

# Construction And Standardization of the Research Aptitude Test (RAT) For Postgraduate Students

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## ARTICLE INFO ABSTRACT

Post graduate students' research aptitudes influence how they mentally approach research including all the work related to research. Research aptitude is an acquired or natural ability for learning and proficiency in research activities. Research aptitude refers to an individual's competence in his or her future research potentialities. The goal of the present study is to develop and standardize an instrument to assess the research aptitude test of postgraduate students. The researcher conducted a pilot study with a sample of 100 postgraduate students to validate the instrument and undertake item analysis. The sample was selected from the postgraduate departments of St. Anthony's College, Shillong and Synod College, Shillong. Spearman Brown's Split Half Method, Cronbach's Alpha Method and Kuder Richardson (KR20) Method were used in the second sample of 200 postgraduate students of NorthEastern Hill University (NEHU), Shillong to test the reliability of the instrument. The reliability value computed in the Spearman Brown's Split Half Method was 0.86, the reliability value computed in the Cronbach's Alpha Method was 0.92 and the reliability value computed in the Kuder-Richardson (KR20) method was 0.91. Face validity and content validity have been established for the instrument. The researcher generated percentile scores for the tool to explain the results. The final version of the research aptitude test has forty-one items. **Keywords—Research Aptitude, Postgraduate students, Item analysis, Reliability, Validity, and Norms**

## Introduction

Research is a systematic scientifically based investigation done in any branch of knowledge for enhancement of existing knowledge and pursuit of new information. Research forms one of the best measures of scientific progress of a country. Research means investigating ideas and uncovering useful knowledge or quality knowledge. Research involves gathering facts and information by employing appropriate research methodology i.e., appropriate research tools and analysis without biases.

Aptitude is an acquired or natural ability for learning and proficiency in a specific area or discipline. It is expressed in interest and is reflected in current performance. It is an individual's competence in any activity. It is an inborn potential to do certain kinds of work whether developed or undeveloped. It refers to an individual's competence in an activity that is indicative of his or her future potentialities. For example, when appraising an individual's aptitude in teaching, we take the individual as he or she is in teaching, and not as what he or she might have been. Aptitude is the potential ability in performance and implies fitness and suitability for the activities in question.

Research aptitude in this study refers to an acquired or natural ability of post graduate students of NEHU towards learning and proficiency in research activities. It refers to their competence in research activities which are indicative to their future research potentialities. It connotes a student's potential ability in performance and implies fitness and suitability for research activities. It relates to the post graduate students' ease in learning, understanding and performing research. Research aptitude will indicate the readiness to acquire proficiency, to develop the students' abilities and capacities and an interest in exercising these abilities. It connotes the potential ability in performance and implies fitness and suitability for research activities. A favourable research aptitude will indicate a readiness to acquire proficiency, to develop one's abilities and capacities and an interest in exercising these abilities. An unfavourable research aptitude leads

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to low efficacy, misinterpretation of statistical findings, lack of scope and avenues in research, and undeveloped and irrelevant research in the education process.

## Review on the Psychological Instruments of Research Aptitude

Research competence is interpreted by Aleksandrova and Sluchayna (2018) as the ability to conduct independent

research and provide its results. Research competence is both the main task of the development of professional and methodological competence and a means of developing other professional, cultural and general competencies (Gorshkova, 2017). The development of student research skills at the university is associated with the improvement of skills related to critical thinking (Kartika et al., 2019), problem solving (Missingham et al., 2016) and employment skills (Bandaranaike & Willison, 2015), especially those who become employed graduates (Willison, Sabir & Thomas, 2017). Davidson and Palermo (2014) conducted a study to assess students' research competencies in areas of information gathering and handling, information evaluation, ability to work independently, and critical thinking. Results indicate high satisfaction and further exploration of learner attitudes towards research is needed with consideration of how these might be addressed in future research skills teaching. Marushkevych, Zvarych, Romanyshyna, Malaniuk and Grynevych (2022) conducted a study to experimentally test the development of students' research competence in the study of the humanities. The study showed that purposeful work on the development of students' research competence had a positive effect on the level of education.

Soman (2007) constructed and standardized a Research Aptitude Test. The components of the instrument are the self-reporting section, research knowledge based section and logical and numerical ability based section. Meerah et al. (2011) developed a questionnaire to measure graduate students' research skills with components of statistical analysis, information seeking, problem solving, communication and methodology. The questionnaire was validated based on expert judgment on the content and the components of research skills were acquired from the review research based literature. Aqil and Upadhyay (2017) developed an attitude towards research scale (ATRS) with dimensions of viz Usefulness of research in professional carrier, Relevance of research in personal and social life, Ethics of Research, Difficulty of research and Anxiety, General aspects of Research and research process. The scale was fairly reliable and valid to measure the attitude of research scholars towards research and research activity. The scale can be employed to compare the attitude of different categories of respondents classified on the basis of different socio-demographic as well as other independent variables.

Lacson and Dejos (2022) validate a research scale that can measure the research skills of SHS students. The study employed an initial draft researchers-made research skills scale for senior high school students. The five point Likert scale consisted of 48 items covering five research constructs namely, problem identification and conceptualization skills, information and evidence seeking skills, research methodology skills, statistics/quantitative analysis and evidence evaluation skills, and communication and language skills. Magnaye and Malabarbas (2022) assessed the research competence of the graduate students employing the use of a questionnaire to gather data on the profile and level of research competence of the students. The components of the questionnaire include motivational-value component, methodology reflective component, operational-activity component, and emotional-volitional component. Vieno, Rogers, and Campbell (2022) identified seven research skills that were most frequently reported across both thesis and non-thesis programs: critical appraisal, information synthesis, decision making, problem solving, data collection, data analysis, and communication. Mathew, Elangovan, Nair, Bhaskar and Yadav (2022) designed and validated an academic research aptitude scale assessing the dimensions of achievement orientation, curiosity, task orientation, analytical ability of the researcher. Afolabi, Afolabi and Aragbaye (2022) conducted a study to investigate the research competence of postgraduate students in library schools in South-west, Nigeria. The dimensions of research competence covered was on research knowledge, research skills and research attitude. The study concluded that postgraduates need to have a positive attitude towards research.

The literature available in the area of development of psychological tests was reviewed intensively by the investigator. In addition, critical discussions were made with research experts and university teachers regarding different dimensions of research aptitude. On the basis of all this, it was finally decided to have five dimensions of research aptitude viz., Basic Concepts in Research, Types of Research, Tools of Data Collection, Analysis of Data and Research Ethics.

## **OBJECTIVES OF THE STUDY**

1. To construct and standardise a tool to assess the research aptitude of postgraduate students.
2. To estimate the reliability of the tool for assessing the research aptitude of postgraduate students.
3. To check the validity of the test for assessing the research aptitude of postgraduate students.
4. To establish norms for interpreting scores obtained on a test for assessing the research aptitude of postgraduate students.

## **Construction and Standardisation of the Research Aptitude Test (RAT)**

Research Aptitude Test is an instrument to assess research competence and ability in research ability. The researcher reviewed many Research Aptitude tests developed by universities across India to screen candidates for selection to the Ph.D. programmes in different departments of their universities. The most renowned Research aptitude tests are from the National Testing Agency (NTA), UGC, NET, Paper 1 on Research Aptitude. Other renowned Research Aptitude Tests are from Jawaharlal Nehru University, Ph.D. Entrance Exams, Jamia Millia Islamia University, Ph.D. Entrance Exams, Jadavpur University Ph.D. Entrance Exams, Banaras Hindu University Ph.D. Entrance Exams, Aligarh Muslim University Ph.D. Entrance Exams, Tata Institute of Social Sciences, Research Aptitude Test, JSS Academy of Higher Education and Research, Mysuru, Doctoral Program Entrance Test (DPET), ICFAI University, Jaipur, Research Aptitude Test, Mumbai University Ph.D. Entrance Test, Indus University Research Aptitude Test (IURAT) for PhD Programs, and Indira Gandhi Delhi Technical University For Women, Research Aptitude Test. The underlying themes and concepts common to the research aptitude tests and Ph.D. entrance test exams of the above universities are: Basic Concepts in Research, Types of Research, Tools of Data Collection, Analysis of Data and Research Ethics. However, the research aptitude tests and Ph.D. entrance exams administered to the candidates and students did not undergo any process of standardisation.

After a thorough and careful review of related literature with regard to research aptitude, the investigator identified the dimensions of the test that are Basic Concepts in Research, Types of Research, Tools of Data Collection, Analysis

of Data and Research Ethics. The investigator then began the tool construction by constructing and arranging all the items according to the dimensions of the test. The test was constructed with 164 items which are connected with the dimensions of the research aptitude test. Correct responses in the RAT were rated “1” (one) score and incorrect responses were rated “0” (zero) scores. As the total number of items is 41, so the total score a student or respondent can achieve in the Research Aptitude Test is 41 scores.

A pre-try-out has been carried out on 100 post graduate students of which were selected from St. Anthony’s College, Shillong and Synod College, Shillong, in order to get a clearer picture of the student’s research aptitude. The try-out was done on 200 post graduate students who were selected from NEHU, Shillong. The data collected from 200 postgraduate students was analysed to select the items for the final test. In order to select the items for the final test the researcher used the t-test method. The critical two-tailed level of significance was 2.63. With the level of significance at .01 level, 58 items were found to be significant ( $t > 2.63$ ) and 30 items were not significant ( $t < 2.63$ ). The items which are not significant were removed and 58 items remained after the t test analysis of the Research Aptitude Test (RAT). The response of the 200 postgraduate students was scored and the items which were not significant were removed and 58 items were selected for inter item correlation of the Research Aptitude Test. The items selected and the t value of the final scale are shown in Appendix 1

**Establishing Reliability:** In order to establish the internal consistency of the Research Aptitude Test (RAT), Spearman Brown’s Split Half Method, Cronbach’s Alpha Method and Kuder-Richardson (KR20) Method were used in the second sample of 200 post graduate students of North Eastern Hill University, Shillong. The reliability value computed in the Spearman Brown’s Split Half Method was 0.86, the reliability value computed in the Cronbach’s Alpha Method was 0.92 and the reliability value computed in the Kuder-Richardson (KR20) method was 0.91. The values range from 0.86 to 0.92 which indicates high and very high reliability coefficient.

**Table 1: Internal consistency of the Research Aptitude Test (RAT)**

Method Used	N	Reliability Coefficient
Split-Half Method (Spearman Brown)	200	0.86
Cronbach Alpha	200	0.92
Kuder-Richardson (KR20)	200	0.91

**Inter-item Correlation:** The correlation method was also used in the selection of the items for the RAT. Those items whose correlation is equal or more than 0.40 ( $R > 0.40$ ) were selected. After the evaluation, the test result showed that 41 items were retained (i.e.,  $R > 0.40$ ) whereby 17 items were rejected (i.e.,  $R < 0.40$ ) which is shown in Appendix 2. After item analysis using the t test and item correlation method, 41 items of the RAT were retained and selected for the final form of the scale.

**Inter Dimension Correlation with Total: Correlation Matrix (Correlation is significant at 0.01 level, 2-tailed)**

From the table of correlation matrix, it is clear that there is a positive high correlation among the dimensions of the Research Aptitude Test (RAT). The ‘r’ value in the five dimensions’ ranges from 0.650 to 0.790, which shows that all the dimensions on the Research Aptitude Test (RAT) are significant at 0.01 level of significance which can be considered reliable.

**Table 2: Inter Dimension Correlation with Total**

Dimensions	Basic Concepts in Research	Types of Research	Tools of Data Collection	Analysis of Data	Research Ethics	Total
Basic Concepts in Research	1	.573	.400	.590	.690	0.650
Types of Research	.573	1	.759	.885	.760	0.790
Tools of Data Collection	.400	.759	1	.820	.473	0.690
Analysis of Data	.590	.885	.820	1	.495	0.758
Research Ethics	.690	.760	.473	.495	1	0.68

						<b>3</b>
<b>Total</b>	<b>0.650</b>	<b>0.790</b>	<b>0.690</b>	<b>0.758</b>	<b>0.683</b>	

**Content Validity:** To check the content validity of the Research Aptitude Test, the test was given to nine experts in the field of education and a rating scale was attached with it. The rating scale consists of five questions and the scale was rated on a 4-option scale. The validity of the present test was rated and it may be reported that according to the expert opinions and suggestions these items are representative of the study of Research Aptitude.

**Establishing Norms:** For establishing the norms of the Research Aptitude Test (RAT), the investigator selected 300 postgraduate students from the various departments of NEHU, Shillong, Meghalaya in order to get a wider view of their Research Aptitude. The investigator then converted the raw scores into percentile and interpretations which are represented in the following Table 3 below.

**Table 3: Norm for interpretation of Research Aptitude Test (RAT)**

Percentile	Range	Interpretation	Frequency
P <sub>87</sub> and above	36 and above	Very Favourable Aptitude	40
P <sub>67</sub> -P <sub>86</sub>	31 - 35	Favourable Aptitude	61
P <sub>33</sub> -P <sub>66</sub>	26 - 30	Average Aptitude	101
P <sub>12</sub> -P <sub>32</sub>	21 - 25	Unfavourable Aptitude	62
P <sub>11</sub> and below	20 and below	Very Unfavourable Aptitude	36
Total			300

**BLUEPRINT:** The blueprint of the Research Aptitude Test (RAT) contains five dimensions, namely Basic concepts in Research, Types of Research, Tools of Data Collection, Analysis of Data and Research Ethics. The final form of the Research Aptitude Test (RAT) is shown in Table 4

**Table 4: Norms for interpretation of Research Aptitude Test (RAT)**

Sl.no	Dimension	Items	No. of Items
1.	<b>Basic concepts in Research</b>	<b>1,7,8,56,69</b>	<b>5</b>
2.	<b>Types of Research</b>	<b>10,13,14,15,16,17,18,19,20,31,</b>	<b>10</b>
3.	<b>Tools of Data Collection</b>	<b>37,39,40,42,43,44,45,47, 49,51,53,54,55,59</b>	<b>14</b>
4.	<b>Analysis of Data</b>	<b>62,63,64,65,66,67,68,78</b>	<b>8</b>
5.	<b>Research Ethics</b>	<b>71,80,83,87</b>	<b>4</b>
		<b>Total</b>	<b>41</b>

### Conclusion

The objective of the current study was to design a test that would measure a postgraduate student's aptitude in research. This would then enable faster and more accurate identification of postgraduate students more suitable for research work and also assist in the identification of areas of development and planning of developmental activities. The items for the test were arrived at through brainstorming sessions and were validated through a review of the literature and expert opinions. The final list of 41 items was found to represent five major dimensions which are, basic concepts in research, types of research, tools of data collection, analysis of data and research ethics. This identification was achieved through a systematic review of the literature. Although the test was found to have high reliability and validity, the researcher believed that continuous review and updating of the scale is essential for ensuring the relevance of the scale.

**Appendix 1 : Items selected and their t value of the Research Aptitude Test (RAT)**

<b>Item No.</b>	<b>t value</b>	<b>Item Selected</b>	<b>Item No.</b>	<b>t value</b>	<b>Item Selected</b>	<b>Item No.</b>	<b>t value</b>	<b>Item Selected</b>
1.	2.951	Selected	31	5.683	Selected	61	2.540	
2.	1.877		32	1.356		62	6.424	Selected
3.	1.086		33	2.951	Selected	63	5.458	Selected
4.	2.361		34	-0.264		64	6.460	Selected
5.	3.000	Selected	35	2.162		65	2.741	Selected
6.	2.423		36	3.472	Selected	66	6.277	Selected
7.	5.042	Selected	37	5.683	Selected	67	3.855	Selected
8.	2.862	Selected	38	3.486	Selected	68	3.497	Selected
9.	1.877		39	6.140	Selected	69	3.200	Selected
10.	4.657	Selected	40	6.194	Selected	70	5.301	Selected
11.	2.843	Selected	41	4.494	Selected	71	2.741	Selected
12.	0.000		42	5.301	Selected	72	3.530	Selected
13.	6.797	Selected	43	3.881	Selected	73	3.674	Selected
14.	4.837	Selected	44	3.351	Selected	74	4.494	Selected
15.	7.661	Selected	45	4.494	Selected	75	0.583	
16.	3.142	Selected	46	4.379	Selected	76	-1.177	
17.	6.194	Selected	47	5.136	Selected	77	1.732	
18.	5.267	Selected	48	-0.564		78	5.196	Selected
19.	4.770	Selected	49	5.267	Selected	79	1.379	
20.	6.140	Selected	50	1.616		80	8.345	Selected
21.	2.652		51	3.142	Selected	81	3.262	Selected
22.	1.630		52	2.248		82	-0.528	
23.	1.899		53	6.647	Selected	83	3.161	Selected
24.	4.298	Selected	54	8.345	Selected	84	5.196	Selected
25.	0.277		55	4.666	Selected	85	3.795	Selected
26.	0.608		56	5.915	Selected	86	0.277	
27.	2.496		57	4.257	Selected	87	6.862	Selected
28.	1.616		58	1.513		88	2.191	
29.	1.794		59	4.243	Selected			
30.	3.795	Selected	60	2.216				

**Appendix 2.: Inter Item Correlation of the various dimensions of Research Aptitude Test (RAT)**

Dimension	Sl.no	Item no.	r value	Sl.no	Item no.	r value	Sl.no	Item no.	r value
<b>1. Basic Concepts in Research</b>	<b>1</b>	Item 1	0.455	<b>*5</b>	Item 24	0.254	<b>*9</b>	Item 73	0.103
	<b>*2</b>	Item 5	0.299	<b>6</b>	Item 56	0.428	<b>10</b>	Item 74	0.203
	<b>3</b>	Item 7	0.411	<b>7</b>	Item 69	0.473			
	<b>4</b>	Item 8	0.400	<b>*8</b>	Item 70	0.282			
<b>2. Types of Research</b>	<b>1</b>	Item 10	0.466	<b>6</b>	Item 16	0.433	<b>*11</b>	Item 30	0.257
	<b>*2</b>	Item 11	0.243	<b>7</b>	Item 17	0.589	<b>12</b>	Item 31	0.467
	<b>3</b>	Item 13	0.568	<b>8</b>	Item 18	0.508	<b>*13</b>	Item 33	0.151
	<b>4</b>	Item 14	0.476	<b>9</b>	Item 19	0.454			
	<b>5</b>	Item 15	0.601	<b>10</b>	Item 20	0.520			
<b>3. Tools of Data Collection</b>	<b>*1</b>	Item 36	0.265	<b>7</b>	Item 42	0.408	<b>13</b>	Item 49	0.412
	<b>2</b>	Item 37	0.461	<b>8</b>	Item 43	0.481	<b>14</b>	Item 51	0.425
	<b>*3</b>	Item 38	0.241	<b>9</b>	Item 44	0.413	<b>15</b>	Item 53	0.538
	<b>4</b>	Item 39	0.564	<b>10</b>	Item 45	0.465	<b>16</b>	Item 54	0.562
	<b>5</b>	Item 40	0.450	<b>*11</b>	Item 46	0.194	<b>17</b>	Item 55	0.466
	<b>*6</b>	Item 41	0.241	<b>12</b>	Item 47	0.439	<b>18</b>	Item 59	0.470
<b>4. Analysis of Data</b>	<b>*1</b>	Item 57	0.085	<b>4</b>	Item 64	0.442	<b>7</b>	Item 67	0.400
	<b>2</b>	Item 62	0.469	<b>5</b>	Item 65	0.498	<b>8</b>	Item 68	0.487
	<b>3</b>	Item 63	0.529	<b>6</b>	Item 66	0.549	<b>9</b>	Item 78	0.422
<b>5. Research Ethics</b>	<b>1</b>	Item 71	0.487	<b>*4</b>	Item 81	0.245	<b>*7</b>	Item 85	0.282
	<b>*2</b>	Item 72	0.118	<b>5</b>	Item 83	0.469	<b>8</b>	Item 87	0.407
	<b>3</b>	Item 80	0.464	<b>*6</b>	Item 84	0.206			

**\*items with r value less than 0.40 (R < 0.40)**

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