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Understanding Fluency and Originality: A latent variable perspective

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ABSTRACT

Divergent thinking tasks, which require participants to generate multiple original ideas, are perhaps the most widely used measures in the creativity literature. Participant performance on divergent thinking tasks is often interpreted in terms of multiple factors, with Fluency and Originality being two of the most commonly utilized. Fluency refers to the quantity of ideas a participant generates, and Originality refers to the relative novelty of each of those ideas. In this study, the Uses of Objects Task is employed, and a comparison of three confirmatory factor models is undertaken on the resulting data to ascertain the nature of the constructs of Fluency and Originality as well as the relation between them. Moreover, Originality is operationalized in this investigation in terms of semantic distance, and calculated via latent semantic analysis (LSA). Results suggest that Fluency and Originality are best conceptualized as distinct but positively correlated constructs, and that Originality, when derived through LSA, can exhibit greater construct reliability than Fluency.

1. Introduction

Since at least the middle of the 20th century, creativity has been touted in scholarly literature as a critical capacity of the human mind (Guilford, 1950; Hudson, 1968; Runco & Albert, 2010). Throughout the history of creativity research, measuring the creative abilities of individuals, and using those measurements to understand the nature of creativity, has been a widely held goal (Plucker and Runco, 2001; Sternberg & Lubart, 1992). In the literature on creativity, divergent thinking tasks, which require participants to generate multiple original ideas, are perhaps the most widely used measure (Hudson, 1968; Lewis & Lovatt, 2013; Plucker & Makel, 2010). While divergent thinking tasks are not generally considered to tap creativity per se, the potential usefulness of divergent thinking tasks in understanding the creative potential of an individual is attested to by the large body of work pertaining to their predictive validity, which can be as good as the predictive validity associated with some tests of intelligence (e.g., Carson, Peterson, & Higgins, 2005; Runco, Millar, Acar, & Cramond, 2010). For example, scores on divergent thinking tasks can be predictive of creative achievements and activities, and remain somewhat stable over the lifespan (Millar, 2002; Torrance, 1972; Torrance & Safter, 1989).

Importantly, performance on divergent thinking tasks is often assessed in terms of multiple components or factors, based on the way responses are scored (Silvia, Martin, & Nusbaum, 2009). Two of the most often used, and potentially most important factors of divergent thinking are Fluency and Originality, where Fluency refers to the ease at which a participant

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can generate a large quantity of ideas, and Originality to the comparative novelty of those generated ideas (Hocevar, 1979; Runco & Mraz, 1992; Silvia, 2008). Because these two components of divergent thinking are often derived and utilized in research, the relation between Originality and Fluency has been a central question in creativity research (e.g., Hocevar, 1980; Silvia, 2008), with wider relevance to diverse pursuits such as applicant selection for jobs (e.g., Batey, Rawles, & Furnham, 2009) and educational interventions (Alfonso-Benlliure, Meléndez, & García-Ballesteros, 2013). However, little consensus exists as to the direction and strength of this relation (Runco, 2010). For example, some scholars (e.g., Benedek, Fink, & Neubauer, 2006) have found that Fluency and Originality are highly separable, or even come at the expense of one another. In contrast, others (e.g., Silvia, 2008) have argued that Fluency and Originality are strongly positively related constructs, and that individuals who generate highly original ideas are also likely to be highly fluent at idea generation. In this investigation, a latent variable perspective is adopted to better understand the nature of Fluency, Originality, and the relation between them.

In psychometrics, the distinction is made between observed variables, which are raw measurements taken from a test or task and have unaccounted-for measurement error within them, and latent variables, which are derived via latent variable models (e.g., confirmatory factor analysis, structural equation modeling) that account for measurement error (Hancock & Mueller, 2006). This is highly relevant to research on divergent thinking and creativity because the measurement error associated with divergent thinking tasks can at times be substantial (Piffer, 2012). This measurement error can cause relations between observed variables to be falsely attenuated or augmented, depending on the situation (Cole & Preacher, 2013). However, if a latent variable model is used, the measurement error associated with each observed or indicator variable is accounted for, and therefore does not affect the constructs being investigated (Hancock & Mueller, 2006). In the literature on divergent thinking and creativity, the relation between observed variables representing Originality and Fluency has been examined (Alliger, 1988; Benedek et al., 2006; Hocevar, 1979; Runco & Okuda, 1991). However, latent variable models of Fluency, Originality, and divergent thinking have appeared much less often (e.g., Silvia, 2008, 2011).

1.1. Fluency

In research pertaining to divergent thinking and creativity, tasks are most often scored and operationalized in terms of Fluency (Guilford, 1967; Plucker & Makel, 2010). Indeed, Fluency scores have often solely been used to represent divergent thinking, or even creativity in general (e.g., Turner, 1999). This trend may have arisen because Fluency can be operationalized objectively and easily by counting the number of ideas that a participant generates. These count scores can be further analyzed using a variety of statistical procedures, and have demonstrated their usefulness in testing hypotheses related to divergent thinking and creativity (Benedek et al., 2006; Torrance, 1972). However, while Fluency scores account for the quantity of ideas that a participant generates on a divergent thinking task, they do not account for the original quality of those ideas.

1.2. Originality

Potentially more closely tied theoretically to creativity than Fluency; Originality has been considered a critical factor of divergent thinking for decades (Sternberg & Lubart, 1992; Torrance, 1972; Wilson, Guilford, & Christensen, 1953). Throughout that time, Originality has been operationalized and scored in a variety of ways, with the most common being through the use of a panel of raters (e.g., Sternberg, 2006a). Sometimes, the participants themselves are also asked to rate the Originality of their generated ideas (e.g., Silvia, 2011). However, the highly subjective nature of these scoring methods for Originality has led to problems. Specifically, Originality scores of the same idea from different raters can differ widely, even when the raters are explicitly trained (Sternberg, 2006b). This compromises measure reliability, and makes it very difficult to fruitfully use Originality scores to predict creative performance outside the laboratory (Forster & Dunbar, 2009).

In response to this problem, researchers have turned to some more objective measures of Originality. One such method is the use of algorithms that produce Originality scores based on the number of participants in a given sample that produced the same idea (e.g., Vargas Hernandez, Schmidt, & Okudan, 2013). Thus, if a participant is the only one in a sample to have generated a particular idea, that idea will receive the maximum score, while ideas that are more common will receive lower scores. While this method is more objective than using raters, it is still highly sample dependent. Indeed, the same idea, generated by different participants in different samples, can receive vastly different originality scores.

Another more recently formulated method of scoring the originality of verbal ideas, is through the use of semantic networks (e.g., Acar & Runco, 2014; Bossomaier, Harré, Knittel, & Snyder, 2009). This method uses the semantic structure of a given language (e.g., English) to operationalize Originality. Specifically, the more semantically distant a generated idea is from a prompt, the higher originality score it will receive. While this concept has existed in the creativity literature for some time (Mednick, 1962), the empirical usage of automated, computerized, semantic networks to operationalize Originality is a more recent endeavor (Bossomaier et al., 2009). This semantic-network based method is more objective, and potentially more useful, than algorithms for Originality based on participant responses in a given sample, because semantically derived Originality scores are not sample dependent and can therefore be compared across samples or studies. Interestingly, among those researchers who use semantic networks to operationalize Originality, multiple methods have been used, with most researchers using measures of semantic distance derived from word co-occurrence or word associations based on human raters (e.g., Acar & Runco, 2014; Mednick, 1962). However, these techniques may hold some of the same pitfalls as previously used methods for operationalizing Originality, in that they are heavily dependent on the sample of raters used to produce