Meta-Analysis of Effect Size Statistic on the Relationship between Emotional Intelligence and Academic Achievement in North Central Nigeria

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Abstract: **The study investigated the relationship between emotional intelligence and students' academic achievement in North Central Nigeria with respect to gender, age and educational level as moderator variables, and the interaction effect size through meta-analytic procedure. Methodological triangulation research design was adopted, and the population of the study consists of all published and unpublished previous research results on the relationship study which are numerically infinite. Sample of 30 primary studies, considering one, two or all three of the moderator variables were purposively and conveniently drawn from the population, using a pro forma titled "coding sheet". Z-transformation, effect sizes and percentage were used to answer the research questions while Winer combined test statistic and two-way classification ANOVA were used to test the set hypotheses at 0.05 levels of significance. The obtained results revealed that the mean effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement with respect to the moderator variables and their interaction effect were significant. It was therefore recommended that the teaching, learning and assessment of emotional intelligence skills should be introduced in schools for both gender and across all ages and academic level to equip students with this competency for a better academic performance.**

Keywords: **Research, Emotional intelligence, Academic achievement, Gender, Age, educational level, Meta-analysis**

I. INTRODUCTION

Research as a process has a key characteristic of being cyclic in nature, which avails researchers to investigate trends, patterns or opinions more than once, and at various stages either for confirmation of previous studies or ascertain more facts yet not previously disclosed, and this has led to the duplication of studies on issues of interest. Consequently, a number of researchers have carried out Several studies on different aspects of cause and effect relationships or treatment-effect interactions in different areas of research interest, with one among the many, been on the relationship between emotional intelligence and academic achievement. Emotional intelligence is believed to have contributed immensely to the advancement of educational psychology, and as well, to an extent, generated some controversies among researchers. Emotional intelligence or emotional competency as it could be interchangeably used even in this study, can be said to be the confluence of developed abilities to perceive, access and express emotion in one's self and in others in other to know and value self, build and maintain a variety of strong, productive and healthy relationships, get along and work well with others in achieving positive results and effectively deal with the pressures and demands of daily life and work (Arockia & Sangeetha, 2013).

Researchers, especially in the field of educational psychology have been curious on finding out the magnitude of the extent to which emotional intelligence as a psychological construct influences measurable outcome such as academic achievement in Nigeria and even in the Diaspora, under the influence of some moderating factors such as gender, age and educational level as it is the focus of this study, which has given the existence of the relationship an appreciable level of recognition in the educational research space.

According to petrides (2011), academic achievement is a measure of achievement of end goals of an individual and an educational system's success in future. It can also be said to be the extent to which a student, teacher or institution has achieved their short or long-term educational goals commonly measured through examinations or continuous assessments. Gender refers to the attitudes, feelings, and behaviors that a given culture associates with a person's biological sex (American psychological association, 2010). Ojeme (2018) described gender as behaviors and attributes expected of a person on the basis of being a male or female, and further submitted that gender is one factor that influences the relationship between emotional intelligence and academic achievement. Age, according to the free dictionary.com is the length of time that a person or thing has existed. Borenstein, Hedges, Higgins, and Rothstein (2009) revealed that age is significant to the development and evolution of emotional intelligence, and that researches on the relationship with respect to age as a moderating variable has been reported at different time and places while Educational levels are subdivisions of formal learning, typically covering early childhood education, primary education, secondary education and tertiary (or higher) education according to UNESCO's Institute for Statistics (UIS, 2012).

Findings on the relationship between emotional intelligence and academic achievement with respect to gender, age and

educational level have attracted a lot of interests and also, have generated a lot of controversies in the global educational research space of which Nigeria and her North central region is not an exception, thereby, leading to cyclic studies about the study with diverse and conflicting results. Therefore, Meta-analysis which is a statistical method for examining and reconciling differences from previous studies, in order to arrive at a conclusive and robust summary result, through effect sizes which simply implies a way of quantifying the size of the difference or relationship between groups, will be used to check for the strength of the relationship between emotional intelligence and academic achievement in North central Nigeria, considering gender, age and educational level as moderator variables of the study.

II. LITERATURE REVIEW

The cyclic nature of research has made it a common practice for researchers to carry out research on a particular problem more than once, either to support the validity and reliability of previous findings or to counter same, maybe as a result of variations due to some contributing factors such as location, method, age, gender among others. At times, when all other conditions might be same, findings may still vary, and this has led to the duplication of similar studies with diverse and conflicting results in different research areas of interest which could impede the clarity and uniformity of reports from researchers on findings for generalized acceptance and implementation of results.

Evidences abounds on findings to similar studies but with diverse and conflicting results in different research areas of interest and the relationship between emotional intelligence and academic achievement in Nigeria at large and north central in particular is one of such study. This has led to continuous duplication of like studies with conflicting results, thereby making it difficult for researchers to arrive at a consensus result and research consumers to make definite decisions with respect to research outcomes as researchers always tend to investigate and reinvestigate findings for the purpose of accuracy and assurance of results reliability.

In this wake, Tajularipin and Rohaizan, Bracket, Habibah in Nwadinigwe and Azuka (2012) revealed a significant relationship between emotional intelligence and academic achievement with respect to gender, age and educational level, while Audrey and Eagan, Zee, Bastian and Kolfman in Nwadinigwe and Azuka (2012) also carried out similar studies with the findings that no significant relationship exists between emotional intelligence and academic achievement with respect to these variables. Relatedly, Amalu (2018) carried out a similar study and reported a positive relationship between emotional intelligence and academic achievement while Azuka and Kurumeh (2015), reported that there was no significant relationship between emotional intelligence skills and gender on the academic achievement scores of students.

Perera and DiGiacomo (2013) conducted a Meta-analysis on the validity of emotional intelligence for predicting academic

performance with gender, age and educational level as moderator variables. The findings of the study revealed that the summary effect on the relationship between emotional intelligence and academic achievement increases as a function of age and educational level but not gender, while MacCann et al., (2019) also conducted a Meta-analytic study on Emotional Intelligence as Predictor of Academic Performance, considering the moderator variables of gender, age and educational level, and reported that generally, emotional intelligence shows a small to moderate relationship with academic performance and the moderating effect of age was not significant, but that of gender and educational level was discovered to be statistically significant.

In other meta-analytic studies on the relationship between emotional intelligence and academic achievement across the educational research space, Hossein (2017) revealed that there is a weak correlation between emotional intelligence and educational achievement with respect to gender, Zahya and Farukh (2016) revealed a significant positive relationship between emotional intelligence and academic achievement with respect to age, Manimozhi and Srinivasan (2018) revealed that on a general note, there is a significant relationship between emotional intelligence and academic achievement with an average correlation coefficient of 0.54. Farhangi and Jafari (2016) also revealed a significant relationship between emotional intelligence and academic achievement in general and with respect to gender.

These literatures reviewed makes it imperative to also, carry out meta-analytic study on this relationship in North central Nigeria to determine the average effect size statistic with respect to the relevant variables in similar studies due to inconsistencies in research report since it is better that when diverse or conflicting results are noticed in previously related studies, or for the purpose of precision and consensus, it is imperative to use meta-analysis. It is against this backdrop that the researchers sought to, through Meta-analysis, estimate the average effect size statistic on the relationship between emotional intelligence and academic achievement in north central Nigeria with respect to gender, age and educational level as moderator variables.

Research Questions

Three research questions were raised to guide the study

1. What is the average effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement with respect to gender?
2. What is the average effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement with respect to age?
3. What is the average effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement with respect to educational level?

Research Hypotheses

The following null Hypotheses formulated will be tested at 0.05 level of significance:

1. The average effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement with respect to gender is not statistically significant.
2. The average effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement with respect to age is not statistically significant.
3. The average effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement with respect to their educational level is not statistically significant.
4. The interaction effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement in North central Nigeria with respect to Gender, Age and Educational level is not statistically significant.

III. METHODOLOGY

The research design adopted for this study is the methodological triangulation research design. Methodological triangulation is the use of more than one research method to study a situation or trend in order to decrease the deficiencies and bias that may come from a single method, thereby strengthening the outcome of the study in such a way that the strengths of one method may compensate for the weaknesses of another (Turner, Cardinal & Burton, 2017). The area of the study is North central Nigeria, otherwise known as the middle belt region. The population of the study consists all available studies on the relationship between emotional intelligence and academic achievement considering one, two or all three of the moderator variables, which are numerically infinite. Purposive and convenience sampling technique was used to select thirty studies in first degree projects, master degree project reports, doctoral dissertations, journal articles and reports. A search procedure was executed to find results of empirical studies from published and unpublished research studies on the relationship between emotional intelligence and academic achievement in North Central Nigeria, using a coding sheet, validated by three experts, with a reliability coefficient of 0.84. The coding sheet consisted of items listed in a tabular form making up sections showing author (s) identification, title or topic of the study, the study sample sizes, statistical tool (s) used for analysis and their associated effect sizes in relevant primary studies with respect to the moderator variables. Statistical transformation, effect sizes and percentage were used in answering the research questions while the Winer combined test statistic and two-way classification ANOVA were used in testing the formulated hypothesis at 0.05 level of significance. In order to classify how, large, medium or small the effect size is, they were classified according to Cohen's d three classic value effect

size statistic classification of 0.2, 0.5 and 0.8 as small, medium and large effect respectively.

IV. RESULTS

Research Question 1

What is the average effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement with respect to gender?

To answer this research question, the average effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement with respect to gender is analyzed and presented in Table 1.

Table 1: Z-transformation, average effect size and percentage variance on the relationship between emotional intelligence and students' academic achievement with respect to gender

Number of studies	$\sum(N-3)$	$\sum$weighted Z	AverageZ$_r$	Average effect(r)	Percentage variance
29	9613	5445.11	0.56	0.51	26.01

From Table 1, it can be observed that the mean effect size statistic estimate associated with the relationship between emotional intelligence and students' academic achievement with respect to gender as a moderator variable is 0.51. This implies that the mean magnitude of effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement with respect to gender as a moderator variable is high and positive with the percentage variance of 26.01%.

Hypothesis 1: The average effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement with respect to gender is not statistically significant.

To test this hypothesis, the statistical significance test for the average effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement with respect to gender, at 0.05 level of significance using the Winer combined test statistic is analyzed and presented in Table 2.

Table 2: Winer combined test of significance for studies analyzed on the relationship between emotional intelligence and students' academic achievement with respect to gender.

$\sum$t	$\sum$ [df/df-2]	Z-Calculated	Z-Critical
320.97	29.37	59.21	1.96

Table 2 reveals that the z-calculated value at 0.05 level of significance is 59.21 while the z-critical value is 1.96. Since z-calculated value is greater than the z-critical value at 0.05 level of significance, the stated hypothesis is rejected.

Research Question 2

What is the average effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement with respect to age?

To answer this research question, the average effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement with respect to age is analyzed using Z-transformation, average effect size and percentage as presented in Table 3.

Table 3: Z-transformation, average effect size and percentage variance on the relationship between emotional intelligence and students' academic achievement with respect to age

Number of studies	$\sum(N-3)$	$\sum_{weighted} z$	Percentage variance	Average Z_r	Average effect (r)
27	8865	4295.39	0.48	0.45	20.25

From Table 3, it can be observed that the mean effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement with respect to age as a moderator variable is 0.45. This implies that the mean magnitude of effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement with respect to age as a moderator variable is moderate and positive with the percentage variance of 20.25%.

Hypothesis 2: The average effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement with respect to age is not statistically significant.

To test this hypothesis, the statistical significance of the average effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement with respect to age, at 0.05 level of significance using the Winer combined test statistic is analyzed and presented in Table 4.

Table 4: Winer combined test of significance for studies analyzed on the relationship between emotional intelligence and students' academic achievement with respect to age.

$\sum t$	$\sum$ [df/df-2]	Z-Calculated	Z-Critical
252.98	27.34	48.37	1.96

Table 4 reveals that the z-calculated value at 0.05 level of significance is 48.37 while the z-critical value is 1.96. Since z-calculated value is greater than the z-critical value at 0.05 level of significance, the stated hypothesis is rejected.

Research Question 3

What is the average effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement with respect to educational level?

To answer this research question, the average effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement with respect to educational level is analyzed using Z-transformation, average effect size and percentage as presented in Table 5.

Table 5: Z-transformation, average effect size and percentage variance on the relationship between emotional intelligence and students' academic achievement with respect to educational level

Number of studies	$\sum(N-3)$	$\sum_{weighted} z$	Average Z_r	Average effect (r)	Percentage variance
28	9534	4284.15	17.64	0.45	0.42

From Table 5, it can be observed that the mean effect size statistic estimate associated with the relationship between emotional intelligence and students' academic achievement with respect to educational level as a moderator variable is 0.42. This implies that the mean magnitude of effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement with respect to educational level as a moderator variable is moderate and positive with the percentage variance of 17.64%.

Hypothesis 3: The average effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement with respect to educational level is not statistically significant.

To test this research hypothesis, the statistical significance test of the average effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement with respect to educational level, at 0.05 level of significance using the Winer combined test statistic is analyzed and presented in Table 6.

Table 6: Winer combined test of significance for studies examined on the relationship between emotional intelligence and students' academic achievement with respect to educational level.

$\sum t$	$\sum$ [df/df-2]	Z-Calculated	Z-Critical
245.47	28.33	46.14	1.96

Table 6 reveals that the z-calculated value at 0.05 level of significance is 46.14 while the z-critical value is 1.96. Since z-calculated value is greater than the z-critical value at 0.05 level of significance, the stated hypothesis is rejected.

Hypothesis 4: The interaction effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement with respect to gender, age and educational level in North central, Nigeria is not statistically significant.

To test this hypothesis, the interaction effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement in North central Nigeria, with respect to gender, age and educational level, at 0.05 level

of significance, using the two way analysis of variance is analyzed and presented in Table 7.

Table 7: Two way classification analysis of variance on the interaction effect of studies analyzed on the relationship between emotional intelligence and students' academic achievement with respect to gender, age and educational level in North central Nigeria.

SV	SS	DF	MS	F_{cal}	Ftab
Total	2.94	83	0.04		
Between row	0.98	29	0.03		
Between Colum	0.04	2	0.02		
Interaction	0.94	58	0.50	12.5*	1.45*
Error	1.96	54	0.04		

Table 7 reveals that the F-calculated value at 0.05 level of significance is 12.50 while the F-critical value is 1.45. Since F-calculated value is greater than the F-critical value at 0.05 level of significance, the stated hypothesis is rejected.

Summary of Major Findings

From the data collected and analyzed, the following findings were revealed:

1. Gender has a significant effect on the relationship between emotional intelligence and students' academic achievement in North Central, Nigeria.
2. Age has a significant effect on the relationship between emotional intelligence and students' academic achievement in North Central, Nigeria.
3. Educational level has a significant effect on the relationship between emotional intelligence and students' academic achievement in North Central, Nigeria.
4. The interaction effect size statistic estimate on the relationship between emotional intelligence and students' academic achievement in north central, Nigeria with respect to all three moderating variables is significant.

V. DISCUSSION OF FINDINGS

Based on the study, the following discussions were made:

Hypothesis one was rejected because there is a significant effect relationship between emotional intelligence and students' academic achievement with respect to gender where the mean effect size statistic estimate is 0.51. This obtained result is in line with the findings of MacCann et al., (2019), Farhangi and Jafari (2016) who reported that gender as a moderator variable has positive and significant effect on the relationship between emotional intelligence and students' academic achievement. However, the finding contradicts those of Hossein (2017), Perera and DiGiacomo (2013) who revealed on the contrary that gender has no significant effect on the relationship between emotional intelligence and students' academic achievement. The finding clarifies the

reviews of Perera and Digiacomo who reported that the influencing impact of gender on the relationship between emotional intelligence and academic achievement has been a difficult issue to resolve as it reports that gender as a moderator variable significantly influences the relationship between emotional intelligence and students' academic achievement.

Hypothesis two was rejected because there is a significant effect relationship between emotional intelligence and students' academic achievement with respect to age where the mean effect size statistic estimate is 0.45. This obtained result is in agreement with the Meta-analysis study of Zahya and Farukh (2016), Perera and DiGiacomo (2013) who reported that age has a positive and significant effect on the relationship between emotional intelligence and students' academic achievement. The result also clarifies the hypothesis of Perera and Digiacomo (2013), who postulated that age and educational level may significantly moderate the relationship between emotional intelligence and academic performance as it confirms to be true. However, the result disagrees with the findings of MacCann et al., (2019) who reported that the moderating effect of age is not statistically significant on the relationship between emotional intelligence and academic achievement.

Hypothesis three was rejected because there is a significant effect relationship between emotional intelligence and students' academic achievement with respect to educational level where the mean effect size statistic estimate is 0.42. This obtained result agrees with the Meta-analysis study of Perera and DiGiacomo (2013) who reported that the summary effect on the relationship between emotional intelligence and academic achievement increases as a function of age and educational level, and clarifies the theoretical hypothesis of same that educational level may moderate the relationship between emotional intelligence and academic performance. However, the finding contradicts the reveal of Azuka (2012) who reported that there is a significantly low positive relationship between emotional intelligence and students' academic achievement with respect to their level of study.

Hypothesis four was rejected because there is a significant effect interaction on the relationship between emotional intelligence and students' academic achievement with respect to gender, age and educational level. This result agrees with the Meta-analysis report of Farhangi and Jafari (2016) and Manimozhi and Srinivasan (2018) who reported that the average relationship between emotional intelligence and academic achievement was significant. Also, the finding is supported by the emperical reports by MacCann et al.,(2019) who submitted that generally, emotional intelligence shows a significant relationship with academic performance.

VI. SUMMARY

This study deals with Meta-analysis of effect size statistic on the relationship between emotional intelligence and students' academic achievement in North Central Nigeria, with respect

to gender, age and educational level as moderator variables with the aims of estimating the average effect size statistic on the relationship between emotional intelligence and students' academic achievement with respect to the moderator variables in order to arrive at a conclusive and robust summary result.

Three research questions and four hypotheses guided the study using the methodological triangulation research design, and the population consists of all published and unpublished previous research findings on the relationship between emotional intelligence and students' academic achievement in North Central, Nigeria considering either one or two or all of the moderator variables, which are numerically infinite. Sample of 30 primary studies were purposively and conveniently drawn from the population in sampled states for even representation. Z-transformation, effect sizes and percentages were used to answer research questions while the Winer combined test statistic and two-way classification ANOVA were used to test the hypotheses at 0.05 levels of significance. The findings revealed that emotional intelligence has a significant effect on academic achievement with respect to gender, age, educational level and a significant interaction effect between the moderator variables of the study.

VII. CONCLUSION

Based on the findings of the study, it is concluded that the meta-analysis of effect size statistic on the relationship between emotional intelligence and students' academic achievement in North Central Nigeria, with respect to gender, age, educational level and the interaction effect between the variables are significant at 0.05 level of significance.

VIII. RECOMMENDATIONS

Based on the findings of this study, it is recommended that:

1. The teaching, learning and assessment of emotional intelligence skills should be introduced in schools for both genders, across all ages and educational level to equip students with this competency for a better academic performance.
2. Training on emotional intelligence should be included into the teacher – education system in Nigeria to make teachers competent in handling the teaching and assessment of emotional intelligence skills.

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