Immediate Effects of Aerobics on Mental Well-being of Primary Resource Teachers in Kerala

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Abstract

Mental well-being of primary teachers is an important yardstick to impart quality teaching learning activities to the elementary students. Many studies suggest that teaching is a difficult job with high burn out rates. This is in addition to other COVID-19 related adjustments and responsibilities in their family, society and institution. The study aims to know the immediate effect of aerobics on mental well-being of primary resource teachers. The study was conducted at a state level training programme for Kerala state primary resource teachers group at Munnar, Kerala. Experimental design was used for the study. 80 resource teachers (F=40 and M=40) aged between 26 and 55 from state resource group (SRG) of primary teachers of Kerala were selected for this study. The teachers interested in aerobics were included into experimental group (n=41), and teachers who lack interest or were unfit for physical activity were put in control group (n=39). Both groups were tested to analyse mental well-being using Warwick Edinburg Mental Well-being Scale. Experimental group were made to do moderate intensity aerobic dance immediately after the pre-test and the control group were left alone. Post-test were conducted to find if there is any significant difference in the experimental group following paired sample 't' test and the results demonstrated significant difference at 0.05 level. Experimental group shows increase in their mental well-being score ($p<0.01$), whereas control group didn't show any difference in mental well-being, ($p=0.135$) which implies that aerobics could be a good intervention even in short run to improve the mental well-being among primary teachers.

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Introduction

Schools have a major role in promoting children's physical and psychological health and well-being and, the mental health literacy of all key stakeholders, especially teachers, is critical to achieving this goal. Teachers' knowledge and beliefs about psychological problems influence the way they deal with their students' mental health issues (Imran et al. 2022).

Mental well-being is a complex construct and includes both hedonic and eudaimonic perspective. Hedonic perspective means feeling happy about one's life and enjoying experiences that cause happiness. Eudaimonic perspective means living a meaningful life, completing goals, striving to attain self realisation (Tennant et al. 2007).

Review of Related Literature

In a study conducted on 15,641 Brazilian public—school teachers aged between 41–60 years during the COVID-19 pandemic reported that 33.7 per cent were dissatisfied with their work, 58 per cent reported increased body weight, 47.9 per cent did not exercise, 35.8 per cent were part of at least one risk group for COVID-19, 40.5 per cent had some flu-like symptoms during the pandemic and 1.2 per cent tested positive for COVID-19. Regarding mental health problems, 25.9 per cent of teachers self reported formal diagnosis of anxiety and/or depression during the pandemic. In addition, 7.1 per cent of teachers were drinking more alcohol than usual, 33.4 per cent started having sleep problems, 30.4 per cent were using relax/sleep/anxiety/depression medications, 67.1 per cent reported that their quality of life worsened and 43.7 per cent reported having severe fear of COVID-19. It was also found that 82.3 per cent of teachers had at least one mental health problem during the pandemic, such as increased alcohol consumption, sleep problems, use of psychotropic medication, decreased quality of life, and fear of COVID-19. The results of this study reveal the numerous challenges and the extent of the impact of the pandemic on working conditions, lifestyle, and especially on the mental health of teachers (Silva et al. 2021).

In another study conducted in the US on 703 teachers from public and private school found that teachers have had to deal with many of the negative aspects of COVID-19 over the past year. The demands associated with the sudden requirement to teach remotely, and later having to manage hybrid (both in person and online) learning may be having adverse effects on the mental and physical health of teachers. Stress and burn out continue to be high for teachers, with 72 per cent of teachers feeling very or extremely stressed, and 57 per cent feel very or extremely burned out. Many teachers struggled to have a satisfactory work-family balance (37 per cent never or almost never; 20 per cent only has sometimes). Investigators suggested that school

systems must start to deal with the mental and physical health of teachers before a large number of them leave the profession (Kotowski et al. 2022).

These studies point to the fact that mental health of the teachers are at stake. The nature of work of primary teachers is hard and exhaustive. They need to have better mental well-being in order to deliver quality instruction and manage students. They need to adopt an easy, economical and practical intervention programme to enhance their mental health.

A systematic review was done by Marconcin et al. in 2022 to examine the association between physical activity and mental health during the first year of the COVID-19 pandemic. Thirty-one studies were included in this review. Overall, the studies suggested that higher physical activity is associated with higher well-being, quality of life as well as lower depressive symptoms, anxiety, and stress, independently of age. There was no consensus for the optimal physical activity level for mitigating negative mental symptoms, neither for the frequency nor for the type of physical activity. Women were more vulnerable to mental health changes and men were more susceptive to physical activity changes. They concluded that physical activity has been a good and effective choice to mitigate the negative effects of the COVID-19 pandemic on mental health. Public health policies should alert for possibilities to increase physical activity during the stay-at-home order in many countries worldwide (Marconcin et al. 2022).

Brush et al. (2022) studied the effect of 8 weeks of moderate-intensity aerobic exercise (n = 35) or light stretching (n = 31) on sixty-six young adults aged 20 to 23 years (S . D . = 2.39) with major depression. Depressive symptoms were assessed across the intervention to track symptom reduction. Compared to stretching, aerobic exercise resulted in greater symptom reduction (g_s = 0.66). They concluded that aerobic exercise is effective in alleviating depressive symptoms in adults with major depression.

Need for the Study

The studies quoted above are all done in western countries. In Indian context, teachers are considered as second parent to children. Our country also lacks psychological support to teachers. Studies conducted in western countries point out the fact that mental health of teachers is of paramount importance to deliver quality instruction

Primary teachers dealing with elementary school students have high work load. COVID-19 pandemic may also have accelerated the decline in mental health of primary teachers. Shifting from physical mode to online mode and then to hybrid mode and again back to physical mode demands a lot of effort and adaptability.

In this study the effect of 30 minutes of moderate intensity aerobics on mental well-being of primary resource teachers is being studied.

Objectives of the Study

1. To assess the mental well-being score of primary resource teachers.
2. To know the effect of single cycle of aerobics on mental well-being scores.
3. To compare the mental well-being score between experimental and control group.

Sample

Eighty primary resource teachers of general subjects in a government school undergoing state level workshop at Munnar, Kerala were selected for the study. We have chosen resource teachers as it is assumed that they will be more active and resourceful than other teachers. They were in the age group of 26 to 55 years. Purpose of the study was made clear to the participating teachers and their consent was taken.

Tools of Data Collection

Pre-test and post-test were administered through Google form using Warwick Edinburg Mental Well-being Scale (WEMWBS), to assess mental well-being. Google form was used as it is a standardised questionnaire and also as resource teachers are considered competent and mature enough to give correct responses without any help from investigator. The scale consisted of 14 items covering both hedonic and eudaimonic aspects of mental health including positive affect (feelings of optimism, cheerfulness, relaxation), satisfying interpersonal relationships and positive functioning which include energy, clear thinking, self acceptance, personal development, competence and autonomy (Tennant et al. 2007).

Individuals completing the scale are required to tick the box that best describes their experience of each statement over the past two weeks using a 5 point Likert scale (none of the time, rarely, some of the time, often, all of the time). The Likert scale represents a score for each item from 1 to 5 respectively, giving a minimum score of 14 and maximum score of 70. All items are scored positively. The overall score for the WEMWBS is calculated by totaling the scores for each item, with equal weights. A higher WEMWBS score therefore indicates a higher level of mental well-being (Tennant et al 2007).

Method of Data Collection

Based on their interest and fitness to do physical activity, teachers were divided into two equal groups, experimental group (n = 41, F = 21, M = 20), and control group (n = 39, F = 19, M = 20).

Pre-test using Warwick Edinburg Mental Well-being Scale is administered to both experimental and control group and data was obtained, experimental group is given one cycle of thirty minutes of moderate intensity aerobics. Moderate intensity (MI) is the exercise done at an intensity of 50 to 70 per cent of maximum heart rate

(HRmax). The exercise programme included warm up by stretching and joint mobilisation for 5 minutes, 20 minutes of aerobic dance (MI) accompanied by music and warm down for another 5 minutes. Control group were not made to do any activity and they were left alone. Post test was conducted again on both the group using Warwick Edinburg Mental Well-being Scale (WEMWBS). The pre-test and post- test scores of both the groups were statistically analysed and the result were obtained.

Results

The collected data from quantitative research is presented, analysed, reported, and evaluated in a systematic manner. Paired sample 't' test was employed to find out the significant differences from pre-test to post-test scores of mental well-being of experimental and control group.

Table 1: The pre-mean and standard deviation, post-mean and standard deviation of both the group (experimental and control group).

Pre mean and standard deviation for the experimental group was 49.07 ± 8.094 and post mean and standard deviation was 54.37 ± 8.561. For the control group pre mean and standard deviation was 52.36 ± 7.485, post mean and standard deviation was 52.21 ± 7.442.

From Table 2, we see that there is significant difference between (increases in post test scores) pre and post test scores in experimental group ($p = 0.000$), and no significant change in control group scores ($p = 0.135$).

For both male and female, there is a significant increase in post test

Table 1: Descriptive Statistics of Mental Well-being (n = 80)

Statistics	Experimental			Control		
	Age	***Pre***	***Post***	***Age***	***Pre***	***Post***
Mean	41.98	49.07	54.37	39.59	52.36	52.21
Std. Deviation	8.002	8.094	8.561	8.100	7.485	7.442
Skewness	0.247	0.249	0.124	0.014	0.174	0.123
Kurtosis	0.515	0.086	0.990	0.915	0.513	0.550

Table 2: Paired t-test of Experimental and Control Group on Mental Well-being (n = 80)

Experimental group	Pre/Post	Mean	Std. Deviation	Std. Error Mean	Mean difference	t	p-value
Experimental	Pre-test	49.07	8.094	1.264	-5.293	-6.415	0.000
	Post test	54.37	8.561	1.337			
Control	Pre-test	52.36	7.845	1.199	0.154	1.525	0.135
	Post test	52.21	7.442	1.192			

Table 3: Gender Wise Paired t-test of Experimental and Control Group on Mental Well-being (n=80)

Experimental group	Sex	Pre/Post	Mean	Std. Deviation	Std. Error Mean	Mean difference	t	p-value
Experiment	Male	Pre-test	49.70	9.039	2.021	-5.100	-4.327	0.000
		Post test	54.80	9.407	2.103			
	Female	Pre-test	48.48	7.257	1.584	-5.476	-4.631	0.000
		Post test	53.95	7.883	1.720			
Control	Male	Pre-test	52.55	9.339	2.088	0.050	0.326	0.748
		Post test	52.50	9.237	2.065			
	Female	Pre-test	52.16	5.113	1.173	0.263	2.041	0.056
		Post test	51.89	5.163	1.184			

scores in the experimental group while there is no significant change in the control group was noticed for them.

Analysis and Discussion

From the results, it is quite evident that the experimental group has increased their mental well-being scores (MD = 5.293). As we can also note that the control group didn't show significant change between pre and post score of mental well-being (MD = 0.154), we can attribute the cause of increased mental well-being score to aerobics practice.

The present study is in line with the study done by Leire Aperribai et al (2020) where the authors plan to explore how teachers have been affected by the lockdown with respect to their mental health and their relationships in three main fields: work, family, and social relationships, and to know the role of physical activity in the mentioned variables. For that purpose, an online survey was designed to collect quantitative and qualitative data. Results showed that indoor physical activity acts as preventive in lockdown situations, whereas the level of activity does not affect mental health. Also, teachers have experienced higher levels of distress due to the workload generated during the lockdown. In conclusion, to prevent health problems among teachers' in future similar situations, it would be important to facilitate the practice of physical activity at home. They also stated that the COVID-19 pandemic has led teachers to an unpredictable scenario, where the lockdown situation has accelerated the shift from traditional to online educational methods, and relationships have been altered by the avoidance of direct contact with

the others, with implications for their mental health. Physical activity seemed to be a factor that could prevent mental disorders such as anxiety or depression in this peculiar situation (Leire et al. 2020).

Our study further strengthens the findings of the above study that physical activity could enchance the mental well-being and prevents teachers from getting into anxiety or depression. Moreover aerobics can be done in isolation or in groups. This increases its chances of acceptability among individuals.

A study done in the UK by Tomlinson et al. (2022) says that exercise is a recognised element of health care management of mental health conditions. In primary health care, it has been delivered through exercise referral schemes (ERS). They reviewed studies and tried to find the effectiveness of ERS where it was found that patients referred to leisure centres significantly improved their long-term symptoms. They also found that uptake and effectiveness of ERSs for mental health conditions was related to programme content and settings. Existing ERSs could be improved through application of individual tailoring and the provision of more face-to-face consultations, and social support. Further research is required to identify the types of ERSs that are most clinically effective for those with mental ill health.

In the above study, it's clear that exercise or physical activity plays a major role in developing mental health. India lacks exercise referral system (ERS). We mainly use drugs and counseling for mental health issues. We also need to try exercises and physical activity for mental health. As the above study states that the uptake and effectiveness of ERS depends upon the programme content and setting, thus, in our study, the programme content was aerobics accompanied by music. This programme is fascinating, economical, is simple, short and thus can be easily accommodated into the life style of teachers.

Our study has positive implication in school and classroom. Presently students are in stress because of broken families, influence of social media and COVID infused financial distress. It has lead to the use of drugs and increased suicidal tendencies among students. If teachers are mentally healthy, then they can identify vulnerable students early and give effective intervention. Mental health of teachers will reflect on student's health too. Moreover intervention programmes like aerobics are liked by students and have high acceptance rate.

The NEP 2020 also highlights the importance of sports and physical activities. The NEP 2020 emphasises on main streaming physical education at par with other subjects. This study acknowledges the recommendations of NEP 2020 with relation to physical education.

Conclusion

Experimental group has shown significant change in mental well-being score as compared to control group. So it is quite evident that resource teachers, mental well-being improved as a result of a single bout of 30 minutes aerobics. This intervention programme requires just 30 minutes, is cost effective and can easily be adopted in daily lives. It may have a positive impact in classroom and school.

Further research needs to be done to know the effectiveness of aerobics in long run for enhancing mental health benefits. Research is also required to assess the adherence capacity of aerobics as physical activity among teachers and students.

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Study of Scientific Aptitude and Academic Performance among Senior Secondary Science Students of Haryana State

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Abstract

The present study was undertaken to analyse the scientific aptitude and academic performance of senior secondary science students of Haryana state with respect to school, gender, stream and coaching. The present study also inspected the influence of scientific aptitude on academic performance of senior secondary science students. Total sample of 400 students was selected at random from twenty government and twenty private schools of Haryana state. The tool used for measuring the level of scientific aptitude was Adolescents' Scientific Aptitude Test (ASAT) developed and standardised by Kusum, Satish Kumar and Sumitra Devi (2021). Academic performance was assessed through marks obtained by senior secondary students in 12th board exam. The result of data analysis concluded that school and coaching significantly influenced the scientific aptitude, but gender and stream does not influence the scientific aptitude. Private school students and students taking coaching have more scientific aptitude. Result also revealed that the school, gender and coaching significantly influenced the academic performance but stream does not influence the academic performance. Significant and positive correlation of between academic performance and scientific aptitude was observed. The result revealed that 28 per cent of academic performance is determined and influenced by scientific aptitude.

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Introduction

Modern life is occupied with scientific technology so enormously that every citizen has to have knowledge of science for effective living. In order to enjoy materialistic happiness in this world, one must be acquainted with adequate knowledge of science. A man with scientific aptitude can easily make his life more happy and comfortable.

Traxler (1957) defines aptitude as "a condition, combination of characteristics, set of qualities in an individual which is indicative of the probable extent to which he will be able to acquire some knowledge, skills or composite of knowledge, understanding and skills, such as ability to contribute to art or music, mechanical ability, mathematical ability or ability to read and speak a foreign language under suitable training". "Scientific aptitude is a complex of interacting hereditary and environmental determinants producing pre-disposition or ability in science" (Rao, 1994).

Scientific aptitude is a composite of abilities which is developed through learning or it is a specific intellectual ability which enables the individual to comprehend scientific facts, to acquire scientific knowledge and understanding through teaching-learning process (Nataraj and Manjula 2012). There ought to be a high degree of interest amongst the scholars to browse the scientific literature and grasp the concepts innately. Quality of numerical ability and information about scientific facts can be raised through development of scientific aptitude among the scholars (Gao and Hangsing, 2019). The students, undoubtedly, will be able to grasp various concepts of science as per the level of their scientific aptitude. Rao (1990) clears that scientific aptitude superbly guides the students to know, understand, organise, comprehend, analyse and synthesise the scientific concepts in a much better manner.

Academic performance or academic achievement is the extent to which a student, teacher or institution has attained their short or long-term goals (Steinmayr et al. 2014).

Academic performance of a student is the ability of the student to study and remember the facts and being able to communicate his knowledge orally or in written form in an exam. Educational researchers have investigated various factors that affect the success in learning. One of these factors is scientific aptitude. Developing scientific aptitude amongst our children should be the major aim of science teaching and education.

Rationale of the Study

The investigation entitled, 'Study of Academic Performance of Senior Secondary Students in relation to their Scientific Aptitude, Interest and Metacognitive Skills', has big importance in shaping the nation's future. By analysing the above mentioned independent variables in students who had chosen science at senior secondary level without having

scientific aptitude, scientific interest and metacognitive skills, we can predict the chances of their success or failure as a professional and accordingly they can be suggested to continue higher study in science subject or switch to other subject/ stream/career. The justification of a research project lies on its contribution in predicting students' performance during studies and entire life ahead. The level of student's scientific aptitude, scientific interest and metacognitive skills, determines the academic performance of the students. That is why the investigator was inspired to study the mentioned variables. The results of this research would be beneficial to educational institutions to develop good quality human resource for developing countries. In addition, this research will revolutionise the field of educational guidance and counseling.

Statement of the Problem

Study of scientific aptitude and academic performance among senior secondary science students of Haryana state

Objectives

1. To study scientific aptitude of senior secondary science students with respect to school, gender, stream and coaching.
2. To study academic performance of senior secondary science students with respect to school, gender, stream and coaching.
3. To observe the influence of scientific aptitude of senior secondary science students on academic performance.

Null Hypothesis

1. There is no significant difference in scientific aptitude of senior secondary science students with respect to school, gender, stream, coaching.
2. There is no significant difference in academic performance of senior secondary science students with respect to school, gender, stream, coaching.
3. There is no influence of scientific aptitude of senior secondary science students on academic performance.

Delimitation of the Study

Four hundred students of Class XII from science stream enroled in Board of School Education Haryana was the sample of the study and scientific aptitude, academic performance, school, gender, stream and coaching were taken as variables.

Research Methodology

The investigator has adopted descriptive survey method for the conduction of his study.

The sample of 400 science students studying in Class XII was selected using multistage random sampling technique. Twenty government and twenty private schools affiliated to Board of School Education Haryana and 10 students from each selected school were selected randomly so as

Sample Design

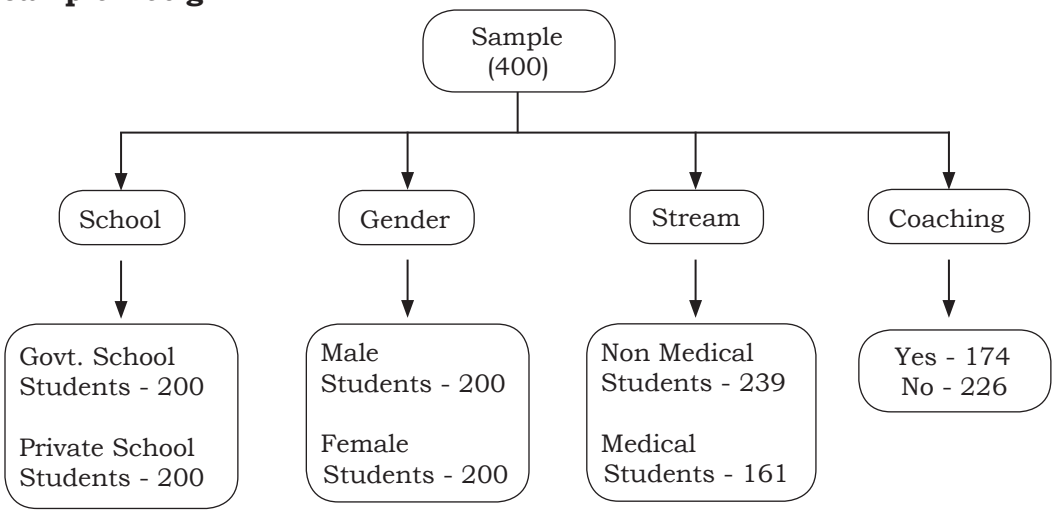

Fig. 1: Distribution of sample

to make a total data collection of 400 students.

Tool Used

1. Adolescents' Scientific Aptitude Test developed and standardised by Kusum, Satish Kumar and Sumitra Devi (2021) was used to study the scientific aptitude of senior secondary science students.
2. Academic performance was determined on the basis of marks obtained by senior secondary science students in Class XII board exam.

Analysis and Interpretation of Data

Statistics like mean, standard deviation and t-test was employed to ascertain the significance of difference of scores of scientific aptitude and academic performance with respect to school, gender, stream and coaching. Relationship between scientific aptitude and academic performance was studied by computing the Pearson's Product Moment Coefficient of Correlation (r).

To Study Scientific Aptitude of Senior Secondary Science Students with respect to School, Gender, Stream and Coaching

Study of Scientific Aptitude of Senior Secondary Science Students with respect to School

It is revealed from Table 1 that mean scores of scientific aptitude of government and private school students are 26.12 and 31.43 with S.D's 7.41 and 9.29 respectively. The computed t-value of 6.320 for the scores of scientific aptitude of government and private school students is found significant at both the level of significance, i.e., 0.05 and 0.01. Therefore, null hypothesis—

Table 1: Differences in Scientific Aptitude of Government and Private School Students

Variable	School	N	Mean	S.D.	p-value	t-value	Level of Significance
Scientific Aptitude	Government	200	26.12	7.41	0.000	6.320	0.05 and 0.01 Significant
	Private	200	31.43	9.29			

N = 400, df = 398

'There is no significant difference in scientific aptitude of senior secondary science students with respect to school' is rejected. So, it is stated that there exists a significant difference in scientific aptitude of government and private school students. Higher mean score value of private school students shows better scientific aptitude of students studying in private school than the students studying in government school.

Study of Scientific Aptitude of Senior Secondary Science Students with respect to Gender

It is revealed from Table 2 that mean scores of scientific aptitude of male and female students are 29.19 and 28.35 with S.D's 9.31 and 8.27 respectively. The computed t-value of 0.954 for the scores of scientific aptitude of male and female students is not found significant at both the level of significance, i.e., 0.05 and 0.01. Therefore, null hypothesis — 'There is no significant difference in scientific aptitude of senior secondary science students with respect to gender' is accepted. It shows that there is no significant difference in scientific aptitude of male and female students.

Study of Scientific Aptitude of Senior Secondary Science Students with respect to Stream

It is revealed from Table 3 that mean scores of scientific aptitude of non-medical and medical students are 29.38 and 27.86 with S.D's 8.65 and 8.98 respectively. The computed t-value of 1.695 for the scores of scientific aptitude of non-medical and medical is not found significant. Therefore, null hypothesis—'There is no significant difference in scientific aptitude of senior secondary science students with respect to stream' is accepted. It shows that there is no significant difference in scientific

Table 2: Differences in Scientific Aptitude of Male and Female Students

Variable	Gender	N	Mean	S.D.	p-value	t-value	Level of Significance
Scientific Aptitude	Male	200	29.19	9.31	0.341	0.954	0.05 and 0.01 Not Significant
	Female	200	28.35	8.27			

N = 400, df = 398

Table 3: Differences in Scientific Aptitude of Non-medical and Medical Students

Variable	Stream	N	Mean	S.D.	p-value	t-value	Level of Significance
Scientific Aptitude	Non-Medical	239	29.38	8.65	0.091	1.695	0.05 and 0.01 Not Significant
	Medical	161	27.86	8.98			

N = 400, df = 398

aptitude of non-medical and medical students.

Study of Scientific Aptitude of Senior Secondary Science Students with respect to Coaching

It is revealed from Table 4 that mean scores of scientific aptitude of students taking coaching and not taking coaching are 30.28 and 27.61 with S.D's 8.42 and 8.93, respectively. The computed t-value for the scores of scientific aptitude of students taking coaching and not taking coaching is 3.033 and is significant. Therefore, null hypothesis—'There is no significant difference in scientific aptitude of senior secondary science students with respect to coaching' is rejected. So, it is stated that there exists a significant difference in scientific aptitude of students taking coaching and not taking coaching. Higher mean score value of students taking coaching shows better scientific aptitude of students taking coaching than the students not taking coaching.

Comparative Analysis of Scientific Aptitude with respect to School, Gender, Stream and Coaching

Comparison of t-value

It is illustrated in Figure 2, that there is a significant difference in scientific aptitude of senior secondary students with respect to school (government and private) and coaching (taking coaching and not taking coaching), but there is no significant difference with respect to gender (male and female) and stream (non-medical and medical).

Comparative analysis of Mean Score of Scientific Aptitude

It is illustrated in Figure 3, that the mean score of private schools students and students taking coaching is significantly higher than the mean score of government schools students and students not taking coaching, which shows that the scientific aptitude of private schools students

Table 4: Differences in Scientific Aptitude of Students Taking Coaching and Not Taking Coaching

Variable	Coaching	N	Mean	S.D.	p-value	t-value	Level of Significance
Scientific Aptitude	Yes	174	30.28	8.42	0.003	3.033	0.05 and 0.01 Significant
	No	226	27.61	8.93			

N = 400, df = 398

and students taking coaching is better than their counterparts. But there is no significant mean difference in scientific aptitude of male and female students and non medical and medical students.

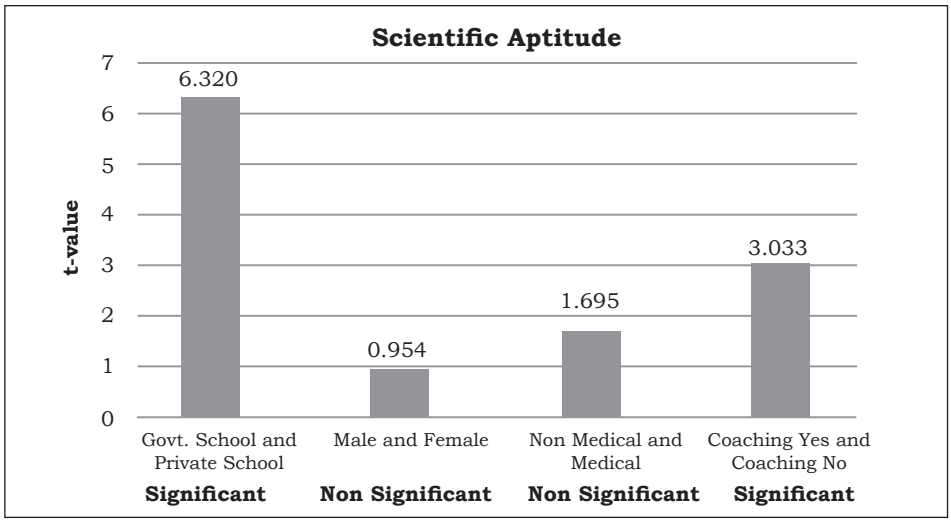

Fig. 2: Showing comparison of t-value of scientific aptitude with respect to school, gender, stream and coaching

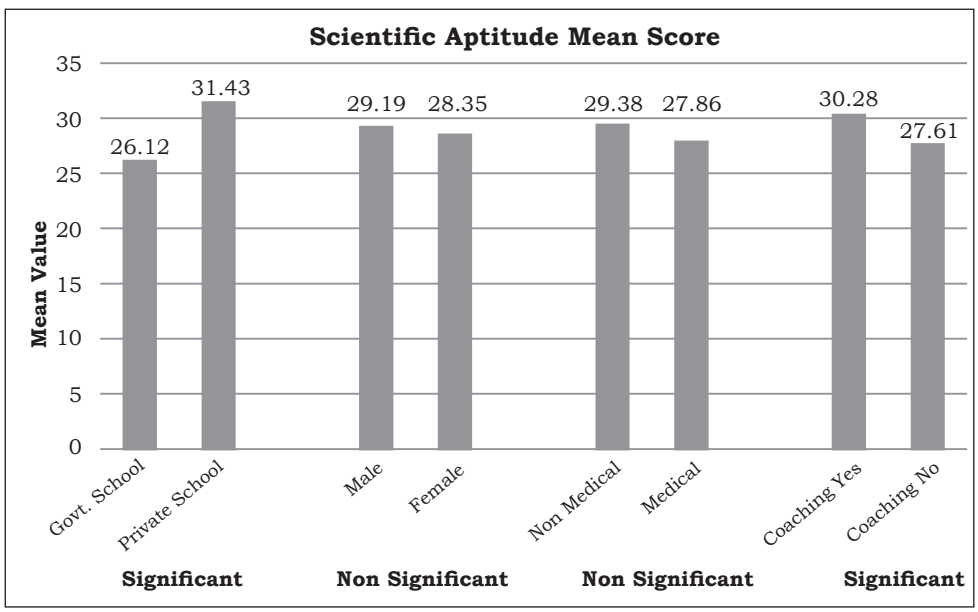

Fig. 3: Comparative analysis of mean score of scientific aptitude of government and private school students, male and female students, non-medical and medical students and students taking and not taking coaching

To Study Academic Performance of Senior Secondary Science Students with respect to School, Gender, Stream and Coaching

Study of Academic Performance of Senior Secondary Science Students with respect to School

It is revealed from Table 5 that mean scores of academic performance of government and private school students are 363.53 and 388.92 with S.D's 56.33 and 58.59, respectively. The computed t-value (4.419) for the scores of academic performance of government and private school students is found significant. Therefore, null hypothesis—'There is no significant difference in academic performance of senior secondary science students with respect to school' is rejected. So, it is stated that there exists a significant difference in academic performance of government and private school students. Higher mean score value of private school students shows better academic performance of students studying in private school than the students studying in government school.

Study of Academic Performance of Senior Secondary Science Students with respect to Gender

It is revealed from Table 6 that mean scores of academic performance of male and female students are 359.59 and 392.86 with S.D's 60.04 and 52.62, respectively. The computed t-value (5.895) for the scores of academic performance of male and female students is found significant. Therefore, null hypothesis—'There is no significant difference in academic performance of senior secondary science students with respect to gender' is rejected. It shows that there exists a significant difference

Table 5: Differences in Academic Performance of Government and Private School Students

Variable	School	N	Mean	S.D.	t-value	Level of Significance
Academic Performance	Government	200	363.53	56.33	4.419	0.05 and 0.01 Significant
	Private	200	388.92	58.59		

N = 400, df = 398

Table 6: Differences in Academic Performance of Male and Female Students

Variable	Gender	N	Mean	S.D.	t-value	Level of Significance
Academic Performance	Male	200	359.59	60.04	5.895	0.05 and 0.01 Significant
	Female	200	392.86	52.62		

N = 400, df = 398

in academic performance of male and female students. Higher mean score of female students shows better academic performance of female students than male students.

Study of Academic Performance of Senior Secondary Science Students with respect to Stream

It is revealed from Table 7 that mean scores of academic performance of non-medical and medical students are 376.44 and 375.90 with S.D's 60.69 and 56.03, respectively. The computed t-value (0.090) for the scores of academic performance of non-medical and medical students is not significant. Therefore, null hypothesis—'There is no significant difference in academic performance of senior secondary science students with respect to stream' is accepted. It shows that there is no significant difference in academic performance of non medical and medical students.

Study of Academic Performance of Senior Secondary Science Students with respect to Coaching

It is revealed from Table 8 that mean scores of academic performance of students taking coaching and not taking coaching are 398.95 and 358.72 with S.D's 44.14 and 62.64 respectively. The computed t-value (7.529) for the scores of academic performance of students taking coaching and not taking coaching is found significant. Therefore, null hypothesis—'There is no significant difference in academic performance of senior secondary science students with respect to coaching' is rejected. It shows that there exists a significant

Table 7: Differences in Academic Performance of Non-Medical and Medical Students

Variable	Stream	N	Mean	S.D.	t-value	Level of Significance
Academic Performance	Non Medical	239	376.44	60.69	0.090	0.05 and 0.01 Not Significant
	Medical	161	375.90	56.03		

N = 400, df = 398

Table 8: Differences in Academic Performance of Students Taking Coaching and Not Taking Coaching

Variable	Coaching	N	Mean	S.D.	t-value	Level of Significance
Academic Performance	Yes	174	398.95	44.14	7.529	0.05 and 0.01 Significant
	No	226	358.72	62.64		

N = 400, df = 398

difference in academic performance of students taking coaching and not taking coaching. Higher mean score of students taking coaching shows better academic performance than the students not taking coaching.

Comparative analysis of Academic Performance with respect to School, Gender, Stream and Coaching

Comparison of t-value

It is illustrated in Figure 4 that there is a significant difference in academic performance of senior secondary students with respect to school (government and private), gender (male and female) and coaching (taking coaching and not taking coaching), but there is no significant difference with respect to stream (non medical and medical).

Comparative Analysis of Mean Score of Academic Performance

It is illustrated in Figure 5 that the mean score of private schools students, female students and students taking coaching is significantly higher than the mean score of government schools students, male students and students not taking coaching, which shows that the academic performance of private school students, female students and students taking coaching is better than their counterparts. But there is no significant mean difference in

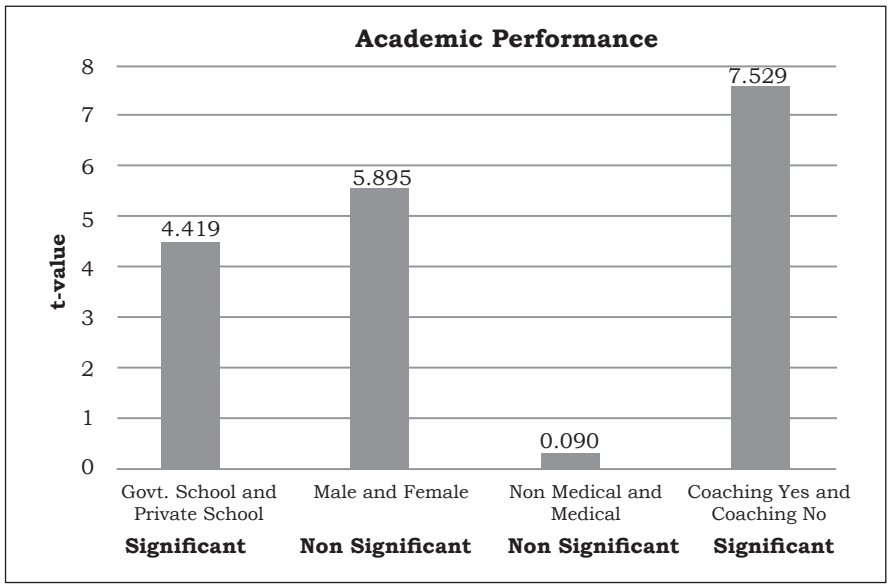

Fig. 4: Showing comparison of t-value of academic performance with respect to school, gender, stream and coaching

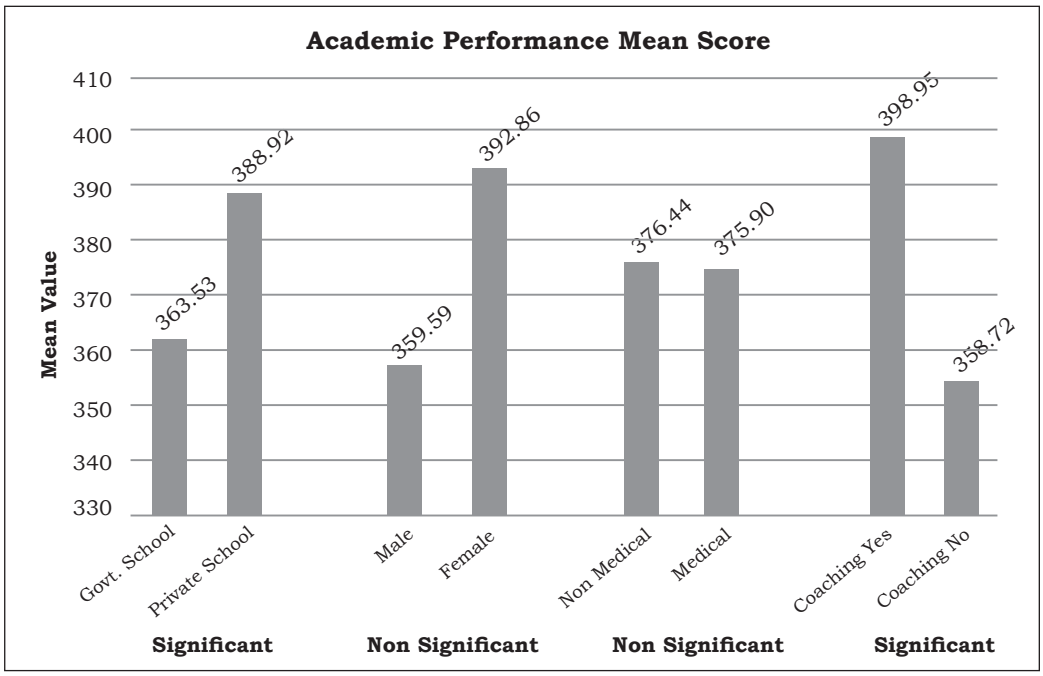

Fig. 5: Comparative analysis of mean score of academic performance of government and private school students, male and female students, non-medical and medical students and students taking and not taking coaching

academic performance of non-medical and medical students.

To observe the influence of Scientific Aptitude of Senior Secondary Science Students on Academic Performance

It is depicted from Table 9 that computed value of coefficient of correlation between academic performance and scientific aptitude is 0.524. Computed (r) value is found greater than table (df 398) value at both 0.05 and 0.01 level of significance, so correlation (r) value is significant at both levels of significance. It shows that academic performance and scientific aptitude have positive and significant relationship with each other which indicates that increase in scientific aptitude leads to increase in academic performance. F value is also significant. Value of R Square (0.275) indicates that scientific aptitude explains 28 per cent of variability of academic performance that is 28 per cent of academic performance is influenced and determined by scientific aptitude. Therefore, null hypothesis—'There is no influence of scientific aptitude of senior secondary science students on academic performance' is rejected.

Table 9: Relationship Between Academic Performance and Scientific Aptitude

Variables	N	Mean	S.D.	Correlation Coefficient (R)	R Square	Percentage contribution	F	Level of Significance
Academic Performance	400	376.22	58.79	0.524	0.275	28%	151.036	0.05 and 0.01 Significant
Scientific Aptitude	400	28.77	8.80					

N = 400, df = 398

It is concluded that scientific aptitude is a powerful determinant of academic performance of senior secondary science students.

Findings

- Scientific aptitude of students studying in private school was found better than the students studying in government school.
- There is no significant difference in scientific aptitude of male and female students.
- There is no significant difference in scientific aptitude of non-medical and medical students.
- Scientific aptitude of students taking coaching was found better than the students not taking coaching.
- Academic performance of students studying in private school was found better than the students studying in government school.
- Academic performance of female students was found better than the male students.
- It was found that there is no significant difference in academic performance of non medical and medical students.
- Academic performance of students taking coaching was found better than the students not taking coaching.
- In this study it was also found that 28 per cent of academic performance is influenced and determined by scientific aptitude and it is interpreted that scientific aptitude is the powerful determinant of academic performance of senior secondary science students.

Discussion

The present study is an attempt to examine the differences in scientific aptitude of government and private school students, male and female students, non-medical and medical students and students taking coaching and not taking coaching.

Significant difference in scientific aptitude of government and private school students was found. Scientific

aptitude of students studying in private school was found better than the students studying in government school. Jai Parkash and Hooda (2019) also reported that scientific aptitude of private secondary school science instructor was more than government secondary school science instructure. In current study, it was found that there is no significant difference in scientific aptitude of male and female students. No difference in scientific aptitude of male and female students can be explained by analysis of the biological capacities of human brain, which is same for male and females of human. Kaur (2013) also reported no important distinction between the male and female students with respect to scientific aptitude. The no difference in scientific aptitude on the basis of stream (medical or non-medical) can be explained because stream could not affect the scientific aptitude once it had been preferred by the students because both non-medical and medical streams are discipline of science. Scientific aptitude of students taking coaching was found significantly higher than the students not taking coaching. Florko et al. (2010) reported that the coaching increased the aptitude test score.

Academic performance of students studying in private school was found significantly higher than the students studying in government school. The findings of the present study were in concordance with previous studies. Wangoo and Khan (1991) also reported that the students from public and private schools differ in academic achievement due to their social and economic status. Academic performance of female students was found higher than the male students. Nayar and Visweswaran (1966) reported the same finding that there was significant distinction in the achievements of urban male and female students of Class X. Vijayalaxmi and Natesan (1992) reported a significant gender distinction in academic achievement and female students were better in academic achievement as compared to male students. Kalaivani (2018) reported higher mean score of female students as compared to the male students in their scholastic achievement. In current investigation it was found that there is no significant difference in academic performance of non-medical and medical students. The no difference in academic performance on the basis of stream (medical or non-medical) can be explained because both non-medical and medical streams are discipline of science and students choose the science stream because of their interest in science or we can say interest of the student in their subject influence the academic performance instead of streams. Academic performance of students taking coaching was found better than the students not taking coaching. Gafoor et al., (2007) reported the similar results that there was an important distinction in achievement in science of students belonging to

coaching and non-coaching teams. According to Mitchell et al., (2016) academic coaching has been found to be effective in enhancing student success. Robinson and Gahagan (2010) reported improvement in students' academic success using a coaching framework of self assessment, reflection, and goal setting.

It was found that there is a significant and positive relationship between academic performance and scientific aptitude. Significant influence of scientific aptitude on academic performance was found. The positive relationship was also reported by most of the previous studies. Rao (1990) investigated 'The relationship among scientific attitude, scientific aptitude and achievement in Biology of secondary students'. Aptitude, attitude and achievement were found to be considerably correlated with each other. Kumar (2013) reported that there was a big correlation in scientific aptitude and educational accomplishment. Leo Stanly (2016) also reported a moderate positive relationship between scientific aptitude and the level of performance in science. Mehna (1986) suggested that scientific knowledge and aptitude is the most important factor for determining the students' performance in science subjects. It was also found that 28 per cent of academic performance is influenced and determined by scientific aptitude and it is interpreted that scientific aptitude is the most significant predictor of academic performance of senior secondary science students. Gao and Hangsing (2019) conducted a study on scientific aptitude and academic achievement of tribal students. Their finding showed that different dimensions of scientific aptitude like reasoning, numerical ability and scientific vocabulary shows moderate direct correlation with accomplishment in science.

Conclusion

It was concluded that scientific aptitude of students studying in private school and students taking coaching was better than their counterparts. But no significant difference in scientific aptitude was found with respect to gender and stream.

The conclusion of the study indicated that academic performance of students studying in private school, female students and students taking coaching was found better than their counterpart. But there was no significant difference in academic performance of non-medical and medical students.

The study concluded the significant and positive relationship between academic performance and scientific aptitude. It is interpreted that scientific aptitude is the most significant influencer of academic performance of senior secondary science students.

Educational Implications

Findings of this research may help in understanding the scientific aptitude of a student and accordingly can be guided to adopt a profession related to the field of science. Achievement in science of a child largely depends upon his aptitude in science. Therefore, in order to develop scientific aptitude in students' right from the beginnings, care must be taken by parents and teachers to identify the aptitude of students in an early age. Teacher should use drill and practice to fix up the science concepts for better learning.

As government school students were found to have low scientific aptitude, the associated reasons and problems should be explored to improve the scientific aptitude of government school students. School authorities, parents and teachers ought to help and encourage government school students. In present study, students who have taken coaching scores high in both scientific aptitude test and Class XII board exam. Parents and teachers should identify the students' special and personalised need of coaching.

As boys were found academically weak, the associated reasons and problems should be explored to improve academic performance of boys. Teachers and parents can make efforts to recognise the troubles which were liable for low academic achievement and then corrective actions should be undertaken to get better academic performance.

Scientific aptitude plays an important role in the academic performance of the students. Identification of aptitude at an early stage will help in utilising the potentials of students. Counseling by aptitude testing and interactive grouping can be more effective than personal characteristics of the students, for improving aptitude capabilities.

This research will suggest that in order to encourage more students in science, intervention need to be designed that focus not only on the academic performance of the students but also on how to make science related occupations more interesting for the senior secondary students. This type of intervention should start early in the academic careers for these students.

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