GAP BODHI TARU
A GLOBAL JOURNAL OF HUMANITIES
(ISSN – 2581-5857)
Impact Factor: SJIF - 5.551, IIFS - 5.125
Globally peer-reviewed and open access journal.

EFFECT OF PSYCHOLOGICAL CAPITAL AND PEER PRESSURE ON SECONDARY SCHOOL MATHEMATICS ACHIEVERS

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Abstract

The mathematics achievements of the students depend on many parameters like socio-economic status, peer pressure, study environment, psychological capital, level of intelligence, mathematical anxiety, academic stress and motivation etc. Out of these, peer pressure is a prominent reason for badly affecting students' performance in mathematics. Further, psychological capital is also a positive contributor to psychological well-being and academic performance. In current study, we have examined how mathematics achievement is affected by psychological capital and peer pressure for a sample of 600 secondary school students. For this, statistical analysis on mathematics achievement, psychological capital and peer pressure based on gender and type of school has been performed. It is found that there are significant differences between mathematics achievement, psychological capital and peer pressure of male and female students. On the other hand, an analysis performed on type of school revels no significant difference between mathematics achievement and psychological capital of government and private secondary school students. However, they differ in peer pressure from each other. Using F-ratios, it is predicted that the two variables, gender and type of school, in combination, has a significant effect on peer pressure only and not on mathematics achievement and psychological capital. The study is of unique importance to find various factors to increase the achievement in the subject of mathematics of the students at secondary school level.

Keywords: *Mathematics achievement; Psychological Capital; Peer Pressure*

1. INTRODUCTION

The knowledge of Mathematics is a must for excelling in every field of study. It serves as the universal language and powerful tool of communication throughout the globe. It provides a strong base to understand and solve problems for a wide range of disciplines. The National Policy on Education (NPE) 1986 of Government of India emphasizes the importance of mathematics education at various levels. This policy highlights the role of mathematics in the development of logical skills and critical thinking among the students.

Mathematics achievement: Mathematics achievement (MA) of a person is attaining a proficiency level in understanding and solving the mathematics problem by applying the concepts of mathematics. It can be governed by quizzes, examinations and problem solving tasks. The MA is not only about memorizing formulas and procedures but also understanding the underlying principles, making connections between different mathematical ideas, and solving problems creatively.

Van den Aardweg and Van den Aardweg (1988) argued that the achievement can be determined by specially designed tests and it is related to mental success. Reber (1985) explained the achievement as "accomplishment or the attaining of a goal." Juter (2005) studied the performance of the students studying mathematics as one subject at a Swedish university and found that the students with a positive attitude were better in solving the limit problems. Shamaki (2015) conducted a case study of some selected secondary schools in Yobe State in mathematics, Nigeria to check the influence of the learning environment on students' academic achievement. He found that there was a significant difference between the learning environment quality and academic achievement in mathematics.

Alordiah et al. (2015) performed a study on the influence of gender, school location, and socio-economic status (SES) on students' academic achievement in mathematics. They found better performance of male over female students, urban over rural students and the students of high SES parents over the students with low SES parents in mathematics. Yalcin et al. (2020) conducted a study on the effect of smartphone addiction on loneliness levels and academic achievement of the Z generation. They found a negative correlation between smartphone usage and academic achievements of the Z generation. Güler (2022) investigated the impact of mobile learning on students' MA by conducting a meta-analysis of 22 quantitative research papers from 2010 to 2020. Their results showed that mobile learning had a intermediate positive effect on MA. In our previous study, we studied the

effect of mathematical anxiety (MA_{nx}) and peer pressure (PP) on the MA of students at secondary school level. Upon analysis, significant differences between MA, MA_{nx} and PP of male/female and also rural/urban students were observed. Analyzing F-ratios, it was found that the combination - Gender and Demographic area has a significant interaction effect on MA, MA_{nx} and MA_{nx} of secondary school students (Rani and Rani, 2024).

Psychological Capital: Psychological capital (PC) consists of the internal resources which a person possesses for managing tough situations. These are defined as: Hope, Efficacy, Resilience, and Optimism (HERO). In other words, PC is the HERO feeling in a person. It predicts a wide range of work-related behavioral and attitudinal outcomes. A person with high PsyCap has more consistent behavior. During adolescence, many changes arise in a person's life. Some of them are unable to deal with these challenges as they lack strong life skills. Pan and Zhou (2009) predicted PC as a positive contributor to psychological well-being through regression analysis. Luthens et al. (2012) studied the impact of business school students' PC on academic performance (grade point average (GPA)). The results predicted the relationship between PC and GPA, and emphasized the training of PC of business school students for their overall development and success. Anila et al. (2014) explored the mediating function of "positive and negative emotions in association with PC and subjective well-being between school adolescents." They found that the negative emotions exert a moderating effect on hope and positive emotions and had no effect on optimism and subjective well-being.
With the help of PC interventions, subjective well-being of the students can be improved by empowering positive emotions and reducing the power of negative emotions. Research conducted by Fleige (2016) found that enhancing students' perceived self-efficacy with the aid of growth mindset intervention and training could increase the belief in their own ability and performance. In a research by Nielsen et al. (2017), it was revealed that student's PC attributes can be developed in the classroom through the support of their instructors and family which also enhances their subjective well-being. Geremias et al. (2022) checked the importance of PC in academic settings and found that PC profiles can have differential effects on the learning outcomes of students.

Peer Pressure: The PP is a feeling of a person about doing the things in same way as other people of his age or social group like to do. It is defined as persuading or encouraging another person to engage in a certain type of behavior. Peers are friends from the same age group as classmates, and they can influence a student's moral development, personality formation, and behavior. They influence each other and bring changes in the behavior mentally and emotionally. The Oxford Advanced Learners Dictionary (2016) defines, "a peer group as a group of people of the same age or social status." Outside home, it is very first social group from which the children learn to get appreciation and respect. Zimmer and Toma (2000) examined the peer effects in private and public schools across various countries in the age range of 13 to 14 years. An analysis of the data revealed that peers play an effective role in the achievement of low-ability students as compared to students having high ability. Webber and Walton (2006) explored the impact of examining students' intentions on gender-specific peer groups (age 16). Their results showed that boys' motives and perceptions were affected by their male counterparts. On the other hand, girls' motivations are influenced by their entire peer group, and their beliefs are influenced by their female peer group. The focus of the research by Patmalniece (2011) was to highlight the factors such as demographic and social psychology that have impacts on the academic and professional aspirations of youth. It was underlined that if a person is surrounded by a certain group, it will affect the person's future, especially his or her educational level or career. Siwach and Devi (2014) examined the relationship between academic stress, emotional intelligence, mindfulness, and PP among adolescents. An analysis of the data revealed that academic stress and PP were significantly and positively related. Sahu (2022) examined the PP level and its impact on risk-taking behavior among undergraduate students at Tezpur University. He found that the PP had a significant effect on students' risk-taking behavior including issues like alcohol consumption, drug abuse, and mental illness. He also established that PP is not dependent on gender. Zhang (2023) examined the influence of PP on students' participation in web-based peer learning (WPL). It was found that PP slowly occurred during WPL as influenced by both technological and non-technological factors, and impacted the students positively. In our previous study (Rani and Rani, 2024), we have examined the dependence of mathematical anxiety (MA_{nx}) and PP on MA of secondary school students. Analyzing F-ratios, we found that a combination of Gender and Demographic area has a significant interaction effect on MA, MA_{nx} and PP of secondary school students.
The existing literature works stressed that the achievement of mathematics is dependent on variables such as PC and PP. Thus, we aim to perform a statistical analysis on secondary school students to check the dependence of MA of these students on their PC and PP. The analysis has been planned to be done on the basis of gender and type of school.

2. OBJECTIVES

To analyze the relationship of MA with PC and PP of secondary school students, the following objectives were set.

1. To compare the MA, PC, and PP of male and female students.
2. To compare the MA, PC, and PP of government and private students.

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3. To find the interaction effect of gender and type of school on MA, PC and PP..

3. HYPHOTHESES

H_1 The MA of male and female students do not differ much.
H_2 The PC of male and female students do not differ much.
H_3 The PP of male and female students do not differ much.
H_4 The MA of government and private students do not differ much.
H_5 The PC of government and private students do not differ much.
H_6 The PP of government and private students do not differ much.
H_7 The combination of Gender and type of school do not interact to affect MA.
H_8 The combination of Gender and type of school do not interact to affect PC.
H_9 The combination of Gender and type of school do not interact to affect PP.

4. RESEARCH DESIGN

To check the difference of MA, PC and PP of secondary school students on the basis of gender (Male and Female) and type of school (Government and Private), and also to find the interaction effect of gender and type of school on MA, PC, and PP of these students, we performed the statistical analysis by calculating means, standard deviations, t-values and F-ratios. The factorial design (2×2) was considered to find the relationship between two independent variables, operating together.

Identification and selection of students for study
To conduct the present study, 32 schools from four districts of Haryana state (Kaithal, Jhajjar, Hisar and Yamunanagar) were selected. The simple random sampling method was used for the selection of schools. A sample of 600 students, consisting of 300 males and females each, was taken from these schools in the present study. Three tests i.e. Mathematics Achievement Test, Psychological Capital Assessment Scale and Peer Pressure Scale were applied to the sample taken and the results were separated into two different groups based on gender and also on type of school.

Instrumentation: The following three instruments were used to collect data from the selected students.
(i) Mathematics Achievement Test was developed by the investigators (Rani and Rani (2023)). Mathematics Achievement Test (MAT) was made from NCERT syllabus of mathematics of Class X. There are 50 multiple choice questions (MCQs) of equal marks in this test with a maximum score of 50.
(ii) Psychological Capital Assessment Scale by Rani and Choudhary (2018).
The Psychological Capital Assessment scale (PCAS) contains 34 items in total. These 34 items are distributed among four dimensions of PC such that 8 items for Hope, 9 for Efficacy, 9 for Resiliency, and 8 for Optimism. The total score of an individual respondent can be varied from 35 to 170. The higher total score reflects a higher level of PC and Vice-versa.
(iii) Peer Pressure Scale by Singh and Saini (2010).
The Peer Pressure Scale (PPS) determines the PP among adolescents. It consists of 25 questions about self-report on 5-point Likert-type scale. The total score of the respondent can be obtained in the range from 25 to 125.

Statistical Technique
In the current investigation, mean, standard deviation, T-test and F-ratio were the statistical techniques, used for the analysis of data.

5. RESULTS AND DISCUSSION

In order to compare MA, PC, and PP of secondary school students based on gender and type of school, objectives 1 and 2 are set, respectively. The null hypotheses H_1-H_6 were formulated for the same. To check the correctness of these hypotheses, mean, standard deviation (SD), standard error of difference (SED) and t-values of the scores as obtained from MAT, PCAS and PPS of secondary school students were calculated. The results for gender based analysis are presented in Table 1 and the corresponding results based on type of school are shown in Table 2.

Table 1: Mean, Standard Derivation (SD), Standard Error of Difference (SED) and t-values of Mathematics achievement (MA), Psychological Capital (PC) and Peer Pressure (PP) of male/female students

Dependent Variable	Group	N	Mean	SD	SED	t-value
MA	Male	300	28.86	11.27	0.871	4.388**
	Female	300	25.03	10.04		

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PC	Male	300	91.22	14.84	1.859	2.205*
	Female	300	87.12	13.79		
PP	Male	300	83.97	23.60	1.731	3.154**
	Female	300	78.51	18.50		

*Significant at 0.05 level of significance (table value = 1.97), **Significant at 0.01 level of significance (table value = 2.59) at df = 592

Table 2: Mean, SD, SED and t-values of MA, PC and PP of government and private secondary school students

Dependent Variable	Group	N	Mean	SD	SED	t-value
MA	Govt.	300	27.79	10.98	0.883	1.690
	Private	300	26.10	10.64		
PC	Govt.	300	90.06	22.59	1.865	1.780
	Private	300	88.28	23.10		
PP	Govt.	300	79.23	22.13	1.738	-4.007**
	Private	300	83.24	20.41		

*Significant at 0.05 level of significance (table value = 1.97), **Significant at 0.01 level of significance (table value = 2.59) at df = 592

From Table 1, it is observed that, for two variables, MA and PP of male and female secondary school students, the calculated t-values (4.388 and 3.154, respectively) are greater than the table values i.e. 2.59 at 0.01 level of significance for degree of freedom (df) as 592. On the other hand, for PC of male and female students, the calculated t-value (2.205) is larger than the table value i.e. 1.97 at 0.05 level of significance. Therefore, first three null hypotheses **H_1, H_2 and H_3** stand rejected. As a result, male and female students have different MAs, PC and PP.

Table 2 shows that for two variables, MA and PC of government and private secondary school students, the calculated t-values (1.690 and 1.780, respectively) are less than the table values i.e. 1.97 at 0.05 level of significance. Therefore, the null hypothesis **H_4** and **H_5** stand accepted. As a result, government and private secondary school students do not have different MAs and PC. On the other hand, for PP, the calculated t-value (|-4.007|) is larger than the table value i.e. 2.59 at 0.01 level of significance. Therefore, the null hypothesis **H_6** stands rejected. Thus, the PP of government and private secondary school students are found to be different. The mean scores of these variables for the secondary school students based on gender/type of school are plotted in Fig. 1 (a)/(b) for comparison.

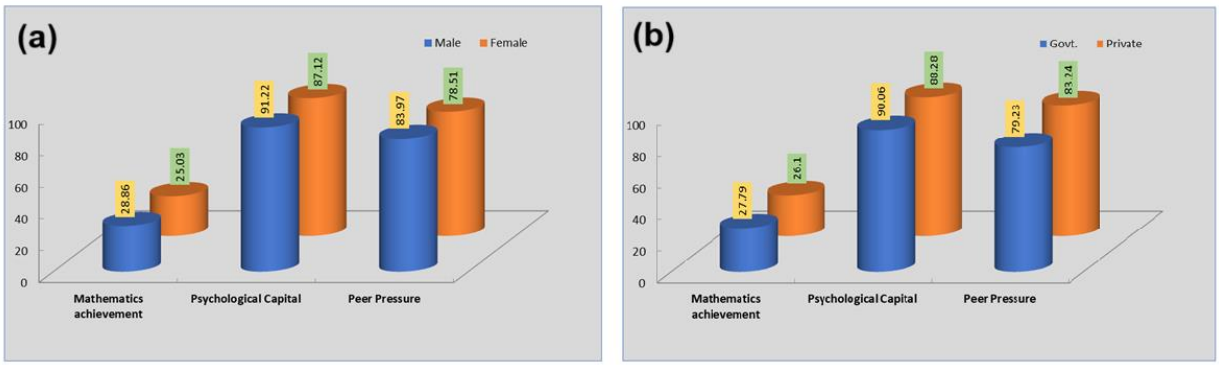

Fig. 1: Mean Scores for MA, PC and PP of Secondary School Students based on (a) gender and (b) type of school

Interactional Analysis

The result of two-way interaction (Gender × Type of School) on MA, PC and PP of secondary school students are shown in Table 3.

Table 3: Analysis of Variance for all variables (MA, PC and PP) of secondary school students

Gender × Type of School	Sum of Squares	df	Mean Squares	F-Ratio
MA	118.815	1	118.815	1.155
PC	218.407	1	218.407	0.880
PP	1320.167	1	1320.167	4.696*

F-Ratio: Table value 6.69/3.86 at 0.01/0.05 level of significance for df 1/592, *Significant at 0.05 level of significance

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It is observed that interaction effects of Gender and Type of School for MA and PC are not significant at 0.05 level of significance as the calculated F-Ratio (1.155 and 0.880, respectively) is found to be lesser than the table value, i.e. 3.86 at 0.05 level of significance. Thus, the null hypotheses **H_7** "There exists no interaction effect of gender and type of school on MA of secondary school students" and **H_8** "There exists no interaction effect of gender and type of school on PC of secondary school students" stand ACCEPTED. It means that a combination of Gender and Type of School has no effect on MA and PC of secondary school students. Secondly, the interaction effect between Gender and Type of School for PP is significant as the calculated value of F = 4.696 is greater than the table value, i.e. 3.86 at 0.05 level of significance. Thus, the null hypothesis **H_9** "There exists no interaction effect of gender and type of school on PP of secondary school students" stands REJECTED. Hence, a combination of Gender and Type of School has a significant effect on PP of secondary school students. In order to interpret this further, t-test was applied to find out the differences between mean MA, PC and PP of the combination group (Gender × Type of School) and the results for the same are shown in Table 4.

Table 4: Mean, SD, SED and t-values of different combinations of (Gender × Type of School) group of secondary school students on PP

Gender × Type of School	Group	N	Mean	S.D.	SED	t-value
PP	Male Govt.	150	87.45	21.78	2.699	2.583*
	Male Private	150	80.48	24.87		
	Female Govt.	150	79.03	18.04	2.139	0.466
	Female Private	150	77.99	18.99		
	Male Govt.	150	87.45	21.78	2.309	3.649**
	Female Govt.	150	79.03	18.04		
	Male Private	150	80.48	24.87	2.555	0.976
	Female Private	150	77.99	18.99		

*Significant at 0.05 level of significance (table value = 1.97 at df =298)
**Significant at 0.01 level of significance (table value = 2.59 at df =298)

Table 5 indicates that there is a significant difference between PP of government male and private male students as the t-value (2.583) is greater than the table value (1.97) at 0.05 level of significance at df=298. This implies that government male students have higher PP than that of private male students. Based on lesser t-value (0.466), it is observed that there exists no significant difference between PP of government female students and private female students. Further, there exists a significant difference between PP of government male and government female students as t-value for this combination comes out to be 3.649 which is larger than the table value (2.59) at 0.01 level of significance. Finally, there exists no significant difference between PP of private male and private female students as the t-value (0.976) is not significant at 0.05 level of significance (table value = 1.97). Thus, private male students and private female students possess PP of similar level.

6. CONCLUSION AND FUTURE IMPLICATIONS

MA is the competency shown by the student in the subject of mathematics. It is a function of different independent variables like PC and PP. The PC, including self-efficacy, optimism, hope, and resilience, may leave a positive impact on MA. One more parameter, PP can also influence MA of secondary school students. The present findings provide valuable insights about the effect of PC and PP on MA of secondary school students. From gender based analysis, it is concluded using the t-values that male students have more MA, higher PC and higher PP than that of female students. The motivation from parents and teachers and giving equal opportunities to female similar to male students, the MA of female students can be increased. The PC of female students can be enhanced by counselling and making them believe that they can perform better with positive feeling and attitude. Due to high competition level among male students, they get affected negatively and develop PP. As a result, their academic performances get reduced. If parents and teachers help male students effectively, they can handle PP easily and perform better in mathematics. From type of school based analysis, it is concluded using the t-values that government and private school students are almost equal achievers in mathematics and have similar PC but they differ in their PP. The private secondary school students possess more PP than government ones. The competition level in private schools generates more PP among students which may result in low MA. This can be reduced by counselling from teachers and motivating private secondary student students to do team work and to support each other for understanding the concepts more easily. The F-ratios analysis shows that a particular combination of gender and type of school has a significant effect on PP only and not on MA and PC. The present results will be beneficial to develop an understanding about various factors which can directly influence the MA of secondary school students. Further, these results may help to make new strategies for effective education to improve the level of MA of secondary school students.

ACKNOWLEDGEMENT

The authors appreciate all those who have participated in the present study and helped to complete the research work.

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