

**A STATISTICAL STUDY ON INTELLIGENCE QUOTIENT (IQ) TEST
BETWEEN MALES AND FEMALES IN THE AGE GROUP OF 20 AND 30 IN
ROHTAK DISTRICT (HARYANA)**

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Abstract

Intelligence is the capacity to suppose rationally, study effectively, apprehend complicated ideas, and adapt to the environment. Accordingly, intelligence is quality visible as a preferred capacity which could have an impact on overall performance on a huge variety of cognitive tasks. IQ (the Intelligence Quotient) is the quantification of an individual's intelligence relative to friends of a comparable age. This have a look at affords knowledge of take a look at of importance distinction among the 2 approach and its utility in IQ tiers from the chosen place in Thanjavur District, Tamilnadu. This case study helps, how to investigate the data by using test of significance difference between two means, what are the assumptions, conditions for application of this test. This have a look at might display the utility of t-test in IQ levels of male and female of the age group of 20 and 30 in Thanjavur district. This additionally consists of how the facts turned into collected, how it's changed to IQ tiers and the way it turned into calculated in t-test. Also, this study would provide a simple knowledge for the utility of Student t-test using SPSS software.

Keywords: t-test, IQ level, testing of hypothesis, SPSS Software

1. Introduction

IQ is one of the maximum heritable mental traits, and a man or woman's rating on a current IQ take a look at is a superb predictor of many existence outcomes, which includes instructional and profession success, health, longevity, or even happiness (Gottfredson 1998) [1]. Like humans, numerous species of animals specific a "widespread cognitive capacity" that affects overall performance on extensive and numerous cognitive tasks, and moreover, animals showcase a extensive variety of man or woman versions on this capacity.

Concepts of 'intelligence' are tries to make clear and arrange this complicated set of phenomena" (Neisser et al. 1996) [2]. In an article in the Wall Street Journal (December 13, 1994) signed through fifty two intelligence researchers, it become asserted that intelligence become "a completely widespread intellectual functionality that, amongst different things, includes the capacity to reason, plan, clear up problems, suppose abstractly, understand complicated ideas, study quick and study from experience. It displays a broader and deeper functionality for comprehending our surroundings." The t-

test a look at is any statistical speculation take a look at wherein the take a look at statistic follows a Student's t- distribution under the null speculation. A t-test a look at is maximum typically implemented while the take a look at statistic might comply with a everyday distribution if the cost of a scaling time period in the take a look at statistic had been known. When the scaling time period is unknown and is changed through an estimate primarily based totally at the records, the take a look at records (under certain conditions) comply with a Student's t distribution. The t-test a look at may be used, for example, to decide if the way of units of records are significantly extraordinary from every different. William Sealy Gosset, who evolved that the “t-statistic” and posted it under the pseudonym of “Student” in 1908 [3]. The impact of Dengue fever in Thanjavur district primarily based totally at the statistical study discussed by Dr.R.Arumugam et. al.,[4]. A statistical study become made for the production of Crops before and after Gaja cyclone in the delta location through Dr.Arumugam.R et.al., [5]. Applications mobile learning through statistical technique in the better instructional establishments becomes mentioned through M.Rajathi and R.Arumugam [6]. Although research of man or woman variations in animal intelligence have been common early in the 20th century (Thorndike 1911, 1935 [7-8]; Tolman 1924 [9]; Tryon 1940 [10], the emergent attention on experimental (in place of correlation) research tended to restrict the hobby on this subject matter in the later a part of that century. McClave et.al [11] described descriptive records makes use of numerical and graphical techniques to search for styles in a records set, to summarize the statistics discovered in a records set, and to give the statistics in a handy form. Altman et.al [12] said that pilot study becomes a small test executed to check the common sense and to enhance the statistics excellent and performance amassed from massive study. Statistical checks are very vital in biomedical studies [13]. Several elements play a position in deciding on the maximum suitable statistical take a look at [14]. The misuse or misguided use of a statistical take a look at can also additionally navigate the studies in the incorrect direction, and therefore wrong conclusions. Because it might be the maximum typically used statistical take a look at, Student's t-test a look at is considered “the bread and butter” of statistical analysis. The William Gossett take a look at “Student's t-test a look at” is straightforward to use, however, it's also misused [15]. There are three sorts of the t-test a look at, which can be used for evaluating both a unmarried suggest or populace way. Each t-test a look at may be used under unique situations and criteria. A Statistical study for A Markov Model for Prediction of Corona Virus COVID-19 in India was made by Dr..Arumugam R, et.al.,[16] and Arumugam.R and Rajathi,M [17] dealt with applications of manpower with various stages in business using stochastic models. On the only hand, then, standardized checking out because it now exists can assist create fairness through contributing to the admissions of college students due to their cognitive capabilities and achievements. But such checking out can also make contributions to the destruction of fairness through giving a bonus to a few companies of college students over others on bases apart from cognitive capabilities and achievements [18].

2. Problem of the Study

Data Collection

The purpose of this paper is to investigate the IQ between the female and male in the age group of 20 to 30. This was done by selecting at random 54 individuals from the population of 500 in Thanjavur. Our intention here is to perform a questionnaire of 10 questions to the age group of 20 and 30 for both male and female to test their IQ level. A point for the given 10 questions is 50. However, the questionnaire was carefully conducted and the data are collected by means of points. We are decided to use these points to formulate the IQ level based on the points obtained by individuals.

Data for IQ Level between Male and Female

We formulate the IQ level as

Table: 1 IQ Level with the points

Points Obtained	IQ Value
0-19	80
20-29	95
30-39	100
40-50	120

Table: 2 IQ level for Males and Females

Femal e	Points obtained	IQ level	Male	Points Obtained	IQ level
1	45	120	1	45	120
2	20	95	2	35	100
3	25	95	3	45	120
4	30	100	4	30	100
5	40	120	5	45	120
6	35	100	6	50	100
7	50	120	7	45	120
8	45	120	8	50	120
9	25	95	9	50	120
10	50	120	10	40	120
11	40	120	11	45	120
12	40	120	12	40	120
13	10	80	13	35	100
14	15	80	14	10	80
15	45	120	15	40	120
16	50	120	16	35	100
17	30	100	17	45	120
18	40	120	18	40	120
19	35	100	19	35	100
20	40	120	20	40	120
21	40	120	21	30	100

22	35	100	22	35	100
23	35	100	23	45	120
24	45	120	24	35	100
25	35	100	25	45	120
26	50	120	26	45	120
27	50	120	--	---	---
28	50	120	--	---	---

Table: 3 Category of IQ level with the Range

Levels of Intelligence	IQ Range
Idiot 0-24	0-24
Imbecile	25-49
Moron	50-69
Border Line	70-79
Low normal	80-89
Normal	90-109
Superior	110-119
Very Superior	120-139
Near Genius	140 and above

Intelligence Quotient

- $IQ = (MA / CA) \times 100$
- MA = Mental age, CA = Chronomolgical age
- 8 year old with MA of 12 has IQ of 150
- Problem across life span, such as someone age 30 with MA of someone 45

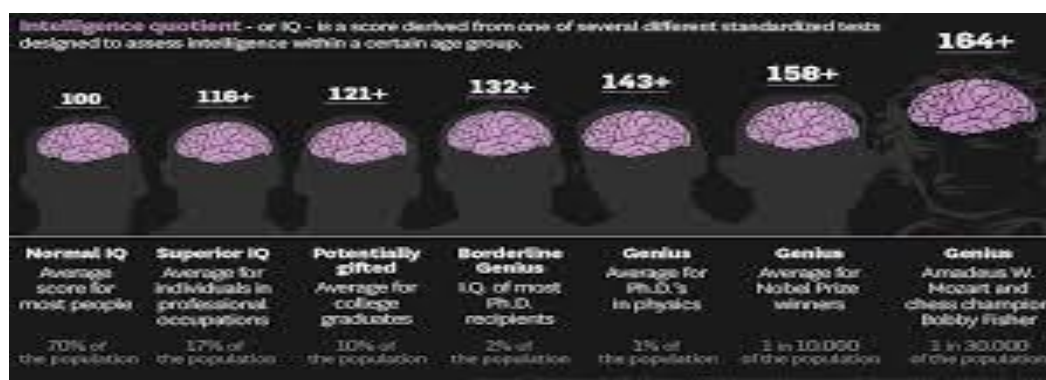


Figure 1: Various Measures of Intelligence Quotient (IQ)

3. ANALYSIS

Analysis for IQ between Male and Female of the Age Group of 20 and 30

Here we must calculate the suggest and the usual deviation for the given samples and to check the importance distinction among the manner of the woman and male of the age organization 20 and 30 the use of t-test (for small samples) at 5% degree of importance from the Table:2. Also discern out that the IQ degree of Female in the given place if extra than that of the male in the equal place.

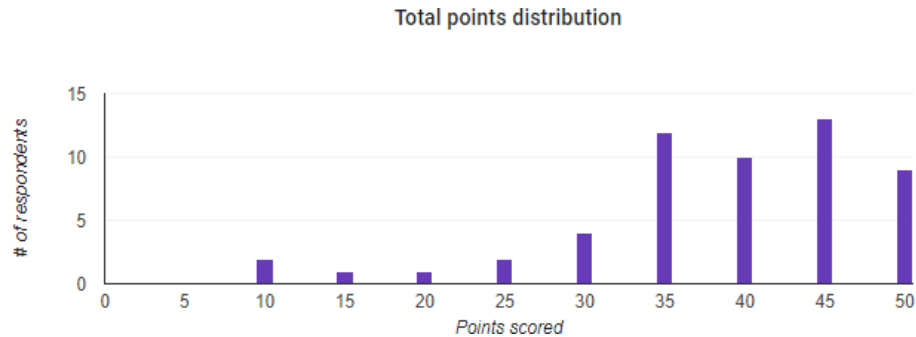


Figure: 2 Number of respondents in this study

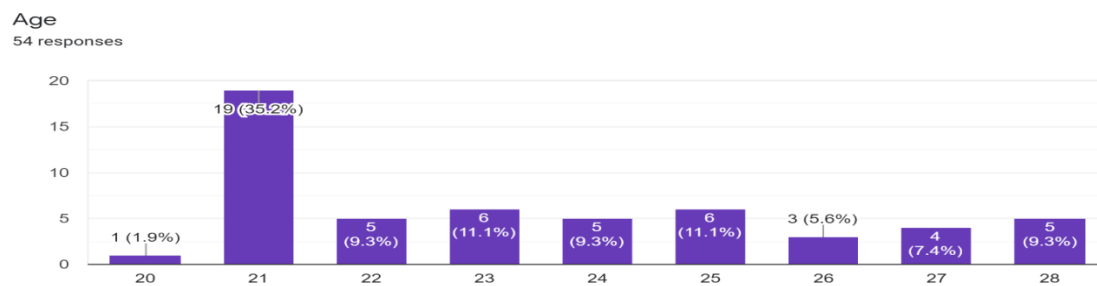


Figure 3: Age group of the Respondents:

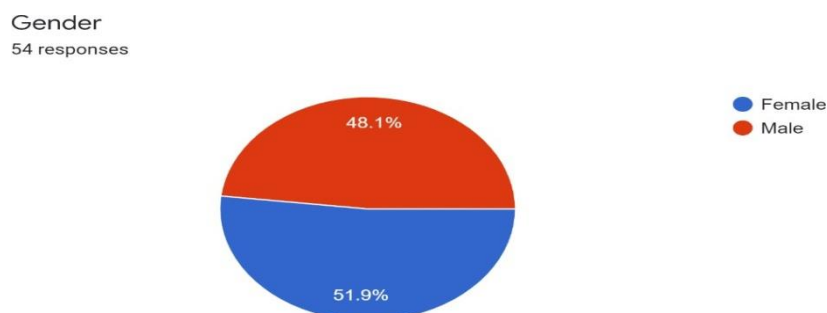


Figure 4: Gender of the respondents:

Here we are taking x_1 as the sample for female and x_2 as the sample for male. x_1 and

\bar{x}_1 and \bar{x}_2 are the sample means and n_1 and n_2 are the sample size of female and male.

We Setup Null Hypothesis $H_0: \mu_1 = \mu_2$ (i.e.,) the IQ level of female is greater than that of the male.

Alternative Hypothesis $H_1: \mu_1 \neq \mu_2$

Level of Significance, $\alpha = 0.05$ Test

Statistic:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

Where s_1 and s_2 are

$$s_1 = \sqrt{\frac{\sum (x_1 - \bar{x}_1)^2}{n_1}} \quad s_2 = \sqrt{\frac{\sum (x_2 - \bar{x}_2)^2}{n_2}}$$

Computation of t:

$$\bar{x}_1 = \frac{\sum x_1}{n_1} = \frac{3065}{28} = 109.5$$

$$\bar{x}_2 = \frac{\sum x_2}{n_2} = \frac{2900}{26} = 111.5$$

Table 4: Calculation of t based on Male

x_1	$x_1 - \bar{x}_1$	$(x_1 - \bar{x}_1)^2$
120	10.5	110.25
95	-14.5	210.25
95	-14.5	210.25
100	-9.5	90.25
120	10.5	110.25
100	-9.5	90.25
120	10.5	110.25
120	10.5	110.25
95	-14.5	210.25
120	10.5	110.25
120	10.5	110.25
120	10.5	110.25
80	-29.5	870.25
80	-29.5	870.25
120	10.5	110.25
120	10.5	110.25
100	-9.5	90.25

120	10.5	110.25
100	-9.5	90.25
120	10.5	110.25
120	10.5	110.25
100	-9.5	90.25
100	-9.5	90.25
120	10.5	110.25
100	-9.5	90.25
120	10.5	110.25
120	10.5	110.25
120	10.5	110.25
$\Sigma x_1 = 3065$		$\Sigma(x_1 - \bar{x}_1)^2 = 4767$

Table 5: Calculation of t based on Female

x_2	$x_2 - \bar{x}_2$	$(x_2 - \bar{x}_2)^2$
120	8.5	72.25
100	-11.5	132.25
120	8.5	72.25
100	-11.5	132.25
120	8.5	72.25
100	-11.5	132.25
120	8.5	72.25
120	8.5	72.25

120	8.5	72.25
120	8.5	72.25
120	8.5	72.25
120	8.5	72.25
100	-11.5	132.25
80	-31.5	992.25
120	8.5	72.25
100	-11.5	132.25
120	8.5	72.25
120	8.5	72.25
100	-11.5	132.25
120	8.5	72.25
100	-11.5	132.25
100	-11.5	132.25
120	8.5	72.25
100	-11.5	132.25
120	8.5	72.25

120	8.5	72.25
$\sum x_2 = 2900$		$\sum (x_2 - \bar{x}_2)^2 = 3338.5$

Now,

$$s_1 = \sqrt{\frac{\sum (x_1 - \bar{x}_1)^2}{n_1}} = \sqrt{\frac{4767}{28}}$$

$$= 13.0480$$

$$s_2 = \sqrt{\frac{\sum (x_2 - \bar{x}_2)^2}{n_2}} = \sqrt{\frac{3338.5}{26}}$$

$$= 11.3315$$

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} = \frac{109.5 - 111.5}{\sqrt{\frac{(13.0480)^2}{28} + \frac{(11.3315)^2}{26}}}$$

$$t = -0.6025$$

The number of degrees of freedom is $v = n_1 + n_2 - 2 = 28 + 26 - 2 = 52$

4. Application of the Data in SPSS Software

SPSS data is a software program package deal used for interactive or batched, statistical analysis. Long produced via way of means of SPSS Inc., it becomes obtained via way of means of IBM in 2009. Current model have the emblem call: IBM SPSS Statistics. The software program call firstly stood for Statistical Package for the Social Sciences


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T-TEST GROUPS=Group(1 2)
/MISSING=ANALYSIS
/VARIABLES=Score
/ES DISPLAY(FALSE)
/CRITERIA=CI(.95).

```

→ T-Test

Group Statistics					
	Group	N	Mean	Std. Deviation	Std. Error Mean
Score	1.00	28	109.4643	13.28737	2.51108
	2.00	26	111.5385	11.55588	2.26630

Independent Samples Test										
Levene's Test for Equality of Variances						t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
Score	Equal variances assumed	1.513	.224	-.610	52	.545	-2.07418	3.40030	-8.89738	4.74903
	Equal variances not assumed			-.613	51.789	.542	-2.07418	3.38254	-8.86240	4.71405

(SPSS).SPSS is a broadly used application for statistical analysis in social science. It is likewise utilized by marketplace researchers, fitness researchers, survey companies, government, schooling researchers, advertising organizations, information miners and others. Here I actually have used the SPSS software program for the gathered information to be run and efficiently were given the output. Table 6: t-test calculation using SPSS

Table 7: One way ANOVA calculation using SPSS:

Oneway

[DataSet1] C:\Users\sowmyaappu\Documents\Case Study\Sem III\data for iq statistics.sav

Warnings

→ Post hoc tests are not performed for Score because there are fewer than three groups.

Descriptives

Score								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
1.00	28	109.4643	13.28737	2.51108	104.3120	114.6166	80.00	120.00
2.00	26	111.5385	11.55588	2.26630	106.8709	116.2060	80.00	120.00
Total	54	110.4630	12.41076	1.68889	107.0755	113.8504	80.00	120.00

ANOVA

Score			Sum of Squares	df	Mean Square	F	Sig.
Between Groups	(Combined)		58.000	1	58.000	.372	.545
	Linear Term	Unweighted	58.000	1	58.000	.372	.545
		Weighted	58.000	1	58.000	.372	.545
Within Groups			8105.426	52	155.874		
Total			8163.426	53			

Table 8: Group Score Cross tabulation using SPSS
Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Group * Score	54	100.0%	0	0.0%	54	100.0%

Group * Score Cross tabulation

		Score				Total	
		80.00	95.00	100.00	120.00		
Group	1.00	Count	2	3	7	16	28
		% within Group	7.1%	10.7%	25.0%	57.1%	100.0%
		% within Score	66.7%	100.0%	43.8%	50.0%	51.9%
	2.00	Count	1	0	9	16	26
		% within Group	3.8%	0.0%	34.6%	61.5%	100.0%
		% within Score	33.3%	0.0%	56.3%	50.0%	48.1%
Total		Count	3	3	16	32	54
		% within Group	5.6%	5.6%	29.6%	59.3%	100.0%
		% within Score	100.0%	100.0%	100.0%	100.0%	100.0%

Table 9: Chi-square-test using SPSS

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.514 ^a	3	.319
Likelihood Ratio	4.675	3	.197
Linear-by-Linear Association	.377	1	.539

N of Valid Cases	54		
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a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is 1.44.

5. Discussion and Results

Table 1 represents that the IQ level with the points from 0 to 50. Table 2 depicts that the sample IQ level for male and female respondent. Table 3 shows that the categories of the IQ level intelligence with the Range from 0-24 to 140 and above. Figure 1 dealt that the various measures of IQ levels. Figure 2 and 3 represents the number of respondent and age group of the respondent of this study and figure four illustrates the gender of the respondent. Table 4 and 5 shows that, the analysis of t-test based on the male and female for finding the significant level. Table 6 representing that the t-test with degrees of freedom 52 and 51.789. From this table $F=1.513$ and it is significance at the 5% level. Table 7 demonstrates that the one way ANOVA, it gives the significant level at the 5% $F = 0.372$ with the degrees of freedom (1, 52). Similarly table 8 shows that the cross tabulation between groups and within groups. Chi-square test with 3 degrees of freedom in the two tailed test, in this case also it is significant from the table 9. Since, the calculated value of $t >$ tabulated value of $t(t_{\alpha})$, H_0 is rejected at the 5% level of significance. There is no significant difference between the IQ level of female and male. Hence the IQ level of female in the given location is greater than that of the male in the same given location.

6. Conclusion

From the report, we can easily understand that there may be moderate deviation or no deviation among the manual calculation and the software program output. Here the samples of this study are IQ levels of men and women in the age group of 20 and 30 in Thanjavur district, Tamilnadu. Also the manual calculations of the t-test for difference between two means were made and the values are plotted in SPSS software program for the significant level. The results indicate that the significant level based on the student t-test and software outputs are clearly representing the deviation. IQ tests can help identify structural inequalities that have affected children's development. This can include the impact of environmental exposure to harmful substances such as lead and arsenic or malnutrition effects on brain health. All of this has been proven to have a negative impact on individual mental abilities and disproportionately affecting low-income and ethnic communities.

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