Contents lists available at ScienceDirect





Verbal fluency and creativity: General and specific contributions of broad retrieval ability (Gr) factors to divergent thinking $\stackrel{\text{trip}}{\sim}$



Paul J. Silvia^{*}, Roger E. Beaty, Emily C. Nusbaum

Department of Psychology, University of North Carolina at Greensboro, United States

ARTICLE INFO

Article history: Received 1 June 2012 Received in revised form 20 May 2013 Accepted 20 May 2013 Available online 13 June 2013

Keywords: Creativity Divergent thinking Verbal fluency Intelligence Broad retrieval ability

ABSTRACT

The Cattell-Horn-Carroll (CHC) model of intelligence views creativity as a first-level factor within the second-level factor of broad retrieval ability (Gr), alongside other first-level abilities such as ideational fluency and word fluency. Traditional methods of measuring creativity, however, confound idea quality with idea quantity, which might exaggerate the relationship between creativity scores and verbal fluency factors. Participants (n = 131 adults) completed two divergent thinking tasks (unusual uses for a rope and a box), which were scored using newer methods that effectively separate creativity (scored via subjective ratings) and fluency (scored as number of responses). They then completed 16 verbal fluency tasks that assessed six lower-order Gr factors: word fluency, associational fluency, associative flexibility, ideational fluency, letter fluency, and dissociative ability. Viewed singly, many of the lower-order factors significantly predicted creative quality and fluency. General Gr had substantial effects on creative quality (standardized $\beta = .443$) and fluency ($\beta = .339$) in a higher-order model as well as in a bifactor model (quality $\beta = .380$, fluency $\beta = .327$). Moreover, general Gr was the only significant predictor in the bifactor model, suggesting that it, not the specific factors, was most important. All effects were essentially the same after controlling for typing speed and vocabulary knowledge. The findings thus support the CHC view of creativity/originality as a lower-order component of Gr, illuminate the relationships between creativity and first-level Gr factors, extend the study of creativity and intelligence beyond fluid intelligence, and further indicate that creativity is more closely tied to cognitive abilities than creativity research has yet recognized.

© 2013 Elsevier Inc. All rights reserved.

1. Introduction

How do people come up with clever and creative ideas, and why are some people better at it than others? Most research on these questions has used divergent thinking tasks, which prompt people to generate ideas than can be scored, based on a variety of systems, for creativity (Kaufman, Plucker, & Baer, 2008; Plucker & Renzulli, 1999). In the Cattell–Horn–Carroll

E-mail address: p_silvia@uncg.edu (P.J. Silvia).

(CHC) model of cognitive abilities (McGrew, 2005, 2009), idea generation tasks fall under the second-level factor known as *broad retrieval ability*, abbreviated as Gr (Carroll, 1993). But as many researchers have argued, traditional methods for assessing divergent thinking yield only a fluency score—the simple number of valid responses—or yield quality scores that are confounded with quantity (Hocevar, 1979b; Michael & Wright, 1989; Silvia et al., 2008). Two problems result: (1) divergent thinking tasks might resemble verbal fluency tasks too closely, leading to questions of construct validity, and (2) the weak correlations between creativity and intelligence observed in past work (Kim, 2005) might be due to weak assessment of creativity, not to a genuinely small effect size.

The present research thus addresses two issues. First, when newer assessment methods that effectively dissociate creativity and fluency are used, how does creativity fit within



[†] We are grateful to Kathryn Aliff, Gabrielle Dailey, Parnia Haj-Mohamadi, Pegah Haj-Mohamadi, Mary Amanda Harmon, Casey Kelly, Jennifer Schenker, Molly Schloss, Tess Warren, and Alireza Zibaie for assisting with data collection and scoring.

^{*} Corresponding author at: Department of Psychology, P. O. Box 26170, University of North Carolina at Greensboro, Greensboro, NC 27402-6170, United States.

^{0160-2896/\$ –} see front matter @ 2013 Elsevier Inc. All rights reserved. http://dx.doi.org/10.1016/j.intell.2013.05.004

the Gr domain? The dominance of fluency-based scoring systems available at the time of Carroll's (1993) landmark analysis might have inflated the association of divergent thinking and Gr. Second, how does divergent thinking relate to both the Gr factor and to its first-level factors? What first-level factors contribute the most to generating creative ideas? In the present research, people completed two divergent thinking tasks and 16 Gr tasks that mapped on to six lower-order Gr factors: word fluency, associational fluency, associative flexibility, ideational fluency, letter fluency, and dissociative ability. Using structural equation modeling, we estimated the contributions of the lower-order factors and the higher-order Gr factor—modeled using higher-order and bifactor models—to both the quality and quantity of responses to the divergent thinking tasks.

2. The creativity-and-intelligence debate

Creativity research has had an ambivalent relationship with the construct of intelligence. Guilford, in a program of work that launched modern creativity research, extensively studied how both convergent and divergent modes of thought fit into his Structure of Intellect Model (Guilford, 1967), which contained many novel tasks for measuring creativity. Later creativity researchers, however, contended that creativity and intelligence are essentially unrelated (Getzels & Jackson, 1962). Wallach and Kogan's (1965) work on creativity and intelligence in children, a touchstone in this field, found a correlation of only r = .09between measures of divergent thinking and intelligence. Work since then supported their view—a meta-analysis by Kim (2005) found a weighted average correlation of r = .17 between intelligence and divergent thinking. For this reason, most reviews conclude that creativity and intelligence are at most weakly related (Kaufman, 2009; Kaufman & Plucker, 2011; Kim, Cramond, & VanTassel-Baska, 2010; Runco, 2007; Weisberg, 2006).

In our recent work, we have argued that this debate deserves a new look (Nusbaum & Silvia, 2011; Silvia & Beaty, 2012). Using the Cattell–Horn–Carroll model as a framework, we have proposed that creativity and intelligence are more closely linked than past research has found. Several methodological factors have caused underestimates of the creativity–intelligence relationship. First, most studies have measured only a few individual tasks and then analyzed the observed scores. Assessing creativity and intelligence as latent variables yields higher effect sizes because task-specific error variance is modeled appropriately (Kline, 2011; Silvia, 2008a). In Wallach and Kogan's (1965) classic study, for example, the observed correlation of r = .09 increased to r = .20 when the data were reanalyzed with latent variable models (Silvia, 2008b).

Second, and most relevant to the present research, traditional methods of measuring divergent thinking have struggled with dissociating *fluency* (the number of responses to the divergent thinking tasks) from *creative quality* (the originality or merit of those responses). The best known approaches to divergent thinking assessment use some form of uniqueness scoring: people receive a point for each response they gave that no one else in the sample gave (Wallach & Kogan, 1965) or that doesn't appear on a list of common responses (Torrance, 2008). Since these methods were published, many researchers have criticized them for confounding fluency and creativity: people who give more responses are likely to have more unique responses (Clark & Mirels, 1970; Dixon, 1979; Hocevar, 1979a, 1979b; Hocevar & Michael, 1979; Michael & Wright, 1989; Plucker, Qian, & Wang, 2011; Silvia et al., 2008; Speedie, Asher, & Treffinger, 1971). In fact, the correlation between fluency and creativity is quite high in several gold-standard data sets, including r = .89 in Wallach and Kogan's (1965) landmark study (see Silvia, 2008b) and r = .88 in the most recent norms for the Torrance Tests of Creative Thinking (Torrance, 2008). As a result, many researchers use only fluency scores when assessing divergent thinking (e.g., Batey, Chamorro-Premuzic, & Furnham, 2009; Preckel, Holling, & Wiese, 2006; Preckel, Wermer, & Spinath, 2011).¹

3. Divergent thinking and Gr

The confounding of fluency and creativity is interesting for several reasons. For one, it sheds new light on the modest relationships between divergent thinking and intelligence (Kim, 2005; Wallach & Kogan, 1965). Divergent thinking tests are probably the most widely used tools for measuring creativity, and an extensive literature provides evidence for their validity (Kaufman et al., 2008; Ma, 2009; Plucker, 1999; Silvia et al., 2008). Nevertheless, in his review of the originality/creativity (FO) factor, Carroll (1993) noted substantial differences in test administration: researchers "tend to give insufficient information as to whether subjects are made aware that they are being tested for originality or creativity, or as to whether subjects are instructed to try to give original or creative responses" (p. 429). In fact, researchers commonly don't inform participants to be creative (e.g., Runco & Acar, 2010). When such tasks are then scored for fluency, it seems hard to claim that the scores measure "creative ability" or "creative potential" instead of ideational fluency. Much of the evidence supporting the claim that creativity and intelligence are weakly related is thus founded on questionable measures of creativity.

Furthermore, if divergent thinking scores have historically been confounded with fluency, then it isn't surprising that Carroll's (1993) analysis found that they formed a lower-order factor of Gr alongside factors such as word fluency, ideational fluency, and associational fluency. Most models of the Gr domain include a first-level factor of creativity (Horn & Blankson, 2005; Kaufman, Kaufman, & Lichtenberger, 2011; McGrew, 2005), and the most typical measures of creative ability are divergent thinking tasks (Carroll, 1993; Runco, 2007). It is thus possible that conventional methods of assessing divergent thinking exaggerate the relationship between Gr and creativity. As noted earlier, omitting instructions to "be creative" and scoring the tasks in ways that confound creativity and fluency yields tasks that resemble ideational fluency tasks. This raises a key question for a CHC approach to creativity: is creativity still strongly

¹ The more common method is Wallach and Kogan's (1965) uniqueness scoring: people get a point for each response they gave that no one else gave or that falls under a cut-off (e.g., one point for a response that no more than 5% of the sample gave). The confounding of creativity and fluency is a problem, but the most fatal problem with this method, in our view, is that estimates of creativity are doubly sample-dependent. First, each person's level of creativity depends on the other people in the sample. Second, as the sample size increases, creativity scores decline, so the task's "difficulty" increases with the sample size. Both forms of sample dependency are obviously undesirable.

دريافت فورى 🛶 متن كامل مقاله

- امکان دانلود نسخه تمام متن مقالات انگلیسی
 امکان دانلود نسخه ترجمه شده مقالات
 پذیرش سفارش ترجمه تخصصی
 امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
 امکان دانلود رایگان ۲ صفحه اول هر مقاله
 امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
 دانلود فوری مقاله پس از پرداخت آنلاین
 پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات
- ISIArticles مرجع مقالات تخصصی ایران