# SELF-PERCEPTIONS OF CREATIVITY AND CREATIVE PERFORMANCE IN ADOLESCENTS

by

ALEXIS W. LEE

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Thesis Advisor: Dr. Sandra W. Russ

Department of Psychology

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**SCHOOL OF GRADUATE STUDIES**

We hereby approve the thesis of

Alexis W. Lee

Candidate for the degree of Master of Arts.*

Committee Chair

Sandra W. Russ

Committee Member

Julie Exline

Committee Member

Elizabeth Short

Date of Defense

September 8, 2017

*We also certify that written approval has been obtained for any proprietary materials contained therein.

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Abstract

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An important question in the creativity field is how self-perceptions of creativity predict actual creative performance. This question has been studied in adults but rarely in children or adolescents. Creativity has been shown to relate to problem solving and coping. These skills are important in adolescence, an age characterized by new challenges and interpersonal conflict. In the present study, two measures of self-perceptions of creativity, the Runco Ideational Behavior Scale (RIBS) and the Kaufman Domains of Creativity Scale (K-DOCS), and a measure of creative performance, the divergent thinking task, were administered to thirty-four adolescents in grades seven through eleven. It was hypothesized that both self-perception measures would be associated with performance on the divergent thinking task. A major finding was that the K-DOCS, but not the RIBS, predicted divergent thinking scores. Results provided support for use of the K-DOCS as a valid indicator of creative performance in this age group.

## Introduction

Creativity is important to study for a number of reasons. Creativity is related to coping (Russ, Robins, & Christiano, 1999; Fiorelli & Russ, 2012), flexibility (Fein, 1987), problem-solving (Singer & Singer, 1990), and self-regulation (Berk, Mann, & Ogan, 2006; Hoffmann & Russ, 2012). All of these skills are important for children as they develop and enter adolescence – a period often characterized by conflict, interpersonal turmoil, and a developing sense of identity (Erikson, 1950). Emerging adolescents have to learn how to deal with new challenges, work collaboratively to solve interpersonal conflicts, and use flexibility in balancing the demands of academics, peers, family, and increased autonomy. Finally, given adolescents' evolving sense of self, it is important to assess whether adolescents' perceptions of their creativity is associated with their creative performance.

One major question in the field is, 'How do self-perceptions of creativity relate to actual creative performance?' By studying this relationship, self-report measures can be used to predict creative potential and achievement. Individuals who perceive themselves as creative are more likely to persist in creative projects and continue to seek out creative behaviors in the future (Pretz & McCollum, 2014). Previous studies have explored this question in adults but rarely in children or adolescent samples. It is important to understand how self-perceptions of creativity relate to actual creative performance in this age group, given the major cognitive, attitudinal, and emotional changes that occur at this

time. Further, adolescence is a transition period between childhood and adulthood. It is important to assess whether the relationship between self-perceptions of creativity and creative performance in adolescents is consistent with that found in adults.

The purpose of the present study is to understand the relationship between self-perceptions of creativity and creative performance in adolescents. In the present study, we asked, 'Do adolescents' self-perceptions of their creativity relate to their creative performance?' To assess self-perceptions of creativity, the Kaufman Domains of Creativity Scale (KDOCS; Kaufman, 2012) and the Runco Ideational Behavior Scale (RIBS; Runco, Plucker, & Lim, 2000-2001) were used. The present study analyzed the nature of the relationship between these self-report measures of creativity and a creative performance measure, the Alternate Uses Test of divergent thinking. In the subset of boys, a cartoon caption task was also included as an additional measure of creative performance. Divergent thinking is a widely used measure of creative potential; according to Guilford (1950), divergent thinking is the ability to generate many different ideas or solutions. Production of humorous cartoon captions is another performance measure of creativity. We also looked at how grit, assessed with the Short Grit Scale (Grit-S; Duckworth, Peterson, Matthews, & Kelly, 2007) was related to creativity. There is tenuous support for the association between self-report measures of creativity and creative performance in the literature, and more research on this topic is needed with adolescent samples.

## Self-Perceptions of Creativity

Self-perceptions of creativity can provide insight into individuals' creative thoughts and behaviors. By including both self-perception measures of creativity and

creative performance measures, we can better understand the relationship between the two. In a review, Silvia, Wigert, Reiter-Palmon, and Kaufman (2012) reported strong validity and reliability of self-report measures of creativity, such as the revised Creative Behavior Inventory (CBI; Hocevar, 1979; Dollinger, 2003) and the Biographical Inventory of Creative Behaviors (BICB; Batey, 2007), that assess everyday creative behaviors across domains. Many self-report measures of creativity require one to endorse previously completed creative behaviors or accomplishments, a difficult task for a child or adolescent with limited opportunity or experience to engage in such activities. One common self-rating of creativity in the literature consists of a single item that assesses global creativity – "How creative do you consider yourself compared to other people on a scale of 1-10?" (Batey, 2007). This measure is limited in breadth and may be difficult for children and adolescents to complete given that they are likely to perceive many adults as more creative than themselves. The self-report measures included in this study are more appropriate for children and adolescents. The Kaufman Domains of Creativity Scale (K-DOCS; Kaufman, 2012) assesses creative behavior across domains but allows the participant to estimate his/her creativity on tasks that he/she has not specifically completed. The Runco Ideational Behavior Scale (RIBS; Runco, Plucker, & Lim, 2000-2001) assesses self-perceptions of creative thinking with items that are suitable for children and adolescents.

*Self-Perceptions of Creative Ideation*

Creative ideation is the tendency to think in creative ways, develop new ideas, or come up with alternative ways of thinking about a problem. One self-report measure of creative ideation is the RIBS. The RIBS assesses the frequency with which participants

think in creative ways. For example, “When reading books or stories, I have ideas of better endings” and “I see a cloud and have an idea for what it looks like.” The RIBS has good ecological validity in that it assesses creative thoughts encountered in day-to-day behaviors. The RIBS was designed as a self-report measure of creative potential, with the intention that it would be associated with divergent thinking (Zeng, Proctor, & Salvendy, 2011; Kaufman, Plucker, & Russell, 2012). Theoretically, the RIBS should predict divergent thinking scores, as divergent thinking is a performance measure of creative ideation (Runco, Plucker, & Lim, 2000-2001; Runco & Acar, 2012). A few studies have found significant associations between the RIBS and divergent thinking in adults (Ames & Runco, 2005; Plucker, Runco, & Lim, 2006; von Stumm, Chung, & Furnham, 2011; Benedek, Franz, Heene, & Neubauer, 2012). In one study with adult entrepreneurs, there was a significant positive association between the RIBS and fluency scores on the SWOT, a divergent thinking task (Ames & Runco, 2005). Performance on the RIBS also distinguished between entrepreneurs who had started 1-2 businesses and those who had started 3 or more. The more successful entrepreneurs reported greater frequency of creative ideation on the RIBS (Ames & Runco, 2005).

The ‘quantity of ideas’ factor on the RIBS was associated with divergent thinking originality and fluency scores ($r = .22$ and $r = .28$, respectively) in UK college students (von Stumm, Chung, & Furnham, 2011). In a separate study with American and Korean college students, originality of divergent thinking was a significant predictor of scores on the RIBS, using a divergent thinking task with real-world dilemmas and Wallach and Kogan’s (1965) task, e.g., ‘List everything you can think of that is round’ (Plucker, Runco, & Lim, 2006). Finally, there was a significant correlation between the RIBS and

originality on five divergent thinking tasks from the Berlin-Intelligence-Structure Test (r = .25, $p < .05$) in a sample of Austrian university students (Benedek, Franz, Heene, & Neubauer, 2012).

There has only been one study that looked at the relationship between the RIBS and divergent thinking in children and adolescents. The RIBS was significantly correlated with the Torrance Test of Creative Thinking-Figural in a sample of South Korean elementary and high school students (Kim & VanTassel-Baska, 2010). In sum, these findings provide initial support for the utility of the RIBS as a measure of creative potential in this age group. Given the numerous studies using the RIBS with adult samples, better understanding the relationship between the RIBS and creative performance in adolescents would be an important contribution to the field.

The relationships between the RIBS and personality and cognitive variables provide convergent validity for this self-report measure (Batey, Chamorro-Premuzic, & Furnham, 2010). Openness to experience was positively associated with the RIBS (r = .30, $p < .01$). Additionally, the Baddeley Reasoning Test, a test of fluid intelligence, was significantly associated with the RIBS, whereas IQ was not. This relationship is consistent with theory, given that fluid intelligence assesses one's ability to solve problems in novel ways without incorporating prior learning (Batey & Furnham, 2006; Kaufman, Kaufman, & Lichtenberger, 2011). Studies in the creativity literature have typically demonstrated small positive associations between divergent thinking and intelligence (Russ, 2004). Intelligence may be more important for big-C public creative accomplishments (Runco, Millar, Acar, & Cramond, 2011) and less important for creative potential and little-c creativity. The RIBS assesses creative potential, rather than

actual creative achievements, so may not show an association with intelligence. Further, there was a small, non-significant correlation between the original version of the RIBS and GPA (r = .11), providing support for the distinction between creative potential and academic achievement (Runco, Plucker, & Lim, 2000-2001).

*Self-Perceptions of Creative Behavior*

Creative behavior is engaging in behaviors or activities that call for originality of thought, problem-solving, or innovation. Findings on the relationship between self-ratings of creativity and creative behavior checklists or creative performance measures are mixed. In a sample of college students, Batey and Furnham (2008) reported that students' self-ratings of creativity were positively associated with the number of items they endorsed on The Biographical Inventory of Creative Behaviors (BICB) scale (Batey & Furnham, 2008). Pretz and McCollum (2014) concluded that college students' global and domain-specific self-efficacy ratings were influenced by their past creative accomplishments, but their actual performance on a divergent thinking task was not associated with these past accomplishments (Pretz & McCollum, 2014). Reiter-Palmon, Robinson-Morral, Kaufman, and Santo (2012) assessed college students' self-perceptions of creativity (using four scales they developed from supervisory creativity evaluations from the literature) and creative problem solving in a real-world task. They found that self-perceptions of creativity were not related to fluency or originality of ideas on the creative problem solving task. In one study with participants ages 13-69 years old, there was a small but significant association between their self-rating of global creativity and divergent thinking (r = .18) (Furnham & Bachtiar, 2008).

One measure of creative behavior is the K-DOCS, a self-report measure that assesses self-perceptions of creativity across five behavior domains. For example, an item from the artistic domain is "Drawing a picture of something I've never actually seen (like an alien)" and an item from the scholarly domain is "Arguing a side in a debate that I do not personally agree with." Participants rate their creativity compared to their peers on a 1-5 scale. Pretz and Kaufman (2015) investigated the associations among self-report measures of creativity, including the K-DOCS, divergent thinking, and college admission criteria in a sample of 207 college applicants. They found no meaningful associations between domains on the K-DOCS and divergent thinking, with the exception of an unexpected negative relationship between everyday creativity and divergent thinking ($r = -.20$, $p < .05$) (Pretz & Kaufman, 2015; Cotter, Pretz, & Kaufman, 2016).

Looking at adolescents, a sample of 128 British high school students completed a series of self-report creativity measures, including a global self-rating, and creative behavior tasks, including Guilford's Alternate Uses Test. There was a significant positive relationship between creativity self-rating and the composite divergent thinking fluency score ($r = .20$, $p < .05$) (Furnham, Batey, Anand, & Manfield, 2008). Lee & Russ (2016) found that organization, imagination, and both positive and negative affect expression in girls' early pretend play predicted the adolescents' global self-perceptions of creativity on the K-DOCS seven years later. All correlations were significant with large effect sizes.

Looking at other variables, Pretz and Kaufman (2015) found no significant associations between everyday or artistic domains of creativity on the K-DOCS and any admissions criteria in college applicants. In another more recent study with adults, performance and artistic domains on the K-DOCS were not related to intelligence

(McKay, Karwowski, & Kaufman, 2017). Thus, these expressive domains of creativity assess a construct that is distinct from academic potential and overall cognitive abilities.

## Grit

Grit is defined as "perseverance and passion for long-term goals" (Duckworth, Peterson, Matthews & Kelly, 2007, p. 1087). A measure of grit, the Short Grit Scale (Grit-S), was used to assess perseverance and passion in the present study. The Grit Scale, which includes two factors, 'perseverance of effort' and 'consistency of interest,' was developed to assess ongoing commitment, stamina, and passion for a single goal (Duckworth & Quinn, 2009; Von Culin, Tsukayama, & Duckworth, 2014). Given that motivation and persistence are important in accomplishing long-term creative goals (Nijstad, De Dreu, Rietzschel, & Baas, 2010), scores on the Grit Scale should relate to creative behaviors that require steadfast persistence and a strong work ethic. In a review, Duckworth, Peterson, Matthews, and Kelly (2007) concluded that high achieving individuals across creative fields, such as art, science, math, and music, were more likely to have a strong passion for their field and perseverance to keep going in spite of challenges along the way. Many high-achievers in science and technology have emphasized the role that passion and perseverance played in their ability to accomplish their creative feats. For example, the 2002 Franklin Institute Laureates discussed their capacity to stay deeply focused on a single task, delay immediate gratification, and derive intense joy from their work (Adelson, 2003). Similarly, Martin (2006) studied creative individuals in science and engineering. He discussed how creative people derive meaning from their work through passion, commitment, and effort.

Intrinsic motivation is important in the creative process (Amabile, 1982; Ruscio, Whitney, & Amabile, 1998; Deci & Ryan, 2008). Specifically, individuals with greater intrinsic motivation are more likely to fully immerse themselves in the task or project (Amabile, 1983; Ruscio, Whitney, & Amabile, 1998). Ruscio, Whitney, and Amabile (1998) reported that task involvement was a significant predictor of expert creativity ratings. Further, task involvement mediated the relationship between participants' intrinsic motivation, as assessed with the Student Interest and Experience Questionnaire (SIEQ; Amabile, 1989), and creativity ratings (Ruscio, Whitney, & Amabile, 1998). A study in China concluded that harmonious passion, assessed with Vallerand et al.'s (2003) 7-item scale, was the mediator between autonomy in the workplace, as measured by both individual autonomy orientation and team autonomy support, and creativity in the workplace (Liu, Chen, & Yao, 2011). Furthermore, 'flow' is the term used to describe engagement in activities that are inherently reinforcing (Csikszentmihalyi, 1990). Passion and deep concentration are embedded in the flow experience, and flow is important in the creative process (Csikszentmihalyi, 1988; Csikszentmihalyi, 1990; Nakamura & Csikszentmihalyi, 2014).

One study with adults examined the relationships among grit, educational attainment, and personality. There was a significant relationship between conscientiousness and grit ($r = .77$) and grit remained a significant predictor of educational attainment after controlling for conscientiousness (Duckworth & Quinn, 2009). Moreover, although the global grit score was not associated with openness to experience, the 'perseverance of effort' factor on the Grit Scale was positively associated with openness to experience ($r = .14$, $p < .001$) (Duckworth & Quinn, 2009). This is an

important link as openness to experience is consistently associated with creativity in the literature (McCrae, 1987; Feist, 1998).

Previous studies have shown that grit does not relate to creativity (Kaufman, 2017; Sharma & Shekhawat, 2017; Grohman, Kaufman, & Silvia, 2014). In one study, there was a small negative relationship between grit and creativity ($r = -.17$, $p = .088$) assessed with the RIBS, in a sample of female Indian college students. Further, grit did not distinguish between college students who were high versus low in creativity (Sharma & Shekhawat, 2017). Prabhu, Sutton, and Sauser (2008) found that perseverance was not related to creativity, and there was actually a negative relationship between perseverance and creativity when extrinsic motivation was high.

A recent unpublished study (Kaufman, 2017) with college students looked at the associations between factors on the Grit Scale and creativity, assessed with the Creative Achievement Questionnaire (CAQ; Carson, Peterson, & Higgins, 2005) and the Creativity Life-Space Scales (Ivcevic & Mayer, 2009). They found that neither factor was associated with the creativity measures. They concluded that the 'consistency of interest' factor on the Grit Scale – designed to assess passion toward long-term goals – actually assesses one narrow aspect of passion, namely, persistence. For example, items on the 'consistency of interest' factor include, "I often set a goal but later choose to pursue a different one" (reverse-coded) and "I become interested in new pursuits every few months" (reverse-coded). Further, Kaufman (2017) reported that teachers' reports of passionate high school students were associated with students' self-reported creative achievements. Thus, a layperson's definition of passion is different from that used in the Grit Scale (Kaufman, 2017). Finally, Csikszentmihalyi (1988) noted that one aspect of

creativity is the ability to find the most original and interesting problems rather than come up with the best solutions, and this process takes time. Thus, it may benefit creative individuals to pursue alternative goals rather than stick with a single goal for a long period of time (Kaufman, 2017). The present study extends upon previous research by further exploring the relationship between grit and various creativity measures, including self-perceptions of creativity across creative behavior domains.

## Creative Performance

### *Divergent Thinking*

Two important cognitive components of creativity that were proposed and supported by Guilford (1950) are divergent thinking and transformation. Divergent thinking, a widely used creative performance criterion, is the ability to generate many original ideas (Guilford, 1950). Creative ideas must be novel as well as relevant, useful, and appropriate for the task or goal (Runco, 2008; Kaufman, Kaufman, & Lichtenberger, 2011). Transformation is the ability to combine ideas in new ways and break out of existing patterns and old sets (Russ, 2014). Guilford's (1950) Alternate Uses Test, a well-established test of divergent thinking, instructs participants to generate as many uses as possible for a given object, e.g., 'How many uses can you think of for a brick?' Participants' responses on the Alternate Uses Task are scored for both fluency and originality. Fluency is the number of acceptable uses generated, and originality is the number of unique responses generated by the individual across all items.

Divergent thinking is considered a performance measure of creative ideation. Creative ideation assesses creative potential and is distinct from creative production or achievement (Plucker, Runco, & Lim, 2006; Runco, 2008; Runco & Acar, 2012), though

both creative ideation and creative production are important components of creativity (Kaufman & Sternberg, 2010). Divergent thinking measures do not directly assess creative production or the evaluation of original ideas; nevertheless, they provide a useful assessment of the creative thought process (Plucker, Runco, & Lim, 2006; Runco, 2008; Runco & Acar, 2012). Moreover, divergent thinking is an important criterion of creativity because it isolates a single cognitive process important in creativity (Runco, 2008). Divergent thinking is one necessary component of creativity but not sufficient for creative production (Plucker, Runco, & Lim, 2006). A number of factors are needed to transform ideas into creative production, such as level of motivation, personality features, resource availability, cognitive ability, and specific skill sets (Runco, Plucker, & Lim, 2000-2001; Batey & Furnham, 2006; Batey, Chamorro-Premuzic, & Furnham, 2010).

Although some critics have argued that divergent thinking does not reliably predict individuals' actual creative output (Zeng, Proctor, & Salvendy, 2011), a substantial body of empirical evidence has demonstrated the predictive validity of divergent thinking. Recent studies have demonstrated predictive validity coefficients of roughly .60 or higher (Runco, Plucker, & Lim, 2000-2001; Runco & Acar, 2012). This body of research supports the use of divergent thinking as a reliable and valid measure of creative potential. Recent evidence has shown that the predictive validity of divergent thinking measures is comparable to that of other psychometric assessments (Runco & Acar, 2012).

Divergent thinking predicts creativity in students and professionals. For example, divergent thinking scores were associated with teacher reports of creativity in art and science students (Batey & Furnham, 2006). Divergent thinking was less effective in

distinguishing among highly accomplished creative individuals who were already established in their fields. Thus, factors other than divergent thinking may play a role in distinguishing among highly creative individuals. Divergent thinking may set those low in creativity apart from those with moderate levels of creativity but may not distinguish between those with moderate and high levels of creativity (Batey & Furnham, 2006).

It is generally accepted that creative production involves both creative potential and basic cognitive abilities (Kaufman, Kaufman, & Lichtenberger, 2011). Although there are mixed findings in the literature, divergent thinking and intelligence seem to be relatively distinct constructs, contributing to the discriminant validity of divergent thinking tests (Kim, 2005; Runco, 2008; Kaufman, Kaufman, & Lichtenberger, 2011). It is likely that some basic level of cognitive ability is needed for creativity but is less important beyond a certain threshold (Davis, 1989; Runco & Acar, 2012). Small non-significant associations between divergent thinking and GPA support the distinction between creative potential and academic achievement (Runco, Dow, & Smith, 2006; Runco & Acar, 2012).

Critics argue that divergent thinking may largely recruit long-term memory retrieval processes rather than represent the pure generation of novel ideas (Batey & Furnham, 2006). Guilford (1966), however, countered by explaining that unavoidably, memory is inherent in the retrieval and production of novel ideas. The accessibility of memory, however, distinguishes those with high divergent thinking scores from those with low divergent thinking scores. Those individuals with high fluency scores have a sophisticated ability to retrieve thoughts, images, or ideas from memory. For those with

low fluency scores, memories exist in storage but may not be as accessible to retrieval (Guilford, 1966).

*Humor as a Form of Creative Expression*

Effective humor production involves the ability to generate something imaginative and original that is entertaining and that makes sense for the context. The relationship between sense of humor and creativity in adolescents, college students, and adults has been demonstrated in previous studies (Ziv, 1976; Derks & Hervas,1988; Lang & Lee, 2010; Ghayas & Malik, 2013; Kellner & Benedek, 2016; Chang, Chen, Hsu, Chan, & Chang, 2015; Nusbaum, Silvia, & Beaty, 2017). Instructing participants to generate humorous captions to cartoons is an established method of assessing humor and creativity (Treadwell, 1970; Koppel & Sechrest, 1970; Ziv, 1983).

Kellner and Benedek (2016) demonstrated small significant correlations between humor production and both divergent thinking fluency ($r = .17$) and creativity ($r = .26$) on a cartoon caption task in college students. The association between divergent thinking and humor production illustrates the role of creative ideation in humor. Being funny involves coming up with new, surprising ideas that still make sense within the context. Nusbaum, Silvia, and Beaty (2017) found that openness to experience was a significant predictor of humor ratings ($ß = .48$, $p < .001$) on a cartoon caption task in college students.

The humor domain score on the Creative Achievement Questionnaire (CAQ; Carson, Peterson, & Higgins, 2005) was associated with all creative behavior domains on the K-DOCS in adults (McKay, Karwowski, & Kaufman, 2017). Individuals who have

engaged in humor-related behaviors, such as writing jokes or cartoons, or who have been recognized for their humor also perceive themselves as more creative relative to their peers across behavior domains. However, in a separate study, the humor domain score on the Creative Achievement Questionnaire was not associated with divergent thinking ($r = .06$) in a pooled sample of adolescents and adults (Kaufman et al., 2016).

Looking at adolescents specifically, Ziv (1976) found that listening to a humorous record was associated with significantly higher scores at post-test than at pre-test compared to a control group on the Torrance Creativity Test-Verbal in 10$^{th}$ grade students. In a sample of middle school Turkish students, there were non-significant associations between self-enhancing and affiliative humor styles and divergent thinking, a significant negative relationship between aggressive humor and divergent thinking, and a significant negative relationship between self-defeating humor and divergent thinking fluency (Cayirdag & Acar, 2010). In a study with Chinese pre-adolescents, Chang et al. (2015) demonstrated that individuals with diverse and flexible styles of humor, or 'general humor endorsers,' outperformed three other humor style groups (humor deniers, positive humor endorsers, and negative humor endorsers) on the Chinese version of the Torrance Creativity Thinking Test-Figural.

While playing, children are having fun, and they may also use humor. Play is often considered to be early practice with skills that are important in the creative process (Russ, 2014). The association between play and creativity has been supported in the literature (Fein, 1987; Singer & Singer, 1990; Russ, Robins, & Christiano, 1999; Hoffmann & Russ, 2012; Wallace & Russ, 2015). Early pretend play ability, assessed with the Affect in Play Scale (APS; Russ, 1993; 2014), was associated with children's

self-reported sense of humor across three years. Specifically, negative affect expression in play was significantly correlated with the overall humor score and the humor creation subscale score on the Multidimensional Sense of Humor Scale for Children (MSHSC; Dowling & Fain, 1999) in a sample of children ages 9-13 years old (Christian, 2012).

Openness to experience has been shown to relate to both humor and creativity (Li et al., 2014; Feist, 1998; Wolfradt & Pretz, 2001; Kaufman, 2013; McCrae, 1987; Ivcevic, 2007; Nusbaum, Silvia, & Beaty, 2017; Howrigan & MacDonald, 2008; Greengross, Martin, & Miller, 2012). In one study, openness to experience was more strongly related to humor production in male ($r = .38$, $p < .01$) than female ($r = .11$, *ns*) college students (Howrigan & MacDonald, 2008). In the present study, we assessed the relationship between self-perceptions of creativity and humor production on a cartoon caption task in the boys' subset. This is an interesting question, as humor is used often in adolescence to seek attention from others and enhance interpersonal interactions. It is important to assess whether adolescents' self-perceptions of their creativity is associated with their humor.

## Self-Esteem and Creativity

The link between self-esteem and creativity in middle school students, college students, and adults has been demonstrated in previous studies (Jaquish & Ripple, 1980; Goldsmith & Matherly, 2001; Karwowski, 2009; Wang & Wang, 2016; Pretz & Nelson, 2017). Goldsmith and Matherly (2001) reported a significant positive relationship between the Rosenberg Self-Esteem Scale (RSE) and a composite of three creativity measures ($r = .37$, $p < .05$) in a sample of American college students. There was a significant positive association between self-esteem, assessed with the RSE, and self-

perceptions of little-c creativity (r = .32, $p < .0001$) in a sample of Polish adults (Karwowski, 2009). Pretz and Nelson (2017) reported that self-esteem was significantly correlated with both divergent thinking fluency (r = .30) and originality (r = .26). Self-esteem was associated with creativity in Chinese middle school students (Wang & Wang, 2016). Finally, Jaquish and Ripple (1980) found that self-esteem was significantly correlated with divergent thinking in pre-adolescents (mean age: 10.8 years) but not adolescents (mean age: 16.4 years). The present study controlled for self-esteem by assessing the relationship between self-esteem and creativity in middle to high school students.

## Present Study

Using a multi-method design, the present study explored the relationship between self-perceptions of creativity and creative performance in adolescents. Studies exploring this relationship with this age group are sparse in the literature. In the present study, the Kaufman Domains of Creativity Scale (K-DOCS; Kaufman, 2012) was used to assess adolescents' self-perceptions of creative behaviors across five behavior domains: Self/Everyday, Scholarly, Performance, Scientific, and Artistic creativity. Additionally, the Runco Ideational Behavior Scale (RIBS; Runco, Plucker, & Lim, 2000-2001) was used to assess adolescents' self-reported frequency of creative ideation (thoughts). The Short Grit Scale (Grit-S; Duckworth, Peterson, Matthews, & Kelly, 2007) was used to explore the relationship between grit and creativity in adolescent boys. Two outcome measures assessed adolescents' creative performance, the Alternate Uses Test of divergent thinking (total co-ed sample) and a cartoon caption task (boys' sample only) to measure humor as an expression of creativity.

*General hypotheses*

It was hypothesized that both self-report measures of creativity would predict creative performance. It was also hypothesized that the self-perception of creativity measures would relate to one other. The present study was the first to analyze the associations between these measures of self-perceptions of creativity and divergent thinking in a sample of adolescents.

## Method

*Participants*

Thirty-four students (19 girls and 15 boys) from two different private same-sex schools in Ohio agreed to participate in the present study. Nineteen girls, out of 37 available girls from a longitudinal study, in the seventh through eleventh grades, participated. Fifteen boys in the seventh through tenth grades were recruited from a larger pool of approximately 120 students with a very small participation rate. Students were recruited via a letter e-mailed home with detailed information about the study and a consent form for parents to sign and send back. Students' parents returned signed consent forms to the school. Students participated in the present study during the 2015-2016 academic year (girls) and 2016-2017 academic year (boys). Though no information regarding socioeconomic status was obtained, the student body at both schools consists predominantly of Caucasian students from middle to upper socioeconomic class families. No monetary compensation was provided to students for participation in the present study.

Post-hoc G*Power analyses were computed to detect the needed effect size to reach an appropriate statistical power given the obtained sample size (Faul, Erdfelder, Buchner, & Lang, 2009). A correlation of .42 with a sample size of 34 would reach a power of .80 for one-tailed tests with alpha set to .05. Thus, for the purposes of the present study, we considered a medium effect size of .42 as evidence for a meaningful relationship for all primary analyses with the total co-ed sample.

*Procedure*

The present study was approved by the Case Western Reserve University Institutional Review Board. After obtaining informed consent from parents and students, participants in the present study completed the Alternate Uses Test of divergent thinking, the RIBS – a measure of self-perceptions of creative ideation, and the K-DOCS – a measure of self-perceptions of creative behavior across five domains.

The battery of measures was administered to the students in small groups of four to eleven students at a time in available rooms at their schools. Students completed all measures in the allotted one period timeframe. The researcher distributed a packet to each participant containing all measures in the following order: Alternate Uses Test, RIBS, and KDOCS. Packets were kept confidential and contained identification numbers only. The researcher read instructions for each measure aloud to the group and did not proceed until all participants had completed the section or the allotted time had elapsed. Students had two minutes for each of the four items on the Alternate Uses Test, and they worked at their own pace on the RIBS and KDOCS.

*Measures administered to total co-ed sample*

**Alternate Uses Test** (Guilford, 1950). Guilford's Alternate Uses Test is a reliable and valid creative performance measure of divergent thinking that assesses participants' ability to generate uses to everyday objects. The interrater reliability of divergent thinking tests is typically .90 or higher, and the internal consistency is typically .70 or higher (Runco & Acar, 2012). Studies with children have demonstrated excellent reliability and validity of the Alternate Uses Test (Kogan, 1983). In studies with students, correlations between divergent thinking and other well-established creativity measures range from r = .20 to r = .48 (Batey & Furnham, 2006). Wallach and Kogan's (1965) adapted divergent thinking task for children was used in the present study. Four objects from the adapted list were included, each one listed on a different sheet of paper: safety pin, chair, nail, and milk carton. Participants were given two minutes to generate as many possible uses for each object. Both fluency and originality of divergent thinking were scored. Fluency is the total number of acceptable uses generated across all four items by each participant. Wallach and Kogan (1965) developed a method of scoring originality in which one point is awarded for each use that is the only use given in the total pool. The originality score is the total number of unique responses across all four items. In the present study, the alpha coefficient for divergent thinking fluency scores across the four items for the total co-ed sample was .83.

**Runco Ideational Behavior Scale** (RIBS; Runco, Plucker, & Lim, 2000-2001). The RIBS is a 25-item self-report measure designed to assess the frequency with which participants engage in creative ideation. The RIBS includes items such as, "I have ideas about what I will be doing in the future," "I have ideas for stories or poems," and "I think

of better titles for movies." Participants indicated on a scale of 0-*Never* to 4-*Very often* the response that most closely matched how frequently they think or behave in such a way. The present study used the global (average) score on the RIBS. Good internal consistency has been demonstrated (alpha = .92) (Runco, Plucker, & Lim, 2000-2001). Using multiple regression analyses, divergent thinking scores accounted for significant variance in the RIBS in a sample of adults (Plucker, Runco, & Lim, 2006). Runco, Plucker, and Lim (2000-2001) concluded that creative ideation can reliably be substituted for creative product as a creativity criterion. This measure is especially useful in children and adolescents who have had limited opportunity and experience needed for creative accomplishments (Runco, Plucker, & Lim, 2000-2001; Batey, Chamorro-Premuzic, & Furnham, 2010).

**Kaufman Domains of Creativity Scale** (K-DOCS; Kaufman, 2012). The K-DOCS is a 50-item self-report measure designed to assess participants' self-perceptions of creative behaviors across various domains compared to others of a similar age and life experience. Participants rated themselves on a scale of 1-*Much less creative* to 5-*Much more creative* in response to statements such as "Mediating a dispute between two friends" or "Learning how to play a musical instrument." The K-DOCS assesses self-perceptions of creative behaviors in five behavior domains: Self/Everyday, Scholarly, Mechanical/Scientific, Artistic, and Performance creativity (Kaufman, 2012). In the present study, both a global score (total average) and individual domain (average) scores on the K-DOCS were used. Good internal consistency was demonstrated for the five domains, with each factor's coefficient alpha reliability above .80. All five factors

showed good test-retest reliability as well (Kaufman, 2012). In the present study, the alpha coefficient across all five domains in the total co-ed sample was .75.

Openness to experience has been established as a meaningful predictor of creativity (McCrae, 1987; Feist, 1998). In the initial validation of the K-DOCS, all creative behavior domains, except scientific, were associated with openness to experience (Kaufman, 2012). A subsequent validation study demonstrated significant positive associations between all five domains on the K-DOCS and openness to experience in a sample of adults from the US and Poland (McKay, Karwowski, & Kaufman, 2017), providing support for convergent validity. Associations between domains on the K-DOCS and achievements in corresponding creative behavior domains provided additional support for convergent validity (McKay, Karwowski, & Kaufman, 2017). The K-DOCS contributed a measure of domain-specific creativity to the present study, allowing us to investigate the relationship between specific domains on the K-DOCS and creative performance measures.

## Boys Subset

For the 15 boys in the sample, three additional measures were administered.

### *Procedure*

Boys completed the following three additional measures: a Cartoon Caption Task to assess humor production, the Short Grit Scale, and the Rosenberg Self-Esteem Scale to control for self-esteem. The battery of measures was administered to the students in small groups. Measures were administered in the following order: Alternate Uses Test, Cartoon Caption Task, RIBS, KDOCS, Short Grit Scale, and Rosenberg Self-Esteem Scale. The researcher read instructions for each measure aloud to the group and did not proceed until

all participants had completed the section or the allotted time had elapsed. Students had a total of ten minutes to generate their most humorous caption for each of three cartoons and were allowed to flip back and forth among the three within the ten-minute timeframe. Students worked at their own pace on the Grit and Rosenberg Self-Esteem Scales.

*Additional measures for boys*

**Cartoon Caption Task.** Three caption-less cartoons were used to assess participants' humor production as a performance measure of creativity. The cartoons were chosen from a Google image search for "*New Yorker* cartoon caption contest drawings." Cartoons were chosen based on appropriateness for pre-adolescent/adolescent boys and non-specific content. Cartoons were chosen that did not elicit specific content themes or emotions, allowing the participants more flexibility in generating creative captions. The first cartoon depicted a young boy sitting on a rug looking up at an old man, the second depicted a woman and man sitting on a couch attached upside down to the ceiling in a cluttered room, and the third depicted two people hanging onto outside wheels that appeared to be attached to an aircraft in mid-flight. Participants were allowed ten minutes to generate their funniest caption to each of the cartoons provided. Six raters, blind to scores on other tasks, scored the captions on a 1-3 humor scale (1-*Unfunny*, 2-*Somewhat funny*, and 3-*Funny*) using Amabile's Consensual Assessment Technique (Amabile, 1982), and the average score of the six raters was calculated to generate a humor rating for each cartoon for all participants. Amabile's Consensual Assessment Technique, an aggregation of creativity ratings by quasi-expert judges based on their own definitions of creativity, has been validated for use as a creativity assessment. Additionally, a global cartoon caption score was calculated for each participant by

aggregating the averages across the three cartoon captions. Although there is often low internal consistency in caption-less cartoon ratings that are used in humor research, there is evidence of good interrater reliability and validity (Kellner & Benedek, 2016). In the present study, the alpha coefficient across the three cartoon captions was .72, and the interrater reliability was .78 across the six raters.

**Short Grit Scale** (Grit-S; Duckworth, Peterson, Matthews, & Kelly, 2007). The Short Grit Scale (Grit-S) was designed to assess participants' passion and commitment toward long-term goals. This 8-item self-report scale instructs participants to rate the extent to which each statement applies to them on a 5-point scale from 1-*Not like me at all* to 5-*Very much like me*. Examples of statements from the scale include, "I finish whatever I begin" and "I often set a goal but later choose to pursue a different one" (reverse coded). In the initial validation of the Grit Scale, grit was significantly related to self-control (r = .63) and not related to verbal IQ (r = .02) (Duckworth, Peterson, Matthews, & Kelly, 2007). The Short Grit Scale was developed to improve psychometric properties of the Grit Scale but kept the two-factor structure from the original scale: 'consistency of interest' and 'perseverance of effort.' The average global score and both factor scores were used in the present study. Internal consistency has been established for the Short Grit Scale, as indicated by alpha coefficients ranging from .73-.83 (Duckworth & Quinn, 2009). Test-retest reliability of the Short Grit Scale has been demonstrated over the course of one year (r = .68) in middle and high school students (Duckworth & Quinn, 2009). In the present study, the alpha coefficient for items on the Grit Scale was .81.

**Rosenberg Self-Esteem Scale** (Rosenberg, 1986). The Rosenberg Self-Esteem Scale (RSE) is a widely used and well-established 10-item self-report measure designed

to assess global self-esteem. Participants are instructed to respond to each item according to the degree to which they agree, on a scale of 1-*Strongly agree* to 4-*Strongly disagree*. Scores in the present study were adapted to reflect higher scores indicate greater self-esteem. An example of an item on the RSE is, "I feel that I'm a person of worth." The average score was used in the present study as a global score of self-esteem. Good construct validity and internal consistency of the RSE in middle school students has been demonstrated (Hagborg, 1996).

## Specific Hypotheses for Total Co-ed Sample

*Self-perceptions and creative performance measures*

1. It was hypothesized that there would be a significant positive association between the global score on the K-DOCS and both fluency and originality scores on the divergent thinking test.
2. It was hypothesized that there would be a significant positive association between the RIBS and both fluency and originality scores on the divergent thinking test.

*Interrelationships among measures*

3. It was hypothesized that the measures assessing self-perceptions of creativity – the K-DOCS and RIBS – would significantly relate to one other.

*Preliminary analyses*

Associations among the RIBS, divergent thinking, and domains on the K-DOCS in the total co-ed sample were explored. Gender differences in means on creativity measures and in interrelationships among creativity measures were explored. Finally, the associations among creativity measures, humor, and grit in boys were considered preliminary given the small sample size.

## Results

*Data analyses*

One-tailed Pearson product-moment correlations were used to test for significant associations for a priori hypotheses, and two-tailed Pearson product-moment correlations were used to test for significant associations for post-hoc exploratory analyses. Standard multiple regression analyses were computed to examine the joint contribution by the K-DOCS and RIBS in predicting divergent thinking. Hierarchical multiple regression analyses were computed, given the correlation between the predictors, to investigate K-DOCS as a predictor of divergent thinking, controlling for RIBS, and RIBS as a predictor of divergent thinking, controlling for K-DOCS. An alpha level of .05 was used for all statistical tests. Given the power analysis, a correlation of .42 was used to indicate a meaningful relationship for analyses with the total sample. According to Cohen (1992), a Pearson product-moment correlation coefficient of .10 is considered small, a correlation of .30 is considered medium, and a correlation of .50 is considered a large effect size. Descriptive statistics are reported in Tables 1 and 2 for all variables. The data were examined for outliers. One outlier on total divergent thinking fluency in the boys' sample was detected. The outlier was excluded.

*Grade*

Looking at the total co-ed sample, there were no associations between grade and creativity measures. Therefore, grade was not partialled out in the analyses. Looking at the boys' sample, there were no associations between grade and any of the measures, except global humor. There was a significant positive association between grade and

global humor rating, r(13) = .64, $p$ = .01. For analyses that included cartoon caption ratings, grade was partialled out in the present study.

*Self-esteem (boys' sample only)*

There were no associations between any of the creativity measures – global RIBS, global K-DOCS, divergent thinking fluency, and divergent thinking originality – and the Rosenberg Self-Esteem Scale (RSE); therefore, self-esteem was not partialled out in the present study.

**Results for Main Hypotheses**

*Interrelationships among self-perception measures and performance measure of creativity in total co-ed sample*

As hypothesized, there were significant positive relationships between the K-DOCS and both divergent thinking fluency, r(31) = .42, $p$ = .008, and originality, r(32) = .40, $p$ = .01 (See Table 3). These correlations were of medium effect size, and the association between K-DOCS and divergent thinking fluency reached the threshold to indicate a meaningful relationship. There was no relationship between the RIBS and divergent thinking fluency and a small approaching significant relationship between the RIBS and divergent thinking originality. Lastly, as hypothesized, there was a significant meaningful positive association between the RIBS and the K-DOCS, r(32) = .58, $p$ < .001.

**Multiple Regression Analyses**

*Standard multiple regressions*

Standard multiple regression analyses were computed to determine the contributions of the K-DOCS and RIBS to divergent thinking (See Table 4). The two

predictors, K-DOCS and RIBS, explained a significant amount (21%) of the total variance in divergent thinking fluency, $R^2 = .21$, $F(2, 30) = 3.98$, $p = .029$. When examined individually, the K-DOCS, but not the RIBS, significantly predicted total divergent thinking fluency, Beta = .55, $t(30) = 2.77$, $p = .009$. Together, the K-DOCS and RIBS explained 16% of the total variance in divergent thinking originality, $R^2 = .16$, $F(2, 31) = 2.95$, $p = .067$. When examined individually, the K-DOCS, but not the RIBS, predicted total divergent thinking originality (trending), Beta = .40, $t(31) = 1.97$, $p = .058$.

*Hierarchical multiple regressions*

Additionally, hierarchical multiple regression analyses were computed to examine the unique contribution of the RIBS to divergent thinking, controlling for the K-DOCS, and that of the K-DOCS to divergent thinking, controlling for the RIBS, given the correlations between the two predictors. First, after taking the K-DOCS into account, the RIBS did not explain significantly more variance in divergent thinking fluency. After taking the RIBS into account, the K-DOCS explained 20.2% of the total variance in divergent thinking fluency beyond that accounted for by the RIBS. After adding the K-DOCS in step two, the change in variance accounted for by the model was significant, $F(1, 30) = 7.68$, $p = .009$.

When looking at divergent thinking originality, after taking the K-DOCS into account, the RIBS did not explain more variance in divergent thinking originality. After taking the RIBS into account, the K-DOCS explained 10.5% of the total variance in divergent thinking originality beyond that accounted for by the RIBS. After adding the K-DOCS in step two, the change in variance accounted for by the model approached significance, $F(1, 31) = 3.88$, $p = .058$.

## Post-Hoc Exploratory Analyses

*K-DOCS domains, RIBS, and divergent thinking in the total co-ed sample*

Though no hypotheses were developed for specific domains on the K-DOCS, an interesting pattern of results emerged when looking at these creative behavior domains in the total sample. These findings provide important information about creative behavior domains most strongly related to divergent thinking and the RIBS. There were significant moderate correlations between the artistic domain on the K-DOCS and both divergent thinking fluency, $r(31) = .43$, $p = .013$, and originality, $r(32) = .38$, $p = .026$, in the total sample. Similarly, there were significant moderate correlations between the scientific domain of creativity and both divergent thinking fluency, $r(31) = .39$, $p = .023$, and originality, $r(32) = .44$, $p = .009$ (See Table 5). Girls and boys who rated themselves as more creative relative to their peers in artistic and scientific creativity also generated more uses and more original uses on the divergent thinking task.

Additionally, there were significant moderate to large positive associations between the self/everyday domain and the global RIBS, $r(32) = .43$, $p = .012$, the performance domain and the RIBS, $r(32) = .61$, $p < .001$, and the artistic domain and the RIBS, $r(32) = .41$, $p = .015$. These findings suggest that perceptions of creative behavior in expressive domains of creativity, especially performance, are strong predictors of perceptions of creative ideation on the RIBS.

## Gender Differences: Preliminary Results

*Gender differences in means across creativity measures*

First, independent samples t-tests were performed to compare the means between boys and girls on the creativity measures. There were no significant gender differences on

global RIBS, global K-DOCS, domains on the K-DOCS, or divergent thinking originality. There was a significant difference between mean scores on divergent thinking fluency, $t(31) = -2.97$, $p = .006$, such that boys ($M = 23.14$, $SD = 5.50$) generated more uses for objects on the Alternate Uses Test than girls ($M = 17.63$, $SD = 5.09$) (See Table 2).

*Gender differences in patterns of correlations*

There were similar patterns of correlations between the K-DOCS and divergent thinking fluency and originality across boys and girls. Additionally, there were significant positive associations between the K-DOCS and the RIBS across genders, though this relationship was much stronger in the boys' sample (See Table 6). Looking at the correlations between the RIBS and divergent thinking scores in boys, there was a non-significant association between the RIBS and divergent thinking fluency, $r(12) = .33$, $p = .123$, and a large significant positive association between the RIBS and divergent thinking originality, $r(13) = .60$, $p = .01$. In the girls' sample, there were no associations between the RIBS and divergent thinking scores. Both the K-DOCS and RIBS were associated with divergent thinking scores for boys, whereas the K-DOCS, but *not* the RIBS, was associated with divergent thinking for girls.

The Fisher r to Z transformation was performed, and tests of significance yielded no significant differences between genders, except the association between the RIBS and divergent thinking originality approached significance ($Z = 1.71$, $p = .087$). For boys, there was a significant association between the RIBS and divergent thinking originality, whereas for girls, there was not. On the RIBS, boys were more accurate than girls in their self-perceptions of their tendency to generate original ideas.

Looking at behavior domains on the K-DOCS, the gender difference in the association between artistic creativity on the K-DOCS and the RIBS was the only correlation difference that reached significance ($Z = 2.46$, $p = .014$), using the Fisher r to Z transformation (See Table 6). For boys, there was a large significant association between artistic creativity on the K-DOCS and the RIBS, $r(13) = .79$, $p < .001$, but for girls, this association was small and non-significant, $r(17) = .13$, $p = .583$. Boys who see themselves as more artistically creative than their peers also reported more frequent creative ideation on the RIBS.

**Creativity, Humor, and Grit in Boys: Preliminary Results**

*Creativity and humor in boys*

Looking at the global humor composite, there were small to moderate non-significant associations with the K-DOCS, RIBS, and divergent thinking fluency (See Table 7). There were moderate non-significant associations between cartoon A and both RIBS and divergent thinking originality. Most importantly, there was a large significant positive association between humor rating on cartoon A and divergent thinking fluency, $r(12) = .56$, $p = .048$. For humor ratings on cartoons B and C, there were no significant associations with the RIBS, K-DOCS, or divergent thinking scores. Humorous cartoon caption generation on cartoon A may have utility as a performance measure of creativity in boys of this age group, though future studies should replicate the present research question with a larger sample size. Lastly, there were no associations between humor ratings on cartoons A, B, C, or global humor composite and any domain on the K-DOCS.

*Creativity and grit in boys*

First, there was a large significant positive association between the 'perseverance of effort' factor on the Grit Scale and global K-DOCS, r(13) = .64, $p$ = .01 (See Table 7). Interestingly, while there was a moderate non-significant positive correlation between the 'consistency of interest' factor on the Grit and global K-DOCS, there was a moderate non-significant *negative* correlation between the 'consistency of interest' factor and divergent thinking fluency.

## Discussion

Main hypotheses in the present study were partially supported. First, in the total co-ed sample, as hypothesized, there were significant positive relationships between the K-DOCS and both divergent thinking fluency and originality. Adolescents who rated themselves as more creative relative to peers across creative behavior domains also generated more uses and more original uses on the divergent thinking task. The global RIBS was not related to divergent thinking fluency. There was a weak relationship between the RIBS and divergent thinking originality, but this relationship was not considered meaningful. This was a surprising finding as the RIBS was designed to assess creative potential and should relate to divergent thinking ability. Adolescents in the present study who reported more frequent creative thoughts on the RIBS did not generate more uses for objects on the divergent thinking test. Finally, as hypothesized, there was a significant positive relationship between the two self-perception measures of creativity. Adolescents who rated themselves as more creative across behavior domains on the K-DOCS also reported more frequent creative ideation on the RIBS.

### *K-DOCS and divergent thinking*

As hypothesized, adolescents who perceived themselves as more creative on the K-DOCS also performed better on the divergent thinking task. This finding is promising in that it demonstrates that children on the verge of adulthood have insight into their creative potential, as demonstrated by a well-validated and widely used test of divergent thinking. The correlations between global K-DOCS and both fluency and originality reached significance; the correlation between the K-DOCS and divergent thinking fluency reached the threshold to indicate a meaningful relationship. Using multiple regression, the K-DOCS was a significant predictor of divergent thinking fluency at a level of ß = .55. The K-DOCS also predicted divergent thinking originality (trending) at a level of ß = .40. These results provide greater support for the validity of the K-DOCS as a creativity measure than did previous studies. For example, Pretz and Kaufman (2015) did not find associations between the K-DOCS and divergent thinking in college applicants. The present study was the first to look at the association between the K-DOCS and divergent thinking in adolescents. Our findings provide promising information regarding the utility of the K-DOCS to assess creative potential in this age group. The present findings are consistent with those in one previous study that reported an association between a single-item self-rating of creativity and divergent thinking in older adolescents (Furnham, Batey, Anand, & Manfield, 2008).

*RIBS and divergent thinking*

Contrary to our hypothesis, adolescents who reported more frequent creative thinking on the RIBS did not perform better on the divergent thinking task. There was no relationship between global RIBS and divergent thinking fluency, and the relationship between global RIBS and divergent thinking originality was small. Using multiple

regression, the RIBS did not predict divergent thinking fluency or originality in the present study. These findings were unexpected given that previous studies have found associations between the RIBS and divergent thinking in college students and adults. Only one previous study looked at the relationship between the RIBS and divergent thinking in middle childhood (Kim & VanTassel-Baska, 2010). They found a relationship between the RIBS and divergent thinking on the Torrance Test of Creative Thinking-Figural, a drawing task where participants are instructed to combine and complete pictures. Perhaps in pre-adolescents and adolescents, the RIBS assesses creative thinking in visual-spatial tasks rather than verbal tasks. For example, items on the RIBS assess visual creative thinking, such as, "I see a cloud and have an idea for what it looks like" and "I see a pattern (on the sidewalk, or anywhere outside) and see a lot of things in it." Further, there is some promise for the RIBS as an indicator of originality in divergent thinking specifically, as this relationship was small and approached significance in the present study. Plucker, Runco, and Lim (2006) also found a stronger association between the RIBS and divergent thinking originality than between the RIBS and divergent thinking fluency. The RIBS might assess potential for original creative thinking rather than fluency in creative thinking. More studies are needed to assess the relationship between the RIBS and creative performance measures in this age group with larger sample sizes.

*Self-perceptions of creativity: K-DOCS and RIBS*

As hypothesized, there was a large significant positive correlation between the K-DOCS and the RIBS. The K-DOCS and RIBS do not assess identical constructs, as evidenced by results showing that the global score on the K-DOCS predicted divergent

thinking but the global score on the RIBS did not. However, the strong association between these two measures demonstrates that there is overlap in the constructs that they measure. Further, this relationship shows that adolescents' self-perceptions of their creativity are similar across parallel measures. Future studies should explore the unique variance in the K-DOCS.

*K-DOCS domains, RIBS, and divergent thinking*

When looking at the creative behavior domains on the K-DOCS, an interesting pattern of associations emerged with the other creativity measures. There were significant positive associations between both scientific and artistic domains on the K-DOCS and both fluency and originality in divergent thinking. Though specific hypotheses were not generated, the associations between artistic creativity and divergent thinking fluency and between scientific creativity and originality are consistent with theory. The magnitudes of these correlations reached the threshold to indicate meaningful relationships. Items on the artistic domain include behaviors such as, sketching, taking photographs, making sculptures, and appreciating art. For example, "Taking a well-composed photograph using an interesting angle or approach" and "Coming up with my own interpretation of a classic work of art" are two items from the artistic domain. It is possible that those who see themselves as more creative in art-related behaviors also generated more uses on the divergent thinking task because they have a sophisticated ability to make connections between prior experiences and new information. By drawing on previous experiences, they may access more emotional material, allowing them to make more abstract associations, a mechanism proposed by Isen, Daubman, and Nowicki (1987). They may

be able to quickly retrieve memories and imagery to come up with ideas for new sketches, sculptures, or paintings.

Individuals who see themselves as more creative in scientific behaviors, such as "Figuring out how to fix a frozen or buggy computer," "Taking apart machines and figuring out how they work," and "Helping to carry out or design a scientific experiment" generated more original uses on the divergent thinking task. Individuals who see themselves as more creative in mechanical and scientific-related behaviors may have been able to generate more original uses for objects because they enjoy thinking about problems in new ways and are skilled in recombining existing information to develop alternative hypotheses or novel solutions. Kuhn (1962) advanced the belief that recombining ideas and rearranging existing sets of information are important for creative success.

Additionally, when looking at the RIBS, there were significant positive associations between the global RIBS score and the three expressive behavior domains on the K-DOCS – self/everyday, performance, and artistic creativity. The associations between RIBS and self/everyday and performance creativity reached the threshold for a meaningful relationship. The associations between the RIBS and the other two creative behavior domains – scholarly and scientific – were small to medium but did not reach significance. These findings demonstrate that individuals who see themselves as creative in behaviors that involve emotional expression and making connections among visual information also report more frequent original thinking for everyday behaviors on the RIBS. For example, items from the RIBS include, "I have ideas for making my chores or schoolwork easier" and "I make up new words." It makes sense that individuals who

report often coming up with new ideas in these everyday behaviors also see themselves as more creative than their peers in everyday behaviors on the K-DOCS, such as "Helping other people cope with a difficult situation" and "Finding something fun to do when I have no money." Adolescents who enjoy and, therefore, often think about new ways of doing something, have more practice with generating original ideas and are likely to see themselves as more creative than their peers.

*Preliminary gender differences*

In the present study, there were no gender differences on any of the creativity variables except divergent thinking fluency, where boys generated more uses for objects than girls. This was a surprising finding given that Baer and Kaufman's (2008) review of the creativity literature suggested no definitive gender differences in creativity. Looking at divergent thinking tests in particular, there are mixed findings, where some favor men and others favor women; however, results that favor girls and women outnumber those that favor boys and men. Other studies have found no gender differences on creativity tests (Amabile, 1983; Goldsmith & Matherly, 2001).

Looking at pre-adolescents and adolescents in particular, a number of studies have shown no significant gender differences in creativity (Ziv, 1980; Shukla & Sharma, 1986; Rawashdeh & Al-Qudah, 2003). Runco (1986) found no gender differences in fifth through eighth graders on Wallach and Kogan's (1965) divergent thinking test. Mullineaux and DiLalla (2009) reported no gender differences in divergent thinking originality in middle childhood. Only one study looking at creative performance in high school students found that boys outperformed girls using both a verbal and nonverbal test of creativity in India (Rajendran & Krishnan, 1992). Three studies using creative

performance measures found that girls outperformed boys, however. Jaquish and Ripple (1980) found that adolescent girls performed significantly better than adolescent boys on a divergent thinking task adapted from Cunnington and Torrance's (1965) *Sounds and Images*. Two other studies with adolescents using divergent thinking tests in India (Singh, 1979) and in Korea (Kim & Michael, 1995) concluded that girls performed better than boys.

In the present study, different recruitment methods for girls and boys may have biased the results. While the girls in the present study were the remaining participants from a larger longitudinal study and were recruited based on previous participation, the boys were a new sample recruited via a letter mailed home to parents. Fifteen boys and their parents, out of approximately 120, agreed to participate based on their level of interest in the study, as no compensation was provided. This is a very low rate of participation. Therefore, selection bias is one limitation of the present study and a possible explanation for why boys generated more uses than girls on divergent thinking fluency in the present study. Those boys who agreed to participate in this study about creativity may have already had an interest in this area and may have already known themselves to be creative when they agreed to participate. Future studies should look at gender differences in means on creativity measures in this age group with larger sample sizes.

Additionally, future studies should look at gender differences specifically in self-perceptions of creativity. Our study showed no gender differences in self-perceptions of creativity, whereas a study with older adolescents in Germany demonstrated that girls' artistic self-concept was higher than that of boys, and boys' problem-solving and

technical self-concepts, such as figuring out why a vacuum cleaner does not work, were higher than those of girls (Marsh, Trautwein, Ludtke, Koller, & Baumert, 2006). Social and cultural influences would likely affect boys' and girls' self-perceptions of creativity differently across gender-stereotyped behavior domains, so future studies should further explore gender differences in self-perceptions of creativity across cultures.

While there were no significant gender differences in interrelationships among the creativity variables in the present study, some interesting differences emerged that did not reach significance. For boys, there were moderate to large correlations between both global RIBS and global K-DOCS and divergent thinking fluency and originality, with correlations between divergent thinking originality and both RIBS and K-DOCS reaching significance. Boys who see themselves as more creative relative to their peers (K-DOCS) and who report frequently coming up with original ideas (RIBS) also generated more original uses for objects on the divergent thinking test in the present study. For girls, on the other hand, the K-DOCS, but not the RIBS, was associated with divergent thinking. There were no associations between the RIBS and divergent thinking fluency or originality. There was a significant moderate positive association between the K-DOCS and divergent thinking fluency, and the moderate positive association between the K-DOCS and divergent thinking originality approached significance in the girls' subset.

For boys, the RIBS appears to be a promising indicator of divergent thinking originality. Boys in the present study were more accurate than girls in their self-perceptions of their originality of thought. For girls, self-perceptions of creative behaviors were more accurate indicators of actual creative performance than self-perceptions of creative ideation frequency. Results should be interpreted with extreme

caution, however, because the respective sample sizes for boys and girls were very small. Finally, for both boys and girls, the association between the K-DOCS and the RIBS was significant. This was an expected relationship, as the RIBS and the K-DOCS are two parallel measures both designed to assess self-perceptions of creativity.

*Creativity and self-esteem in boys*

Interestingly, we did not find an association between self-esteem and any creativity variable in the present study. This finding was surprising given that most studies in the literature did find associations between self-esteem and creativity, such as one study with Chinese middle school students (Wang & Wang, 2016) and others with adult samples. It is possible that adolescence is one life stage when self-esteem and creativity do not relate, but more studies are needed to replicate these findings. Jaquish and Ripple (1980) also reported that self-esteem was not related to divergent thinking in adolescents. In adolescence, self-esteem may fluctuate more than in childhood and adulthood. Further, in adolescence, the sources of one's self-worth are in flux and may be more contingent on social influences and one's sense of belonging, rather than other important skills like creativity and resiliency. In adulthood, one may begin to see the value of creativity and innovation in the workplace, and self-perceived creativity may become more associated with self-esteem.

*Preliminary results: Creativity, humor, and grit in boys*

The associations between humor on cartoon captions and the other creativity measures in the present study yielded only one significant finding – the correlation between humor on cartoon A and divergent thinking fluency. Boys who generated funnier captions on cartoon A, according to the raters, also generated more uses for

objects on the divergent thinking task. This relationship is consistent with that found in a sample of college students, where the significant relationship between cartoon caption humor and divergent thinking fluency was small (r = .17) (Kellner & Benedek, 2016). Treadwell (1970) found a significant positive correlation between humor on cartoon captions and three creativity measures, including the Remote Associates Test (Mednick, 1962). Our young sample of pre-adolescents and adolescents, small set of cartoons (three), and limited (three-point) humor rating scale may have affected our findings, as Treadwell (1970) used a sample of college students, included a set of 11 cartoons, and his raters used a five-point humor rating scale to score cartoon captions. Nusbaum, Silvia, and Beaty (2017) found that openness to experience was a significant predictor of humor ratings on cartoon captions in a sample of college students. They used three *New Yorker* cartoons, as we did, and a five-point humor rating scale, as Treadwell did.

The association between humor on cartoon A and divergent thinking fluency in boys should be interpreted with caution, as it was the only significant finding and our sample size was very small. It is possible that cartoon A, the image of a young boy looking up at an old man, was the most appropriate and relatable cartoon image for this age group. The other two cartoon illustrations were more fantastical and required the individual to make larger leaps from real world experience. Specifically, it may be easier for adolescent boys to generate a funny caption to a simple, concrete stimulus. Conversely, it may be more difficult to generate a funny caption when one already has to use divergent thinking to imagine what it would be like to be in a novel situation, such as sitting on a couch upside down on the ceiling. Given that previous studies that found more promising results with cartoon captions used samples of college students, it is likely

that we would have found more interesting results with an older sample of students. Alternatively, it is possible that there was too large an age gap between participants in our study and the caption raters. We may have found more promising results had we recruited raters of a similar age to the boys in the present study.

It is possible that a humor appreciation measure, such as that from the Multidimensional Sense of Humor Scale for Children (MSHSC; Dowling & Fain, 1999), as used in Christian's (2012) study with 9-13-year-olds, would be a more age-appropriate measure and would reveal more promising results for these young adolescents. This would be a valid alternative to the cartoon caption task, as Treadwell (1970) found that self-reported appreciation of humor significantly correlated with cartoon caption humor ratings.

In looking at grit and creativity, we found one large significant positive correlation between the 'perseverance of effort' factor on the Grit Scale and global self-perceptions of creativity on the K-DOCS. Post-hoc exploratory analyses revealed large significant correlations between the 'perseverance of effort' factor and self/everyday and performance creativity on the K-DOCS. This association was surprising given that previous studies have not found associations between grit and creativity (Kaufman, 2017). Duckworth and Quinn (2009), however, found that openness to experience was significantly associated with the 'perseverance of effort' factor, but the effect size was small ($r = .14$, $p < .001$). Theoretically, the relationship between perseverance and creativity makes sense to some degree in that creative individuals may need patience and persistence to figure out the best solution to a problem. Creative individuals may need to be open to diverse perspectives, so perseverance might help them keep looking for new

or contradictory pieces of information. However, Prabhu, Sutton, and Sauser (2008) concluded that perseverance and creativity were not related.

Further, it was interesting that the 'consistency of interest' factor on the Grit Scale was negatively correlated with divergent thinking fluency in the present study, though this relationship did not reach significance. This association suggests that individuals who maintain focus on one project for a long time or who pursue a single goal at a time generate fewer uses on the divergent thinking task. This makes sense, as these individuals may have difficulty thinking of new ideas given their committed investment in a single project. This correlation should be interpreted with caution given the small sample size. Grittier individuals may be more likely to accomplish long-term creative feats but less likely to demonstrate more immediate and spontaneous creative thinking.

*Implications*

Results of the present study suggest that self-perceptions of creativity on the K-DOCS can be used as an indicator of actual creative performance in adolescents. Boys and girls who see themselves as more creative across behavior domains relative to their peers also generated more and more original ideas on a divergent thinking task. The correlation between global score on the K-DOCS and divergent thinking fluency reached the threshold of a meaningful association. This is an important contribution to the field, as correlations of this magnitude in this age group have not been found in previous studies. Results of the present study support the utility of the K-DOCS as a valid indicator of creative performance in adolescents.

Surprisingly, when looking at the RIBS, we did not find a similar pattern of associations. These contrasting findings may have been due to the type of instruction and

response format on the two measures. On the K-DOCS, participants rate their creativity on a 1-5 scale relative to their peers across various creative behaviors, whereas on the RIBS, participants indicate how frequently they come up with original ideas on a 0-4 scale in various everyday behaviors. Adolescents may have an easier time thinking about themselves compared to their peers, as social comparison is highly salient in this age group, whereas they may have difficulty accurately reporting on how often they think in creative ways. It would be interesting to look at the RIBS items with a response format similar to that on the K-DOCS, where participants rate themselves compared to their peers. Additionally, the RIBS may more accurately assess creativity on visual tasks rather than verbal tasks, like the Alternate Uses Test. This is an important question for future studies.

*Limitations*

The limitations of the present study should be addressed. First, the obtained sample size of 34 was small, so the results from the present study should be interpreted with caution. A larger sample size would increase power and allow us to identify meaningful smaller correlations. Additionally, participants in the present study were enrolled in elite private schools where socioeconomic status is high. Thus, the small sample size combined with the sample characteristics limited the generalizability of the present study's findings. Further, the sample sizes for the boys and girls, 15 and 19, respectively, were extremely small. Thus, the analyses exploring gender differences in means of creativity variables and in interrelationships among creativity variables are preliminary, and more studies are needed with larger samples of boys and girls to explore similar questions. Finally, as noted above, there was likely selection bias in boys'

participation. Boys were recruited for the present study with a general information letter sent home to parents. Boys and their parents who agreed to participate were likely already interested in the topic of creativity.

*Future Directions*

Future studies should examine similar research questions in larger, more nationally representative samples of adolescent boys and girls to generalize the association between self-perceptions of creativity and creative performance in this age group. Additionally, future studies should explore gender differences in means on divergent thinking and in the interrelationships among creativity measures in larger and more diverse samples. It would be interesting to look at gender differences in the association between self-perceptions of creativity and creative performance across age cohorts as well. Future studies should replicate our findings that self-esteem and creativity are not related in adolescents. Finally, future research should address how these self-perceptions of creativity and creative performance measures relate to other important abilities in this age group, such as interpersonal skills, emotion regulation, self-control, and resiliency.

Table 1.

*Descriptive Statistics of the Total Co-ed Sample*

| **Measure** | **n** | ***M*** | ***SD*** | **Range** |
|---|---|---|---|---|
| **Grade** | 34 | 8.21 | 1.27 | 7-11 |
| **Divergent thinking** | | | | |
| Fluency | 33 | 19.97 | 5.88 | 10-33 |
| Originality | 34 | 3.97 | 2.92 | 0-10 |
| **RIBS - global** | 34 | 2.18 | .64 | .76-3.20 |
| **K-DOCS – global** | 34 | 3.29 | .49 | 2.18-4.08 |
| 1-Self/everyday | 34 | 3.5 | .43 | 2.55-4.45 |
| 2-Scholarly | 34 | 3.21 | .64 | 2.09-4.82 |
| 3-Performance | 34 | 3.26 | .89 | 1.10-4.70 |
| 4-Scientific | 34 | 3.07 | .76 | 1.11-4.44 |
| 5-Artistic | 34 | 3.38 | .71 | 2.0-4.56 |

*Note.* RIBS and K-DOCS global = the mean was used for global scores on each of these measures.

Table 2.

*Descriptive Statistics for Boys and Girls Subsets*

| **Measure** | **Boys** | | | **Girls** | | |
|---|---|---|---|---|---|---|
| | *M* | *SD* | Range | *M* | *SD* | Range |
| **Grade** | 8 | .93 | 7-10 | 8.37 | 1.50 | 7-11 |
| **Divergent Thinking** | | | | | | |
| Fluency | 23.14 | 5.50 | 16-33 | 17.63 | 5.09 | 10-26 |
| Originality | 4.40 | 2.32 | 1-9 | 3.63 | 3.34 | 0-10 |
| **RIBS – global** | 2.24 | .62 | 1.36-3.16 | 2.14 | .66 | .76-3.2 |
| **K-DOCS – global** | 3.41 | .45 | 2.48-4.08 | 3.19 | .51 | 2.18-4 |
| 1-Self/everyday | 3.47 | .45 | 2.55-4.27 | 3.53 | .42 | 2.82-4.45 |
| 2-Scholarly | 3.38 | .68 | 2.09-4.82 | 3.08 | .58 | 2.09-3.91 |
| 3-Performance | 3.58 | .88 | 1.10-4.7 | 3.01 | .83 | 1.2-4.5 |
| 4-Scientific | 3.19 | .72 | 1.78-4.44 | 2.98 | .80 | 1.11-3.89 |
| 5-Artistic | 3.42 | .71 | 2.33-4.56 | 3.35 | .72 | 2-4.44 |
| **Cartoon – global** | 1.71 | .40 | 1.17-2.45 | | | |
| Cartoon A | 1.67 | .48 | 1-2.33 | | | |
| Cartoon B | 1.86 | .51 | 1.17-2.67 | | | |
| Cartoon C | 1.62 | .51 | 1-2.5 | | | |
| **Grit – global** | 3.08 | .72 | 1.5-4 | | | |
| Grit – perseverance | 3.75 | .70 | 2-4.75 | | | |
| Grit – consistency | 2.42 | .88 | 1-3.75 | | | |
| **RSE – global** | 2.97 | .66 | 1.5-3.7 | | | |

*Note.* n = 15 in boys' sample, except divergent thinking fluency is n = 14 because outlier was removed.
n = 19 in girls' sample; girls did not complete the cartoon caption task, Grit Scale, or RSE.

Table 3.

*Pearson Product-Moment Correlations Among Creativity Variables in Total Co-ed Sample*

| | **Divergent thinking** | | **K-DOCS** | **RIBS** |
|---|---|---|---|---|
| | Fluency[a] | Originality | | |
| **Divergent thinking** | | | | |
| Fluency[a] | 1.00 | | | |
| Originality | .68** | 1.00 | | |
| **K-DOCS – global** | .42** | .40** | 1.00 | |
| **RIBS – global** | .09 | .23† | .58** | 1.00 |

[a] indicates n = 33
n = 34

† $p < .10$
* $p \leq .05$
** $p \leq .01$

Table 4.

*Summary of Standard Multiple Regression Analyses for Divergent Thinking*

| | **Dependent Variables** | | | | | |
|---|---|---|---|---|---|---|
| **Predictors** | *Divergent Thinking Fluency*[a] | | | *Divergent Thinking Originality*[b] | | |
| | B | SE(B) | ß | B | SE(B) | ß |
| RIBS | -2.107 | 1.823 | -.229 | .003 | .932 | .001 |
| K-DOCS | 6.656 | 2.401 | .549 | 2.396 | 1.216 | .399 |

[a] n = 33; *Note.* $R^2$ = .21
[b] n = 34; *Note.* $R^2$ = .16

Table 5.

*Pearson Product-Moment Correlations Between K-DOCS Domains and Creativity Variables in Total Co-ed Sample*

| | **Divergent Thinking** | | **RIBS** |
|---|---|---|---|
| | Fluency[a] | Originality | |
| **K-DOCS –** | | | |
| 1-Self/everyday | -.04 | .02 | .43* |
| 2-Scholarly | .31† | .29 | .29 |
| 3-Performance | .32† | .25 | .61** |
| 4-Scientific | .39* | .44** | .31† |
| 5-Artistic | .43* | .38* | .41* |

[a] indicates n = 33
n = 34

† $p < .10$
* $p \leq .05$
** $p \leq .01$

Table 6.

*Preliminary Pearson Product-Moment Correlations Among Creativity Variables in Boys (Girls)*

| | **Divergent thinking** | | **RIBS** |
|---|---|---|---|
| | Fluency[a] | Originality | Global |
| **Divergent thinking** | | | |
| Fluency | 1.00 | | |
| Originality | .60* (.83**) | 1.00 | |
| **RIBS –** global | .33 (-.12) | .60** (.04) | 1.00 |
| **K-DOCS –** global | .36 (.39*) | .49* (.33†) | .75** (.48*) |
| 1-Self/everyday[b] | .11 (-.11) | .26 (-.11) | .53* (.36) |
| 2-Scholarly[b] | .04 (.42†) | .08 (.40†) | .33 (.24) |
| 3-Performance[b] | .30 (.15) | .56* (.03) | .61* (.64**) |
| 4-Scientific[b] | .29 (.47*) | .28 (.51*) | .19 (.38) |
| 5-Artistic[b] | .42 (.48*) | .39 (.38) | .79** (.13) |

n = 15 (n = 19)
[a] indicates n = 14 (n = 19)
[b] indicates 2-tailed tests

† $p < .10$
* $p \leq .05$
** $p \leq .01$

Table 7.

*Preliminary Pearson Product-Moment Correlations: Creativity Variables with Humor and Grit in Boys*

| | **Cartoon Average**[a] | **Cartoon A**[a] | **Cartoon B**[a] | **Cartoon C**[a] | **Grit** | | |
|---|---|---|---|---|---|---|---|
| | | | | | Global | Perseverance | Consistency |
| **Divergent thinking** | | | | | | | |
| Fluency[b] | .33 | .56* | .26 | -.15 | -.16 | .18 | -.40 |
| Originality | .19 | .39 | -.03 | .04 | .17 | .36 | -.01 |
| **K-DOCS** – global | .25 | .05 | .17 | .28 | .50† | .64** | .31 |
| **RIBS** – global | .43 | .46 | .09 | .35 | .20 | .29 | .10 |

[a] indicates that grade in school was controlled
$n = 15$
[b] indicates n = 14

† $p < .10$
* $p \leq .05$
** $p \leq .01$

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