’s creativity. Lau and Li (1996) asked 633 Hong Kong fifth-grade students and their teachers to evaluate the creativity of the students in their class. Boys were regarded as more creative by their classmates, but there was no gender difference in teachers’ ratings. It should be noted that although used routinely in screening for gifted/talented programs, Howieson (1980) and Wallach (1970) have warned that teacher ratings of students’ creativity may be poor predictors of creative performance.

Creative
Personality Tests

In addition to Gough’s work on creativity and personality, there are several studies that specifically try to measure creative personality. Many of the major self-report personality tests (e.g., the California Psychological Inventory; Myers-Briggs Type Indicator) include creativity indices. Perhaps the most consistent finding on personality and creativity is that on the five-factor personality test (e.g., Goldberg, 1992), Openness to Experience correlates strongly with creativity (see Feist, 1999; McCrae, 1987).

Several studies have explored gender differences on the Openness to Experience factor. Some studies have found that girls score higher on the Openness to Experience factor. McCrae et al. (2002) measured personality in 230 students twice, during the sixth grade and then four years later. Girls

scored higher at both points in time. In a second study, McCrae et al. (2002) tested 1,947 high school students and found females scored significantly higher on Openness. Misra (2003) studied 156 Indian students and also found higher Openness scores in females. Other studies found no differences in Openness to Experience, including Hakstian and Farrell (2001; 2,375 college students and non-management job applicants) and Harris (2004; 404 undergraduates).

Costa, Terracciano, and McCrae (2001) analyzed gender differences in Openness to Experience based on a secondary analysis of 23,031 people from 26 cultures. They analyzed different components of Openness to Experience, and found that women scored higher than men on Openness to Aesthetics, Feelings, and Actions. Men scored higher than women on Openness to Ideas. There were no differences on Openness to Fantasy or Values. As with Kaufman and Baer's (2006) findings, these differences may be related to gender stereotypes as much as individual beliefs.

GENDER DIFFERENCES IN CREATIVE ACHIEVEMENT

The focus of this section is on assessments of creative achievements, not assessments of the creativity of individuals. Because of space limitations we have not listed studies that simply demonstrate that men have been more successful in a given domain than women. Readers are referred to Piirto (2004) for more extensive information on gender differences in creative accomplishments.

ASSESSMENTS OF CREATIVE PRODUCTION Evaluations of Individuals' Creative Products

Almost no differences in creativity among male and female subjects have been reported in a series of studies using Amabile's (1982, 1983) Consensual Assessment Technique. In each of these studies, subjects are asked to create something (a poem, story, collage, etc.). These products are later rated for creativity by experts.

In a series of studies of creativity in art using a collage-making task, Amabile (1983) found no significant gender differences. Using the same task with adults, in one study, "there was a nearly significant sex difference. Females made collages that were rated higher in creativity than those made by males ($p < .052$)" (p. 49), but in other research using the same task there were no significant gender differences.

In three studies of verbal creativity among adults using a poetry-writing task, Amabile (1983) reported that there were no significant gender differences. In three additional studies of

verbal creativity involving either story-telling by children or caption-writing by adults, no gender differences were reported.

In an investigation by Baer (1993), fifty academically gifted eighth-grade students wrote poems, stories, mathematical word problems, and original mathematical equations. Only among the equations was there a significant gender difference (in which males scored higher than females). In the six other studies reported, which involved second-, fourth-, and fifth-grade students, as well as one study that focused on adults, no gender differences were observed.

Kaufman, Baer, and Gentile (2004) studied 102 poems, 103 fictional stories, and 103 personal narratives taken from the 1998 NAEP Classroom Writing Study. In the NAEP study, eighth graders from 32 states were asked to choose their two best pieces of writing that they had completed for their regular classroom assignments. Three groups of experts read all 308 pieces of writing. The experts included teachers of 8th grade creative writing, psychologists who studied creativity, and published creative writers who had extensive experience working with middle school students. Across all groups of experts, no gender differences were found for the poems, stories, or narratives.

A Study of Gender Differences in Authorship

In a study of trends in the creativity literature, Feist and Runco (1993) counted the numbers of male and female contributors to the *Journal of Creative Behavior* from 1967 until 1989. Over this 22-year period, there were approximately three times as many male authors as female authors (mean number of male authors/article = .93; mean number of female authors/article = .33). The number of female authors increased, however, from a per-issue mean of little more than 0 in 1967 to a per-issue mean of just under 3 for the years 1980-1989. The mean number of male authors per issue dropped during the same period, although only slightly, from about 6 in the late 60s to about 5 in the 80s. The number of women authors reached a plateau in the 1980s. Feist and Runco noted that this follows the trend in other journals, specifically the *Australian Journal of Psychology*, where the number of women authors increased into the 1970s and then reached a plateau.

Emotional Creativity

Emotional creativity is “the development of emotional syndromes that are novel, effective, and authentic” (Averill & Thomas-Knowles, 1991, p. 270). Averill and Nunley (1992) presented evidence that “women may be more emotionally creative than men” (p. 159), although they caution against emphasizing any conclusions based (as this one was) on

paper-and-pencil tests. Averill (1999) later created and tested the Emotional Creativity Inventory (ECI). The ECI has three facets — preparedness (e.g., background knowledge about emotional creativity); novelty; and effectiveness/ authenticity. Averill found that females scored higher than males on the preparedness and effectiveness/authenticity facets, as well as on the overall mean score. There were no differences on the novelty facet.

THEORIES OF
GENDER
DIFFERENCES IN
CREATIVITY

This section reviews theories of gender differences that theorists believe have an impact on creativity or explain gender differences in creative accomplishment. This is an area that the reader will probably not be surprised to hear is fraught with controversy.

Abra and Valentine-French (1991) surveyed available explanations for gender differences in creative achievement and argued that, although empirical studies of creativity have mushroomed, these studies have told us little about the causes of the great difference between women and men in creative achievement at the highest levels; this is due, in large part, to the fact that such studies “typically assess creativity with one of the available tests (e.g., Guilford, 1967; Mednick, 1962) of which the validity is suspect” (p. 237). According to Abra and Valentine-French (1991), this problem is compounded by the fact that most of the subjects of these studies have been either children or college students who have, at best, creative potential, but who have not yet exhibited the kind of creative achievement in which significant gender differences are apparent.

Abra and Valentine-French (1991) considered both nature and nurture arguments for the observed gender differences in creative accomplishments and noted the special problem of disentangling the two when considering gender differences (e.g., “identical twin pairs with one male and one female pair are in short supply” (p. 240)). They argued that possible explanations range from differences in specific cognitive abilities and in educational opportunities to differences in selfishness and competitiveness, and they considered possible genetic and environmental sources of such differences in an often speculative vein. Their conclusion that “creative achievement depends on both biological and environmental factors. . . [and] because men and women differ in both factors, either or both could have produced the achievement difference” (p. 235) will settle few arguments about why we find significant gender differences in many fields of endeavor.

The remainder of this section is divided into three subsections. The first looks at biological theories of gender differences in creativity — theories that are clearly on the nature side of the nature-nurture controversy — and also examines the theory that androgynous males and females may be more creative than their less androgynous counterparts, a theoretical approach which includes arguments from both sides of the nature-nurture issue. The second subsection looks at several developmental theories of gender differences influencing creativity in specific age groups and settings. The final subsection provides a unifying perspective using the framework provided by the APT hierarchical model.

BIOLOGICAL
EXPLANATIONS

Vernon (1989) argued that although social-environmental influences are certainly major causes of differences in the numbers of highly creative men and women in various fields, these factors are not sufficient explanation for the patterns of achievement that have been observed. “It is entirely implausible that human society should approve of females becoming highly talented performers of music, dance, and drama, and even allowing them to become creative writers, while, at the same time, disapproving of their becoming musical composers or painters. To me, this is the crux of the argument for attributing sex differences in creativity at least, in part, to genetic factors” (pp. 102-103).

Simonton (1994) at least partially refuted this argument by pointing out that active sex discrimination has often prevented women from acquiring the resources necessary for achievement. “This male domination of resources alone could explain why women have the best prospects in literature. It doesn’t require a well-equipped laboratory, a full orchestra, or a large block of marble to write a masterpiece of fiction or poetry” (p. 36). In addition to direct sex discrimination, Simonton argued that at least three other factors have led men and women to compete for acclaim on an uneven playing field: different socialization practices for girls and boys, different costs of marriage and family for men and women, and the effects of a “gender ambience of a particular civilization at a given time. . . . not very sympathetic to female attainments” (p. 36). Simonton (1992) conducted an interesting, though somewhat inconclusive, empirical test of the hypotheses that three cultural factors which change over time — the creative zeitgeist, levels of machismo mentality, and sexist ideologies — influence creative productivity of men and women in different ways by

comparing the creative productivity of men and women in Japan over a period of 1,400 years. Prevalence of gender-biased belief systems was negatively associated with female literary and nonliterary eminence; overall, however, literary success of women and men was linked to similar contextual factors.

Although authors like Vernon (1989) may find logical grounds for speculating that genetic differences must account for some of the observed gender differences in creative achievement, specific genetic or other biological theories of gender differences in creativity are difficult to find. Hassler, Nieschlag, and de la Motte (1990) reviewed research suggesting that musical talent and spatial ability are highly correlated, pointing out that in one group — women composers — this correlation is not found. This difference may be related to differences in testosterone levels on brain development, which may in turn result in gender differences in patterns of hemispheric dominance. Such testosterone-related differences would be consistent with Geschwind and Galaburda's (1985) hypothesis that there is a relationship between anomalous hemispheric dominance and special talents, Waterhouse's (1988) thesis that special cognitive talents have specific neurological substrates, and Gronemeyer's (1984) speculation that there may be a specifically female way of composing (for example, by using the human voice). Hassler et al. (1990) conducted three experimental studies that provided limited support for all three hypotheses.

One currently popular explanation rooted in biology for gender differences at the most extreme levels of creative performance is based on evidence that, even when mean levels are identical on a given trait, men and women often have different normal curves, with men's curves often being flatter. Steven Pinker summarized the statistical basis for this claim as follows: "[E]ven in cases where the mean for women and the mean for men are the same, the fact that men are more variable implies that the proportion of men would be higher at one tail, and also higher at the other. As it's sometimes summarized: more prodigies, more idiots" (Pinker & Spelke, 2005, para. 24). Pinker reports data from Hedges and Nowell (1995) showing that in 35 or 37 cognitive areas tested, the male variance was greater than the female variance. Such differences could explain why at the very highest level of accomplishment men are over-represented and women under-represented while at the same time acknowledging overall equal levels of creativity between genders.

Gender Differences in Creativity

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| DEVELOPMENTAL THEORIES | Several theorists have suggested explanations for possible gender differences in creative behavior that are related to specific developmental periods and task constraints. |
| CHILDREN IN PRESCHOOL AND ELEMENTARY SCHOOL Exploratory Behavior and Divergent Thinking | <p>Singer and Singer (1990) argued that failure to engage in exploratory behavior as a toddler is related to lack of curiosity in boys, but to problematic personality and social adjustment in girls. Singer and Rummo (1973) found that kindergarten boys who scored high on divergent-thinking tests were rated by teachers as more playful, open, curious, and expressive than their peers, while girls who scored high on divergent-thinking tests were <i>less</i> open, expressive, self-confident, and effective in peer relations than their peers. Saracho (1992) found significant gender differences in cognitive style among 3- to 5-year-old subjects and discussed the possible significance of the relationship of cognitive style and play to creativity.</p> <p>Hutt and Bhavnani (1976) found gender differences in the ways 3- to 5-year-old children explored novel toys. Forty-eight girls and boys were classified as <i>non-explorers</i>, who looked at but did not actively investigate or inspect the toy; <i>explorers</i>, who actively investigated the toy but did little else with it; and <i>inventive explorers</i>, who, after investigating the toy, used it in many imaginative ways. Most girls were classified as non-explorers, while most boys were classified as inventive explorers. When the children were 7 to 10 years old, they were given the Wallach and Kogan (1965) battery of divergent thinking tests. The relationship between inventive exploration and scores on a divergent-thinking test 4 years later was positive, but much more so for boys than girls. Similarly, failure to explore was negatively correlated with later divergent-thinking test scores for boys, but not for girls.</p> <p>Hutt and Bhavnani (1976) argued that this difference may be explained by the fact that preschool girls, who are more linguistically and socially competent than preschool boys, may engage in more symbolic and therefore covert role-play than boys, and that this kind of imaginative activity would not be very obvious to an observer. It should be noted that the behavioral differences observed by Hutt and Bhavnani (1976) are consistent with gender stereotypes; it is not clear whether such differences are due to nature or nurture (Berndt, 1992; Maccoby & Jacklin, 1974; Vernon, 1989).</p> |
| ADULTS | Several theorists have tried to explain why there are so many more creatively accomplished men than women. Helson (1990) |

argued that cultural values, social roles, and sexist thinking are now recognized as key reasons for the comparative lack of creative accomplishment by women. In comparison to the situation just 30 years ago, we now “realize that social roles have not been structured so that many women would ever become high achievers. It is hard to feel a sense of mystery about why there are more eminent men than women” (p. 46).

According to Helson (1990), “differences between men and women in biology and early socialization experience are ‘exaggerated’ by culture” (p. 47). Among the differences in early socialization experiences that culture exaggerates are differences in the ways parents perceive and interact with their daughters and sons. “Right from childhood, women are less likely to be picked as special by their parents” (p. 48). These early differences are then intensified by cultural rules, roles, and assumptions.

Readers are encouraged to consult the original papers for a more thorough exegesis, including interesting experimental evidence drawing both on Helson’s (1983, 1985, 1987; Helson, Roberts, & Agronick, 1995; Helson & Wink, 1987) own research and related work by such researchers as Albert (1980), Block (1984), and Bloom (1985).

In an article with the provocative title “Why Are There So Few? (Creative Women: Visual Artists, Mathematicians, Musicians),” Piirto (1991b) made the interesting observation that girls do not show less creative achievement until after high school and college. Differences seem to come, according to her own research and to studies she reviewed by Helson (1983), Getzels and Csikszentmihalyi (1976), and Barron (1972), “in the choices that creative people make after college, a time when commitment and regular effort in the field of creativity matter” (p. 146). This is related to such things as the conflict between family roles and professional roles, parents’ and teachers’ values and expectations, and self assessments of the quality of one’s work. It may also be rooted in gender differences that predate post-college decisions by as much as a decade, differences in how boys and girls develop distinctive styles of expression and discourse (Piirto, 1991a). Belenky, Clinchy, Goldberger, and Tarule (1986) and Gilligan, Lyons, and Hanmer (1990) argued that girls favored connectedness rather than separateness, and this may prefigure choices later in life that preclude the kind of intense commitment to a field necessary for creative eminence. Piirto (1991b) concluded that teachers should focus more on the motivation and

“encouraging commitment and intensity for both boys and girls” (pp. 146-147).

Cole and Zuckerman (1987) tested one hypothesis that has been proposed to explain why women scientists generally publish fewer papers than men when matched for age, doctoral institution, and field. They interviewed 73 female and 47 male scientists and concluded that, although married women scientists “do pay a price to remain scientifically productive” (p. 125), a price which generally involves eliminating everything from their lives but work and family, “women scientists who marry and have families publish as many papers per year, on the average, as single women” (p. 125). They caution that these results should not be interpreted as meaning that marriage and children have no effect on the careers of women scientists; however, the difference between publication rates of female and male scientists is not explained by marriage and motherhood.

Two other theories that attempt to explain gender differences in adult creative achievement deserve brief mention. In their effort to understand why men tend to achieve more than women to an extent not explainable by differences in divergent thinking abilities, Ruth and Birren (1985) recently revisited Maslow’s (1971) and Greenacre’s (1971) explanations of the relatively low incidence of creative contributions by women to the arts and sciences. “[Women] appear more interested in the creative process itself than in its end-product. Women sometimes have difficulties in externalizing their inner creative processes or have a lower need of achievement in creative endeavors” (Ruth & Birren, 1985, pp. 100-101). These differences, Ruth and Birren argued, are probably “not inherent, but reflect cultural values which are manifest in upbringing, educational possibilities, and freedom of action for the two sexes” (p. 101).

Seeking a very different kind of explanation, Harris (1989) reviewed studies of color and shape preferences which have shown significant gender differences. For example, girls tend to prefer lighter colors than boys (although there are exceptions to this generalization, notably a strong preference by girls for rich reds and red-purples). Harris argued that these differences have resulted in a devaluation of the work of women artists by both men and women, and that society needs to adjust its perceptions to allow women’s creative expression to be more highly valued.

EFFECTS OF EXTRINSIC
CONSTRAINTS ON
MOTIVATION

Amabile’s (1983) intrinsic motivation theory of creativity is well known, as is the fact that extrinsic constraints like rewards tend to undermine intrinsic motivation (Lepper, Greene, & Nisbett,

1973). Some researchers have argued that there may be important gender differences in the ways extrinsic constraints impact intrinsic motivation and influence creative performance.

Baer (1997) asked eighth-grade subjects (66 girls, 62 boys) to write original poems and stories under conditions favoring both intrinsic and extrinsic motivation. In the intrinsic motivation conditions, subjects were told that their poems and stories would not be evaluated; in the extrinsic condition, subjects were led to expect evaluation, and the importance of the evaluation was made highly salient. The poems and stories were judged for creativity by experts. There was a significant gender x motivational condition effect. For boys, there was virtually no difference in creativity ratings under intrinsic and extrinsic conditions, but for the girls these differences were quite large. This was confirmed in a follow-up study (Baer, 1998b) using students of the same age, in which the negative impact of both rewards and anticipated evaluation were shown to be largely confined to female subjects. More recently, Conti, Collins, and Picariello (2001) found that girls were less creative in competitive situations and boys were more creative in competitive situations.

It may be that boys are less sensitive to interpersonal communications than girls (Gilligan, Lyon, & Hammer, 1990; Pool, 1994), which would make their levels of intrinsic and extrinsic motivation less susceptible to messages that would affect levels of motivation in girls. There is some empirical evidence in the creativity literature to support this hypothesis. Kogan (1974) noted that the testing situation — individual versus group — resulted in significant differences in the divergent thinking test scores of girls, but not of boys. Katz and Poag (1979) found that, on Guilford's (1967) Alternate Uses Test, "males alone improve when given instructions to be creative; females, if anything, are slightly poorer under the creativity inducing set [of instructions]" (p. 523).

An alternative explanation is that there may be differences in the ways girls and boys (and possibly women and men) respond to evaluation. Deci, Cascio, and Krusell (1975) presented evidence showing that "positive feedback increases the intrinsic motivation of males, whereas it decreases the intrinsic motivation of females" (p. 84). The difference in response to praise — an important extrinsic motivator — may be even more complex. In a study of fifth- and sixth-grade boys and girls in which two kinds of praise — praise for effort and praise for ability — were manipulated, Koestner, Zuckerman, and Koestner

(1987) found that girls showed greater intrinsic motivation when given effort praise, whereas boys showed more intrinsic motivation when given ability praise. However, in a later study (Koestner, Zuckerman, & Koestner, 1989) of the same two kinds of praise using college students as subjects, they concluded, “women tended to display more intrinsic motivation in the no-praise condition than in the two praise conditions, whereas men showed the reverse pattern” (p. 383).

Differences of this type might be hidden in most intrinsic-extrinsic motivation research, which typically shows a decrease in creativity under conditions favoring extrinsic motivation (Amabile, 1983; for exceptions to this effect, see Amabile, 1990). In Baer’s (1997) study, gender differences overall (combining intrinsic and extrinsic conditions) were *not* statistically significant ($p = .16$), but the difference between the combined (male and female) means of the intrinsic and extrinsic groups *was* statistically significant ($p = .02$) — despite the fact that virtually *all* the impact of different motivational conditions occurred for the girls, while the boys were not touched by the change in motivational conditions. In Amabile’s (1983) research in support of the intrinsic motivation theory of creativity, subjects were either mixed in gender or, in several studies, all women. Further research is needed to determine what gender (or gender x age) limitations there may be on the applicability of the intrinsic motivation theory of creativity.

THE APT MODEL OF
CREATIVITY AND
GENDER
DIFFERENCES

Domain-specificity is one of the most controversial issues in creativity research (Baer, 1998; Kaufman & Baer, 2005b, Plucker, 1998), but we believe both sides in this debate offer ideas that can help us understand the seemingly conflicting evidence on gender differences in creativity. There are domain-general effects — at the level of Initial Requirements in the APT model — that help explain some gender differences, and there are more domain-specific effects (at the levels of General Thematic Areas, Domains, and Micro-Domains) that help us understand other kinds of gender differences in creativity.

Looking first at the test performance data, overall there appear to be few differences in measured abilities, with girls and women out-scoring boys and men to a small degree. These tests are designed to measure general divergent thinking skills, and these skills are hypothesized to contribute to creative performance across domains. In terms of the creativity-relevant skills that have been measured, there is no reason to predict greater male than female real-world accomplishment or creativity.

We know, of course, that there are gender differences in creativity at the highest levels, as judged by the experts in their respective domains, with men dominating most fields. So there seems to be some general factor at work that is limiting female accomplishment. We believe the primary general factor to be the Initial Requirement of environment. This is also in line with research showing that divergent thinking tests are, in general, more predictive of creative achievement in males than females (Arnold & Subotnik, 1994; Cramond, 1994; Howieson, 1981). The environments in which male creators work are generally more conducive to creative accomplishment than those of female creators, allowing men more regularly to express their creative abilities than women. Mcvey (2004) found that adolescent girls in single-sex high schools had significantly higher creativity scores (originality test scores and experts ratings on a creative writing task) than matched female subjects in a co-ed high school, suggesting environmental effects on the girls' creative performance.

Boys and girls grow up in different environments and rapidly become different, as some of the developmental theories cited above note. They also face different societal constraints, as Piirto (2004) and others have well documented, and possible bias in the judgments of experts in their fields as well as different access to resources in general (Simonton, 1994, 1996). In addition, gender differences in ways that male and female subjects in laboratory studies respond to extrinsic constraints (Baer, 1997, 1998b) lead to lower creative performance when extrinsic constraints are made salient are an additional environmental check on women's creative performance. Girls and boys, and women and men, simply do not live in environments that are equally conducive to creative accomplishment.

But not all fields show the same imbalance, which is the argument that led Vernon (1989) to reject global environmental explanations for gender differences in creativity and look for biological explanations. This is where lower, more domain-specific levels of the APT hierarchy can help us. There are general factors limiting women's creative accomplishment across the board, but there are also specific factors that limit it more, or less, in given domains. Piirto (2004) and Simonton (1994, 1996) outlined many such domain-specific factors, such as (1) issues regarding the amount of resources necessary to achieve in a given Micro-Domain (e.g., a particle accelerator for a nuclear physicist v. pencil and paper for a poet), (2) issues regarding stereotypic gender-appropriate behavior in different

Domains (e.g., biology is less “masculine” than physics), and (3) issues regarding different expectations and access in General Thematic Areas (e.g., women have had easier access in most domains that are part of the General Thematic Area of communication than in the General Thematic Area of math/science).

The evidence does not point toward simple explanations of gender differences in creativity because the factors underlying these differences are diverse and complex. These many kinds of influences also operate at many different levels – some very general, some influencing large areas, and some operational only in very limited domains.

CONCLUSIONS Lack of differences between girls and boys, and between men and women, is the most common outcome of the many studies reported above. In some cases, especially in the area of divergent-thinking testing, there are significant numbers of studies in which one group or the other scores higher, but these are generally counter-balanced by studies showing just the opposite. It is unlikely that a meta-analysis would show a significant overall gender difference on these tests, but it should be noted that if there were to be an overall “winner” in the numbers of studies in which one gender outperformed the other, it would be women and girls over men and boys.

There continue to be large gender differences in creative productivity, and these differences represent the most significant unanswered questions about gender and creativity. It is clear that a large part of those differences is environmental, including differences in adult expectations of girls and boys, differences in opportunities available to male and female children and adults, and differences in the kinds of experiences women and men are likely to have. There are also differences in how different kinds of creative works – including those more typically produced by women and men – are valued by society. These factors are at work, in different ways and to greater and lesser degrees, at all levels of domain generality and specificity.

It is of course possible that there are significant creativity-relevant differences rooted in biology, although the most convincing evidence of this sort thus far does not suggest that either biological maleness or femaleness leads to greater creativity. What kind of research should be done to help untangle gender and creativity issues? It will need to be more complex than giving more creativity tests to boys and girls. Looking for

gender differences in the interactions among aptitudes, motivations, and opportunities would be one promising area to investigate. Looking for changes over time in situations where gender bias has been reduced would be another. And while we wait for these and other, more conclusive research results, we would argue that assuming any gender differences in creativity are most likely the product of differing environments would represent the best overall synthesis of what we currently know about gender differences in creativity.

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Please address correspondence to John Baer, School of Education, Rider University, Lawrenceville, NJ. Email: baer@rider.edu.

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