

Review Article

IS CREATIVE ACHIEVEMENT RELATED TO LEVEL OF INTELLIGENCE?

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ABSTRACT

One of the variables associated with creativity is information literacy. Increasing information literacy in the universities and education centers plays an important role in teaching and training a creative workforce. Creativity is a prerequisite for scientific inventions and innovation. Forms one of the main functions of universities in expanding the frontiers of knowledge and production of scientific information. Creativity is vital and needed for innovative teaching and quality education. The processes of behaving creatively and appreciating creativity were understood to be fundamentally unrelated. In this paper, we made an attempt to investigate the relationship between information, intelligence and creativity of university students and school children.

Keywords: Creativity, Medical Education, Students, University

INTRODUCTION

The writers showed mental illness, predominantly affective disorder, with a tendency toward the bipolar subtype. Higher prevalence of affective disorder and creativity was noted in the writers' first degree relatives, suggesting that these traits run together in families and might be genetically mediated. Writers excelled only on the WAIS vocabulary subtest, suggesting that intelligence and creativity is independent mental abilities (Andreasen, 1987). Mind wandering plays an important role in autobiographical planning and creative problem solving, thus providing adaptive functions of the phenomenon (Mooneyham and Schooler, 2013). The cognitive mechanisms behind figures of speech such as creative metaphors rely more on executive processes, whereas conventional metaphors draw primarily from acquired vocabulary knowledge (Beaty and Silvia, 2013).

Creativity and Schizophrenia

Remitted schizophrenic patients performed worse on selected measures of creativity than healthy subjects due to executive dysfunctions (Jaracz *et al.*, 2012). Highly creative and schizophrenic individuals habitually sample a wider range of available environmental input than individuals who are less creative. Involuntary widening of attention in a schizophrenic had a deleterious effect on performance, while, in contrast, the highly creative individual was more successful in processing a greater input without a performance deficit (Dykes and McGhie, 1976). Bipolar disorder was more common in people with exceptional cognitive or creative ability. In men, high intelligence was a risk factor for bipolar disorder, but only in minimal cases, who had the disorder in a pure form with no psychiatric Comorbidity (Gale *et al.*, 2013). Divergent processing involved higher task related electro encephalogram (EEG) alpha power than convergent processing in both the alternate uses task and the word association task. EEG alpha synchronization was associated with divergent cognitive processing rather than with general task characteristics of creative ideation tasks (Jauk *et al.*, 2012). Working memory capacity (WMC) benefits creativity and enables the individual to maintain attention focused on the task, preventing undesirable mind wandering (Dreu *et al.*, 2012). A study done on participants with creative personalities, showed an association between creativity and dishonesty, thus highlighting the dark side of creativity (Gino and Ariely, 2012). Higher the degree of complexity of the profile either gifted or quadruple talented versus simple talented, the greater is regulation of metacognition, even though minor differences in metacognitive functioning were present (Sastre-Riba, 2011).

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Individuals with bipolar disorder or schizophrenia and their healthy siblings overrepresented in creative professions. People with schizophrenia had no increased rate of overall creative professions, but showed an increase in the subgroup of artistic occupations (Kyaga *et al.*, 2011). Art students were more creative on a drawing task measured in terms of fluency, originality, elaboration, and flexibility than the savant artists, individuals with autism spectrum disorder (ASD), and individuals with mild/moderate learning difficulties (Pring *et al.*, 2012).

Convergent and Divergent Thinking

Convergent thinking was positively correlated with intelligence but negatively correlated with EBR, suggesting that higher dopamine levels impair convergent thinking. Creativity and dopamine were related. Conceptual differentiation was recommended with respect to the processes involved in creative performance (Chermahini and Hommel, 2010). The study done by Furnham *et al.*, (2009) on intelligence questionnaire showed more cultural than sex differences in all the ratings, with various interactions. British sample differentiated more between the sexes than the Turks. Males rated their overall, verbal, logical, spatial, creative and practical intelligence higher than females. Turks rated their musical, body kinesthetic, interpersonal and intrapersonal intelligence, existential, naturalistic, emotional, creative, and practical intelligence higher than the British. Participants rated their fathers' intelligence higher than their mothers' on multiple factors (Furnham *et al.*, 2009).

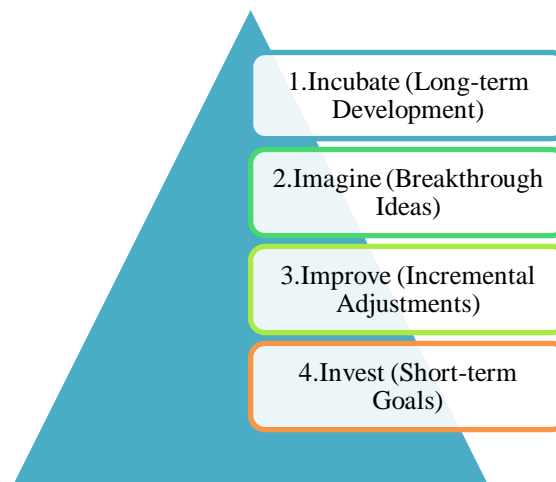


Figure 1: Creativity profiles

Different patterns of correlations between N-acetyl aspartate and Composite Creativity Index (CCI) were found in higher verbal ability versus lower verbal ability participants, providing neurobiological support for a critical threshold regarding the relationship between intelligence and creativity (Jung *et al.*, 2009). Charlton (2009) suggested that to seek potential revolutionary scientists, the elite revolutionary science and institutions should be a platform that encourages brilliant, impulsive, inspired, antisocial oddballs so long as they are dedicated truth seekers. Anodal stimulation of the left dorsolateral prefrontal cortex improved performance on a complex verbal problem solving task that required significant executive function capacity (Cerruti and Schlaug, 2009). Creative individuals were characterized by enhanced divergent thinking, which was supported by increased frontal cortical activity (Gibson *et al.*, 2009). Psychodynamic and relational factors like worry about the preterm condition, overprotective behaviour by parents and relatives led to diminished autonomy, flexibility and manipulatory interest in the low birth weight group of children (Parisi *et al.*, 2007). One third of the creative children displayed clinically elevated levels of attention deficit hyperactivity disorder (ADHD) symptomatology. Regarding to cognitive functioning, both ADHD and creative children with ADHD symptoms had deficits in naming speed, processing speed, and reaction time (Healey and Rucklidge, 2006). Dyslexic children were at risk to lag behind their peers in terms of Verbal IQ, if they are not provided with needed special education

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(Ingesson, 2006). The study done with electroencephalography revealed that creative problem solving was accompanied by lower levels of cortical arousal, increases in alpha power from a pre stimulus reference to an activation interval. More original responses were associated with stronger task related alpha synchronization in posterior centro parietal cortices. Task related alpha power changes during creative problem solving were moderated by verbal IQ and sex (Fink and Neubauer, 2006). Study done by Zhang LF 2004, revealed that creativity generating and complex thinking styles contributed positively to vocational purpose in contrasting to more conforming and simplistic thinking styles that contributed negatively to vocational purpose (Zhang, 2004). Study conducted on youthful high IQ samples, demonstrated that high lifetime creative achievers had low LI scores than low creative achievers (Carson *et al.*, 2003).

Children and adolescents with spinal muscular atrophy had normal range of general intelligence. By adolescence, environmentally mediated aspects of intelligence were high in those with spinal muscular atrophy. Hence suggested that the development of cognitive skills and knowledge as the creative way to compensate the many restrictions due to physical handicap (Gontard *et al.*, 2002). Highly creative group had higher trait anxiety than the low creative group. On the intelligence tests the low creative group was superior on logical inductive ability and on perceptual speed, while the groups showed similarity on verbal and spatial tests (Carlsson *et al.*, 2000). Higher EEG complexity during divergent than convergent thinking was due to concurrent activation of a greater number of independently oscillating processing units in brain neurons (Mölle *et al.*, 1999). Graduate Record Examination (GRE) test was useful in predicting year one grades but not other kinds of performance, with one exception, performance on the GRE Analytical test was predictive only for men (Sternberg and Williams, 1997).

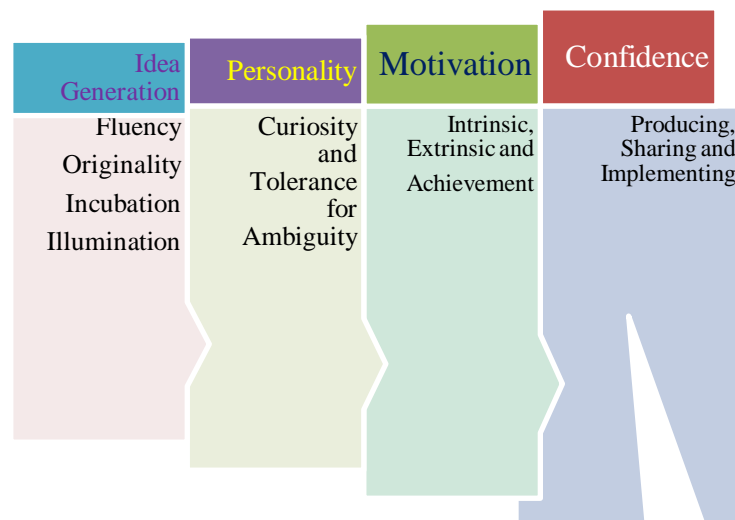


Figure 2: Primary creativity traits

Studies on School Children

Study done on Malaysian secondary school pupils revealed that verbal creativity was related to intelligence but figural creativity was not (Yong, 1994). Sixth grade children scored higher than fifth grade children and girls in earned higher scores than boys in Torrance Tests of Creative Thinking, suggesting that school setting and classroom atmosphere were important to creative potential (Dudek *et al.*, 1993). Students who practiced Transcendental Meditation scored high on the test of field independence compared to non meditating students (fergusson, 1993). Neutral mood induction elicited a mild negative feeling state suggesting that the compatibility thesis is applicable to the field of negative emotions (Otto and Schmitz, 1993). Rogers-prescribed preschool child rearing practices were found antecedents of adolescent creative potential in regression analyses that held constant the influence of sex,

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preschool intelligence, and preschool creative potential (Harrington *et al.*, 1987). Studies done on differences in thinking strategies between intellectually gifted and creative children revealed a linking between imaging abilities and creative thinking (Shaw, 1985). Divergent thinking was associated with right hemispheric dominance in younger children (Tegano *et al.*, 1983). Socially and intellectually competent high risk children of psychotic mothers were more competent, colorful, creative, and talented than the children born to non psychotic mothers (Kauffman *et al.*, 1979). Study done on adolescent males to determine the possibility of an interaction between levels of intelligence and delinquent status with regard to verbal and figural creativity test scores showed no effects or interaction between IQ and adjudication status with respect to figural creativity (Anderson and Stoffer, 1979). Psychoticism was directly related to divergent thinking. Psychoticism was not related inversely to speed in a convergent thinking task (Woody and Claridge, 1977). In a study done on students in Grade 5, middle ability children scored higher on fluency, flexibility, and originality (Helwig, 1975). Study done by Guilford JP 1968, suggested that assessment of intellectual qualities must go beyond present standard intelligence tests, which neglect the abilities that contribute to problem solving and general creative performance. Educational philosophy, curriculum building, teaching procedures, and examination methods must be improved by giving attention to the structure of intellect as the basic frame of reference (Guilford, 1968).

University and College Studies

Differences were found for staff and students between the disciplines regarding attitudes towards, and perceptions of, the relevance of interdisciplinary learning opportunities, and the role of creativity and innovation. Medical students exhibited greater resistance to using of structured creativity tools and interdisciplinary teams (Spoelstra *et al.*, 2014). Seminars led by students of Shifa College of Medicine were effective in breaking monotony and generating an interest of the topic. Activity served as a tiny step to make graduate students more empathic, humane, competent, and skillful (Iqbal *et al.*, 2013). The complex, phased and multi sensory nature of the critical looking skills developed through the drawing exercises had potential value in medical education, proposed as analogous to processes involved in clinical examination and diagnosis. The interdisciplinary collaborative drawing experience was useful for students as a creative, participatory and responsive form of learning (Lyon *et al.*, 2013). Females were found to have intellectual wellness higher compared to the males. Males used mentorship support to acquire intellectual wellness (Naz *et al.*, 2013). Students who were creative were more information literate and accomplished higher goals, suggesting that increasing information literacy in the universities and other scientific education centers plays a key role in teaching and training a creative workforce (Raeis *et al.*, 2013). In Muhimbili University of Health and Allied Sciences, (MUHAS) creation of a 'teaching commons' reinforced a new focus on innovative teaching as faculty members shared experiences and gained recognition for their contributions to quality education (Mloka *et al.*, 2012). In a study that compared and examined how medical students on term one and nine understand and adopted ideas and reasoning when estimating death causes, it revealed that experienced clinicians had transformed a normative issue of shortening life into an empirical issue about death causes and transferred this strategy to term nine students (Lynöe and Juth, 2013). Common sense was connected with consensus, opinion and ideas that require scientific validation. The study indicated that MD-PhD students shared with their senior academic colleagues the same reluctance to consider common sense as a valid adjunct for the solution of scientific problems. Overcoming this toil is important step towards stimulating the interest of physicians in pursuing experimental research (Oliveira *et al.*, 2011). The creativity training pilot program at the University of Texas, suggested that academic health centers must implement and evaluate new methods to enhance science students' innovative thinking to keep the United States as a worldwide leader in scientific discovery (Ness, 2011). Integration of social media tools with in class room activities gave manifold benefits over traditional classroom methods, like real time communication outside of the classroom, connecting with medical experts, collaborative opportunities and enhanced creativity (George and Dellasega, 2011). A valid questionnaire measuring perceptions about the portfolio by undergraduate medical students revealed that students perceived an improvement in their creativity and professionalism as one of the strengths of portfolio (Riquelme *et al.*, 2011). Creative activity did not play a substantial part

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in medical education, but was of considerable importance. The development of creative models stimulates, informs and educates the constructors, thus providing a teaching resource for didactic teaching (Barling and Ramasamy, 2011). The study done by Thompson *et al.*, (2010) on medical students at the University of Bristol, revealed that incorporating a compulsory creativity activity served as a model and a guide for educationalists interested in developing artistic creativity within the medical curriculum. As an alternative to the conventional pedagogical report and in keeping with the subject matter, a unique educational enterprise of an on line exhibition of creative output, and its principle architects were discussed in a study done by Thompson *et al.*, (2010). Concept mapping was a useful pedagogical tool for medical students used to acquire meaningful learning in Pharmacology, supplementary to traditional teaching techniques. But was not beneficial in improving examination grades because standard examinations and concept mapping measured different cognitive domains (Qadir *et al.*, 2011).

Conclusion

Brain diseases and their treatment can aid or attenuate creativity in ways that shape quality of life. Increased creative drive can be associated with bipolar disorder, depression, psychosis, fronto temporal dementia, temporal lobe epilepsy, Parkinson disease treatments, and autism. Creativity is determined by goal driven approach motivation from midbrain Dopaminergic systems. Fear driven avoidance motivation cannot aid to creativity. Reserving creative motivation helps creativity and other aspects of wellbeing in all students, patients, artists as well as researchers. Key skills like communication and critical thinking are essential for today's medical university graduates to outperform their peers. There are many opportunities within the undergraduate medical curriculum that help students to use, develop and appreciate their own unique set of creative skills (Verran, 2010). Care protocols and their proliferation hindered the enthusiasm of professionals in their daily practice, suggesting an institution's clinical approach should be designed in terms of admission in order not to leave madness on the threshold of care. Trusting the enthusiasm and desire of nurses leads eventually to creativity within practices (Ponroy, 2013).

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