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Relationships between intelligence and creativity in gifted and non-gifted children

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ABSTRACT

The interplay between creativity and intelligence has been extensively documented for decades. However, there is currently no consensus on how these constructs are related. The threshold hypothesis states that intelligence fosters creativity only below a 120 cut-off IQ. To clarify these issues, the relationships between intelligence and creativity were studied, using respectively WISC-IV and EPoC (Evaluation of Potential Creativity), in 338 children including 118 intellectually gifted children (IQ ≥ 130) and 220 non-gifted children (IQ < 130). Weak correlations were found between intelligence and creativity. However, high verbal ability children (Verbal Comprehension Index ≥ 130) showed significantly higher scores on verbal tasks of EPoC. Additionally, the threshold effect was only found for correlations between verbal integrative thinking and perceptual reasoning or processing speed. Thus, the findings indicate that the threshold effect depends on the type of process involved in the expression of creativity (divergent or integrative thinking), the domain of creativity (verbal or graphic), and the factors of intelligence considered. Taken together, these results suggest that giftedness should be conceptualized by specifying the cognitive domain of high ability, rather than focusing on a general conception of intelligence, and by distinguishing intellectual and creative giftedness.

1. Introduction

Historically, giftedness has been conceptualized on the basis of performance on intelligence tests. For example, the World Health Organization criteria for giftedness rely solely on the basis of general intelligence (total IQ ≥ 130). However, dimensional approaches to intelligence extend this definition to different types of intellectual giftedness based on intra-individual profiles (Achter, Lubinski, & Benbow, 1996; Milgram & Hong, 1999). In this vein, some authors have argued that creativity is the expression of "true" giftedness and deplore the fact that this concept relies on total IQ. For example, Gowan (1971) considers giftedness as an ability to produce novelty in a domain. Several authors consider high level of creativity as a particular form of giftedness (Heller, 1994; Sarouphim, 2001; Sternberg & Lubart, 1993; Winner, 2000). Therefore, creative potential is seen as a good candidate to complete the identification of giftedness (Naglieri & Kaufman, 2001; Treffinger, 1980). Furthermore, Renzulli (1986) proposed to distinguish between two types of giftedness. The first type – academic giftedness – includes individuals identified by conventional IQ tests, such as the Wechsler scales, which are most often used to justify the implementation of special educational programs. The second type – creative–productive giftedness – refers to the ability to produce original and adapted work. This conception has been supported by a large number of studies that have identified specific aspects of creative cognition not captured by intelligence tests, such as divergent thinking, mental flexibility and the capacity to encode, link and combine information in unusual ways (Bink & Marsh, 2000; Getzels & Jackson, 1962). As emphasized by Besançon, Lubart and Barbot (2013), children and adults who have creative potential and/or creative talent do not necessarily have high intellectual ability, and those who are intellectually gifted are not necessarily creatively gifted (see also Guignard & Lubart, 2007 for empirical support).

Creativity is seen as the capacity to achieve a production that is both novel and adapted to its context (Lubart, 1994). It is noteworthy that divergent thinking, or the capacity to generate diverse and numerous ideas, is commonly used to investigate individual differences in creativity (Guilford, 1950). Individuals are asked to provide as many as possible ideas to open-ended tasks in a limited time. Runco and Albert (1985) reported that divergent thinking is qualitatively and quantitatively different in gifted (IQ ≥ 130) and non-gifted (IQ < 130) individuals. Divergent thinking tests have been created in several domains of production, for example verbal (TTCT; Torrance, 1966), graphic (TCT-DP; Urban & Jellen, 1996) or numerical (BIS-HB; Jäger et al.,

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2005). Alternatives to evaluate creative potential include convergent-integrative thinking tasks that require combining several ideas and synthesizing them into a unique production that fits constraints imposed by the stimulus. This can be a story, a drawing, a musical composition, or other work using predetermined elements. The Consensual Assessment Technique (Amabile, 1982) allows trained experts to assign scores for individual productions, following criteria associated with creativity. Satisfactory agreement between their scores indicates that they assess the same characteristics, and it is then possible to calculate the mean of these scores in order to obtain a final consensual score of creativity.

Studies that investigate relationships between intelligence and creativity have often been conducted within the frame of the threshold hypothesis (MacKinnon, 1962; Torrance, 1962). This hypothesis states that a greater amount of intelligence is not synonymous with a higher level of creativity. Empirically, correlations between intelligence and creativity can be found below a critical IQ level, which is usually thought to be 120, and tend to disappear above this cut-off. In support of this hypothesis, Yamamoto (1964) investigated secondary school children and found a significant correlation between intelligence and creative potential of $r = .30$, but no significant correlations for gifted children. More recently, Cho, Nijenhuis, van Vianen, Kim, and Lee (2010) tested the threshold hypothesis in a sample of adolescents and adults and found similar results.

However, the threshold effect has not always been supported by empirical research on creativity (Runco & Albert, 1986). Kim (2005) performed a meta-analysis on more than 100 studies published from 1961 to 2004 and rejected the threshold hypothesis, given the fact that mean correlations between creativity and IQ scores were comparable over four IQ levels (from $r = .14$ to $r = .26$). Preckel, Holling, and Wiese (2006) compared structural models in different ability groups and found similar relationships between intelligence and ideational fluency. It is worth noting that divergent thinking scores are often used to estimate creative potential in these studies, without taking into account other aspects of creative cognition, such as convergent-integrative thinking. This is probably due to the fact that fluency scores are easy to calculate and the least subjective (Runco, 1997). Additionally, several studies show that ideational fluency scores are highly and robustly correlated with other scores derived from divergent thinking tasks, like flexibility or originality (Hocevar, 1979; Lubart, Besançon, & Barbot, 2011; Silvia et al., 2008). Moreover, recent models of intelligence clearly favor a multi-dimensional structure (see McGrew, 2009) and one can ask why the threshold theory has been only explored relying on a unique indicator of intelligence (i.e., total IQ). Indeed, even if a global score of intelligence is a valuable indicator of general cognitive efficiency, it does not reflect potential intra-individual differences. Thus, a reason for inconsistent results in studies on the threshold theory may be IQ's general nature. This is especially worth consideration when we take into account that scholars emphasized that the mental process of creative thinking have an important part of domain-specificity, with different theoretical and operational definitions for each domain (Amabile, 1996; Baer, 1998; Kaufman & Baer, 2004).

This debate on the role of creativity in cognitive functioning and its structure is important because it guides the way we identify giftedness and influences the development of pedagogical programs specifically aimed at gifted students. To clarify these issues, we compared creative potential (in particular divergent and integrative thinking) of intellectually gifted children (total IQ ≥ 130) with non-gifted children (total IQ < 130) based on the internationally used 130 cut-off of intellectual giftedness. Furthermore, we used the continuous IQ score without dichotomizing IQ in order not to lose any available information. To go beyond the classical conception of intellectual giftedness that relies on a total IQ, we have also created high ability groups based on several intelligence dimensions such as, for example, verbal abilities based on the Verbal Comprehension Index of the WISC-IV intelligence test.

The objective of this study was to better understand the relationships between intelligence and creativity and to examine the threshold hypothesis with regard to different dimensions of intelligence.

2. Methods

2.1. Participants

The cognitive assessments have been performed on a sample of 338 children (mean age ± SD = 10.8 ± 3.0 years), including 118 intellectually gifted children (total IQ ≥ 130, 107 boys and 11 girls, mean age ± SD = 10.9 ± 3.1 years, with IQ scores ranging from 130 to 157) and 220 non-gifted children (total IQ < 130, 184 boys and 36 girls, mean age ± SD = 10.7 ± 3.0 years, with IQ scores ranging from 65 to 129). They were all referred to a child psychiatry centre for gifted children (CNAHP: National Center for Assistance to High Potential children and adolescents) that provides a global psychological evaluation based on several tools, including cognitive, conative and socio-emotional assessments given their difficulties (learning disabilities with school difficulties, emotional and/or behavioral problems). More specifically, according to the ICD-10 criteria (World Health Organization, 1993), the participants displayed the following disorders and/or problems: 40.5% anxiety disorders (including phobia, generalized anxiety disorder, unspecified anxiety disorder), 9.5% conduct disorder, 8% depressive disorders, 3.5% personality disorders, 3.5% ADHD (Attention-deficit/hyperactivity disorder), 1.5% obsessive–compulsive disorder, 6.8% learning disabilities, and 26.6% other problems (such as, for example, family problems with sibling conflicts).

2.2. Cognitive assessments

Children's intellectual functioning was assessed by a psychologist using the WISC-IV which is the age-appropriate Wechsler intelligence scale validated for children and adolescents aged from 6 to 16 years old (French version, Wechsler, 2005). Four composite scores were calculated based on 10 subtests: Verbal Comprehension Index (VCI), Perceptual Reasoning Index (PRI), Working Memory Index (WMI) and Processing Speed Index (PSI). Additionally, each child was administered four tasks from the Evaluation of Potential Creativity (EPoC, Lubart et al., 2011), in order to assess cognitive abilities linked to the creative process. Tasks were characterized by domain (verbal or graphic) and the cognitive process evaluated (divergent-exploratory thinking and convergent-integrative thinking). The tasks were: (a) Verbal Divergent: finding as many as possible endings given the beginning of a story in 10 min; (b) Graphic Divergent: drawing as many as possible sketches based on a given abstract form in 10 min; (c) Verbal Integrative: telling a story with elements imposed in a maximum of 10 min; (d) Graphic Integrative: producing a drawing with at least 4 among 8 abstract forms in a maximum of 15 min. Following the test manual, we used fluency scores to assess divergent thinking, and experts' ratings to assess integrative thinking. Experts were trained following the Consensual Assessment Technique (Amabile, 1982) described in the introduction section to rate the verbal and graphic integrative thinking tasks. According to EPoC manual, the inter-judge agreement for convergent integrative task (after training) ranges from .80 to .90. The inter-judge agreement for divergent exploratory thinking scores (fluency) ranges from .98 to 1. Test–retest reliability between form A and B is at one week interval .84 and .38 at 6 months interval. Confirmatory factor analysis shows that EPoC measures fit with the underlying theoretical model: the Normed Fit Index and Comparative Fit Index are greater than .90. Also, the scores forming each factor show strong homogeneity coefficients (internal consistency). Concerning concurrent validity, the Torrance Tests of Creative Thinking (TTCT) correlates positively and significantly with EPoC tasks (median $r = .39$; r from .26 to .48 depending on EpoC tasks).

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