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Intelligence, Creativity and Academic Self-Concept in relation to Academic Performance in Early School Age Children

Alice Lalchhandami Fanai
C. Lalfamkima Varte

Abstract

The study attempted to reveal the influence of intelligence, creativity and academic self-concept on academic performance among 391 participants (191 males and 200 females) belonging to 6-8 years of age within Aizawl Municipal area of Mizoram in India's North-East. The participants completed the background demographic information; Working Memory Index (WMI) and Perceptual Reasoning Index (PRI) of Wechsler's Intelligence Scale for Children-IV (WISC-IV; Wechsler, 2003); fluency, originality and imagination subtests of Thinking Creatively in Action and Movement (TCAM; Torrance, 1981) ; as well as academic self-concept scale and academic performance index developed for the study based on operationalization in empirical research. Only one significant instance emerged in the analyses for gender differences, wherein, males as compared to females to indicate greater scores on imagination subtest of creativity. The step-wise multiple regression analysis revealed WMI as the major predictor of academic performance followed by PRI of the intelligence measure. The demographic profiles; fluency, originality and imagination subtest of creativity; and academic self-concept failed to evince significant predictability of academic performance. The findings are discussed in the light of the developmental changes occurring at early elementary school years and the relative academic performance occurring with differing scores on intelligence, more specifically the working memory.

Keywords: Intelligence, Creativity, Academic self-concept, Academic performance.

Introduction

Intelligence, creativity, academic self-concept and academic performance have been a topic of interest for scholars for many decades now. Amongst the different dimensions that made up a person, these constructs are notably considered the most important, partly because they are believed to be the predictors of different aspects of behaviors like learning and mastering new information, adaptability to new situations, academic success, potential for developing something new and original.

Intelligence refers to the activities involved in thinking, reasoning, decision-making, memory, problem solving and all

other forms of higher mental processes. It is the brightness and sharpness of an individual, and his ability to understand things, figure things out quickly, and learn from experience (Nayak & Mishra, 2012). Thus, intelligence is the aggregate or global capacity of the individual to act purposefully, to think rationally and to deal effectively with his environment (Wechsler, 1944).

Theoretical formulations and research findings regarded creativity as the process that includes original ideas, a different point of view, breaking out of the mould, recombining ideas or seeing new relationships among ideas (Torrance, 1974; Sigelman & Rider, 2003). The process involves four components by which individual creativity can be assessed, namely fluency, flexibility, elaboration and originality (Torrence, 1974).

Most creative people are quite intelligent, but then, the highly intelligent people may not be creative (Sternberg & O'Hara, 2000). Researchers maintained that creativity and intelligence are two completely different and independent constructs (Getzels & Jackson, 1962; Sternberg & O'Hara 2000) and are only modestly correlated (Preckel, et. al., 2006; Furnham & Bachtiar, 2008; Naderi et. al., 2010). Therefore, creativity and in-telligence are not fundamentally related but intelligence may be need-ed in order to display creativity (Hayes, 1989; Reeves & Clark, 2000).

Academic self-concept refers to the specific attitudes, feelings, and perceptions about one's intellectual or academic skills, representing a person's self-beliefs and self-feelings regarding the academic setting (Lent et. al., 1997). It is the individuals' self-concepts that are formed specifically toward an academic domain (Bong & Skaalvik, 2003).

There is a general agreement among scholars that self-concept is multidimensional (Marsh et. al., 1988; Bong & Skaalvik, 2003). It is not innate, but rather formed through an individual's experiences and interaction with the environment (Bong & Clark, 1999; Bong & Skaalvik, 2003). Findings also revealed that the self-concept of children varies with age, while it improve between 5 and 8 years of age, as children grew older it tends to decrease significantly during pre-adolescence and early adolescence (Marsh et. al., 1998; Liu & Wang, 2005). It is found to be inaccurate at the beginning of schooling as younger children tend to overestimate their abilities but then they tend to get closer to an appropriate self-concept as they grow older (Guay et. al., 2003; Valentine et al., 2004; Filipp, 2006).

Academic achievement or academic performance is the outcome of education and the extent to which students achieve their educational goals. Academic achievement is commonly measured by examination or continuous assessment but there is no general agreement on how it is best tested or which aspects are most important. Different researchers have used different methods to measure academic performance of students; the most widely

used being the cumulative grade point average (Naderi et. al., 2010; Bacon, 2012; Mohammadyari, 2013). In addition, teachers' and parents' rating have also often been used to measure academic achievement (Hay et. al., 1997; Guay et. al., 2003).

Inevitably, psychologists and educationists have recognized the important roles of intelligence, creativity and self-concept and the significant influence it has on the academic performance of an individual in school. Several studies have looked into the relationships between the constructs under study. They reported the predictability of academic achievement from intelligence (Colom & Mendoza, 2007; Anees, 2013), creativity (Hirsh & Peterson, 2008; Naderi et. al., 2009) and academic self-concept (Marsh, 2006; Bacon, 2012; RaisSaadi et. al., 2012).

Aims and Rationale

While there have been numerous studies on intelligence, self-concept, creativity and academic achievement in various dimensions amongst adolescents and young adults, very few studies have been conducted amongst young children. Interestingly, it appears that until well into the twentieth century, it was wildly assumed that children and adults think, reason and remember in the same manner. Many societies assumed that while adults are mentally and physically superior to children, their cognitive processes are basically similar. This assumption was challenged by Piaget (1975) who argued that in several respects children differ from the adults in their way of thinking and reasoning (Baron, 1995).

The present study attempts to provide empirical evidence to suggest the predictability of academic performance from the independent and compounding influence of intelligence, creativity and academic self-concept amongst the elementary students, belonging to 6 to 8 years of age, within the Aizawl Municipal area of Mizoram in India's North-East. The period is sometimes labeled as middle childhood or early elementary school years. It spans from the latter part of Piaget's (1975) pre-operational stage and early part of the concrete operational stage. It is a period where stable concepts begin to form and mental reasoning emerges.

Most young children are naturally curious and highly imaginative and each child is unique with an individual pattern and timing of growth, as well as individual personality, temperament, learning style, and experiential and family background (Dacey, 1989; Bredekamp, 1997). Middle childhood is in essence, a challenging stage to study since their verbal and nonverbal skills are yet not fully developed which is likely to impede their skill to completely communicate their original ideas (Fishkin, 1998), their working styles and personalities usually have not yet matured (Isenberg & Jalongo, 2001) and their creative potentiality may not be fully comprehensible.

Methods and Rationale

The 391 participants (191 males and 200 females) belonging to the age of 6-8 years (M=7.50; SD=.80) were selected from the Aizawl Municipal area in Mizoram (a small state located in North-East India). Multistage random sampling procedure was employed considering the school type (government and private management), classes (I, II and III) and the student's registration number. Finally, 18 government management schools and 17 private management schools were randomly selected, out of which 16 participants failed to complete all the required demographic responses and behavioral measures and therefore were excluded from analyses.

Demographic descriptions: Demographic profiles of gender, age, number of siblings, birth order, father's educational qualification, mother's educational qualification, father's occupation, mother's occupation, father's religious involvement, mother's religious involvement, father's social involvement, mother's social involvement, family size and family income of the participants has been taken into account.

Materials: The participants received a booklet containing sheets for: consent information, demographic profile, parents rating form, teachers rating form and the behavioral measures. All the participants responded positively by completing the questionnaires administered among them and performed all the experimental tasks of behavioral assessment under the careful observation of the researchers.

Psychological measures:

Wechsler's Intelligence Scale for Children-IV (WISC-IV; Wechsler, 2003): It is an individually administered instrument employed to assess the cognitive ability of children. In the study, the composite scores from Working Memory Index (WMI) with Digit Span Forward (±=.75), Digit Span Backward (±=.70), Letter Number Sequencing (±=.85) and Arithmetic (±=.87) as the core subtest as well as the composite scores from Perceptual Reasoning Index (PRI) with Block Design (±=.81), Picture Concept (±=.84) and Matrix Reasoning (±=.84) as the core subtest were administered. The WMI reflects ability for attention, concentration and working memory and the PRI reflects ability for perceptual reasoning and organization.

Thinking Creatively in Action and Movement (TCAM; Torrance, 1981): It measures creative thinking abilities as well as creativity demonstrated through movements. The four subtests taps the ability to produce alternative ways of moving; ability to imagine empathies, fantasize and assume unaccustomed roles; indicator of creative thinking potentials; and ability to improvise common objects for utility other than intended purpose. The TCAM measures *Fluency*: the capacity to generate many ideas, answers, responses, possibilities to a given situation/problems (±=.89); *Originality*: the capacity to generate new, unique and novel responses/ solutions (±=.74) and *Imagination*: the ability to build mental pictures, visualize

possibilities and new things or reach beyond practical limits (±=.90).

Academic Self-Concept (ASC): Based on empirical research reporting the academic self-concept of children (Marsh et. al., 1983; Fakhroo et. al., 2008), twelve items measuring academic self-concept for middle childhood or early elementary school years was developed. The scale encompasses curricular and co-curricular activities as well as the relationship with peers and teachers. Each item was rated on a three-point scale from True=3, Partly True=2 and False=1 with the higher comprehensive score indicating higher academic self-concept. The internal consistency for the academic self-concept for the participants under study emerged to be robust (±=.96).

Academic Performance (AP): The percentage of marks secured for the major subjects in the academic as well as the parent's and the teacher's rating of each participant on the curricular and co-curricular activities; cognitive, psychomotor and affective domains comprised the indicators for academic performance. Academic Performance was assessed by employing the composite scores based on weighted average from the indicators of grade point average of the last examination, teachers rating of children(±=.90), parents rating of children (±=.87) following the works of previous researchers (Hay et. al., 1997; Guay et. al., 2003; Naderi et. al., 2010; Bacon, 2012; Mohammadyari, 2013).

Results and Discussion

The mean and standard deviation as well as bivariate correlation coefficients for gender, WMI, PRI, fluency, originality, imagination, academic self-concept and academic performance are presented in Table 1. The mean differences for gender failed to emerge statistically significant for all the demographic and behavioral measures except on imagination subtest of creativity (t=4.26; p<.000). Males (Mean=23.36; SD=3.38) as compared to females (Mean=21.83; SD=3.73) indicated significantly greater scores on imagination subtest of creativity.

Table-1: The mean, SD and bivariate correlation coefficients for gender, scales/ sub-scales of the behavioral measures and academic performance.

** *Significant at .01 level;* * *Significant at .05 level.*

Several studies have reported gender differences in intelligence (Lynn, 1998; Hattori & Lynn, 1997; Allik et. al., 1999). Some researchers (Furnham & Rawles, 1999; Deary et. al., 2003) argued that there is gender difference in specific cognitive abilities. Empirical studies have shown that males performed better on gross motor skills, spatial orientation, visio-spatial tasks, mechanical aptitude, logical-mathematics and matrix reasoning, while females performed better on verbal facility, perception of details, perceptual speed, memory and digit of symbol substitution (Rammstedt & Rammsayer, 2000; Hyde, 2005; Monastersky, 2005). The non-significant effect of gender on the WMI and PRI subtest of intelligence in the present study support the findings of previous researchers (Reilly & Mulhern, 1995; Naderi et. al., 2008). Further, these researchers do not support the importance of Intelligence Quotient (IQ) and gender in predicting academic achievement.

The effect of gender failed to emerge statistically significant for fluency and originality subtests of creativity, but for the subtest of imagination. This is in consonance with the findings in the field of creativity research studies (Cheung et. al., 2004; Kaufman & Baer, 2004; Naderi et. al, 2008). In contrast to the foregoing, several scholars supported the evidence of gender differences in creativity (Kim & Michael, 1995; Khaleefa et. al., 1996; Baer, 1998). In support of the present finding, a comprehensive reviews conducted by Baer and colleagues (Baer, 1998; Baer & Kaufman, 2008) reported inconsistent pattern in gender differences on creativity test scores.

Gender differences in the academic self-concept have been reported in literature (Wigfield et. al., 2001; SarAbadaniTafreshi, 2006; Matovu, 2012). Boys in general have been reported to be higher in academic self-concept as compared to girls (Johnsson-Smaragdi & Jonsson, 1995; Funk & Bachman, 1996; Kling et. al., 1999). Contrasting to these findings, Deary and colleagues (Deary et. al., 2007) found that there were gender differences in educational attainment and reported that girls performed better than boys on overall academic performance. Hossaini (2002) upholds that gender does not influence self-concept and self-concept does not influence academic achievement in any way, in support of the findings of the present study.

Step-wise multiple regression analysis was performed with the demographic variables (gender, age, number of siblings, birth order, father's educational qualification, mother's educational qualification, father's occupation, mother's occupation, father's religious involvement, mother's religious involvement, father's social involvement, mother's social involvement, family size and family income) ; WMI and PRI subtest of WISC-IV; fluency, originality and imagination subtest of TCAM; and academic self-concept simultaneously entered as the *predictors* of academic performance, the *criterion*. The results of the step-wise multiple regression analysis

for the prediction of academic performance from the demographic variables and the behavioral measures is presented in Table 2.

Table-2: *Beta*-coefficients, adjusted R^2 tolerance and variance inflation factor (VIF) of the stepwise multiple regression analysis for the prediction of academic performance from the demographic variables and the behavioral measures.

	Standardized B-values		**Collinearity Statistics**	
	Model-1	**Model-2**	**Tolerance**	**VIF**
Working Memory Index	.39**	.32**	0.74	1.36
Perceptual Reasoning Index	-	.13*	0.74	1.36
Adjusted R^2	.15**	.16*	-	-

** *Significant at .01 level;* * *Significant at .05 level.*

The step-wise multiple regression was not influenced by serial correlation (Durbin-Watson=1.83) and multicollinearity as indicated by the tolerance and variance inflation factor. The WMI subtest emerged as the main predictor of academic performance (32% of variance explained) followed PRI (13%of variance explained), whereas, all the demographic variables; fluency, originality and imagination subtests of TCAM; and academic self-concept failed to predict significant variation on academic performance.

The end results of the present study reinforced the findings of previous studies conducted, which endorsed intelligence as the best predictor of academic performance (Gottfredson, 2002; Furnham & Monsen, 2009). Strong positive relationships between intelligence and academic performance had been reported (Gottfredson, 2002; Kuncel et. al., 2004), and that intelligence is the best predictor of students' grade point (Laidra et. al., 2007). Providing corroborating evidences to the findings of the present study, a longitudinal study from 11 to 16 years of age reported consistent predictability of academic performance from the subtests of intelligence (Deary et. al., 2007).

Conclusions

Amongst the two subtests operationalized to measure intelligence, the working memory index surpasses the perceptual reasoning index in the predictability of academic performance. The WMI assessed the ability to retain information temporally and process it to generate a result at a certain moment. It requires attention and concentration, cognitive flexibility, important for higher-order thinking and is therefore strongly related to academic performance; whereas the perceptual reasoning index measures non-verbal ability and fluid reasoning. It assesses tasks that involve abstract

concepts, rules, generalizations, or logical relations that remains wanting in the academic curriculum.

The findings clearly show the condition of the children, that they are weak in abstract thinking, reasoning and problem solving while they have the ability to use their learned knowledge and experiences. It may not be wrong to assume that the outcome reflected the present education system; where rote learning is advocated and little or no space is given for promotion of abstract thinking, reasoning and problem solving. The proverbial or novelty factor of the test material may be another criterion. For young children who have never been exposed to such kind of the test material and who have had little opportunity to use their fluid intelligence may lack competency to perform the task given. At the same time, they have had at least a minimum of one year exposure to schooling which had familiarized them with numbers and alphabets which are components of the WMI.

The predictability of academic performance from creativity failed to emerge in the study following other empirical findings (Behroozi, 1997; Nori, 2002). It appears that creativity is fostered in the young children, however, significantly necessary elements appear to remain wanting in the academic sphere. Young children's creativity can be nurtured through educational settings in three respects: the creative environment, creative programmes and creative teachers and ways of teaching (Mellou, 1996). The role of creativity needs to be emphasized in the schools. The fact that the need for creative personnel is required more than ever before necessitates that creativity and academic achievement should go hand in hand. The design of the curriculum should enhance creativity and provides opportunity for the children to think creatively and critically and instill problem solving skills.

Another factor that may be considered for the subdued creativity of the participants may be linked to the work of Torrance (1968) as well as Smith and Carlsson (1985 & 1990). These researchers posited that student's creativity tend to decline around age 6 to 8 years of age, peak at 10 to 11 years old, and then decline again at 12 years. Probably this occurs due to the need to conform in the first few years of schooling and submission to peer pressure. The need to conform might have discouraged students to display creative abilities.

According to Pullmann & Allik (2008), high self-concept facilitates academic achievement. Different studies have also maintained the reciprocal relationship between academic self-concept and academic achievement (Awad, 2007; Tan & Yates, 2007; RaisSaadi et. al., 2012). The outcome of the present study does not provide evidence for the predictability of academic performance from academic self-concept. The reason may be ascribed to the inaccurate academic self-concept

portrayed by the young children who are believed to have a highly positive self-concept and tends to overestimate their abilities at the beginning of schooling, but with increasing life experience, they slowly get closer to an appropriate self-concept (Marsh, 1990; Filipp, 2006; Guay et. al., 2003; Valentine et. al., 2004; Wigfield et. al., 1991 & 1997).

The outcomes of the present study followed by study of Naderi and colleagues (2009) consistently conform to the theoretical accounts of the development of children and adolescents as well as empirical findings relating to the predictability of academic performance from intelligence, creativity and academic self-concept. It, however, needs to be mentioned that the sample taken for the study were young children belonging to the age of 6-8 years, who have had short experience of schooling. Since very young children as stated earlier are still not consistent in their self-concept, social adjustment, possess limited attention span, which poses a little difficulty while collecting the data. The other limitation of the study is that the environment during the test could not be fully controlled since the test was taken in the school premises and there were instances that other students peep and try to witness the test given and in some cases the noise disturbance was quite distinct which thwarted their level of concentration. Some children also exhibited some inhibition to perform in front of the researcher being a stranger. In spite of all the impediments, effort was given to make the participants relax before the administration of the tasks that resulted in robust trustworthiness of the measures employed to tap the constructs under the study.

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About the Authors:
Ms. Alice Lalchhandami Fanai is Lecturer in SCERT, Mizoram, Aizawl-796001.
Email: alicefanai@gmail.com

Dr. Lalfamkima Varte is Professor in Department of Psychology, Mizoram University, Aizawl-796004. Email: kimavarte.psy@mzu.edu.in

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A writer must refuse to allow himself to be transformed into an institution.
- Jean-Paul Sarte
Writer and Philosopher (1905-1980)

Trickle-down theory – the less than elegant metaphor that if one feeds the horse enough oats, some will pass through to the road for the sparrows.
- **JK Galraith,** *The Culture of Contentment*

Professional men, they have no cares;
Whatever happens, they get theirs.
- ***Ogden Nash,*** *I Yield to My Learned Brother*