



Distributors of Psytech International

Assessment Instrument and Software

Graduate Reasoning Test Battery (GRT1)

**South African User Guide and
Research Reference**

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Graduate Reasoning Test Battery (GRT1)

Introduction

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This guide is for users and potential users of the Graduate Reasoning Test Battery (GRT1).

It should be used in conjunction with the GRT1 Technical Manual published by Psytech International.

This guide does not replace the Technical Manual, but it is intended to provide the additional information on the GRT1 that South African users need.

This user guide will be updated regularly as new research evidence becomes available.

Psytech manuals are distributed on CD at a nominal cost, and extracts as well as updates are published on the company's website from time to time. It is recommended that users print the manuals and update sections as new studies become available. Printed copies of the latest versions of the user guides can also be purchased from the company if users prefer not to download the document themselves.

Structure of this manual

The manual is divided into the following sections:

- **Introduction**
 - This section covers the background to the questionnaire, administration instructions and general advice on its use in South Africa.
- **Norms**
 - This section contains descriptions of the various norm groups available for the various subtests of the GRT1 – the composition of the norm groups, basic statistics on GRT1 subtests and stanine tables.
- **Reliability**
 - This section contains reports on the reliability studies done on the GRT1 in South Africa – the composition of the groups, reliability coefficients and standard error of measurement where suitable data exists.
- **Validity**
 - This section contains reports on the validation studies done on the GRT1 in South Africa
- **Differential item functioning**
 - This section reports on the differential item functioning for the tests in the GRT1.

Studies will be added to the various sections as they are completed. The date when it was last updated appears on every study.

Every section has its own table of contents and introductory section.

Classification status of the GRT1

The GRT1 was submitted to the Psychometrics Committee of the Health Professions Council of South Africa in April 2001. The process of evaluation and classification is a lengthy one. Feedback reports received from the test reviewers indicate that the GRT1 meets the requirements for classification as a psychological test and a classification certificate was issued in August 2010. The test battery is currently on the list of classified tests.

Conditions of use and professional responsibilities

The GRT1 must be used under the control of a registered Psychologist, Psychometrist (Independent Practice), or Registered Counsellor.

Purchasing Graduate Reasoning Test Battery materials and scoring services

When purchasing test materials or scoring services relating to the GRT1, the signature and registration number of a Psychologist, Psychometrist (Independent Practice), or Registered Counsellor.

Constructing of test batteries

Only a Psychologist, Psychometrist (Independent Practice), or Registered Counsellor may decide which tests or questionnaires to use for a particular purpose. Psychometrists registered for supervised practice or other role players such as HR Practitioners or line managers may not act independently of the Psychologist, and may not overrule the Psychologist's decisions.

Administration of the Graduate Reasoning Test Battery

- The tests may be administered by a Psychologist, Psychometrist, Psychometrist (Independent Practice), Registered Counsellor or Psychotechnician.
- Psychometrists (Supervised Practice) have to be supervised by a Psychologist.

Scoring of the Graduate Reasoning Test Battery

The GRT1 may be scored by

- A Psychologist,
- A Psychometrist (Independent Practice),
- A Psychometrist (Supervised Practice),
- A Registered Counsellor, or
- A Psychotechnician

The scoring of the GRT1 is always done by computer. The act of scoring is pure data capture and no interpretation is involved.

Detailed instructions for scoring the GRT1 by computer can be found on the GeneSys Online platform, under tutorials. There are videos and downloadable PDFs. Special training in the use of the software is available and we strongly recommend attending this.

Reporting on the Graduate Reasoning Test Battery

The choice of which computerised report to use should be made by:

- A Psychologist, Psychometrist (Independent Practice) or a Registered Counsellor.

Psychometrists (Supervised Practice) and Psychotechnicians should consult with a Psychologist about the most suitable report to use.

The choice of which norm group to use should be made by:

- A Psychologist, Psychometrist (Independent Practice) or a Registered Counsellor.
-

Psychometrists (Supervised Practice) and Psychotechnicians should consult with a Psychologist about the most suitable norm group to use.

Feedback on Graduate Reasoning Test Battery reports

Feedback on GRT1 reports may be done by Psychologists, Psychometrists (Independent Practice) and Registered Counsellors. Psychometrists registered for supervised practice may give feedback on the GRT1 within clearly circumscribed guidelines laid down by a Psychologist, and provided proper supervision, with regular consultation, is maintained.

What the Graduate Reasoning Test Battery measures

The GRT1 consists of three tests that can be administered separately or together.

- **Verbal Reasoning (GRT1V)**

Measures high level verbal fluency, vocabulary and the ability to understand and reason using words. This test is appropriate for all jobs which require a high level of verbal ability, such as senior management, sales and administrative positions, systems analysts, marketing and advertising executives.

- **Numerical Reasoning (GRT1N)**

Measures the ability to use and understand complex numerical concepts, to reason using numbers and perceive logical relationships between them. This test is appropriate for all jobs which require a high level of numerical ability, such as accountants and others in the financial services sector, and all senior positions which require dealing with financial and technical data.

- **Abstract Reasoning (GRT1A)**

Measures the ability to understand high level abstract logical problems and use new information outside the range of previous experience. This is the purest form of mental ability and is least affected by previous education and achievement. This test is appropriate for all jobs, which require the use of logical analysis in novel, intellectually demanding situations, such as technical and scientific posts and senior management positions.

For detailed information about the constructs measured by the GRT1A, please consult the technical manual published by Psytech International. The technical manual gives an overview of the theoretical basis for the constructs, as well as a more in-depth discussion regarding the development rationale and the relationship of the GRT1 to other measures of ability.

Administration options for the Graduate Reasoning Test Battery

The subtests of the GRT1 can be administered separately or together, and may be combined with other measures, such as measures of personality, learning potential or technical ability, to form a customised battery. The table below should help with the planning of a test battery:

Test	Time Limit	Pencil and Paper administration available	Computerised administration available
Graduate Verbal Reasoning	8 minutes	Yes	Yes
Graduate Numerical Reasoning	10 minutes	Yes	Yes
Graduate Abstract Reasoning	10 minutes	Yes	Yes

Respondents for whom the Graduate Reasoning Test Battery is suitable

Level of Education

The GRT1A is intended for “graduate or graduate level” respondents. It is not recommended that this test be used for respondents who do not have tertiary qualifications. If it is used on persons without tertiary qualifications, the test user must have good reason to believe that the respondent is functioning at a graduate level, or that the position for which a person is being evaluated, truly requires graduate level ability.

Proficiency in English

The test user should bear in mind that even persons with graduate qualifications can have widely varying levels of proficiency in English. The quality of a person’s basic education can have an influence on his or her English comprehension, and with South Africa’s history of educational inequalities, this cannot be ignored. The Graduate Verbal Reasoning test (GRT1V), in particular, demands a high level of proficiency in English. If a respondent’s first language is not English, the test user should carefully consider whether the Graduate Verbal Reasoning test (GRT1V) should be used, or whether perhaps the General Verbal Reasoning test (GRT2V) from the General Reasoning Test Battery (GRT2) should not be substituted for it. Some users have chosen to first use the General Verbal Reasoning Test (GRT2V), and then decide whether to apply the Graduate Verbal Reasoning test (GRT1V) after that.

Standardised tests of English proficiency from other sources, such as the Elsa-plus from Kaleidoprax, or the HSRC’s standardised tests of English proficiency, can also be considered.

A history of the Graduate Reasoning Test Battery in South Africa

The GRT1 was introduced in South Africa in 1995. Initially its use was limited to the financial sector, but since 1998 it has become more widely used. As data become available and new norms get published, the use of the GRT1 is increasing. However, its use is not nearly as widespread as the General Reasoning Test Battery (GRT2), and as a result there is still a shortage of data for norms, reliability and validity studies.

The effect of affirmative action recruitment and selection practices on test statistics

Many employers in South Africa are adopting affirmative action recruitment and selection practices. Because most of the data available to Psytech SA come from recruitment projects, this has an effect on the reported test statistics.

A very common strategy when recruiting candidates for affirmative action positions, is as follows:

- Seriously consider every applicant from a formerly disadvantaged background who may possibly meet the requirements of the position.
- Only consider applicants from formerly advantaged backgrounds once a quota of formerly disadvantaged individuals has been met, or when the supply of suitable disadvantaged applicants has been exhausted.

Assessing candidates with psychometric tests incurs a cost for the employer, and employers usually try to minimise costs. Thus testing occurs fairly late in the selection process. Frequently candidates are evaluated on application forms, CVs and interviews before they are tested. Often this means that the candidates from formerly advantaged backgrounds, who are tested, have been more rigorously pre-screened than the candidates from formerly disadvantaged backgrounds. This serves to aggravate the reported group differences on the tests, and can make a test appear more biased than it otherwise would be.

Users are advised to bear this in mind when evaluating the reported figures in this manual. Test users are also welcome to approach Psytech SA when large recruitment projects are being undertaken, so that the project can be

planned in such a way as to render less distorted information about the tests. If necessary and justifiable in the interest of research, Psytech SA is willing to subsidise such projects.

Some cautionary notes:

- No subtest of the GRT1 should be used on its own as a selection instrument. The tests should always form part of an assessment battery that includes other measures, and preferably some non-test information as well.
- It is strongly recommended that a validation/integration interview should follow any assessment by means of tests or questionnaires. The interviewer should use this opportunity to put the test results into perspective relative to the respondent's background and the purpose of the assessment.
- Users should pay attention to the reliability and validity data available relating to the population group on which they intend to use the questionnaire.
- Users should use norm groups that are appropriate for the test person being assessed, also bearing in mind the demands of the situation for which the person is being assessed.
- Bearing in mind that the GRT1 tests are all very short, users should bear in mind that they are not in-depth measures, and they should therefore not be interpreted in isolation.

Computer-assisted reports

Psytech tests and questionnaires are all supported by computer-assisted reports. Some of the tests have a range of computer-assisted reports, allowing instant interpretation of the test results from a variety of perspectives. For the GRT1, a standard report and a feedback report are available, either as a battery or individually for each subtest. In addition, a results summary spreadsheet is available to generate which is particularly useful as a summarised version of the individual candidates scores, or scores of a group of candidates that have completed the GRT1. Computerised reports can also be created for specific batteries of measures, integrating the results of ability tests with personality and perhaps interests.

How do the computer-generated reports work?

The reports represent an expert system, drawing on numerous built-in relationships between patterns of scores and human behaviour. It would normally take a user many years of experience to gain the knowledge and insight that are contained in this reporting system.

What are the advantages of computer-generated reports?

Computer-generated reports ensure that the complete pattern of scores is interpreted every time. No score or combination of scores is overlooked. Everyone is treated in exactly the same way, irrespective of whether the person interpreting the results is having an 'off day' or is pressed for time. This helps to ensure fairness and consistency. Moreover, computer-generated reports save a lot of time, freeing the professional up to add value in the interview, integration of results from other sources and feedback processes.

Are computer-assisted reports open to abuse?

Like any powerful tool, computer-assisted reports can be misused. They should not be used to substitute for professional expertise, but rather to supplement and support it.

One must remember that these reports are generic-the standard reports do not know anything about the requirements of the positions that the respondent may have applied for. They are also completely unaware of the respondent's background and personal circumstances. They can usually not stand on their own, but must be used as one source of information in the assessment process, and be integrated with other information. This integration and interpretation is highly skilled professional work, and it should not be left to persons who have not had the required training.

In some situations, handing out unaltered computer-generated reports to respondents or line managers without any counselling or explanation, could be considered abuse of these reports. We recommend that the technical appendix in a report, which gives a graphic summary of raw scores and profiles, not be given to untrained persons.

What about competency-based reports?

You need not be limited to the reports supplied with the GeneSys online platform. Special reports can be written for clients based on their own competency models, or based on the results of validation studies. Psytech SA undertakes to do these as consulting projects, and the cost is dependent on the length and complexity of the report that the client requires.

Instructions for administering tests on computer

All three tests in the Graduate Reasoning Test Battery can be administered on computer.

For instructions on how to operate the platform for test administration, please refer to the GeneSys Online platform, under tutorials via <https://eu.genesysonline.net/>. There are videos and downloadable PDFs. Special training in the use of the software is available, which is strongly recommend. Do not attempt to use computer software for test administration if you are not completely comfortable with how the software works. Familiarise yourself with the process of setting up a testing session with the software, creating the data record and entering the respondent's biographical information into the system, or assisting the respondent in doing so himself.

Make sure that the respondent is physically able to operate the keyboard and the mouse, and can see the screen clearly.

Welcome the respondents (you may use a standard introduction), set them at ease and ensure that every respondent has given informed consent for the assessment.

Provide respondents who are completing tests on computer, with blank notepaper and a pencil, in case they want to make a note of an item they might want to revise when they reach the end of the test. Respondents may also make some rough calculations during the test. **A calculator may not be used for the numerical subtest (GRT1N) and as such, blank notepaper and a pencil is essential for this subtest.**

Stay with the respondents while they start the test, and read through the instructions with them. If the respondents have any questions about the operation of the computer, or the example questions, answer those.

Once the respondent has completed the instruction section and started on the actual test items, do not provide any further help with the items, although you can assist if there are any actual computer problems (such as the mouse or the keyboard not responding correctly). Do not allow respondents to talk among themselves during testing.

Do not leave respondents to complete a battery of tests unsupervised. Remain in the room, and when the respondent reaches the end of the first test, provide support for the subsequent tests by reading through the instructions with them again.

At the end of the test battery, a screen will appear telling the respondent to call the test administrator. At this stage you need to enter the PIN you have chosen (when opening an account with Psytech SA) to exit the test administration program and save the responses. Do not allow the respondents to do this themselves.

Graduate Reasoning Test Battery: Pencil and Paper Administration Instructions

If this is the first or only test being administered give an introduction welcoming the respondents, setting them at ease and ensuring that every respondent has given informed consent for the assessment.

Continue by using the instructions **EXACTLY** as given. Say:

"From now on, please do not talk among yourselves, but ask me if anything is not clear. We shall be doing three tests, verbal, numerical and abstract, each test takes 8, 10 and 10 minutes respectively. During the test I shall be checking to make sure that you are not making any accidental mistakes when filling in the answer sheet. I will not be checking your responses to see if you are answering correctly or not."

WARNING: It is most important that answer sheets do not go astray. They should be counted out at the beginning of the test and counted in again at the end.

Distribute the answer sheets

Then ask:

"Has everyone got two sharp pencils, an eraser, some rough paper and an answer sheet?"

Rectify any omissions, then say:

"Print your last name and first name clearly on the line provided and indicate your title, sex and age by ticking the appropriate boxes. Please insert today's date which is []."

Walk round the room to check that the instructions are being followed.

WARNING: It is vitally important that test booklets do not go astray. They should be counted out at the beginning of the session and counted in again at the end.

Distribute the booklets with the instruction:

"Please do not open the booklet until instructed."

Remembering to read slowly and clearly, go to the front of the group and say:

"Please open the booklet at Page 2 and follow the instructions for this test as I read them aloud." (Pause to allow booklets to be opened).

*This test is designed to assess your understanding of words and relationships between words. Each question has six possible answers. **One and only one** is correct in each case. Mark your answer, by filling in the appropriate box that corresponds to your chosen answer, on your answer sheet. You now have a chance to complete the four example questions on Page 3 in order to make sure that you understand the test.*

Please attempt the example questions now, marking your answers in boxes E1 to E4 (indicate where).

While the candidates are doing the examples, walk around the room to check that everyone is clear about how to fill in the answer sheet. Make sure that no one is looking at the actual test items during the example session. When all have finished (allow a maximum of two minutes) give the answers as follows:

"The answer to Example 1 is number 2, sick means the same as ill.

The answer to Example 2 is number 3, you drive a car and fly an aeroplane.

The answer to Example 3 is number 5, wood is the odd one out.

The answer to Example 4 is number 4, as both heavy and light have a similar relationship to weight.

Is everyone clear about the examples?"

Then say:

REMEMBER:

"Time is short, so when you begin the timed test, work as quickly and as accurately as you can.

If you want to change an answer, simply erase your first choice and fill in your new answer.

There are a total of 30 questions and you have 8 minutes in which to answer them.

*If you reach the **end** before time is called you may review your answers if you wish.*

If you have any questions please ask now, as you will not be able to ask questions once the test has started."

Then say very clearly:

"Is everyone clear about how to do this test?"

Deal with any questions, appropriately, then, starting stop watch or setting a count-down timer say:

"Please turn over the page and begin"

Answer only questions relating to procedure at this stage, but enter in the Administrator's Test Record any other problems which occur. Walk around the room at appropriate intervals to check for potential problems.

At the end of the 8 minutes, say:

"Stop now please and turn to Page 12"

You should intervene if candidates continue after this point.

Then say:

"We are now ready to start the next test. Has everyone still got two sharpened pencils, an eraser, and some unused rough paper?"

If not, rectify, then say:

"The next test follows on the same answer sheet, please locate the section now." (Indicate section)

Check for understanding, then remembering to read slowly and clearly, go to the front of the group and say:

"Please follow the instructions for this test as I read them aloud."

*This test is designed to assess your ability to understand numbers and the relationship between numbers. Each question has six possible answers. **One and only one** is correct in each case. Mark your answers, by filling in the appropriate box that corresponds to your chosen answer, on your answer sheet. You now have a chance to complete the four example questions on Page 13 in order to make sure that you understand the test.*

Please attempt the example questions now, marking your answers in the example boxes.

While the candidates are doing the examples, walk around the room to check that everyone is clear about how to fill in the answer sheet. Make sure that no-one is looking at the actual test items during the example session. When all have finished (allow a maximum of two minutes) give the answers as follows:

"The answer to Example 1 is number 5, the sequence goes up in twos.

The answer to Example 2 is number 4, as all of the other fractions can be reduced further.

The answer to Example 3 is number 2, 100 is 10 times 10.

The answer to Example 4 is number 5, the journey will take 1 hour and 30 minutes.

Is everyone clear about the examples?"

Then say:

REMEMBER

"Time is short so when you begin the timed test work as quickly and as accurately as you can.

If you want to change an answer, simply erase your first choice, and fill in your new answer.

There are a total of 25 questions and you have 10 minutes in which to attempt them.

If you reach the end before time is called you may review your answers to the numerical test if you wish, but do not go back to the verbal test.

If you have any questions please ask now, as you will not be able to ask questions once the test has started."

Then say very clearly:

"Is everyone clear about how to do this test?"

Deal with any questions, appropriately, then, starting stop watch or setting a count-down timer and say:

"Please turn over the page and begin"

Answer only questions relating to procedure at this stage, but enter in the Administrator's Test Record any other problems which occur. Walk around the room at appropriate intervals to check for potential problems.

At the end of the 10 minutes, say:

"Stop now please and turn to Page 20"

You should intervene if candidates continue after this point.

Then say:

"We are now ready to start the next test. Has everyone still got two sharpened pencils, an eraser, and some unused rough paper?"

If not, rectify, then say:

"The next test follows on the same answer sheet, please locate the section now." (Indicate section)

Check for understanding, then remembering to read slowly and clearly, go to the front of the group and say:

"Please follow the instructions for this test as I read them aloud."

In this test you will have to work out the relationship between abstract shapes and patterns.

*Each question has six possible answers. **One and only one** is correct in each case. Mark your answer, by filling in the appropriate box that corresponds to your chosen answer, on your answer sheet. You now have a chance to complete the three example questions on Page 21 in order to make sure that you understand the test.*

Please attempt the example questions now, marking your answers in the example boxes. "

While the candidates are doing the examples, walk around the room to check that everyone is clear about how to fill in the answer sheet. Make sure that no one is looking at the actual test items during the example session. When all have finished (allow a maximum of two minutes) give the answers as follows:

"The answer to Example 1 is number 5 as the series alternates between 2 and 4 squares as does the direction of the two squares which return to their original position."

The answer to Example 2 is number 4, as all of the other options have an open side to one of the boxes.

The answer to Example 3 is number 6, as this is a mirror image of the pattern.

Is everyone clear about the examples?"

Then say:

REMEMBER:

"Time is short so when you begin the timed test work as quickly and as accurately as you can.

If you want to change an answer, simply erase your first choice, and fill in your new answer.

There are a total of 25 questions and you have 10 minutes in which to answer them.

*If you reach the **end** before time is called you may review your answers to the Abstract test if you wish, but do not go back to either the verbal or numerical tests.*

If you have any questions please ask now, as you will not be able to ask questions once the test has started."

Then say very clearly:

"Is everyone clear about how to do this test?"

Deal with any questions, appropriately, then, starting stop watch or setting a count-down timer and say:

"Please turn over the page and begin"

Answer only questions relating to procedure at this stage, but enter in the Administrator's Test Record any other problems which occur. Walk around the room at appropriate intervals to check for potential problems.

At the end of the 10 minutes, say:

"Stop now please and close your booklet"

You should intervene if candidates continue after this point.

COLLECT THE ANSWER SHEETS AND THE TEST BOOKLETS, ENSURING THAT ALL MATERIALS ARE RETURNED (COUNT BOOKLETS AND ANSWER SHEETS)

Then say:

"Thank you for completing the Graduate Reasoning Test"

Graduate Reasoning Test Battery (GRT1)

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South African Norms available for the Graduate Reasoning Test Battery

Different types of norms available

There are two kinds of norms available for Psytech tests. Many of the norm groups are based on means and standard deviations obtained through research. These means and standard deviations are used by the GeneSys reporting software to calculate standard scores. In the case of the Graduate Reasoning Test Battery (GRT1), stanines are used.

Users of the test do not need to look up raw scores to find the corresponding standard scores, because the software does it for them. For this manual, however, stanine tables have been specially calculated from means and standard deviations to facilitate comparison between norm groups, so that users can more easily choose which norm group is most suitable for a given situation. This allows users to make a more informed choice rather than simply relying on automatic choices made by the online platform.

The second type of norm is the frequency norm. In this case, more information is stored internally, and it is possible to add additional cases to the norm group as more data are collected. The GeneSys online platform is able to create tables of standard scores for frequency norms. The tables of standard scores are provided for interest and information, which would assist when comparing one norm group with another. For the purpose of generating a report, the online system does the calculations internally, and doesn't refer to any tables.

Biographical data

The GeneSys online platform offers the facility to collect comprehensive biographical information on respondents. Unfortunately, test users very seldom collect these data. Having this information incomplete poses a serious concern for us as Psytech SA obtains most of its information from clients who use the assessments.

Users are advised to make an effort to capture full biographical information on the respondents. This will help to enable them to adhere to best practice and compliance with legal requirements.

SA Norms and international norms

The GeneSys online platform contains international norms on all Psytech tests, besides the South African norms that have been collected by Psytech South Africa.

Unless you have a very good reason to do otherwise, we recommend the use of South African norms rather than international norms. The South Africa norms are clearly marked with 'SA' in the heading. All other norms that do not include 'South Africa' or 'SA' in the heading are international norms. If you are assessing a person for placement overseas and you have a suitable international norm available, you could consider using the international norm in conjunction with a South African norm.

Outdated or unsuitable norms are subject to removal from the GeneSys online platform, but would still be reflected in the South African User Guide as it serves as a repository of all research that has been done to date.

User-developed norms

The GeneSys online platform offers users the facility to generate their own norms on the data they have collected – these are frequency norms. These norms will only appear on your online account and will not be available to other online accounts. Users must ensure that the data included in these in-house norms are “clean” – that they contain no dummy cases resulting from experimenting with the software, duplicates or other data that could interfere with the interpretation of the results. Psytech SA offers assistance in the creation of in-house norms for users who need it. If the norm group was generated on your own computer and not shared with Psytech SA, it will not appear in the documentation.

The norms we recommend and have calculated are based on standard deviations and means and are only added to the online system after they have done through an elaborate process of cleaning the data by removing duplicates, dummy and test cases and other data to make sure that users are using norms that were calculated on uncontaminated data (as far as is possible).

Choose the comparison group with care. Bear in mind factors such as race, language, level of education and level of proficiency in English.

List of South African norm groups for the Graduate Reasoning Test Battery (GRT1)

Description	Study number
SA Applicants to business school courses	N1
SA Bank applicants	N2
SA Applicants for training in the Information Technology industry	N3
SA Managers and Professionals	N4
SA Learnership applicants	N5
SA Combined Group updated 2010	N6
SA General Population updated 2010	N7
SA African updated 2010	N8
SA Coloured updated 2010	N9
SA European updated 2010	N10
SA Asian updated 2010	N11
SA English 2010	N12
SA Afrikaans 2010	N13
SA African Norms Updated 2012	N14
SA Afrikaans Norms Updated 2012	N15
SA Asian Norms Updated 2012	N16
SA Coloured Norms Updated 2012	N17
SA English Norms Updated 2012	N18
SA European Norms Updated 2012	N19
SA General Population Norms Updated 2012	N20

GRT1 Norms: SA Applicants to a business school

Sample composition

The sample consisted of applicants to courses at the Graduate Business School of a South African University.

Sample composition

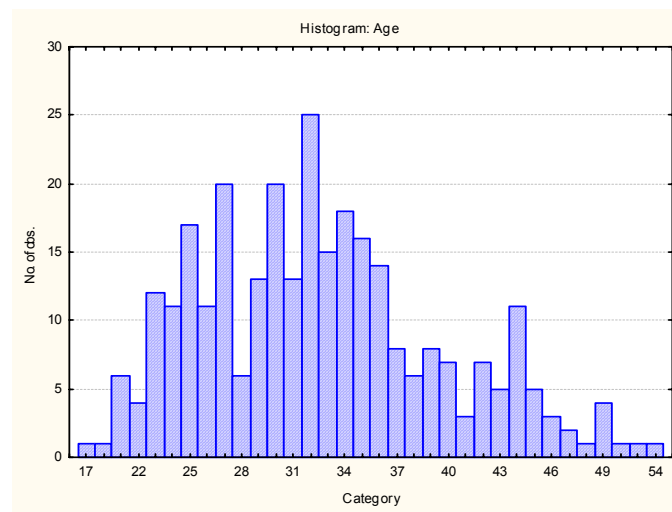
Frequency table: Sex				
Category	Count	Cumulative Count	Percent	Cumulative Percent
M	202	202	67.78523	67.7852
F	95	297	31.87919	99.6644
U	1	298	0.33557	100.0000
Missing	0	298	0.00000	100.0000

Frequency table: Education				
Category	Count	Cumulative Count	Percent	Cumulative Percent
Degree	65	65	21.81208	21.8121
Grade 12	109	174	36.57718	58.3893
Grade 10 or 11	17	191	5.70470	64.0940
Technikon	32	223	10.73826	74.8322
Post Graduate	19	242	6.37584	81.2081
University diploma	17	259	5.70470	86.9128
Vocational Training	13	272	4.36242	91.2752
University entrance matric	1	273	0.33557	91.6107
University entrance matri	1	274	0.33557	91.9463
Missing	24	298	8.05369	100.0000

Frequency table: First Language				
Category	Count	Cumulative Count	Percent	Cumulative Percent
English	133	133	44.63087	44.6309
Afrikaans	41	174	13.75839	58.3893
isiXhosa	45	219	15.10067	73.4899
Other	12	231	4.02685	77.5168
Setswana	1	232	0.33557	77.8523
isiNdebele	3	235	1.00671	78.8591
Sesotho	2	237	0.67114	79.5302
Missing	61	298	20.46980	100.0000

Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	159	159	53.35570	53.3557
African	91	250	30.53691	83.8926
Asian	23	273	7.71812	91.6107
European	9	282	3.02013	94.6309
Missing	16	298	5.36913	100.0000

Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	32.60811	7.015851	17.00000	54.00000	296	2



Descriptive statistics on GRT1 Subtests

Subtest	Sample	Mean	SD
Graduate Verbal Reasoning	298	6.90	3.63
Graduate Numerical Reasoning	298	7.90	4.57
Graduate Abstract Reasoning	298	10.01	3.93

Stanine table

Subtest	1	2	3	4	5	6	7	8	9
Grad Verbal Reasoning	0-1	2	3-4	5	6-7	8-9	10-12	13	14-30
Grad Numerical Reasoning	0-1	2	3-4	5	6-8	9-11	12-14	15-17	18-25
Grad Abstract Reasoning	0-3	4-5	6-7	8	9-10	11-13	14-15	16-17	18-25

GRT1 Norm group: SA Bank Applicants

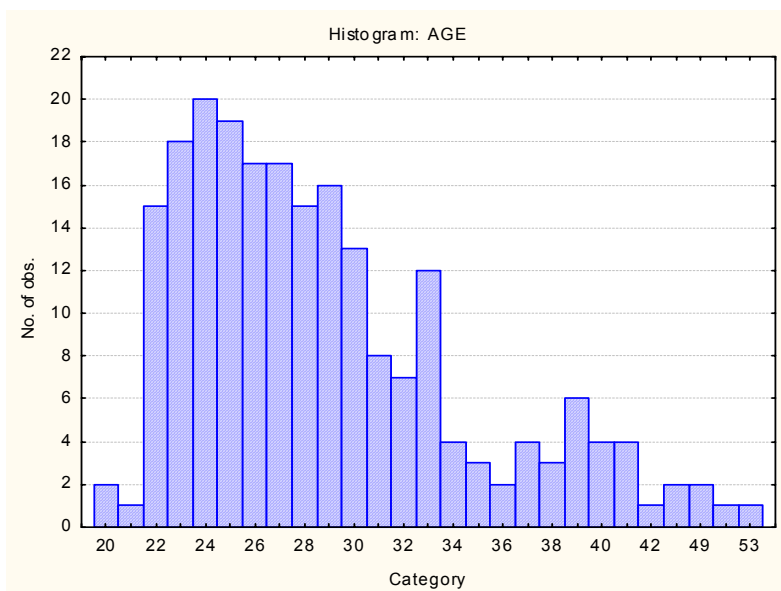
Sample composition

Applicants and incumbents in a major SA Bank (Positions that require graduate qualifications).
Data were collected between 1997 and 2000

Frequency table: RACE				
Category	Count	Cumulative Count	Percent	Cumulative Percent
Whites/coloureds	123	123	53.71179	53.7118
Asians	26	149	11.35371	65.0655
Blacks	78	227	34.06114	99.1266
Missing	2	229	0.87336	100.0000

Frequency table: GENDER				
Category	Count	Cumulative Count	Percent	Cumulative Percent
Female	98	98	42.79476	42.7948
Male	131	229	57.20524	100.0000
Missing	0	229	0.00000	100.0000

Descriptive Statistics						
Variable	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
AGE	28.88018	6.027285	20.00000	53.00000	217	12



Descriptive statistics on GRT1 subtests

Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Graduate Verbal Reasoning	12.15284	5.186712	0.000000	28.00000	229	0
Graduate Numerical Reasoning	9.74672	4.671353	0.000000	24.00000	229	0
Graduate Abstract Reasoning	11.20961	4.117751	3.000000	22.00000	229	0

Stanine table

	1	2	3	4	5	6	7	8	9
	S9 1	S9 2	S9 3	S9 4	S9 5	S9 6	S9 7	S9 8	S9 9
Verbal Reasoning	0-3	4-5	6-8	9-10	11-13	14-16	17-18	19-21	22-30
Numerical Reasoning	0-1	2-3	4-6	7-8	9-10	11-13	14-15	16-17	18-25
Abstract Reasoning	0-4	5-6	7-8	9-10	11-12	13-14	15-16	17-18	19-25

GRT1 Norm Table: SA IT Applicants

Sample composition

Applicants for training in the SA Information Technology Industry.
Data were collected between 2001-2002.

Age			
Mean	Min	Max	Missing
25.33	18	52	0

Sex		
Male	Female	Missing
210	94	10

Race and language data were not collected

Basic statistics on GRT1 subtests

Subtest	Sample Size	Mean	SD
Grad verbal reasoning	314	8.87	4.63
Grad numerical reasoning	314	8.06	4.86
Grad abstract reasoning	136	12.23	3.83

Stanine table

Subtest	1	2	3	4	5	6	7	8	9
Grad Verbal Reasoning	0-1	2-3	4	5-7	8-9	10-12	13-14	15-18	19-30
Grad Numerical Reasoning	0-1	2-3	4	5	6-8	9-11	12-15	16-18	19-25
Grad Abstract Reasoning	0-4	5	6-7	8-10	11-12	13-14	15-16	17-18	19-25

GRT1 Norm Group: SA Managers and Professionals

Sample composition

This norm was calculated from raw data submitted by various clients of Psytech SA in 2001.

Graduate Verbal Reasoning

Age			
Mean	Min	Max	Missing
29.39	2	53	48

Sex		
Male	Female	Missing
309	166	0

Graduate Numerical Reasoning

Age			
Mean	Min	Max	Missing
29.37	2	53	47

Sex		
Male	Female	Missing
303	165	0

Graduate Abstract Reasoning

Age			
Mean	Min	Max	Missing
28.97	2	53	40

Sex		
Male	Female	Missing
214	134	0

Race and language data were not collected

Descriptive statistics on GRT1 subtests

Dim	Sample Size	Mean	SD
Grad Verbal Reasoning	475	10.64	5.74
Grad Numerical Reasoning	468	9.27	5.39
Grad Abstract Reasoning	348	11.18	4.26

Stanine table

Dim	1	2	3	4	5	6	7	8	9
Grad Verbal Reasoning		0-3	4-6	7-9	10-11	12-14	15-17	18-21	22-30
Grad Numerical Reasoning	0	1-2	3-5	6-7	8-10	11-13	14-16	17-19	20-25
Grad Abstract Reasoning	0-4	5-6	7	8-9	10-11	12-14	15-17	18-19	20-25

GRT1 Norm group: SA Learnership Applicants – Services Sector

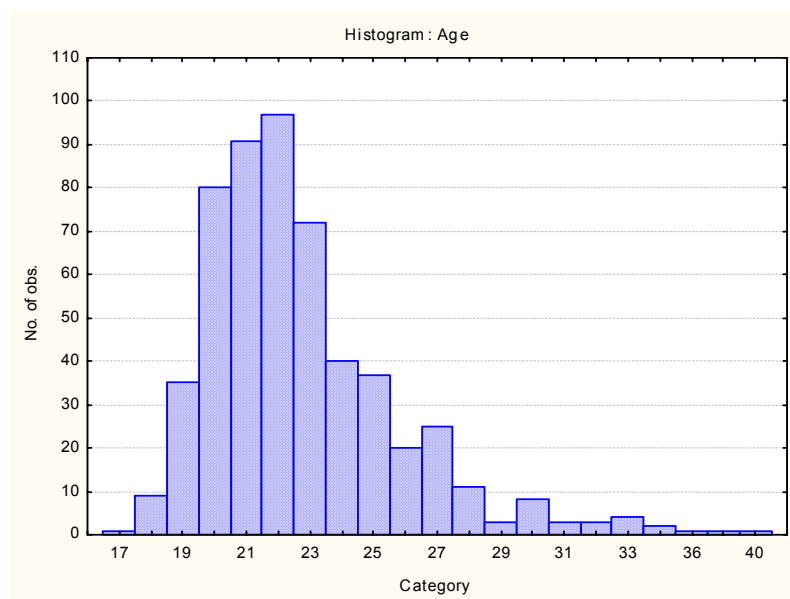
Sample Composition

Applicants for learnerships in the Services Sector. Tested in Gauteng during 2003. Applicants had at least a Grade 12 education.

Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
Asian	4	4	0.73529	0.7353
White/coloured	37	41	6.80147	7.5368
Black	500	541	91.91176	99.4485
Missing	3	544	0.55147	100.0000

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	272	272	50.00000	50.0000
M	272	544	50.00000	100.0000
Missing	0	544	0.00000	100.0000

Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	22.72610	3.113622	17.00000	40.00000	544	0



Descriptive statistics on GRT1 subtests

Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Graduate Verbal Reasoning	5.613971	2.659613	0.00	14.00000	544	0
Graduate Numerical Reasoning	4.496324	2.540281	0.00	15.00000	544	0
Graduate Abstract Reasoning	8.590074	3.321227	0.00	19.00000	544	0

Stanine table

	1	2	3	4	5	6	7	8	9
	S9_1	S9_2	S9_3	S9_4	S9_5	S9_6	S9_7	S9_8	S9_9
Graduate Verbal Reasoning	0-0	1-2	3-3	4-4	5-6	7-7	8-8	9-10	11-30
Graduate Numerical Reasoning	0-0	1-1	2-2	3-3	4-5	6-6	7-7	8-8	9-25
Graduate Abstract Reasoning	0-2	3-4	5-6	7-7	8-9	10-11	12-12	13-14	15-25

Graduate Reasoning Test Battery norm table: South African Combined Group updated 2010

Sample composition

The sample consisted of South Africans of all races and languages tested by Psytech South Africa and collaborators in the period leading up to January 2010. Not all respondents completed the entire Graduate Reasoning Test Battery, therefore biographical particulars are reported separately for the Verbal, Numerical and Abstract Graduate Reasoning tests.

Sample composition: Graduate Verbal Reasoning Test

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	1174	1174	40.38528	40.3853
M	1719	2893	59.13313	99.5184
U	14	2907	0.48160	100.0000
Missing	0	2907	0.00000	100.0000

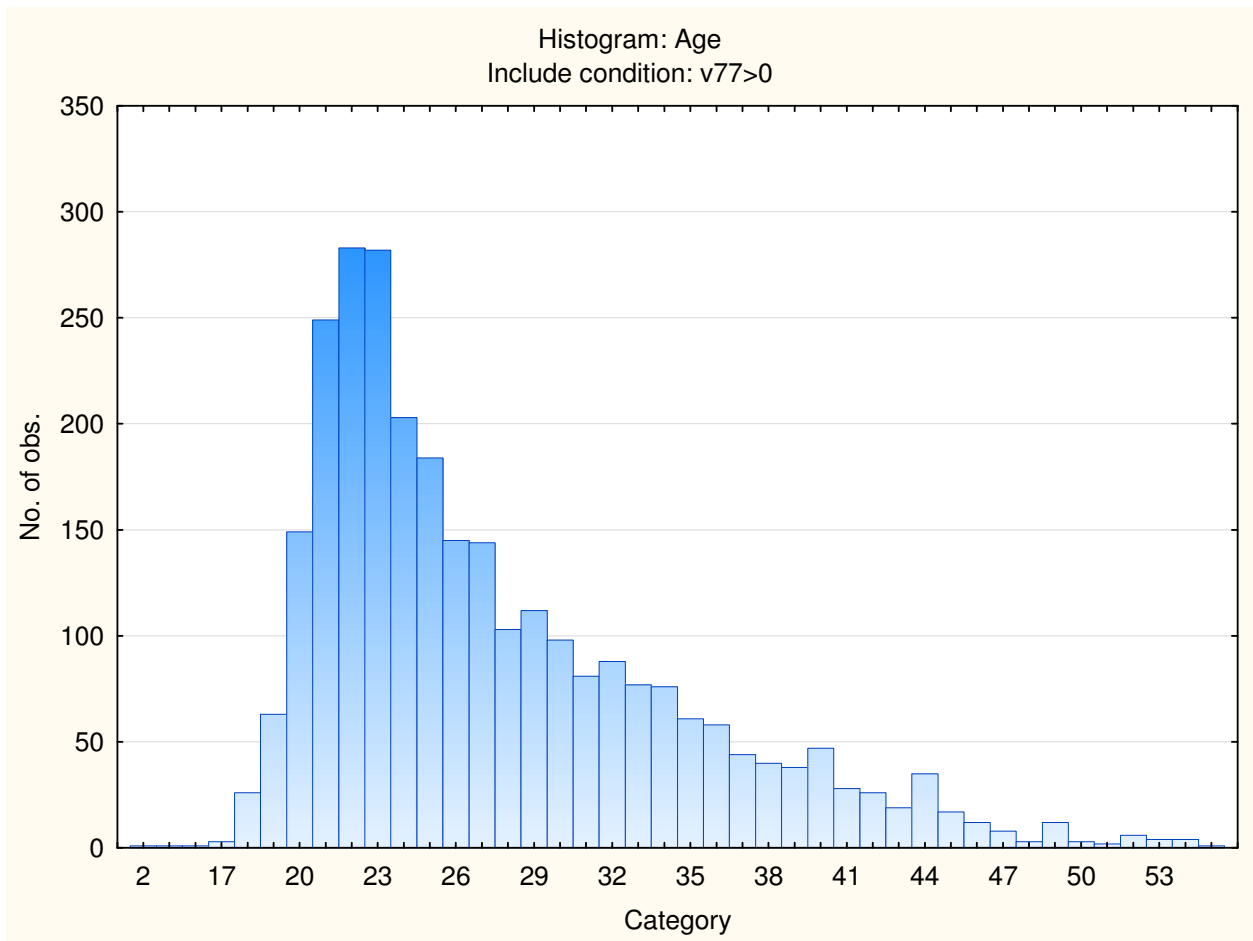
Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	271	271	9.32233	9.3223
Grade 12	278	549	9.56312	18.8854
Diploma	102	651	3.50877	22.3942
<Grade 12	48	699	1.65119	24.0454
Post Graduate	144	843	4.95356	28.9990
Certificate	26	869	0.89439	29.8934
Missing	2038	2907	70.10664	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	482	482	16.58067	16.5807
Afrikaans	156	638	5.36636	21.9470
Setswana	28	666	0.96319	22.9102
isiXhosa	127	793	4.36877	27.2790
Xitsonga	6	799	0.20640	27.4854
isiZulu	42	841	1.44479	28.9302
Sesotho	21	862	0.72239	29.6526
Sepedi	14	876	0.48160	30.1342
isiNdebele"	3	879	0.10320	30.2374
Tshivenda	5	884	0.17200	30.4094
siSwati	3	887	0.10320	30.5126
Missing	2020	2907	69.48744	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	482	482	16.58067	16.5807
Afrikaans	156	638	5.36636	21.9470
Indigenous	252	890	8.66873	30.6158
Missing	2017	2907	69.38424	100.0000

Category	Frequency table: Race Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	343	343	11.79911	11.7991
European	147	490	5.05676	16.8559
Asian	126	616	4.33437	21.1902
African	383	999	13.17509	34.3653
Missing	1908	2907	65.63467	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	27.53472	7.021020	2.000000	59.00000	2837	70



Sample composition: Graduate Numerical Reasoning Test

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	1180	1180	40.32809	40.3281
M	1732	2912	59.19344	99.5215
U	14	2926	0.47847	100.0000
Missing	0	2926	0.00000	100.0000

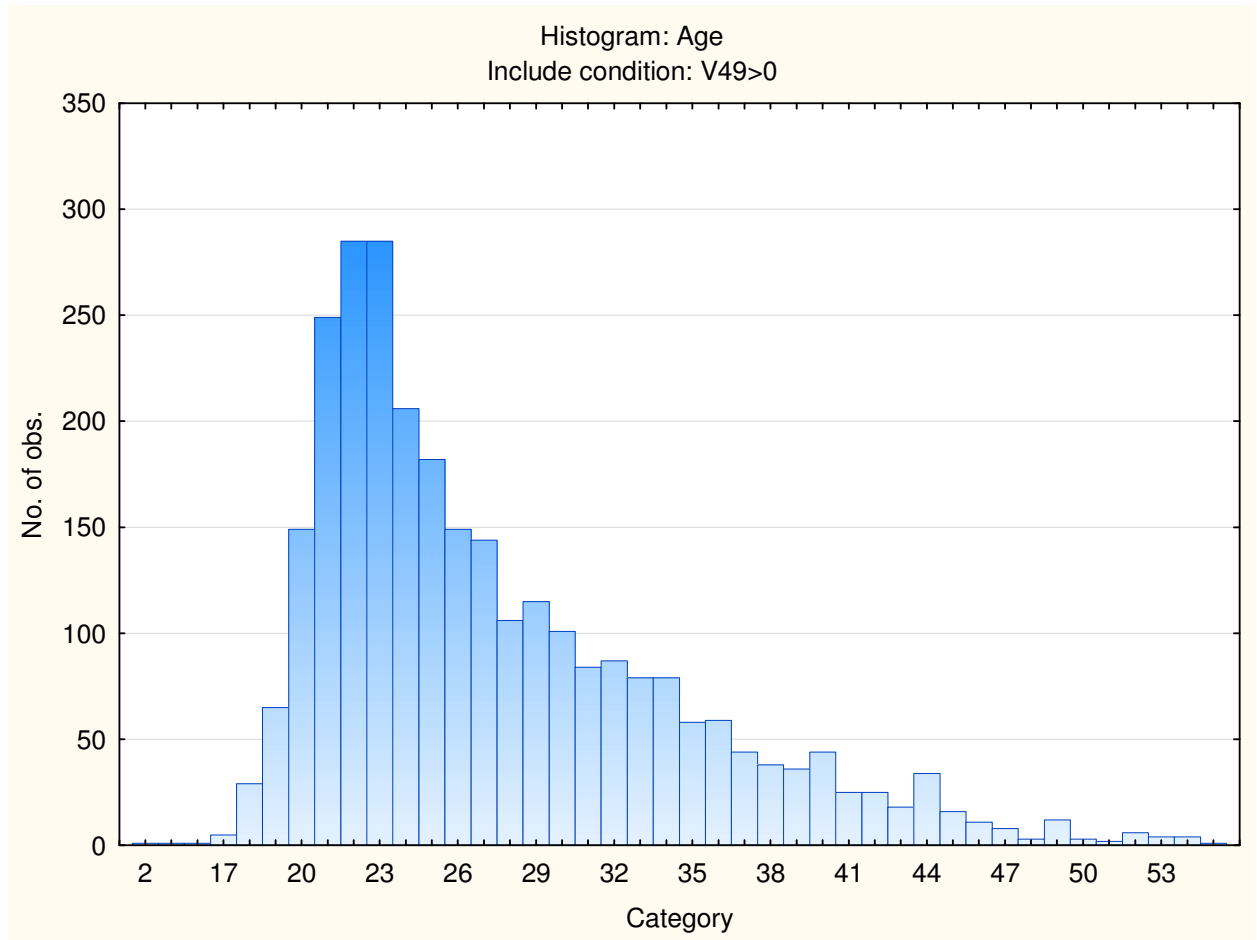
Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	257	257	8.78332	8.7833
Grade 12	282	539	9.63773	18.4211
Diploma	101	640	3.45181	21.8729
<Grade 12	49	689	1.67464	23.5475
Post Graduate	141	830	4.81887	28.3664
Certificate	26	856	0.88859	29.2550
Missing	2070	2926	70.74504	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	478	478	16.33630	16.3363
Afrikaans	155	633	5.29733	21.6336
Setswana	26	659	0.88859	22.5222
isiXhosa	125	784	4.27204	26.7943
Xitsonga	5	789	0.17088	26.9651
isiZulu	47	836	1.60629	28.5714
Sesotho	20	856	0.68353	29.2550
Sepedi	14	870	0.47847	29.7334
isiNdebele"	3	873	0.10253	29.8360
Tshivenda	4	877	0.13671	29.9727
siSwati	3	880	0.10253	30.0752
Missing	2046	2926	69.92481	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	478	478	16.33630	16.3363
Afrikaans	155	633	5.29733	21.6336
Indigenous	250	883	8.54409	30.1777
Missing	2043	2926	69.82228	100.0000

Category	Frequency table: Race Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	342	342	11.68831	11.6883
European	145	487	4.95557	16.6439
Asian	126	613	4.30622	20.9501
African	379	992	12.95284	33.9029
Missing	1934	2926	66.09706	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	27.43954	6.952171	2.000000	59.00000	2853	73



Sample composition: Graduate Abstract Reasoning Test

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	1522	1522	41.77875	41.7788
M	2104	3626	57.75460	99.5334
U	17	3643	0.46665	100.0000
Missing	0	3643	0.00000	100.0000

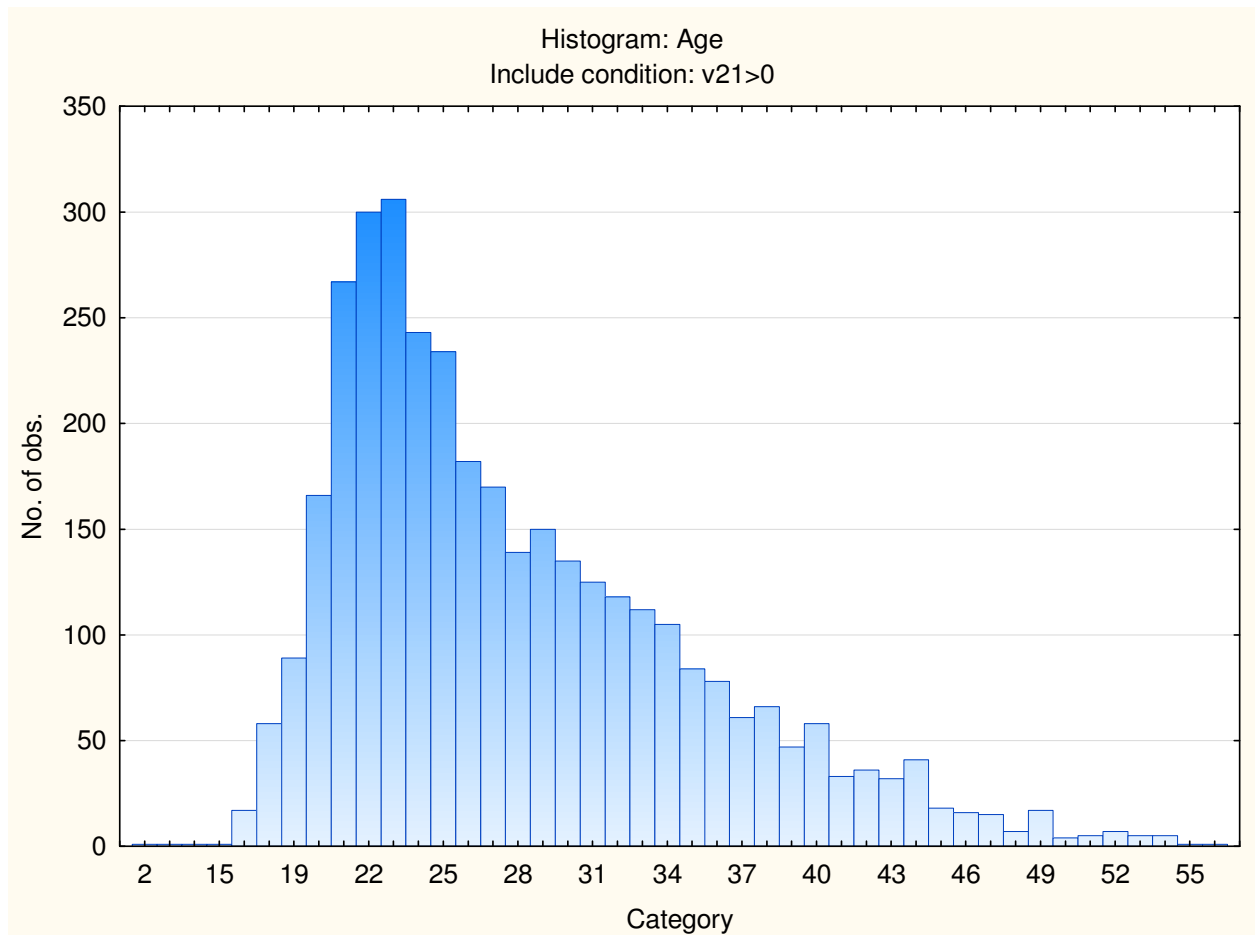
Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	333	333	9.14082	9.1408
Grade 12	345	678	9.47022	18.6110
Diploma	191	869	5.24293	23.8540
<Grade 12	54	923	1.48229	25.3363
Post Graduate	171	1094	4.69393	30.0302
Certificate	28	1122	0.76860	30.7988
Missing	2521	3643	69.20121	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	528	528	14.49355	14.4935
Afrikaans	198	726	5.43508	19.9286
Setswana	58	784	1.59209	21.5207
isiXhosa	206	990	5.65468	27.1754
Xitsonga	13	1003	0.35685	27.5323
isiZulu	106	1109	2.90969	30.4419
Sesotho	50	1159	1.37250	31.8144
Sepedi	23	1182	0.63135	32.4458
isiNdebele	3	1185	0.08235	32.5281
Tshivenda	6	1191	0.16470	32.6928
siSwati	8	1199	0.21960	32.9124
Missing	2444	3643	67.08757	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	528	528	14.49355	14.4935
Afrikaans	198	726	5.43508	19.9286
Indigenous	481	1207	13.20340	33.1320
Missing	2436	3643	66.86797	100.0000

Category	Frequency table: Race Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	364	364	9.99177	9.9918
European	183	547	5.02333	15.0151
Asian	152	699	4.17239	19.1875
African	634	1333	17.40324	36.5907
Missing	2310	3643	63.40928	100.0000

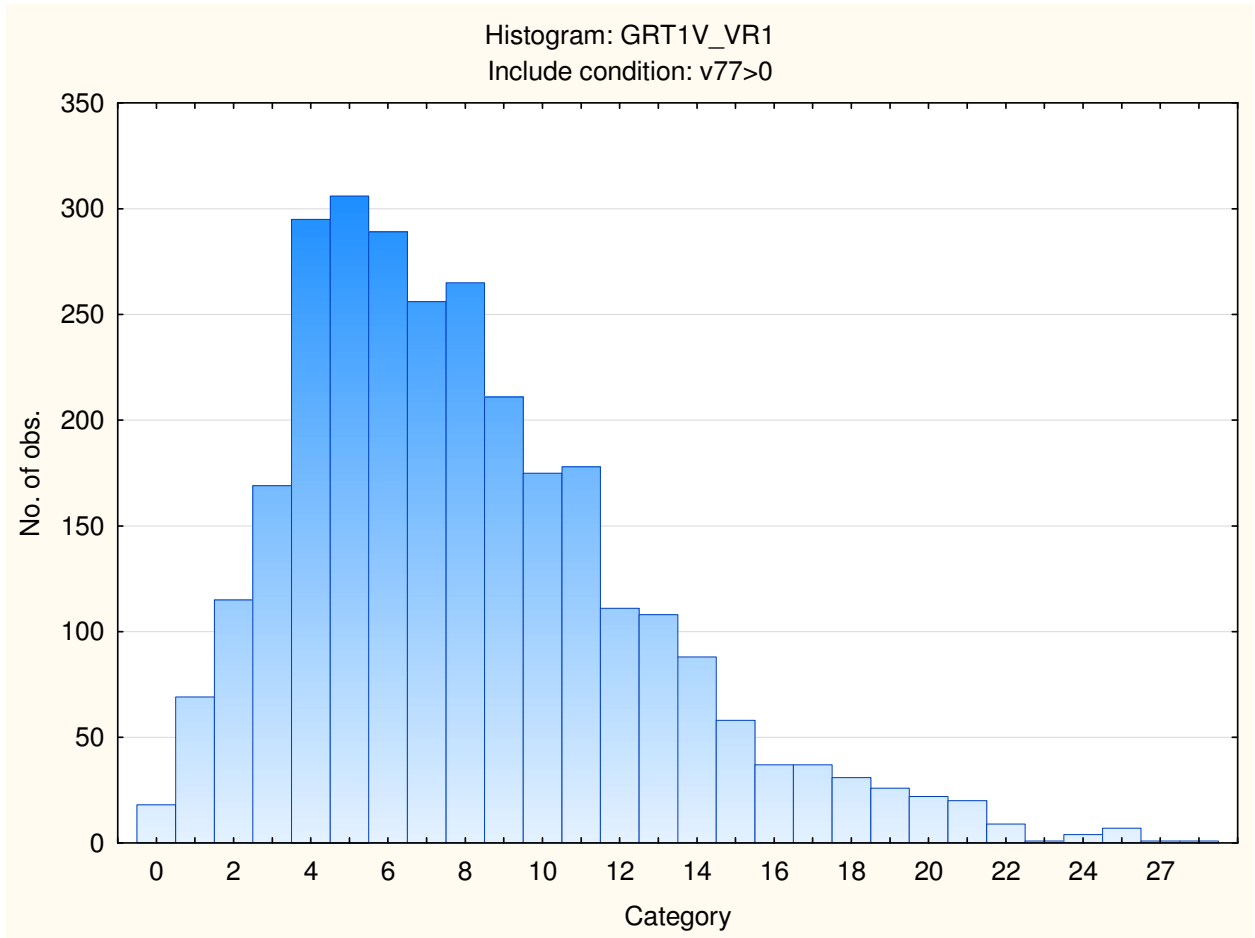
Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	27.95474	7.191728	2.000000	59.00000	3557	86



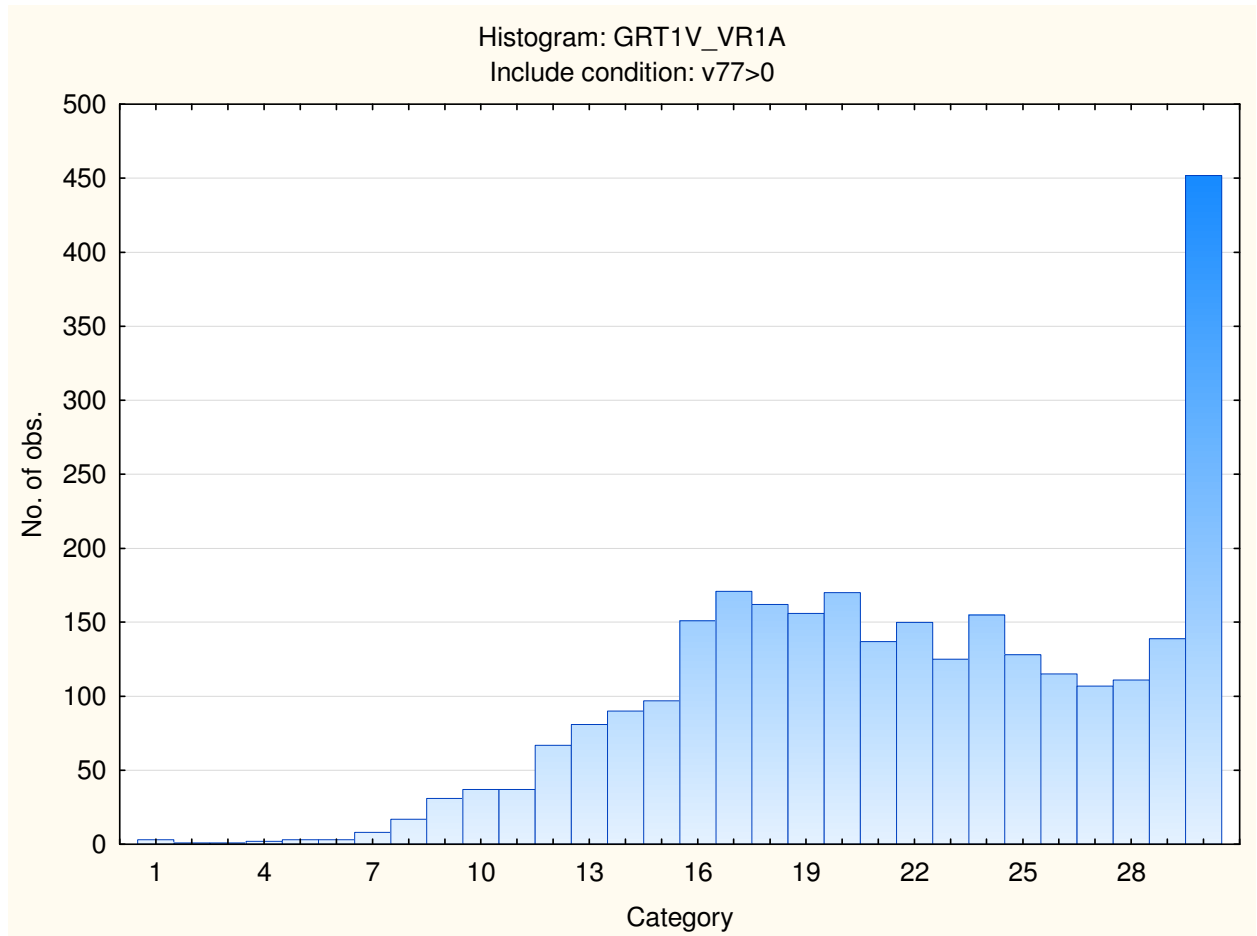
Variable	Descriptive statistics on Graduate Reasoning Test Battery subtests					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Graduate Verbal Reasoning	8.01066	4.495875	0.000000	28.00000	2907	0
Graduate Verbal Reasoning items attempted	21.67939	6.115689	1.000000	30.00000	2907	0
Graduate Numerical Reasoning	7.33766	4.898714	0.000000	25.00000	2926	0
Graduate Numerical Reasoning items attempted	16.60800	5.346566	1.000000	25.00000	2926	0
Graduate Abstract Reasoning	9.77079	4.000879	0.000000	25.00000	3643	0
Graduate Abstract Reasoning items attempted	20.39665	4.463712	1.000000	25.00000	3643	0

Frequency distributions of Graduate Reasoning Test Battery subtests

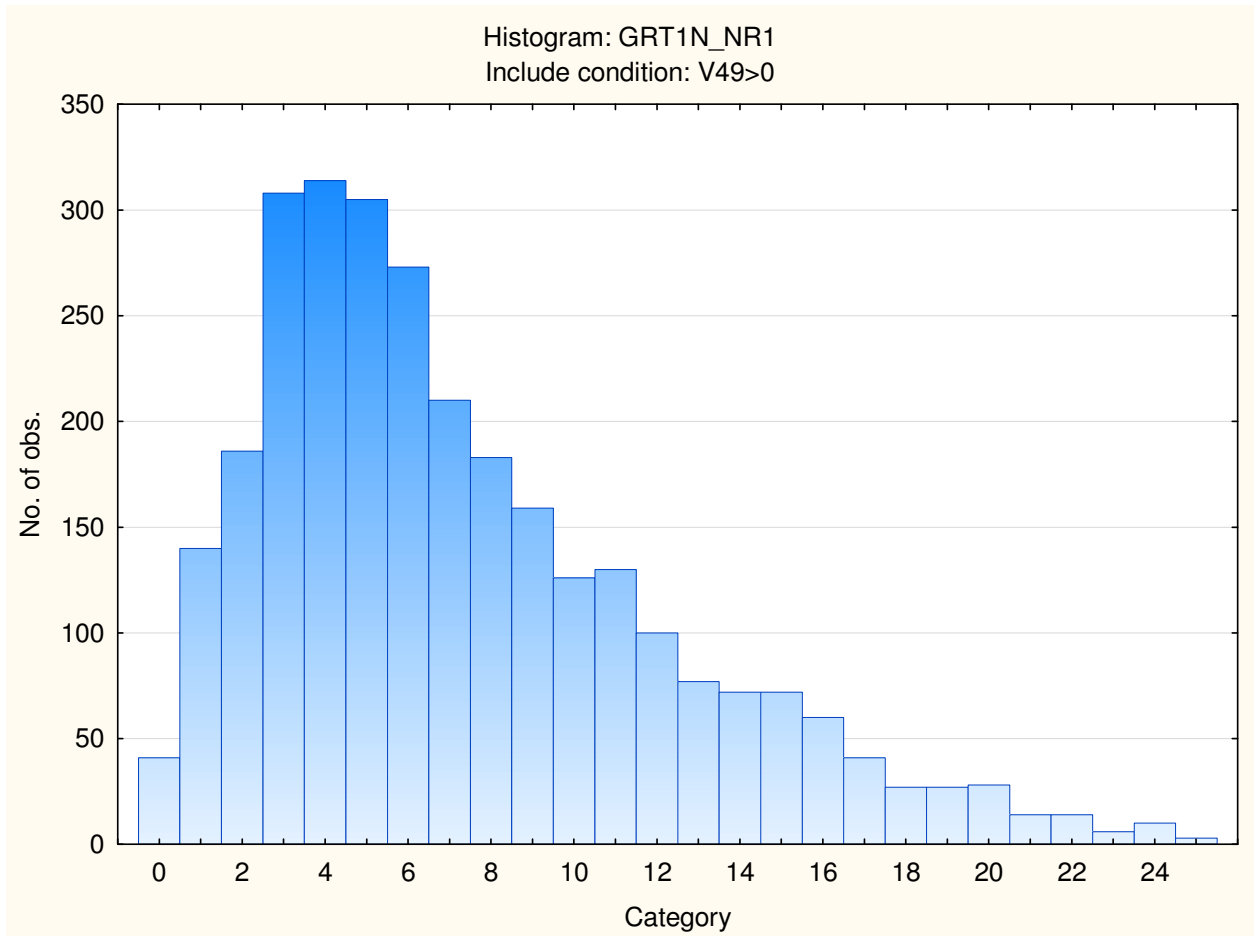
Frequency distribution: Graduate Verbal Reasoning Test



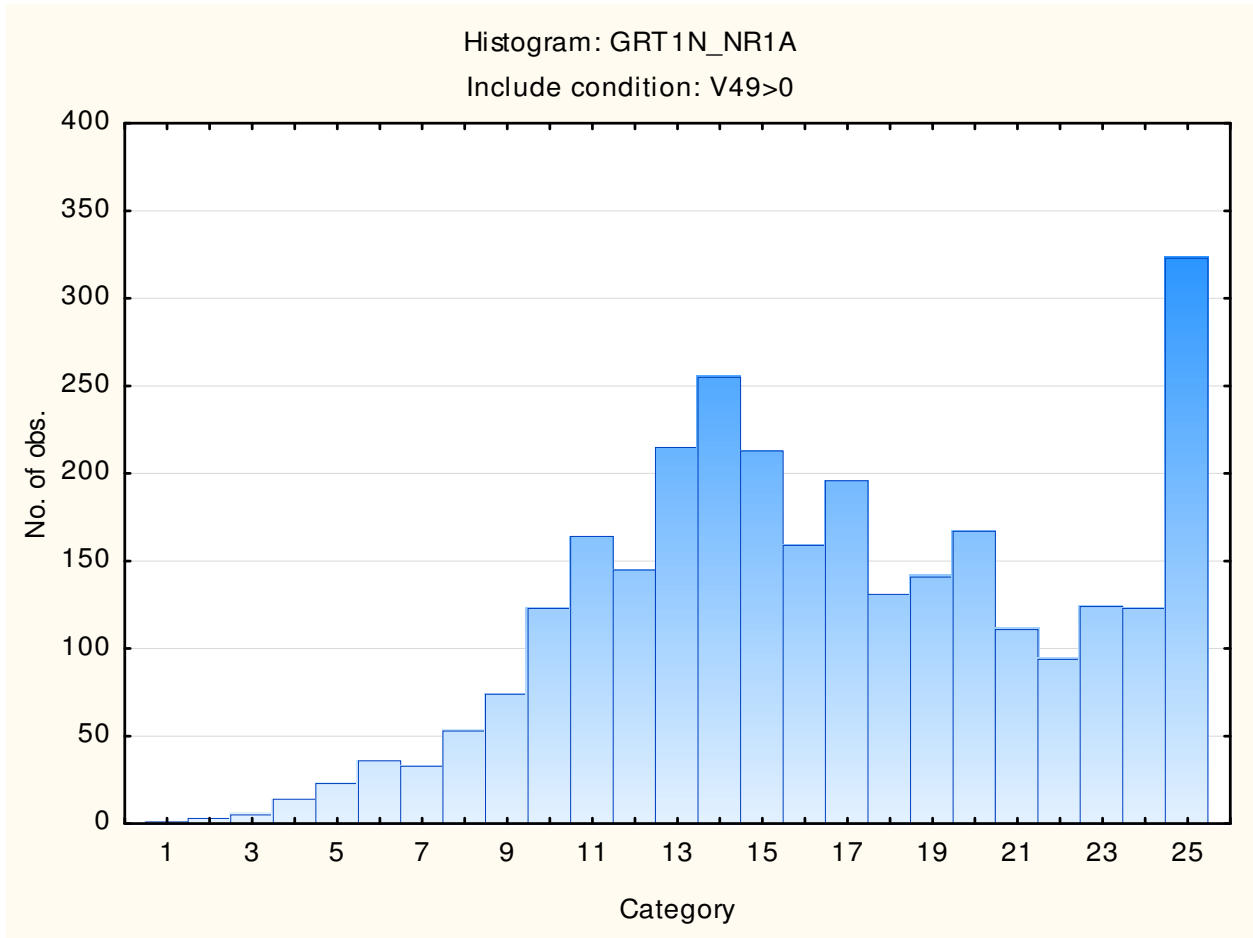
Frequency distribution: Graduate Verbal Reasoning Test Items Attempted



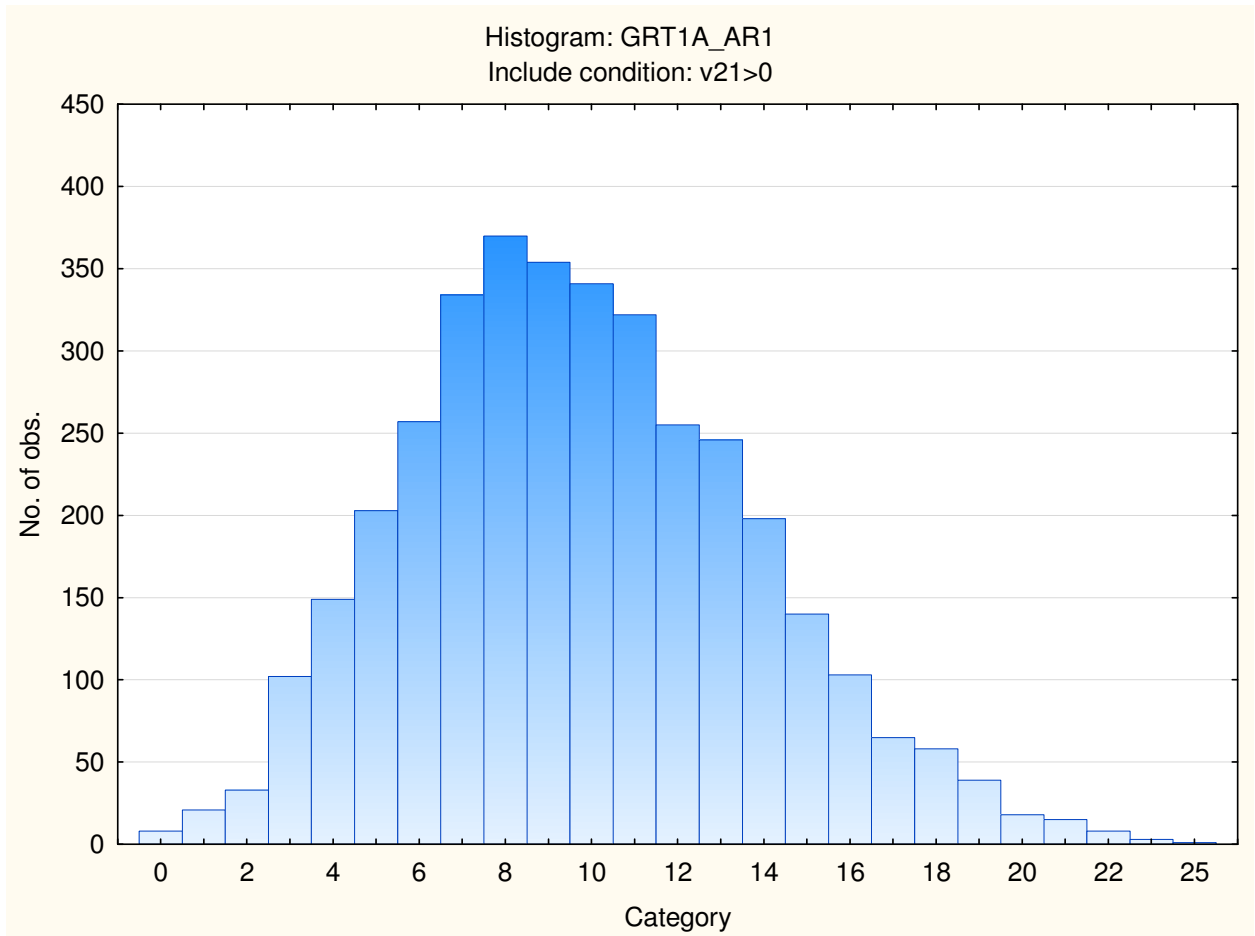
Frequency distribution: Graduate Numerical Reasoning Test

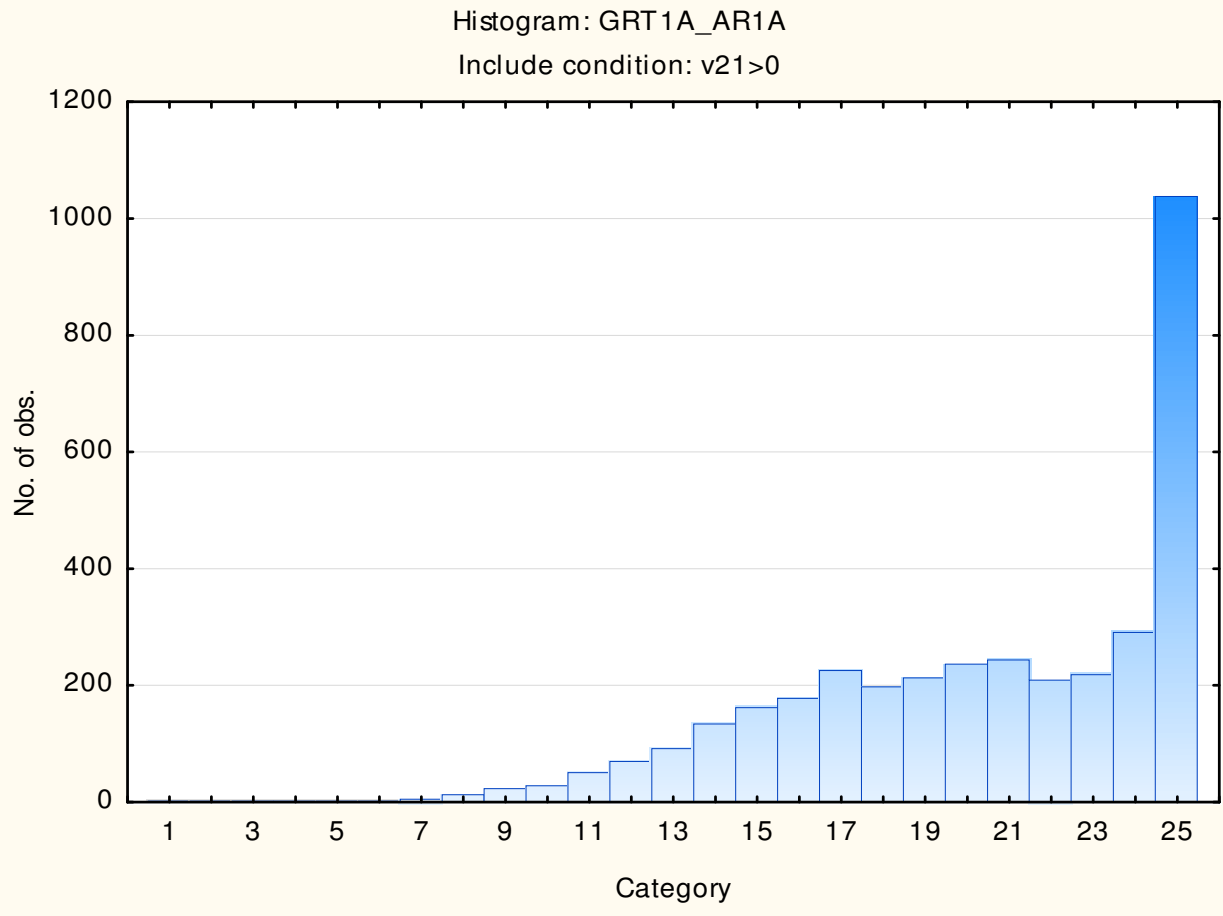


Frequency distribution: Graduate Numerical Reasoning Test Items Attempted



Frequency distribution: Graduate Abstract Reasoning Test





Stanine table

	S9_1	S9_2	S9_3	S9_4	S9_5	S9_6	S9_7	S9_8	S9_9
Graduate Verbal Reasoning	0-0	1-2	3-4	5-6	7-9	10-11	12-13	14-15	16-28
Graduate Verbal Items Attempted	1-10	11-14	15-17	18-20	21-23	24-26	27-29	30-30	
Graduate Numerical Reasoning	0--1	0-1	2-3	4-6	7-8	9-11	12-13	14-15	16-25
Graduate Numerical Items Attempted	1-7	8-9	10-12	13-15	16-17	18-20	21-23	24-25	
Graduate Abstract Reasoning	0-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16	17-25
Graduate Abstract Items Attempted	1-12	13-14	15-17	18-19	20-21	22-23	24-25		

Graduate Reasoning Test Battery norm table: South African General Population updated 2010

Sample composition

The sample consisted of South Africans tested by Psytech South Africa and collaborators in the period leading up to January 2010. Not all respondents completed the entire Graduate Reasoning Test Battery, therefore biographical particulars are reported separately for the Verbal, Numerical and Abstract Graduate Reasoning tests.

Sample composition: Graduate Verbal Reasoning Test

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	1174	1174	40.38528	40.3853
M	1719	2893	59.13313	99.5184
U	14	2907	0.48160	100.0000
Missing	0	2907	0.00000	100.0000

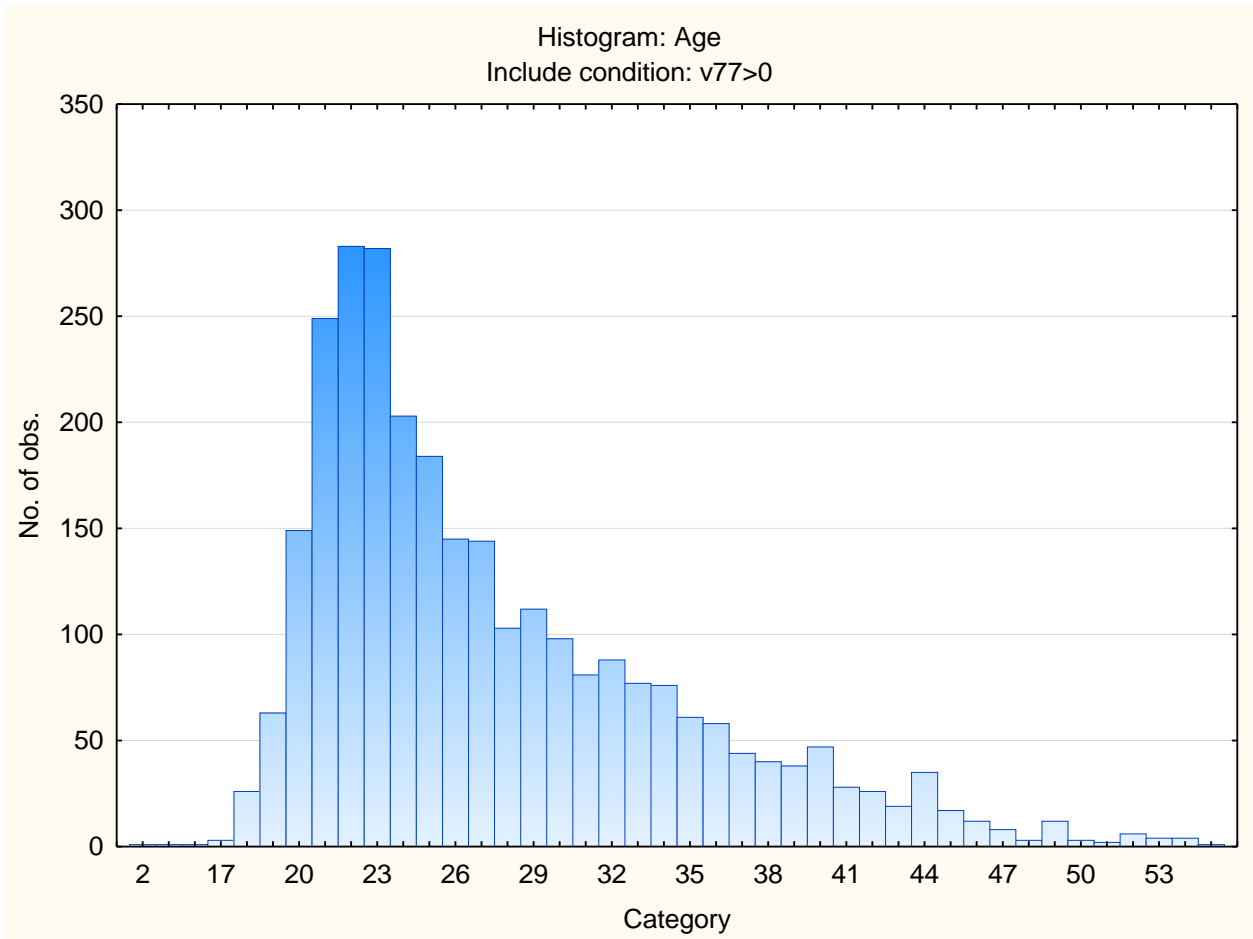
Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	271	271	9.32233	9.3223
Grade 12	278	549	9.56312	18.8854
Diploma	102	651	3.50877	22.3942
<Grade 12	48	699	1.65119	24.0454
Post Graduate	144	843	4.95356	28.9990
Certificate	26	869	0.89439	29.8934
Missing	2038	2907	70.10664	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	482	482	16.58067	16.5807
Afrikaans	156	638	5.36636	21.9470
Setswana	28	666	0.96319	22.9102
isiXhosa	127	793	4.36877	27.2790
Xitsonga	6	799	0.20640	27.4854
isiZulu	42	841	1.44479	28.9302
Sesotho	21	862	0.72239	29.6526
Sepedi	14	876	0.48160	30.1342
isiNdebele"	3	879	0.10320	30.2374
Tshivenda	5	884	0.17200	30.4094
siSwati	3	887	0.10320	30.5126
Missing	2020	2907	69.48744	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	482	482	16.58067	16.5807
Afrikaans	156	638	5.36636	21.9470
Indigenous	252	890	8.66873	30.6158
Missing	2017	2907	69.38424	100.0000

Category	Frequency table: Race Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	343	343	11.79911	11.7991
European	147	490	5.05676	16.8559
Asian	126	616	4.33437	21.1902
African	383	999	13.17509	34.3653
Missing	1908	2907	65.63467	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	27.53472	7.021020	2.000000	59.00000	2837	70



Sample composition: Graduate Numerical Reasoning Test

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	1180	1180	40.32809	40.3281
M	1732	2912	59.19344	99.5215
U	14	2926	0.47847	100.0000
Missing	0	2926	0.00000	100.0000

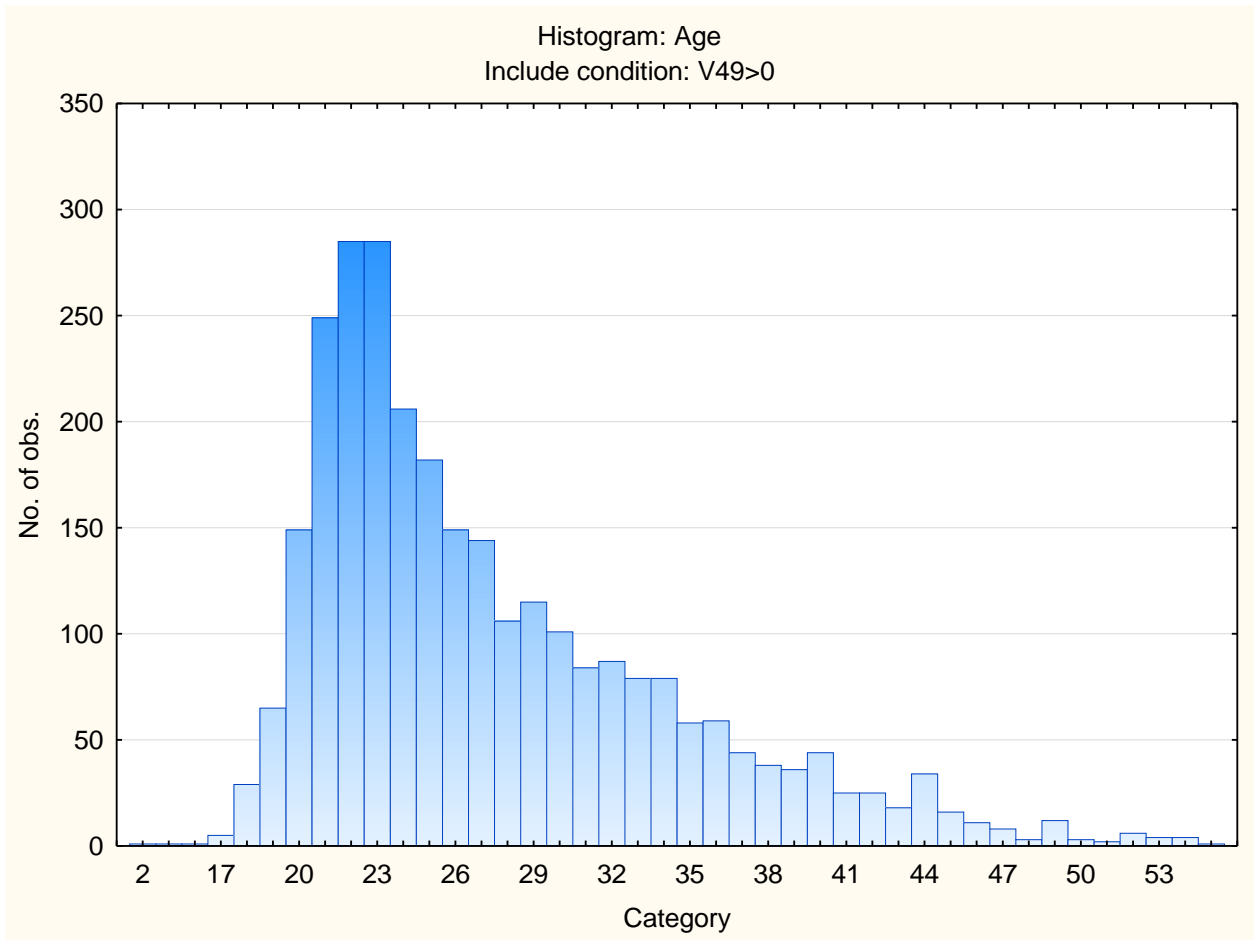
Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	257	257	8.78332	8.7833
Grade 12	282	539	9.63773	18.4211
Diploma	101	640	3.45181	21.8729
<Grade 12	49	689	1.67464	23.5475
Post Graduate	141	830	4.81887	28.3664
Certificate	26	856	0.88859	29.2550
Missing	2070	2926	70.74504	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	478	478	16.33630	16.3363
Afrikaans	155	633	5.29733	21.6336
Setswana	26	659	0.88859	22.5222
isiXhosa	125	784	4.27204	26.7943
Xitsonga	5	789	0.17088	26.9651
isiZulu	47	836	1.60629	28.5714
Sesotho	20	856	0.68353	29.2550
Sepedi	14	870	0.47847	29.7334
isiNdebele"	3	873	0.10253	29.8360
Tshivenda	4	877	0.13671	29.9727
siSwati	3	880	0.10253	30.0752
Missing	2046	2926	69.92481	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	478	478	16.33630	16.3363
Afrikaans	155	633	5.29733	21.6336
Indigenous	250	883	8.54409	30.1777
Missing	2043	2926	69.82228	100.0000

Category	Frequency table: Race Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	342	342	11.68831	11.6883
European	145	487	4.95557	16.6439
Asian	126	613	4.30622	20.9501
African	379	992	12.95284	33.9029
Missing	1934	2926	66.09706	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	27.43954	6.952171	2.000000	59.00000	2853	73



Sample composition: Graduate Abstract Reasoning Test

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	1522	1522	41.77875	41.7788
M	2104	3626	57.75460	99.5334
U	17	3643	0.46665	100.0000
Missing	0	3643	0.00000	100.0000

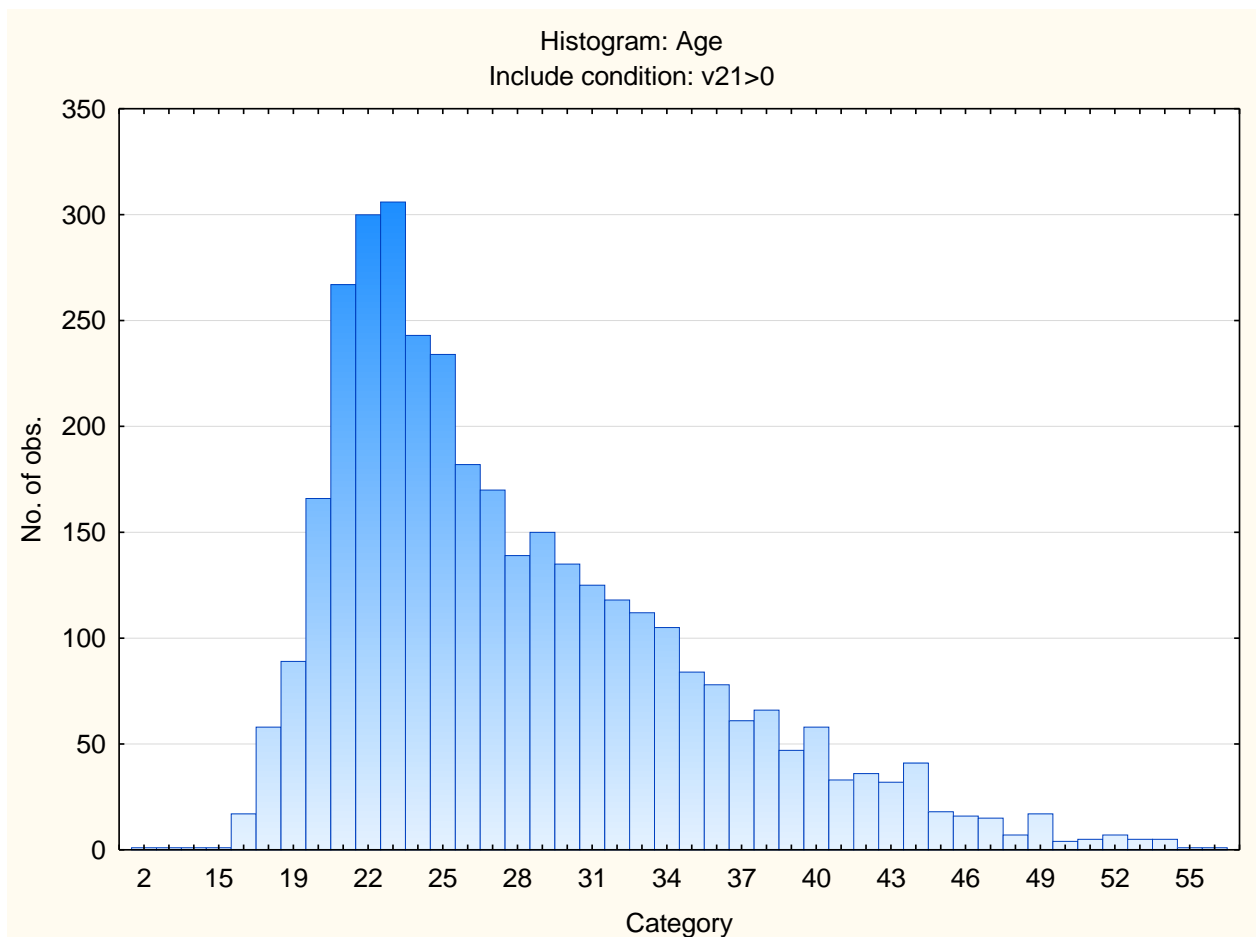
Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	333	333	9.14082	9.1408
Grade 12	345	678	9.47022	18.6110
Diploma	191	869	5.24293	23.8540
<Grade 12	54	923	1.48229	25.3363
Post Graduate	171	1094	4.69393	30.0302
Certificate	28	1122	0.76860	30.7988
Missing	2521	3643	69.20121	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	528	528	14.49355	14.4935
Afrikaans	198	726	5.43508	19.9286
Setswana	58	784	1.59209	21.5207
isiXhosa	206	990	5.65468	27.1754
Xitsonga	13	1003	0.35685	27.5323
isiZulu	106	1109	2.90969	30.4419
Sesotho	50	1159	1.37250	31.8144
Sepedi	23	1182	0.63135	32.4458
isiNdebele	3	1185	0.08235	32.5281
Tshivenda	6	1191	0.16470	32.6928
siSwati	8	1199	0.21960	32.9124
Missing	2444	3643	67.08757	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	528	528	14.49355	14.4935
Afrikaans	198	726	5.43508	19.9286
Indigenous	481	1207	13.20340	33.1320
Missing	2436	3643	66.86797	100.0000

Category	Frequency table: Race Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	364	364	9.99177	9.9918
European	183	547	5.02333	15.0151
Asian	152	699	4.17239	19.1875
African	634	1333	17.40324	36.5907
Missing	2310	3643	63.40928	100.0000

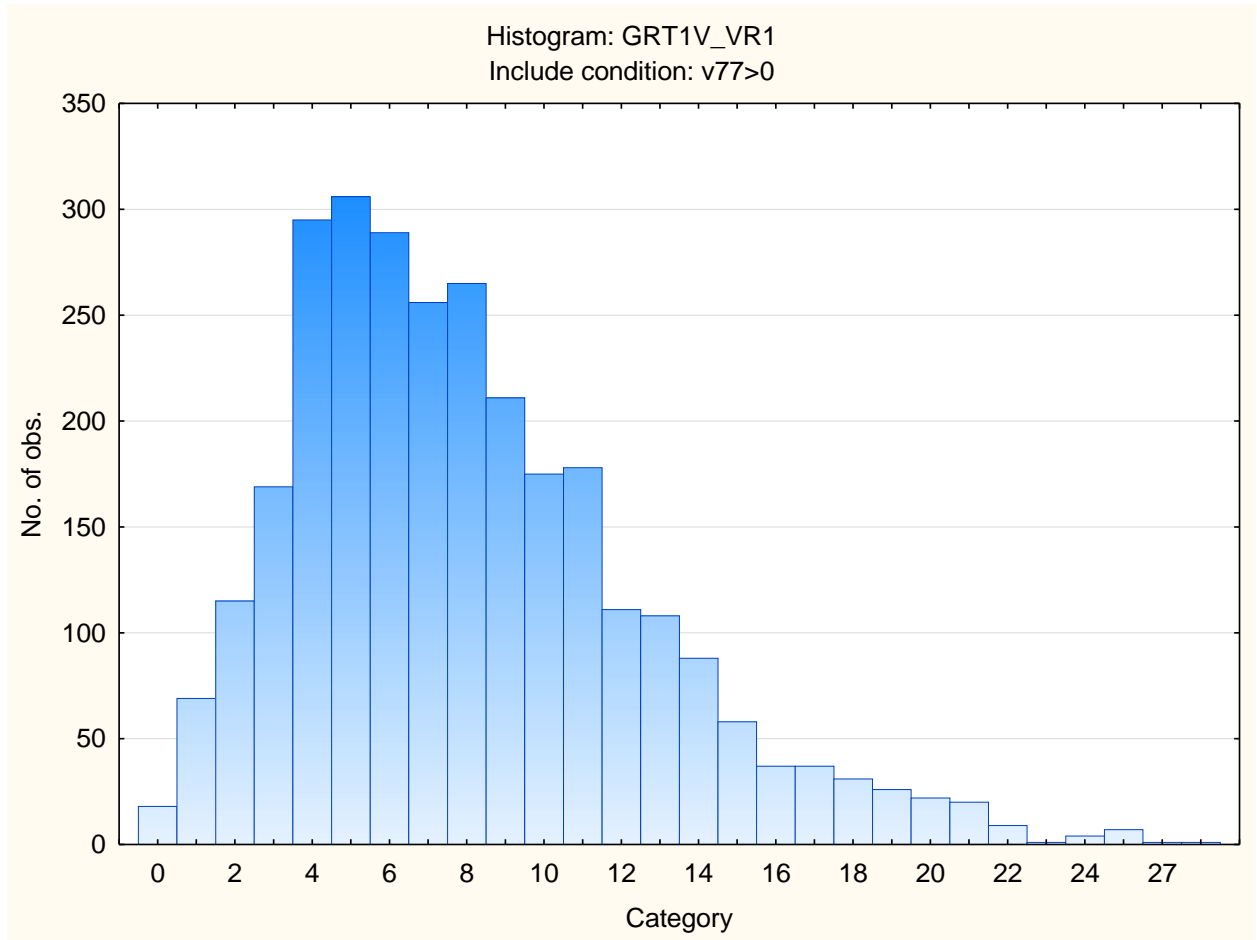
Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	27.95474	7.191728	2.000000	59.00000	3557	86



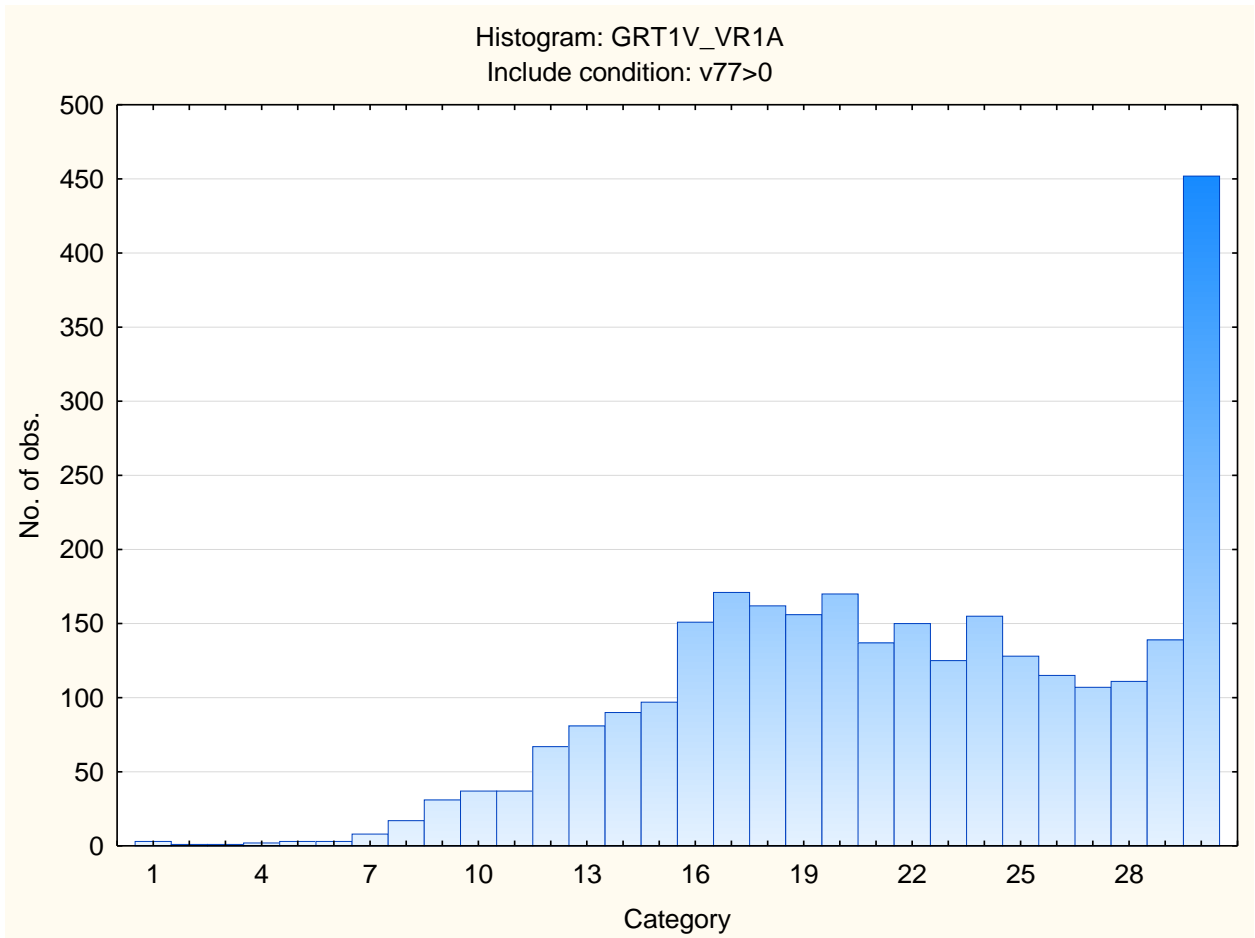
Variable	Descriptive statistics on Graduate Reasoning Test Battery subtests					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Graduate Verbal Reasoning	8.01066	4.495875	0.000000	28.00000	2907	0
Graduate Verbal Reasoning items attempted	21.67939	6.115689	1.000000	30.00000	2907	0
Graduate Numerical Reasoning	7.33766	4.898714	0.000000	25.00000	2926	0
Graduate Numerical Reasoning items attempted	16.60800	5.346566	1.000000	25.00000	2926	0
Graduate Abstract Reasoning	9.77079	4.000879	0.000000	25.00000	3643	0
Graduate Abstract Reasoning items attempted	20.39665	4.463712	1.000000	25.00000	3643	0

Frequency distributions of Graduate Reasoning Test Battery subtests

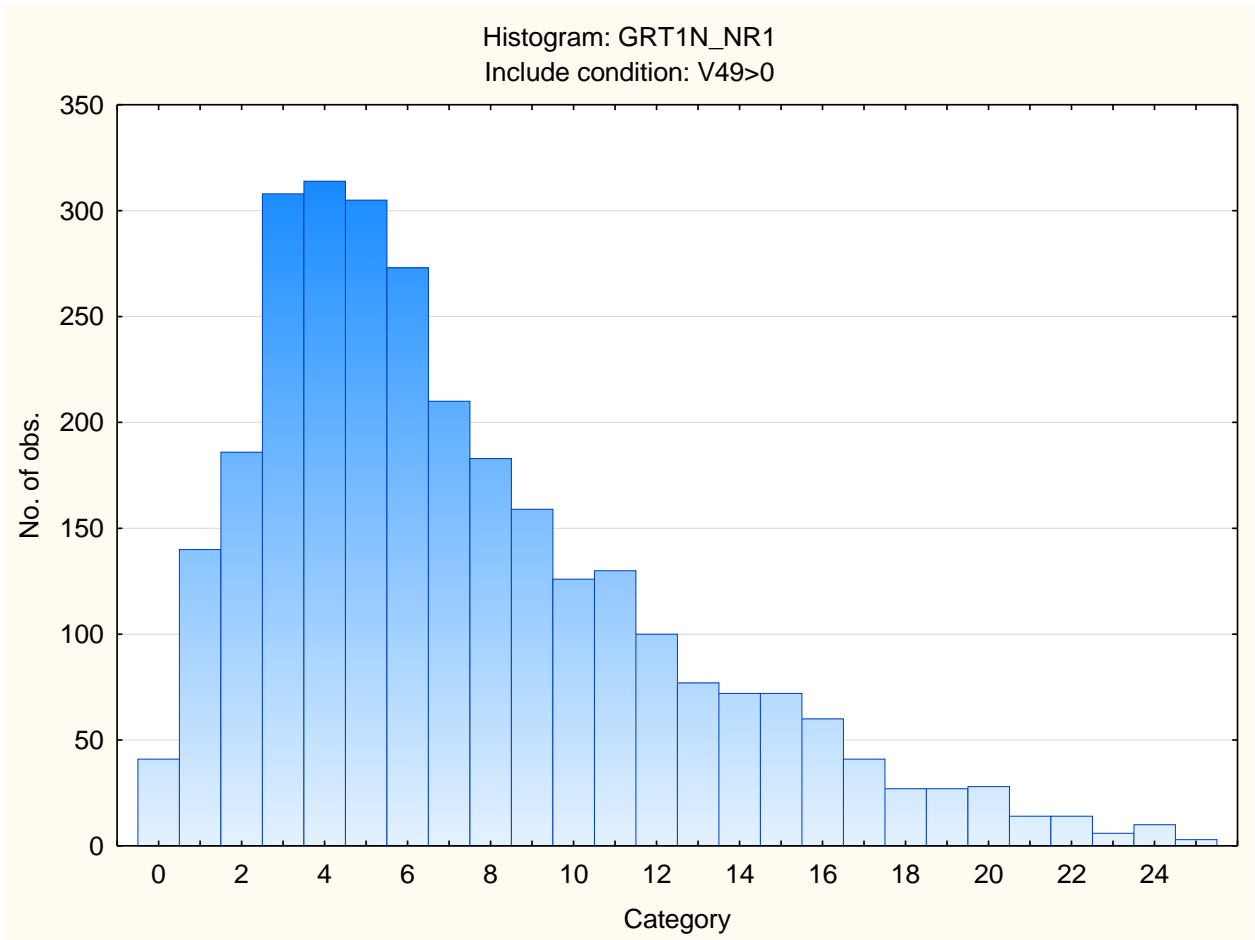
Frequency distribution: Graduate Verbal Reasoning Test



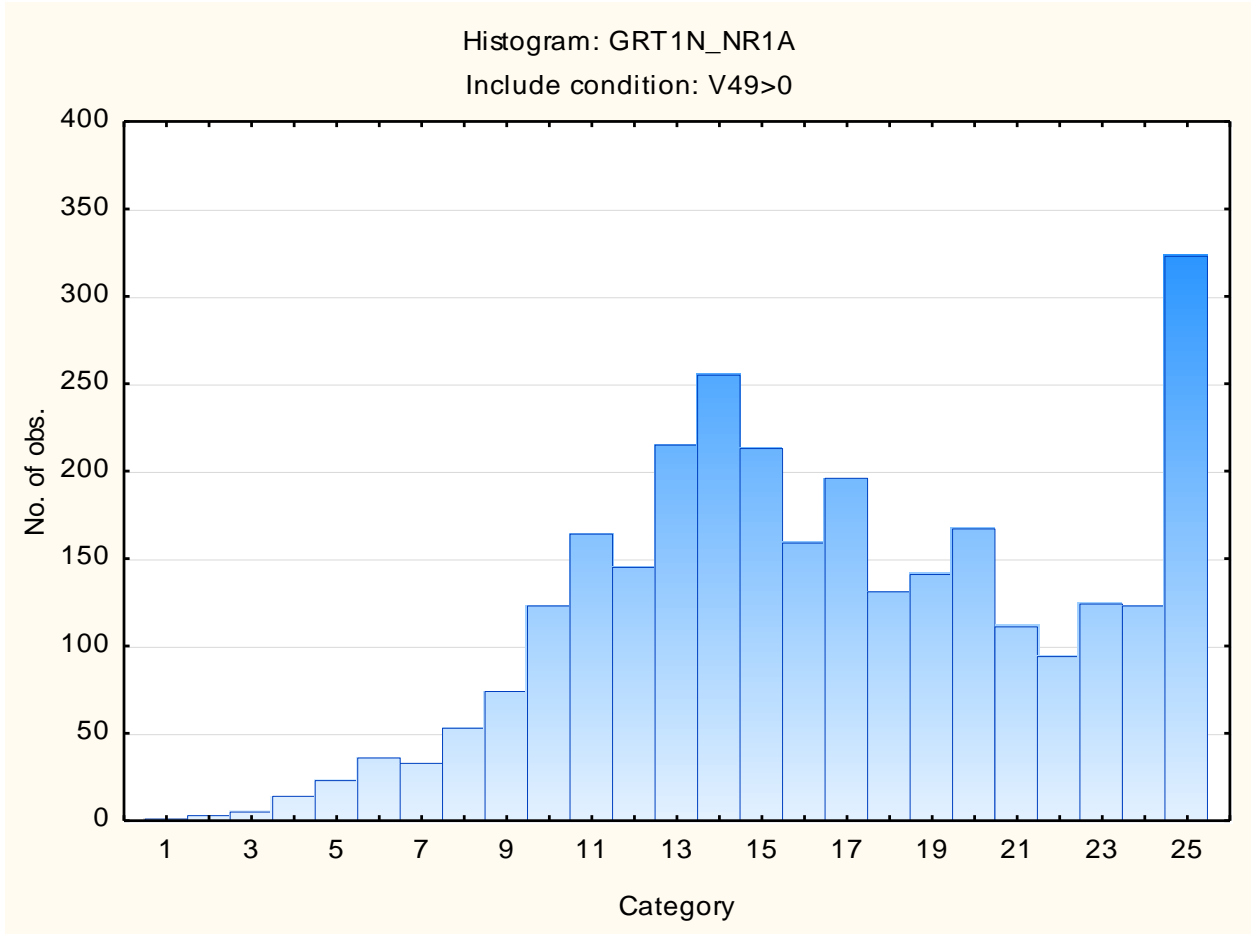
Frequency distribution: Graduate Verbal Reasoning Test Items Attempted



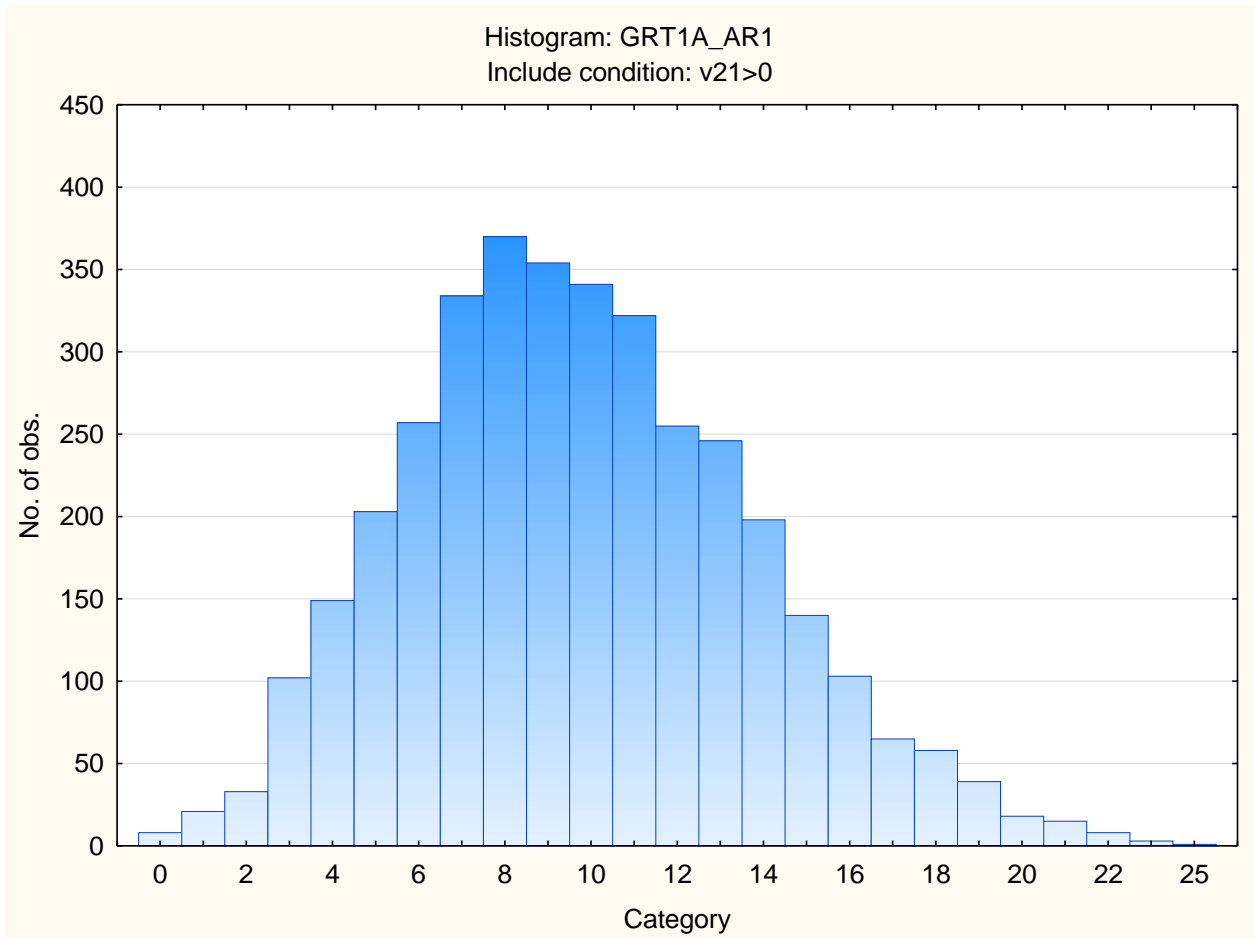
Frequency distribution: Graduate Numerical Reasoning Test

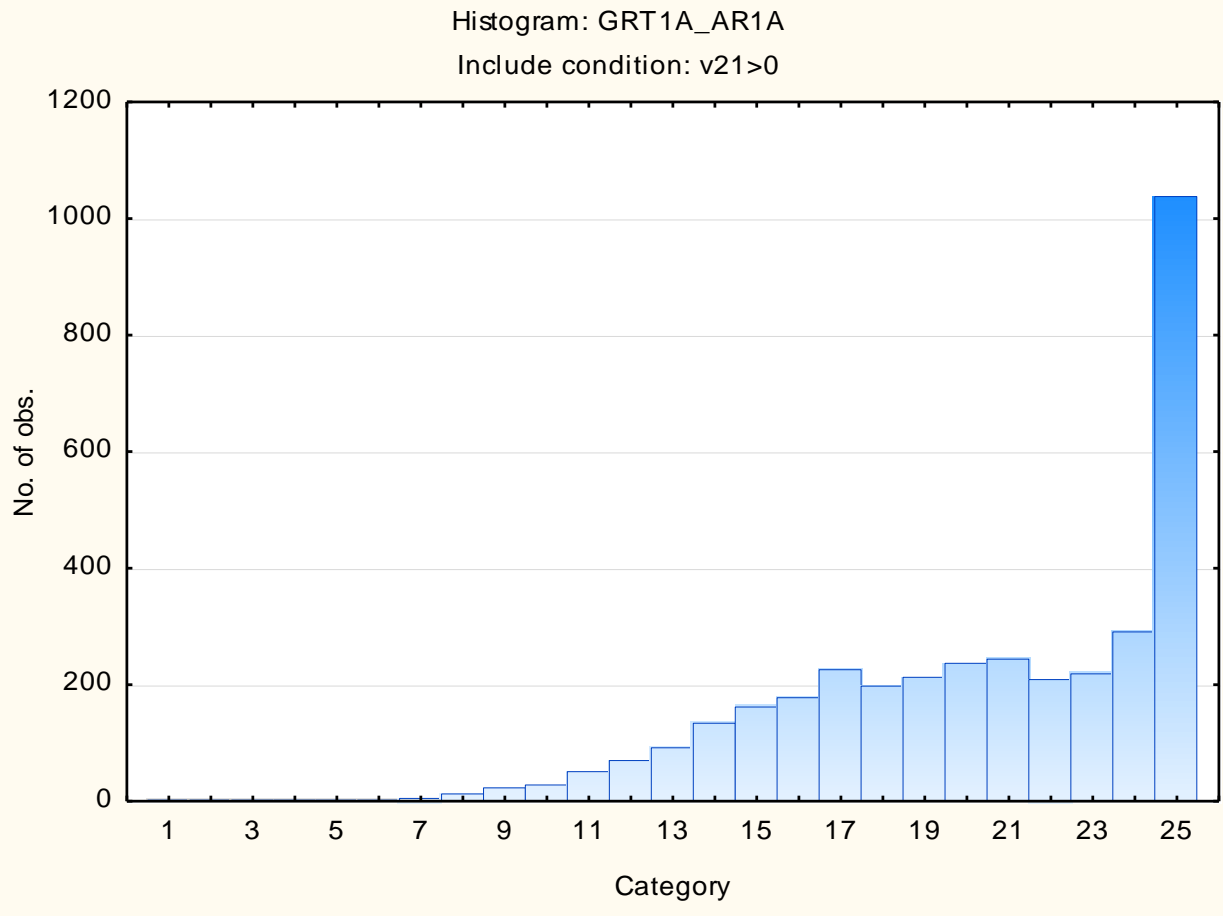


Frequency distribution: Graduate Numerical Reasoning Test Items Attempted



Frequency distribution: Graduate Abstract Reasoning Test





Stanine table

	S9_1	S9_2	S9_3	S9_4	S9_5	S9_6	S9_7	S9_8	S9_9
Graduate Verbal Reasoning	0-0	1-2	3-4	5-6	7-9	10-11	12-13	14-15	16-28
Graduate Verbal Items Attempted	1-10	11-14	15-17	18-20	21-23	24-26	27-29	30-30	
Graduate Numerical Reasoning	0--1	0-1	2-3	4-6	7-8	9-11	12-13	14-15	16-25
Graduate Numerical Items Attempted	1-7	8-9	10-12	13-15	16-17	18-20	21-23	24-25	
Graduate Abstract Reasoning	0-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16	17-25
Graduate Abstract Items Attempted	1-12	13-14	15-17	18-19	20-21	22-23	24-25		

Graduate Reasoning Test Battery Norm Group: South Africans of African race, updated 2010

Sample composition

The sample consisted of South Africans who declared their race to be African, tested by Psytech South Africa and collaborators in the period leading up to January 2010. Not all respondents completed the entire Graduate Reasoning Test Battery, therefore the biographical particulars are reported separately for the Graduate Verbal, Numerical and Abstract Reasoning tests.

Sample composition: Graduate Verbal Reasoning Test

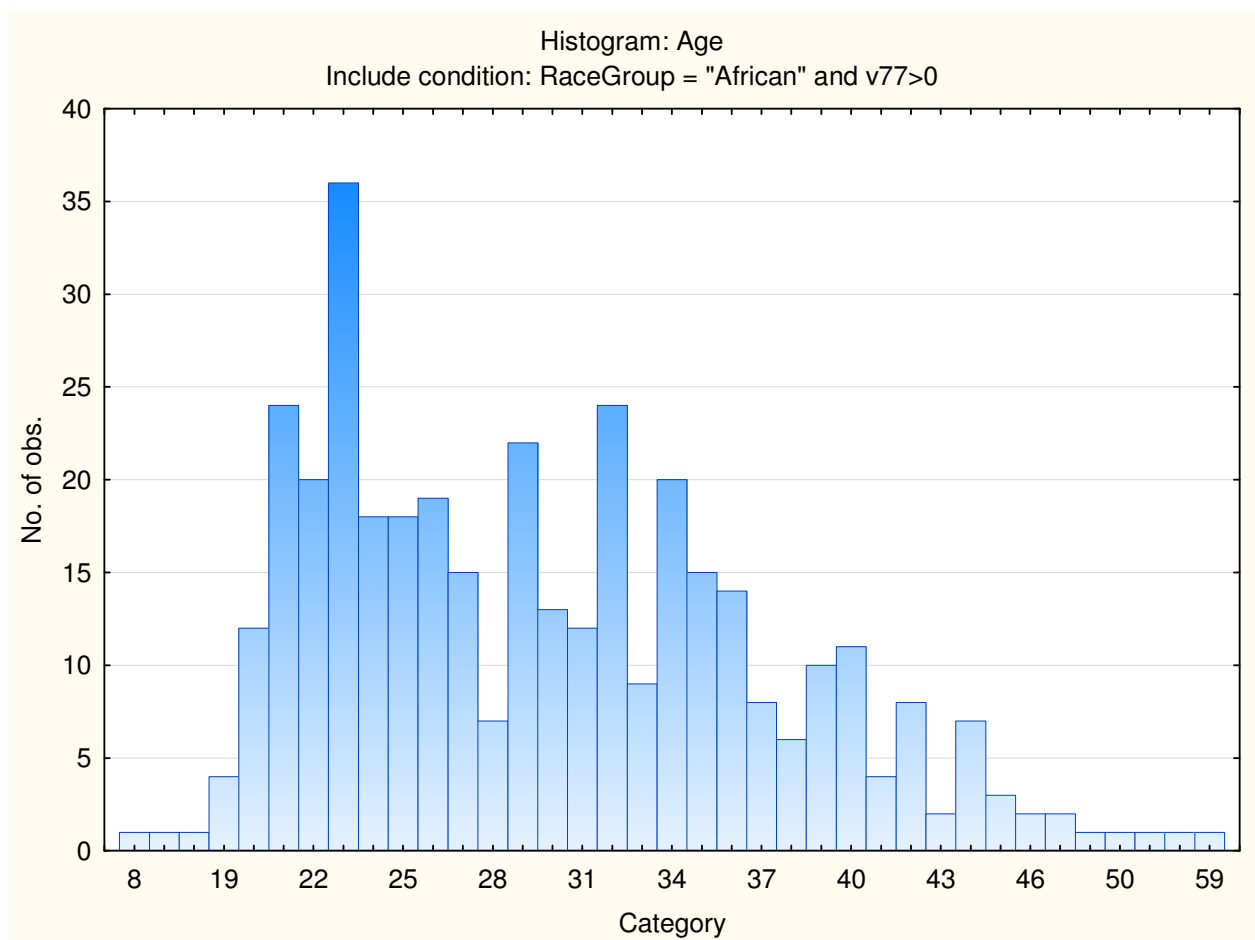
Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	152	152	39.68668	39.6867
M	230	382	60.05222	99.7389
U	1	383	0.26110	100.0000
Missing	0	383	0.00000	100.0000

Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	129	129	33.68146	33.6815
Grade 12	80	209	20.88773	54.5692
Diploma	37	246	9.66057	64.2298
<Grade 12	9	255	2.34987	66.5796
Post Graduate	40	295	10.44386	77.0235
Certificate	6	301	1.56658	78.5901
Missing	82	383	21.40992	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	74	74	19.32115	19.3211
Afrikaans	5	79	1.30548	20.6266
Setswana	28	107	7.31070	27.9373
isiXhosa	125	232	32.63708	60.5744
Xitsonga	6	238	1.56658	62.1410
isiZulu	41	279	10.70496	72.8460
Sesotho	21	300	5.48303	78.3290
Sepedi	13	313	3.39426	81.7232
isiNdebele"	3	316	0.78329	82.5065
Tshivenda	5	321	1.30548	83.8120
siSwati	3	324	0.78329	84.5953
Missing	59	383	15.40470	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	74	74	19.32115	19.3211
Afrikaans	5	79	1.30548	20.6266
Indigenous	248	327	64.75196	85.3786
Missing	56	383	14.62141	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	29.77480	7.532918	8.000000	59.000000	373	10



Sample composition: Graduate Numerical Reasoning Test

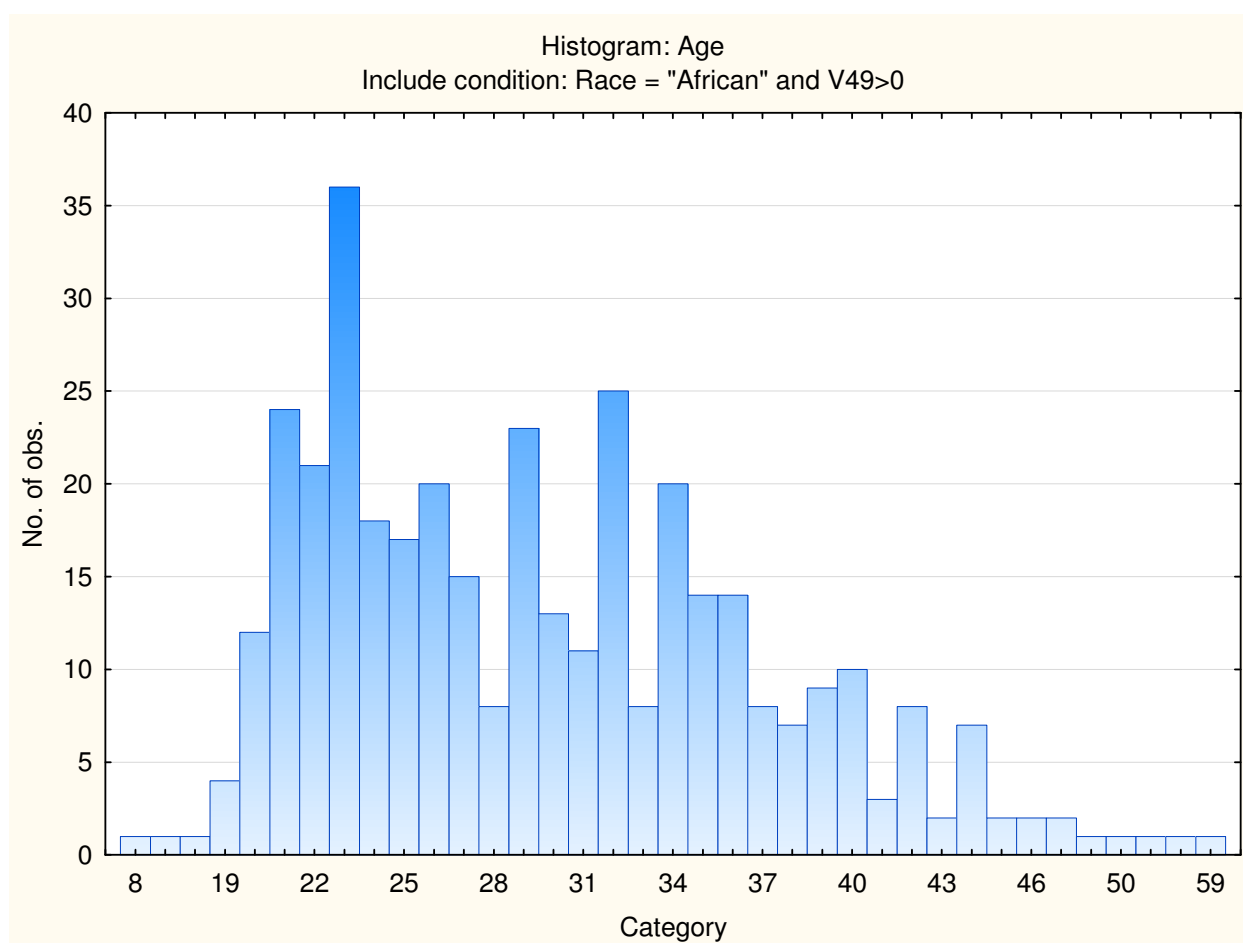
Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	152	152	40.10554	40.1055
M	226	378	59.63061	99.7361
U	1	379	0.26385	100.0000
Missing	0	379	0.00000	100.0000

Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	122	122	32.18997	32.1900
Grade 12	83	205	21.89974	54.0897
Diploma	37	242	9.76253	63.8522
<Grade 12	9	251	2.37467	66.2269
Post Graduate	39	290	10.29024	76.5172
Certificate	6	296	1.58311	78.1003
Missing	83	379	21.89974	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	74	74	19.52507	19.5251
Afrikaans	5	79	1.31926	20.8443
Indigenous	246	325	64.90765	85.7520
Missing	54	379	14.24802	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	74	74	19.52507	19.5251
Afrikaans	5	79	1.31926	20.8443
Setswana	26	105	6.86016	27.7045
isiXhosa	123	228	32.45383	60.1583
Xitsonga	5	233	1.31926	61.4776
isiZulu	46	279	12.13720	73.6148
Sesotho	20	299	5.27704	78.8918
Sepedi	13	312	3.43008	82.3219
isiNdebele	3	315	0.79156	83.1135
Tshivenda	4	319	1.05541	84.1689
siSwati	3	322	0.79156	84.9604
Missing	57	379	15.03958	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	29.62803	7.469337	8.000000	59.00000	371	8



Sample composition: Graduate Abstract Reasoning Test

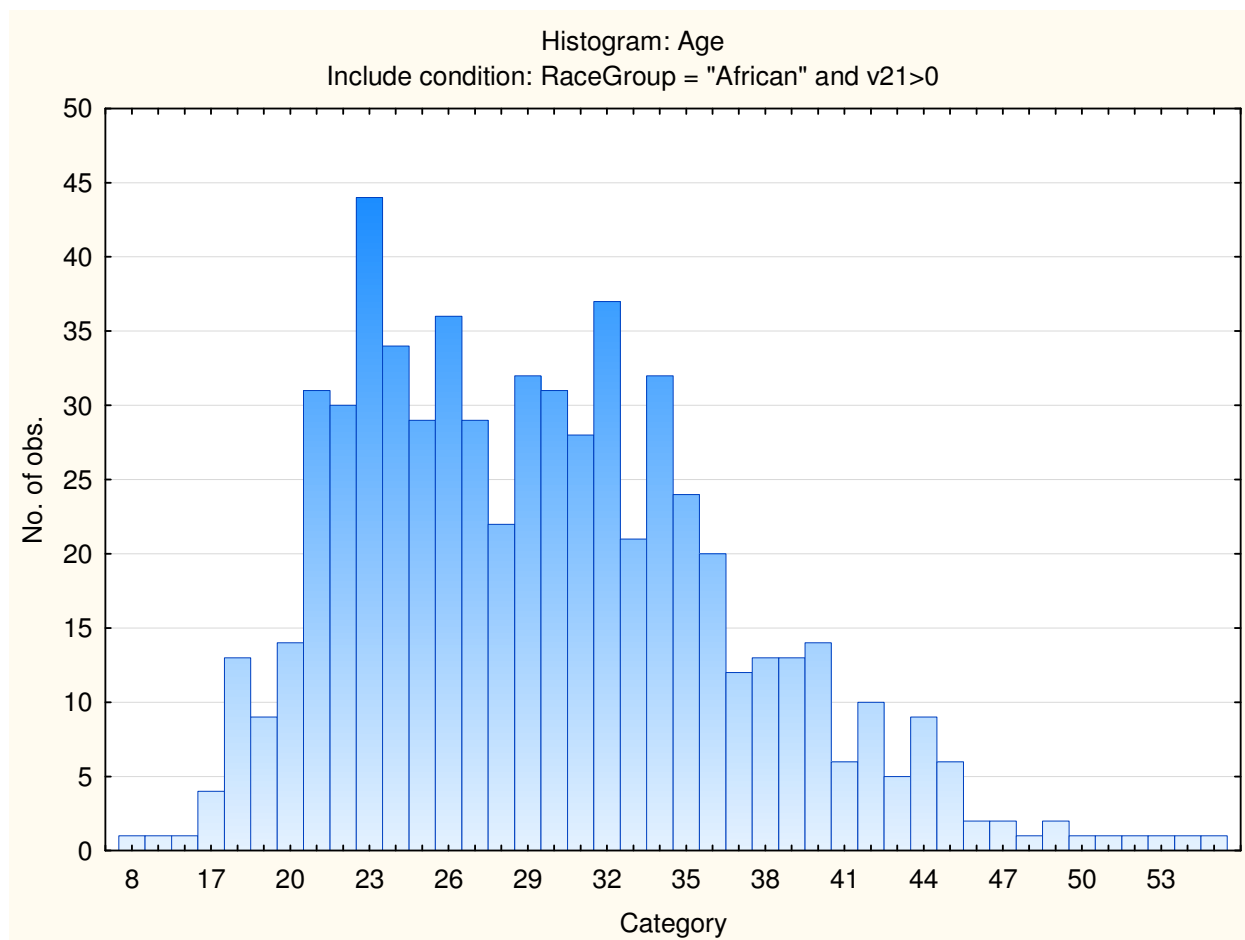
Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	255	255	40.22082	40.2208
M	376	631	59.30599	99.5268
U	3	634	0.47319	100.0000
Missing	0	634	0.00000	100.0000

Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	169	169	26.65615	26.6562
Grade 12	129	298	20.34700	47.0032
Diploma	108	406	17.03470	64.0379
<Grade 12	13	419	2.05047	66.0883
Post Graduate	65	484	10.25237	76.3407
Certificate	7	491	1.10410	77.4448
Missing	143	634	22.55521	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	82	82	12.93375	12.9338
Afrikaans	5	87	0.78864	13.7224
Setswana	58	145	9.14826	22.8707
isiXhosa	203	348	32.01893	54.8896
Xitsonga	13	361	2.05047	56.9401
isiZulu	104	465	16.40379	73.3438
Sesotho	50	515	7.88644	81.2303
Sepedi	22	537	3.47003	84.7003
isiNdebele"	3	540	0.47319	85.1735
Tshivenda	6	546	0.94637	86.1199
siSwati	8	554	1.26183	87.3817
Missing	80	634	12.61830	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	82	82	12.93375	12.9338
Afrikaans	5	87	0.78864	13.7224
Indigenous	475	562	74.92114	88.6435
Missing	72	634	11.35647	100.0000

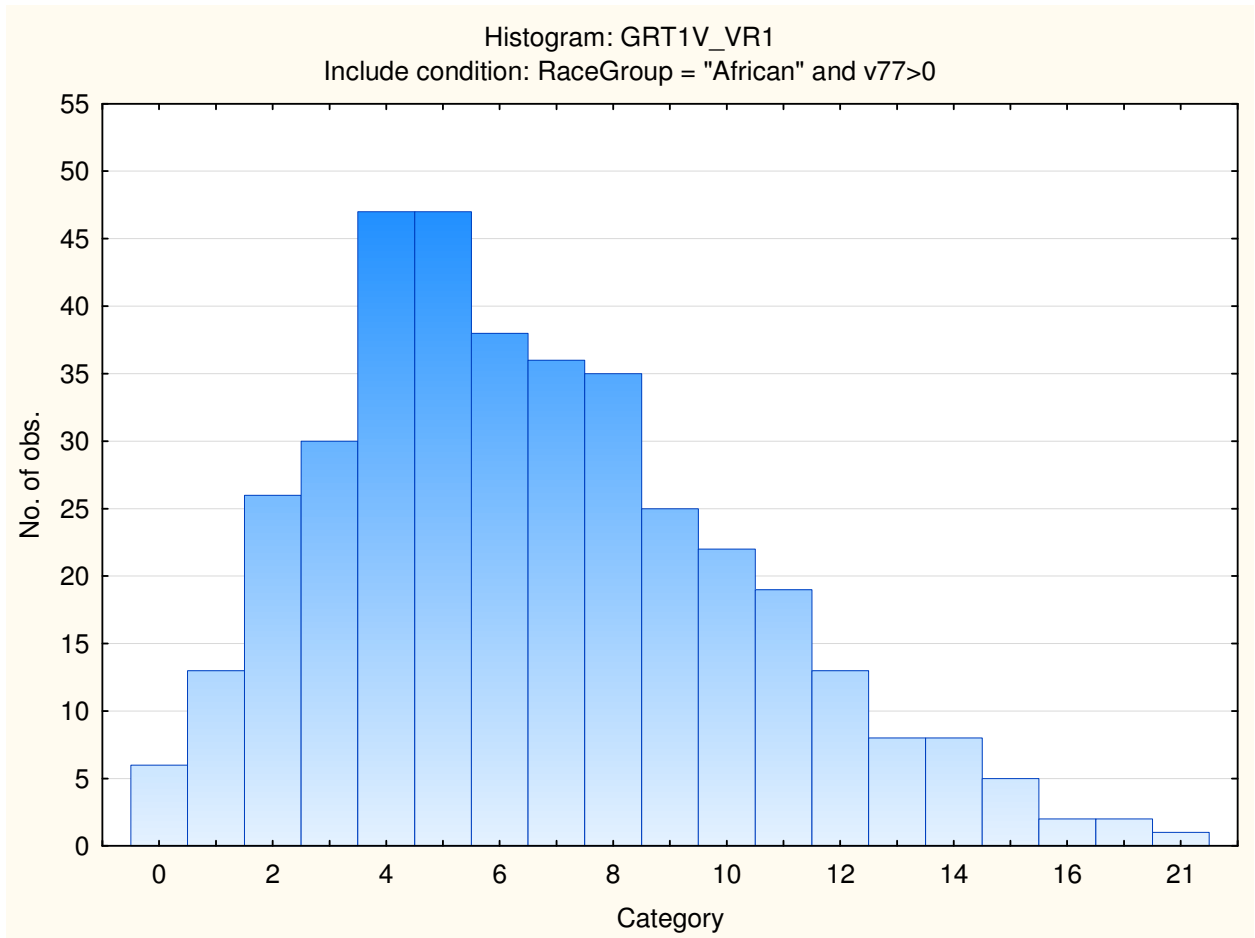
Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	29.54968	7.300527	8.000000	59.000000	624	10



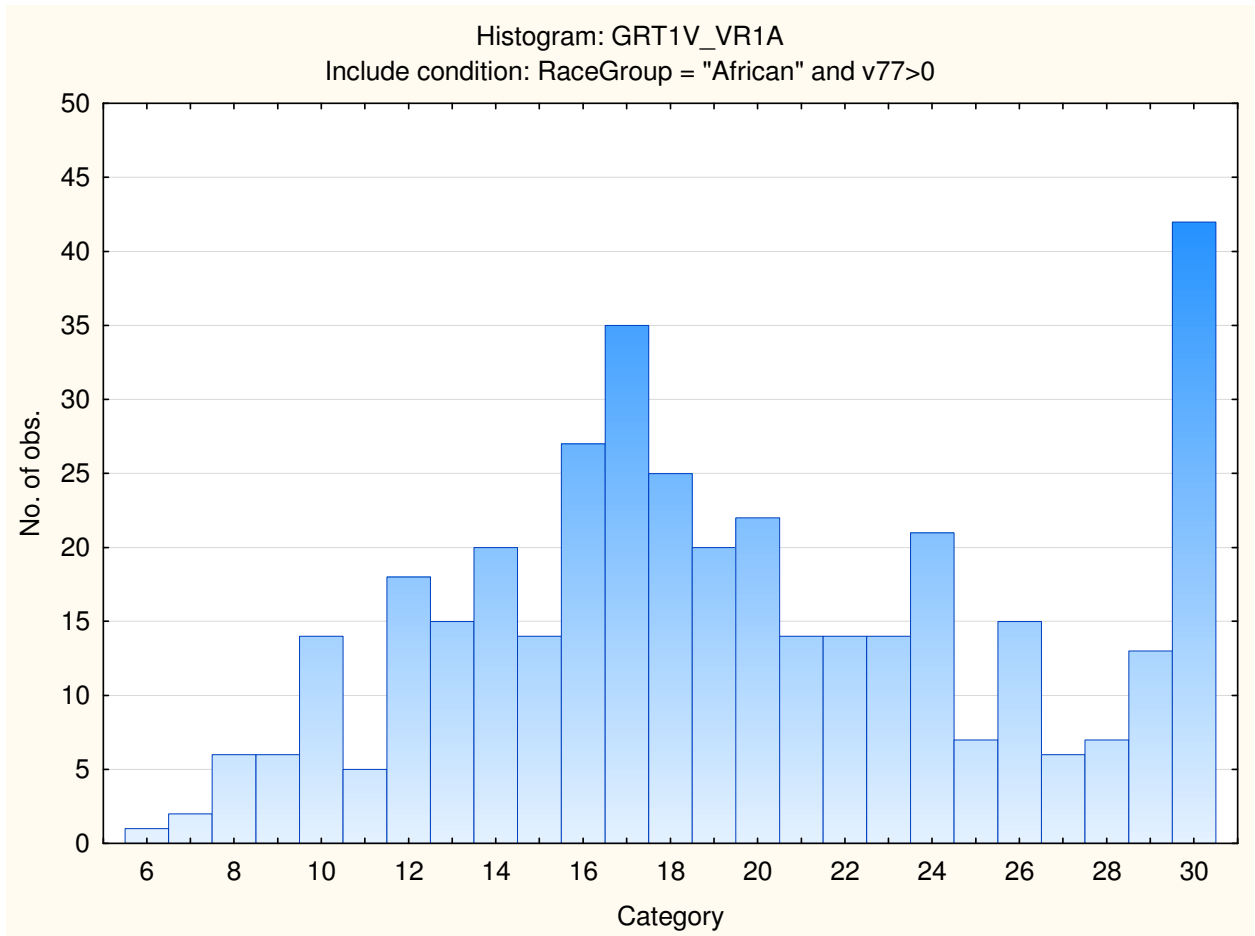
Descriptive statistics for Graduate Reasoning Test Battery subtests

Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Graduate verbal reasoning test	6.61097	3.668542	0.000000	21.00000	383	0
Graduate verbal reasoning items attempted	19.59008	6.251836	6.000000	30.00000	383	0
Graduate numerical reasoning test	6.12929	3.635024	0.000000	20.00000	379	0
Graduate numerical reasoning items attempted	15.52507	5.588753	1.000000	25.00000	379	0
Graduate abstract reasoning test	8.34543	3.423585	0.000000	20.00000	634	0
Graduate abstract reasoning items attempted	19.21924	4.734086	1.000000	25.00000	634	0

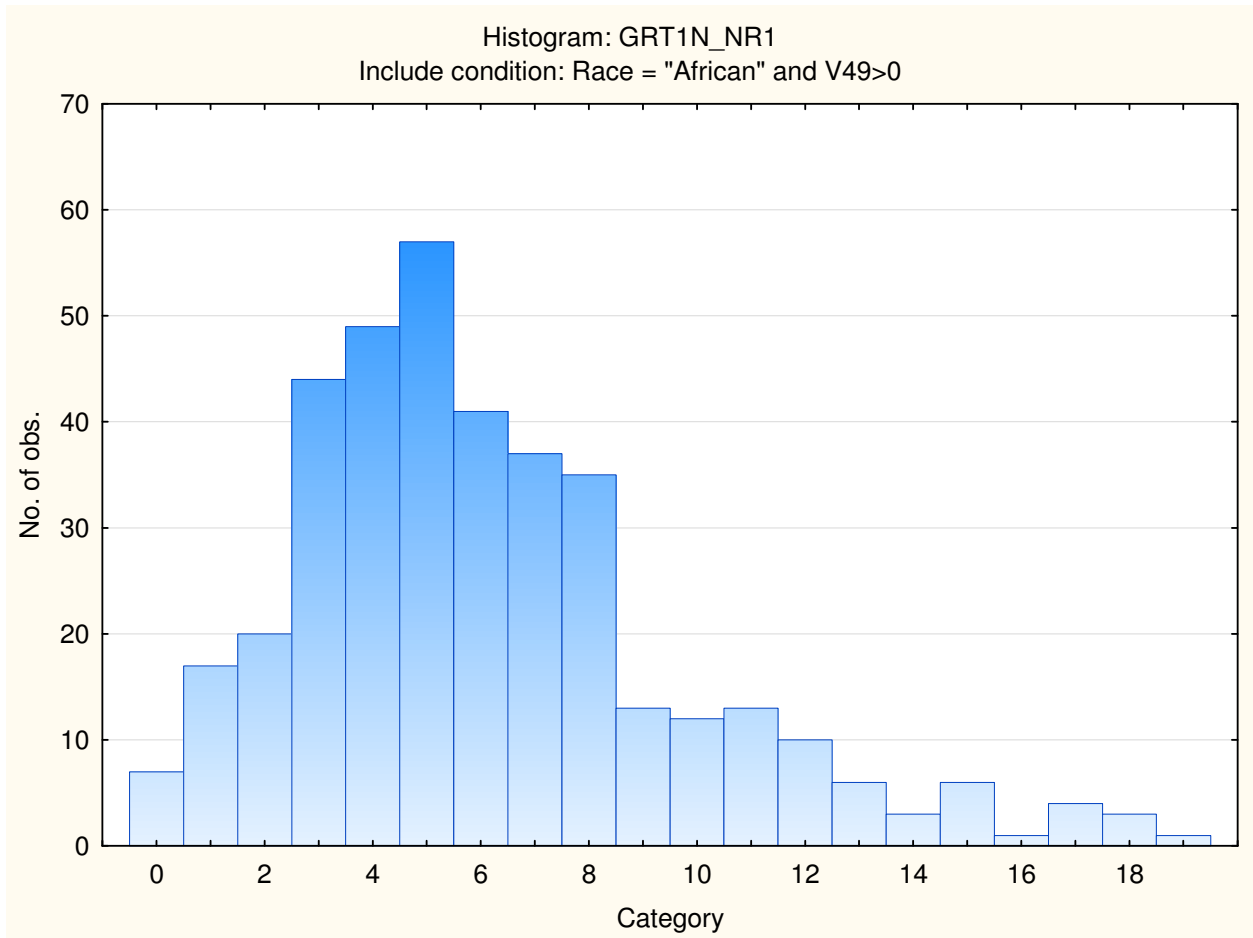
Frequency distribution: Graduate verbal reasoning test



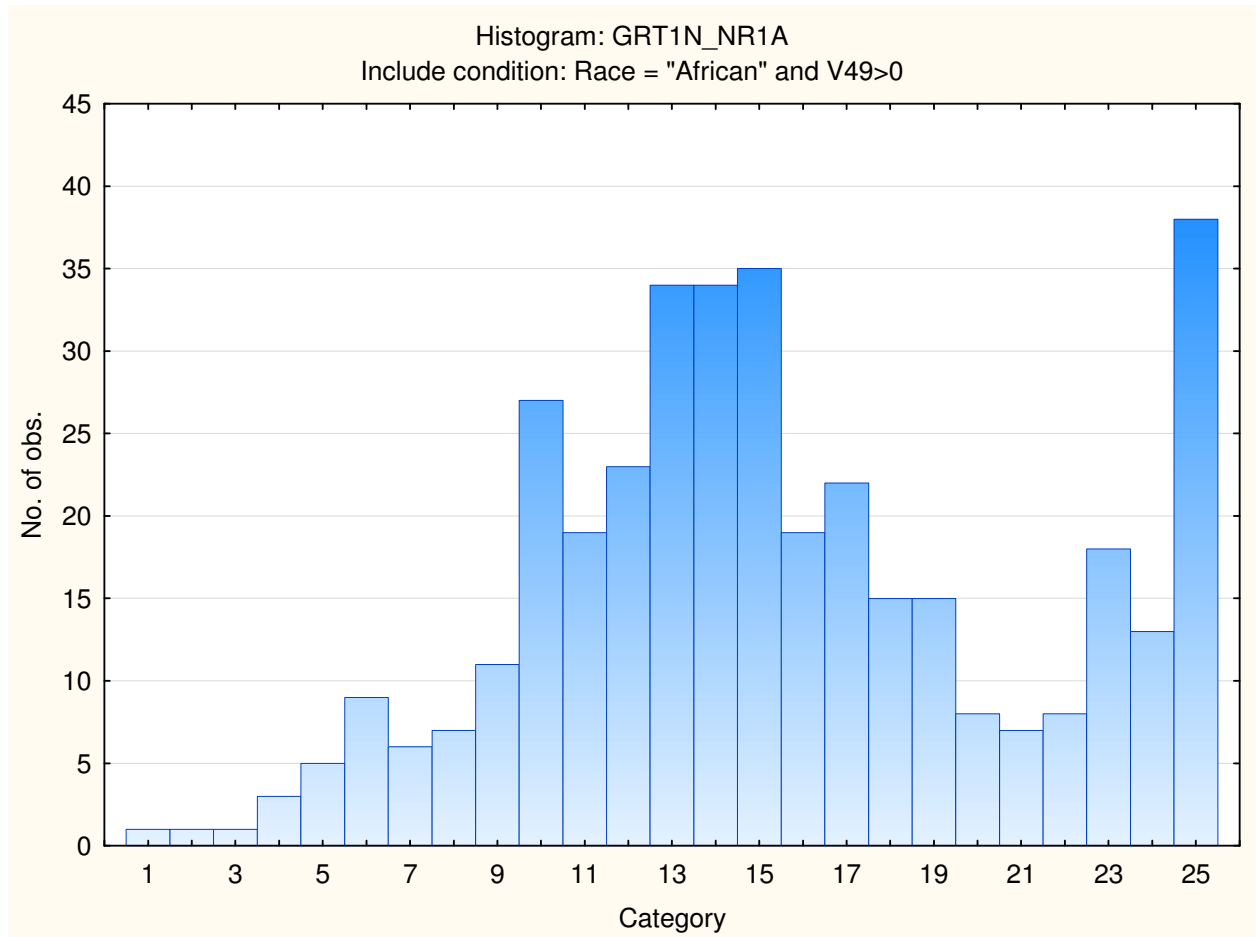
Frequency distribution: Graduate verbal reasoning items attempted



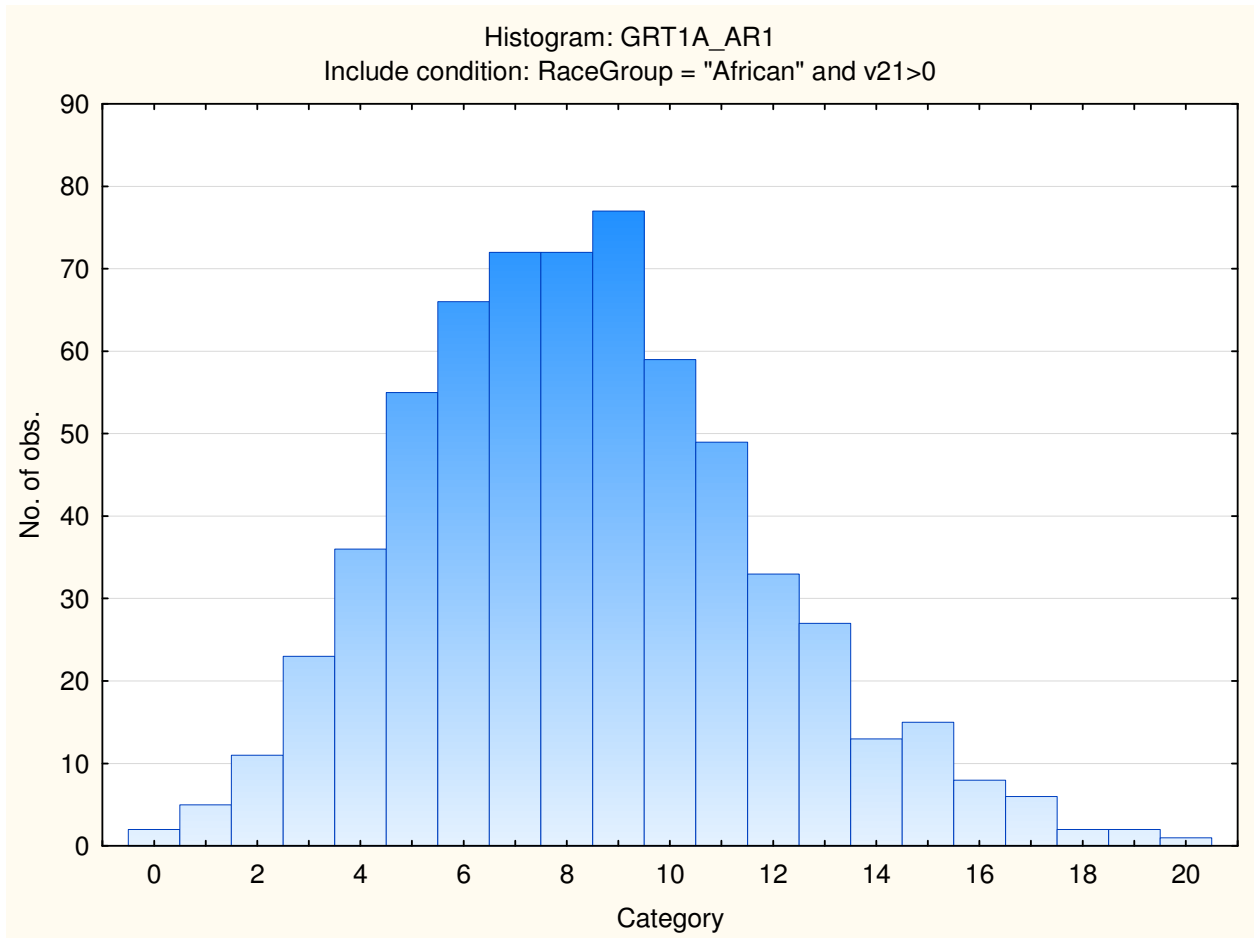
Frequency distribution: Graduate Numerical Reasoning test



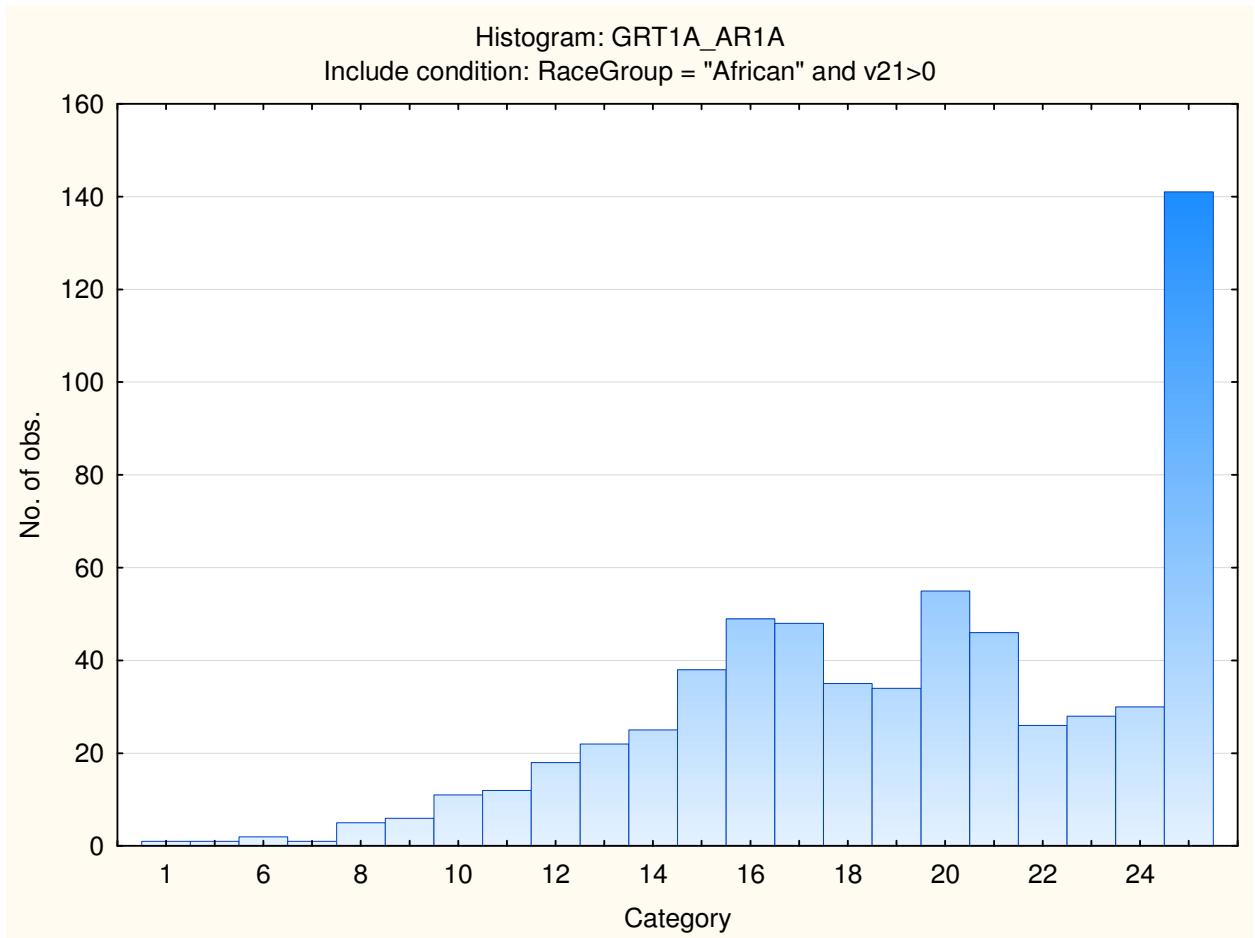
Frequency distribution: Graduate Numerical Reasoning items attempted.



Frequency distribution: Graduate Abstract Reasoning test



Frequency distribution: Graduate Abstract Reasoning items attempted



Stanine table

	S9_1	S9_2	S9_3	S9_4	S9_5	S9_6	S9_7	S9_8	S9_9
Graduate Verbal Reasoning	0-0	1-2	3-3	4-5	6-7	8-9	10-11	12-13	14-21
Graduate Verbal Items Attempted	6-8	9-11	12-14	15-18	19-21	22-24	25-27	28-30	
Graduate Numerical Reasoning	0--1	0-1	2-3	4-5	6-7	8-8	9-10	11-12	13-20
Graduate Numerical Items Attempted	1-5	6-8	9-11	12-14	15-16	17-19	20-22	23-25	
Graduate Abstract Reasoning	0-2	3-4	5-5	6-7	8-9	10-10	11-12	13-14	15-20
Graduate Abstract Items Attempted	1-10	11-13	14-15	16-18	19-20	21-22	23-25		

Graduate Reasoning Test Battery norm table: South Africans of Coloured race, updated 2010

Sample composition

The sample consisted of South Africans who declared their race to be Coloured, tested by Psytech South Africa and collaborators in the period leading up to January 2010. Because not all respondents completed all the subtests of the Graduate Reasoning Test Battery, the biographical particulars are reported separately for the Graduate Verbal, Numerical and Abstract Reasoning tests.

Sample composition: Graduate Verbal Reasoning Test

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	131	131	38.19242	38.1924
M	211	342	61.51603	99.7085
U	1	343	0.29155	100.0000
Missing	0	343	0.00000	100.0000

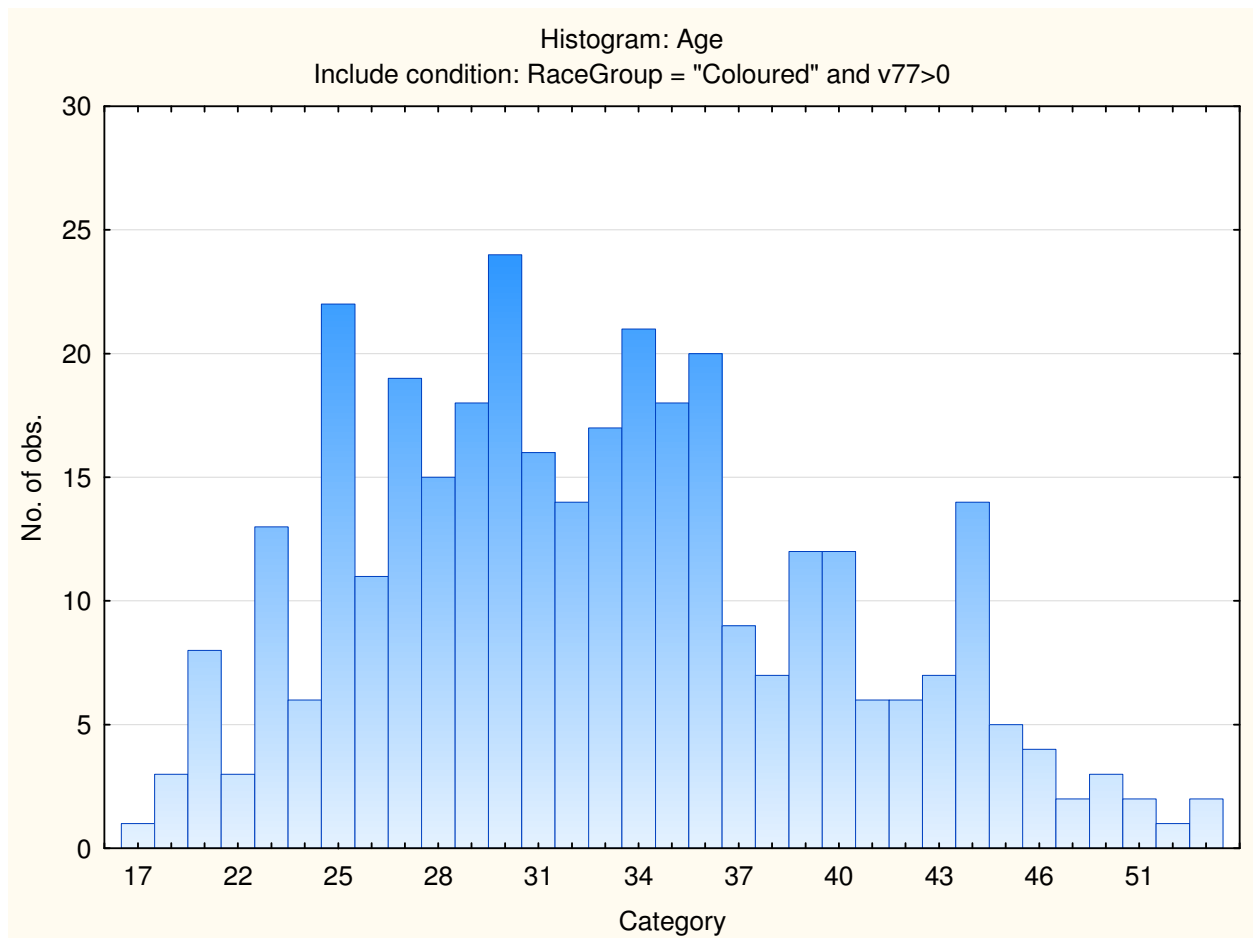
Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	50	50	14.57726	14.5773
Grade 12	145	195	42.27405	56.8513
Diploma	42	237	12.24490	69.0962
<Grade 12	35	272	10.20408	79.3003
Post Graduate	27	299	7.87172	87.1720
Certificate	11	310	3.20700	90.3790
Missing	33	343	9.62099	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	234	234	68.22157	68.2216
Afrikaans	80	314	23.32362	91.5452
isiXhosa	2	316	0.58309	92.1283
isiZulu	1	317	0.29155	92.4198
Missing	26	343	7.58017	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	234	234	68.22157	68.2216
Afrikaans	80	314	23.32362	91.5452
Indigenous	3	317	0.87464	92.4198
Missing	26	343	7.58017	100.0000

Category	Frequency table: Race Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	343	343	100.0000	100.0000
Missing	0	343	0.0000	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	32.86804	7.064631	17.00000	54.00000	341	2



Sample composition: Graduate Numerical Reasoning Test

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	131	131	38.30409	38.3041
M	210	341	61.40351	99.7076
U	1	342	0.29240	100.0000
Missing	0	342	0.00000	100.0000

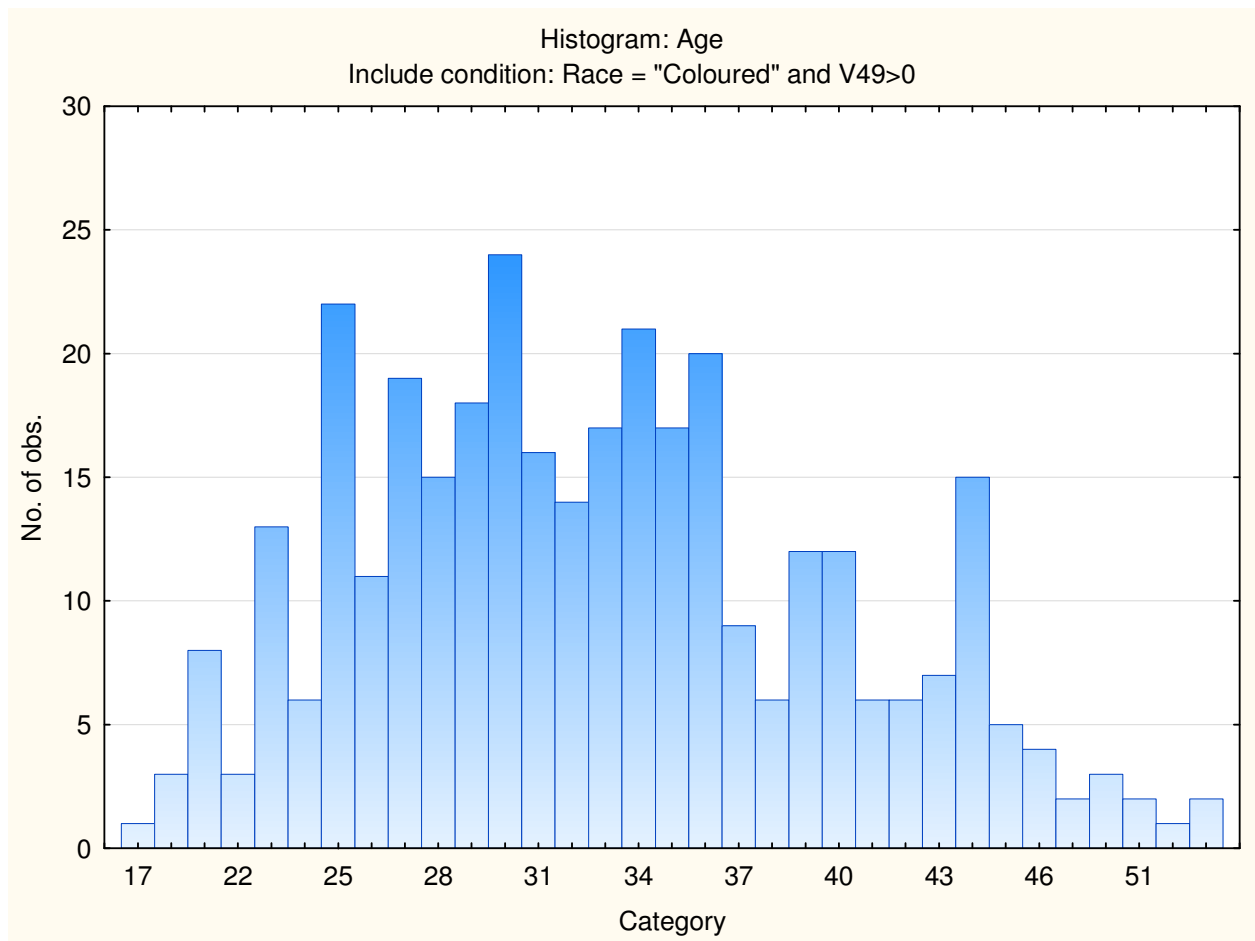
Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	49	49	14.32749	14.3275

Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Grade 12	145	194	42.39766	56.7251
Diploma	41	235	11.98830	68.7135
<Grade 12	36	271	10.52632	79.2398
Post Graduate	27	298	7.89474	87.1345
Certificate	11	309	3.21637	90.3509
Missing	33	342	9.64912	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	234	234	68.42105	68.4211
Afrikaans	79	313	23.09942	91.5205
isiXhosa	2	315	0.58480	92.1053
isiZulu	1	316	0.29240	92.3977
Missing	26	342	7.60234	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	234	234	68.42105	68.4211
Afrikaans	79	313	23.09942	91.5205
Indigenous	3	316	0.87719	92.3977
Missing	26	342	7.60234	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	32.87941	7.094403	17.00000	54.00000	340	2



Sample composition: Graduate Abstract Reasoning Test

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	140	140	38.46154	38.4615
M	223	363	61.26374	99.7253
U	1	364	0.27473	100.0000
Missing	0	364	0.00000	100.0000

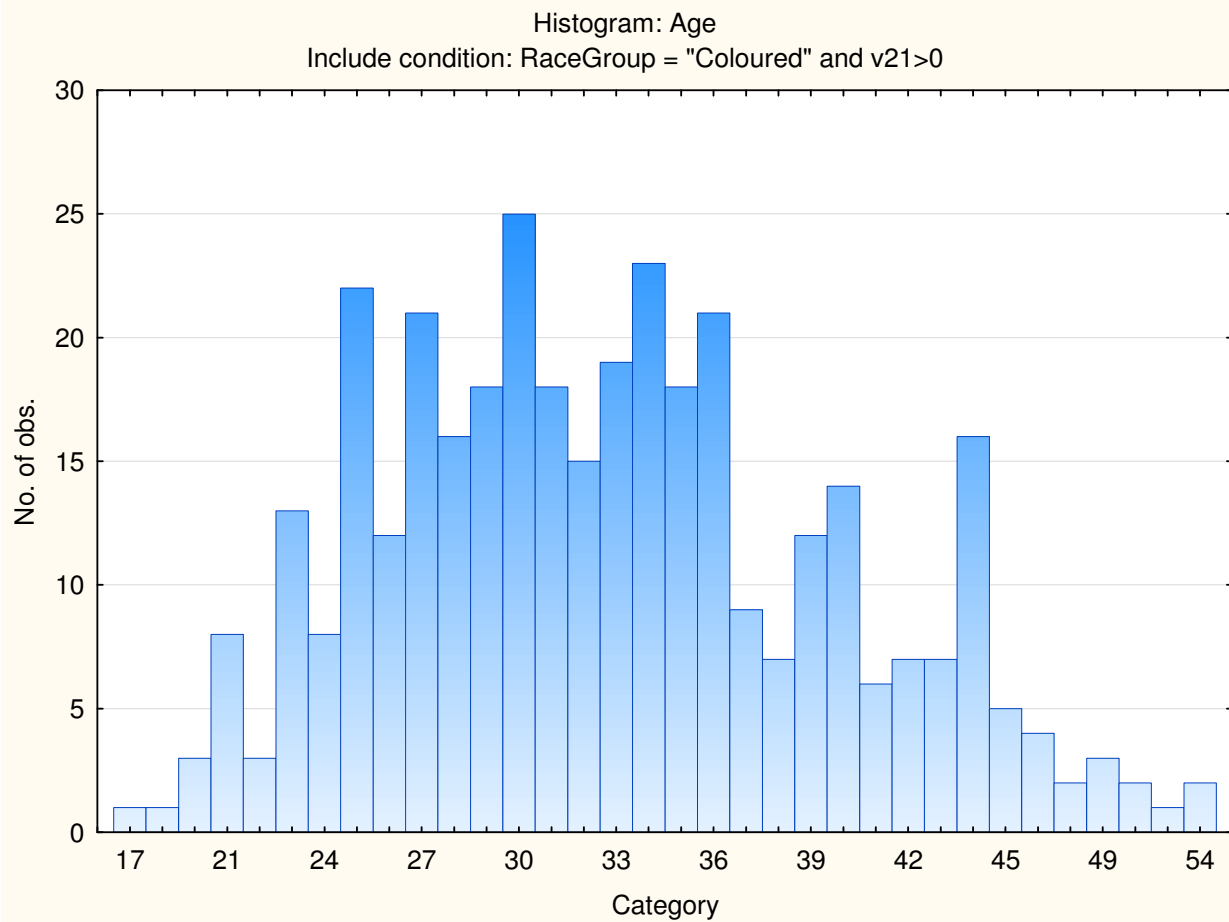
Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	55	55	15.10989	15.1099
Grade 12	151	206	41.48352	56.5934
Diploma	45	251	12.36264	68.9560

Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
<Grade 12	36	287	9.89011	78.8462
Post Graduate	29	316	7.96703	86.8132
Certificate	11	327	3.02198	89.8352
Missing	37	364	10.16484	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	241	241	66.20879	66.2088
Afrikaans	94	335	25.82418	92.0330
Indigenous	3	338	0.82418	92.8571
Missing	26	364	7.14286	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	241	241	66.20879	66.2088
Afrikaans	94	335	25.82418	92.0330
isiXhosa	2	337	0.54945	92.5824
isiZulu	1	338	0.27473	92.8571
Missing	26	364	7.14286	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	32.83702	7.045437	17.00000	54.00000	362	2

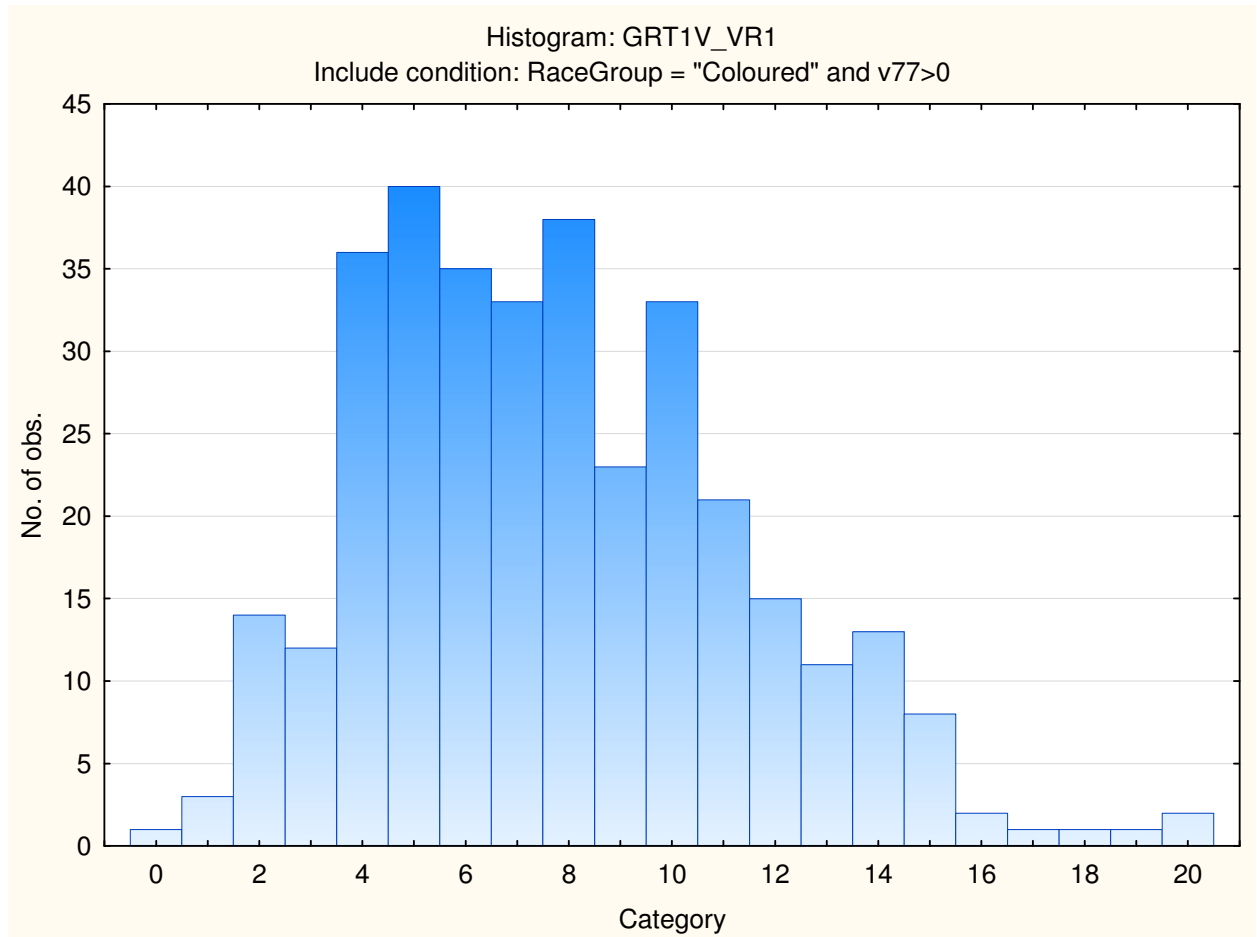


Descriptive statistics for Graduate Reasoning Test Battery subtests

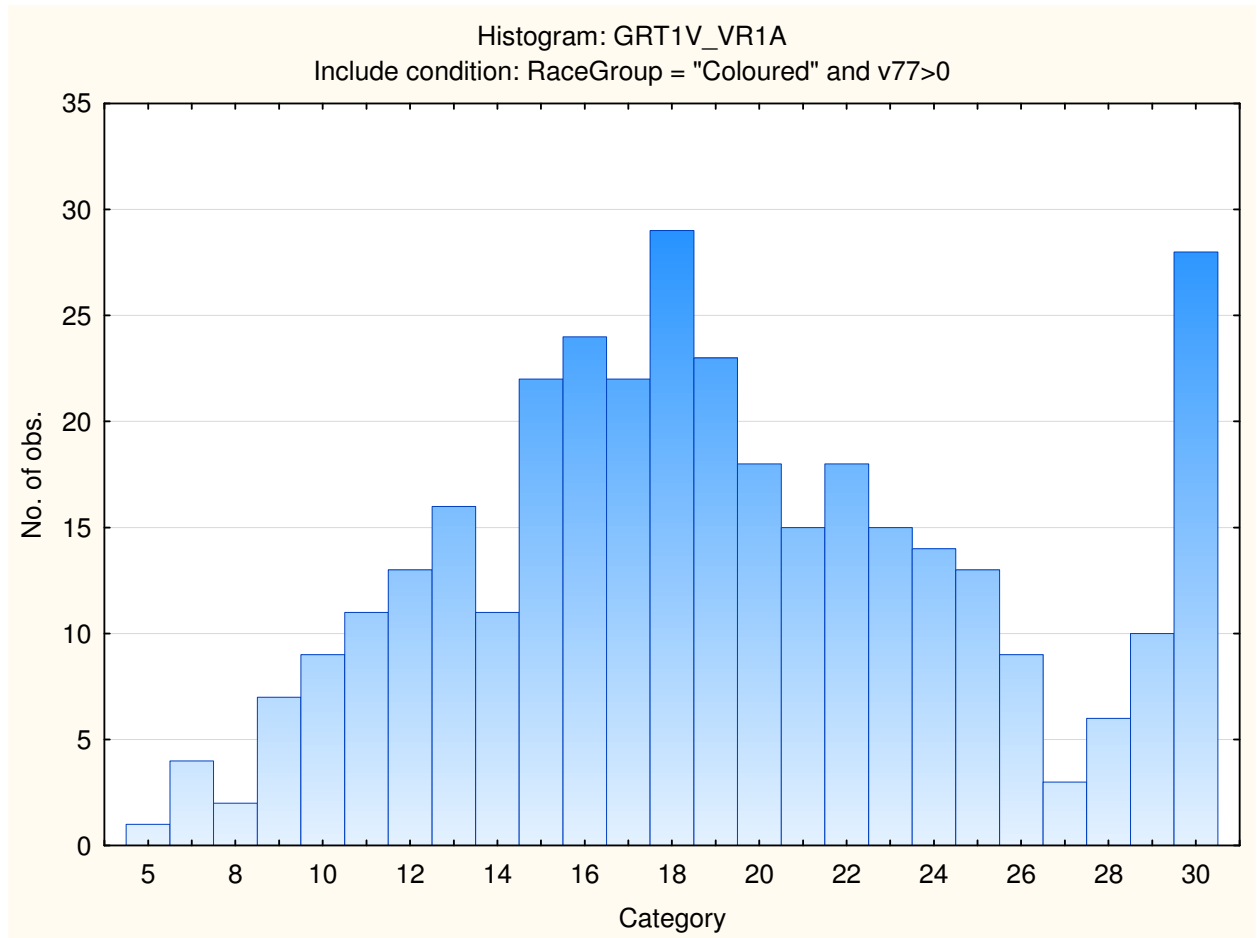
Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Graduate Verbal Reasoning	7.79883	3.646323	0.000000	20.00000	343	0
Graduate Verbal Reasoning items attempted	19.17784	5.951596	5.000000	30.00000	343	0
Graduate Numerical Reasoning	7.91520	4.225513	1.000000	23.00000	342	0
Graduate Numerical Reasoning items attempted	16.16082	5.199863	4.000000	25.00000	342	0
Graduate Abstract Reasoning	9.79396	3.764246	1.000000	19.00000	364	0
Graduate Abstract Reasoning Items Attempted	19.18132	4.585290	5.000000	25.00000	364	0

Frequency distributions on Graduate Reasoning Test subtests

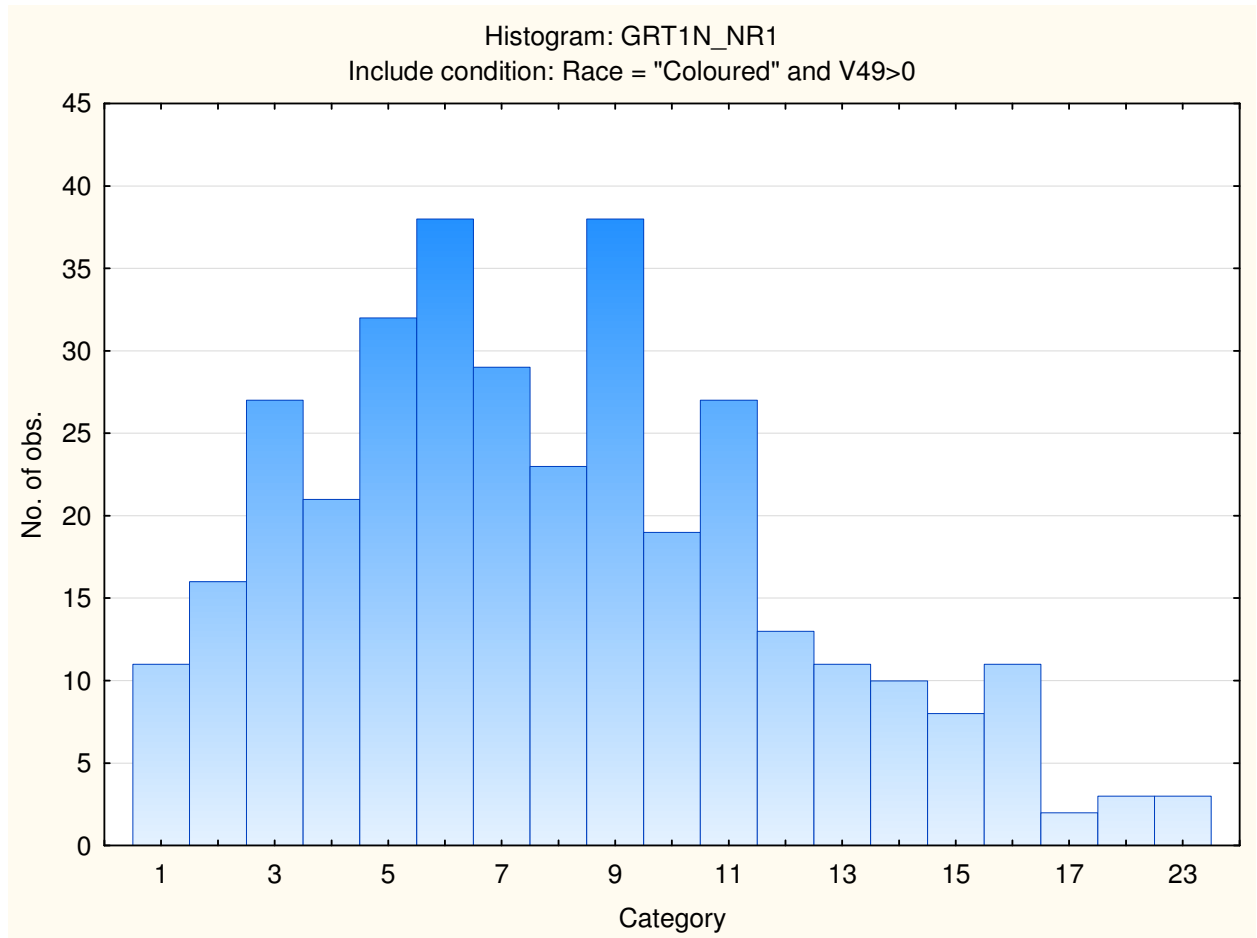
Graduate Verbal Reasoning



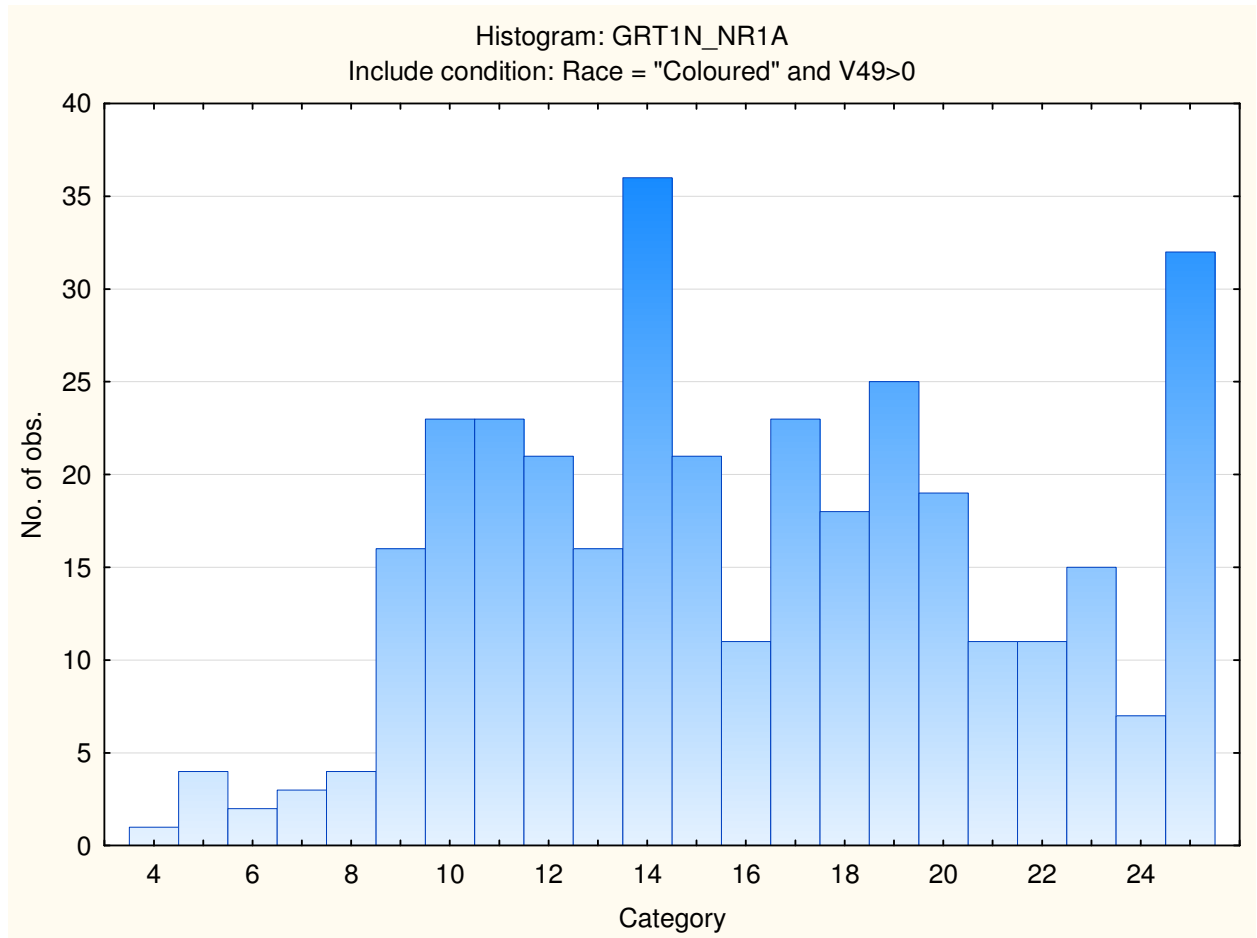
Graduate Verbal Reasoning items attempted



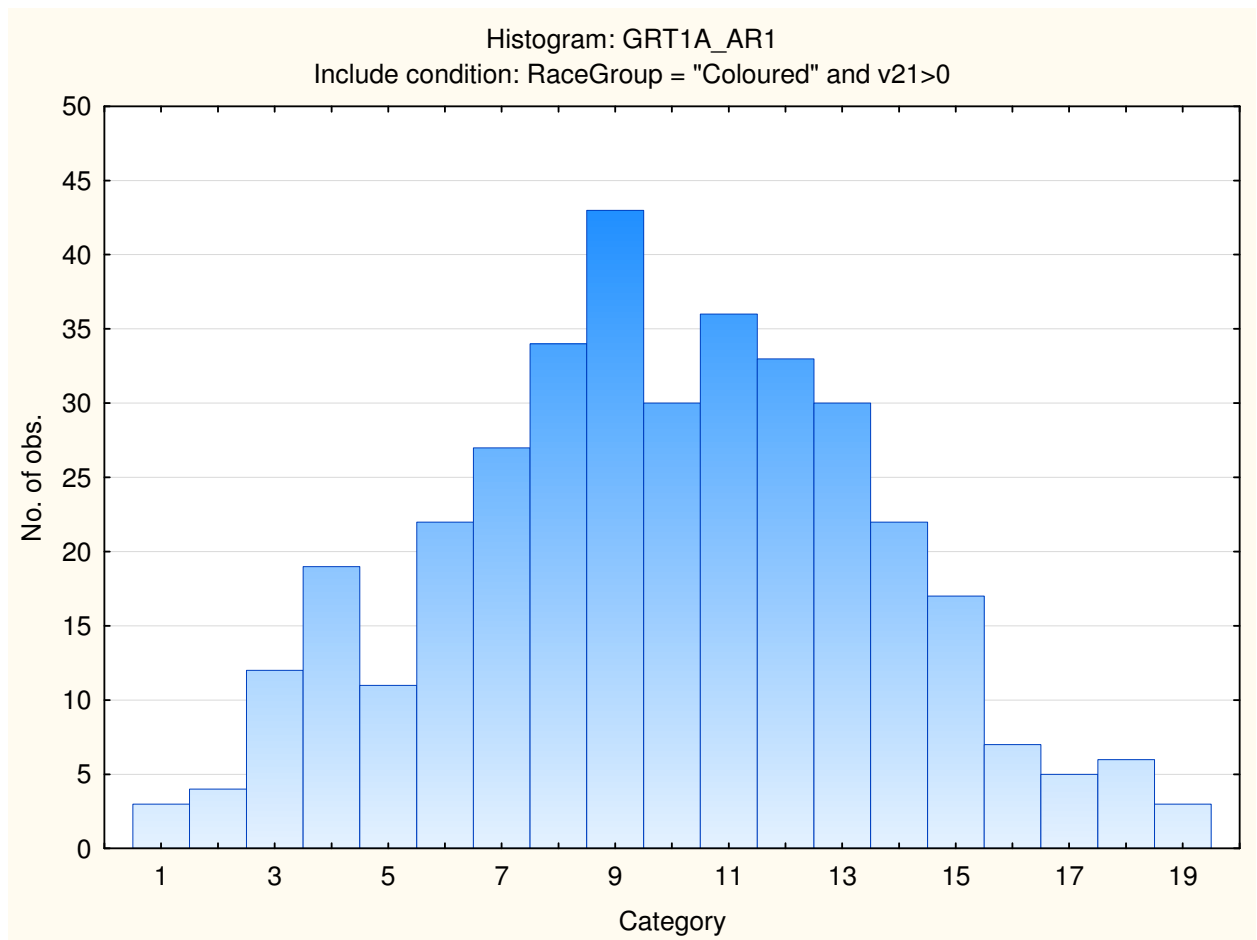
Graduate Numerical Reasoning



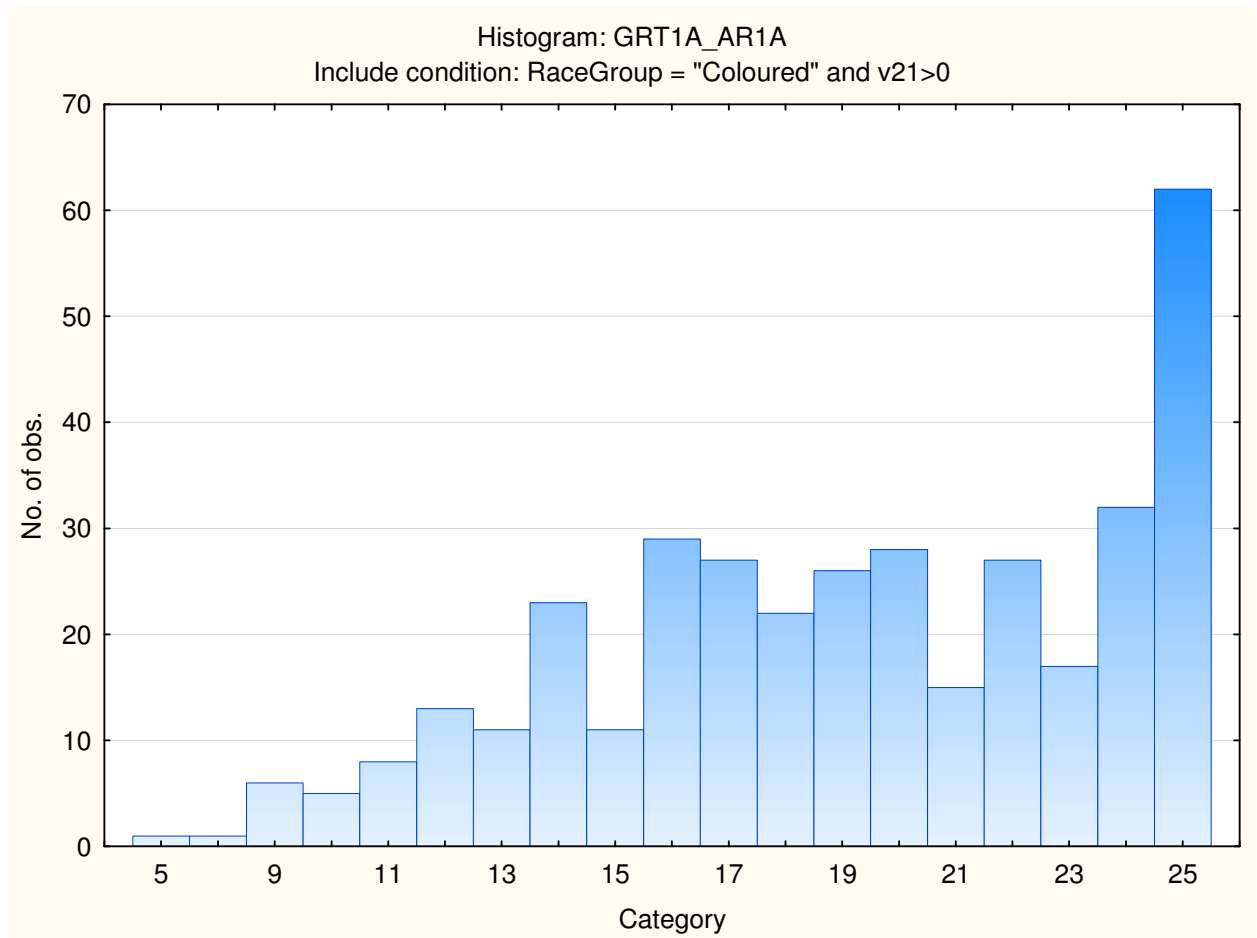
Graduate Numerical Reasoning Items Attempted



Graduate Abstract Reasoning



Graduate Abstract Reasoning items attempted



Stanine table

	S9_1	S9_2	S9_3	S9_4	S9_5	S9_6	S9_7	S9_8	S9_9
Graduate Verbal Reasoning	0-1	2-3	4-5	6-6	7-8	9-10	11-12	13-14	15-20
Graduate Verbal Items Attempted	5-8	9-11	12-14	15-17	18-20	21-23	24-26	27-29	30-30
Graduate Numerical Reasoning	1-0	1-2	3-4	5-6	7-8	9-11	12-13	14-15	16-23
Graduate Numerical Items Attempted	4-7	8-9	10-12	13-14	15-17	18-20	21-22	23-25	
Graduate Abstract Reasoning	1-3	4-5	6-6	7-8	9-10	11-12	13-14	15-16	17-19
Graduate Abstract Items Attempted	5-11	12-13	14-15	16-18	19-20	21-22	23-24	25-25	

Graduate Reasoning Test Battery norm group: South Africans of European race, updated 2010

Sample composition

The sample consisted of South Africans who declared their race to be European, tested by Psytech SA and collaborators in the period leading up to January 2010. Not all respondents completed the entire Graduate Reasoning Test Battery, therefore the biographical particulars are reported separately for the Graduate Verbal, Numerical and Abstract Reasoning Tests.

Sample composition: Graduate Verbal Reasoning Test

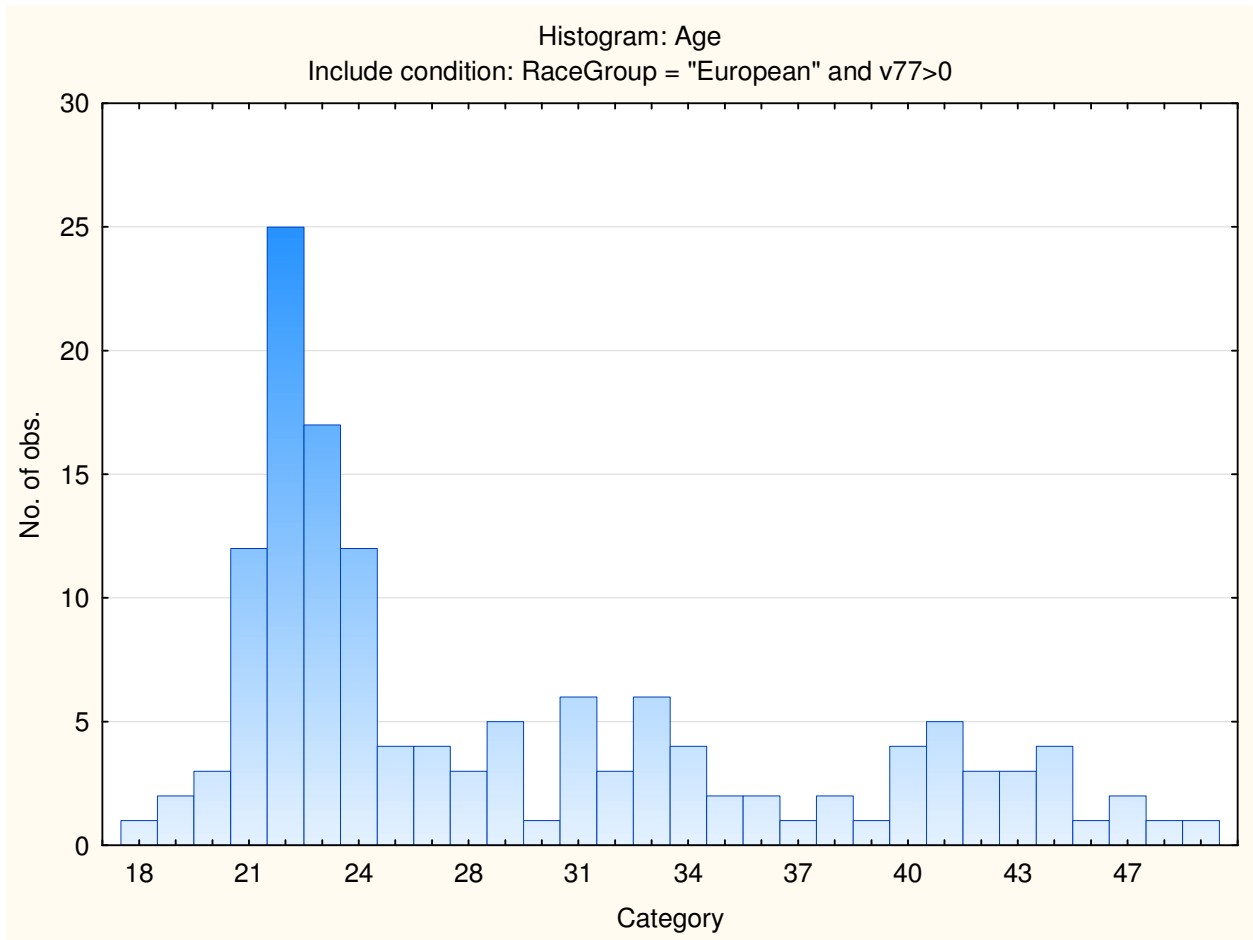
Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	53	53	36.05442	36.0544
M	94	147	63.94558	100.0000
Missing	0	147	0.00000	100.0000

Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	40	40	27.21088	27.2109
Grade 12	21	61	14.28571	41.4966
Diploma	9	70	6.12245	47.6190
Post Graduate	43	113	29.25170	76.8707
Certificate	4	117	2.72109	79.5918
Missing	30	147	20.40816	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	74	74	50.34014	50.3401
Afrikaans	61	135	41.49660	91.8367
Sepedi	1	136	0.68027	92.5170
Missing	11	147	7.48299	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	74	74	50.34014	50.3401
Afrikaans	61	135	41.49660	91.8367
Indigenous	1	136	0.68027	92.5170
Missing	11	147	7.48299	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	28.64286	8.184097	18.00000	52.00000	140	7



Sample composition: Graduate Numerical Reasoning Test

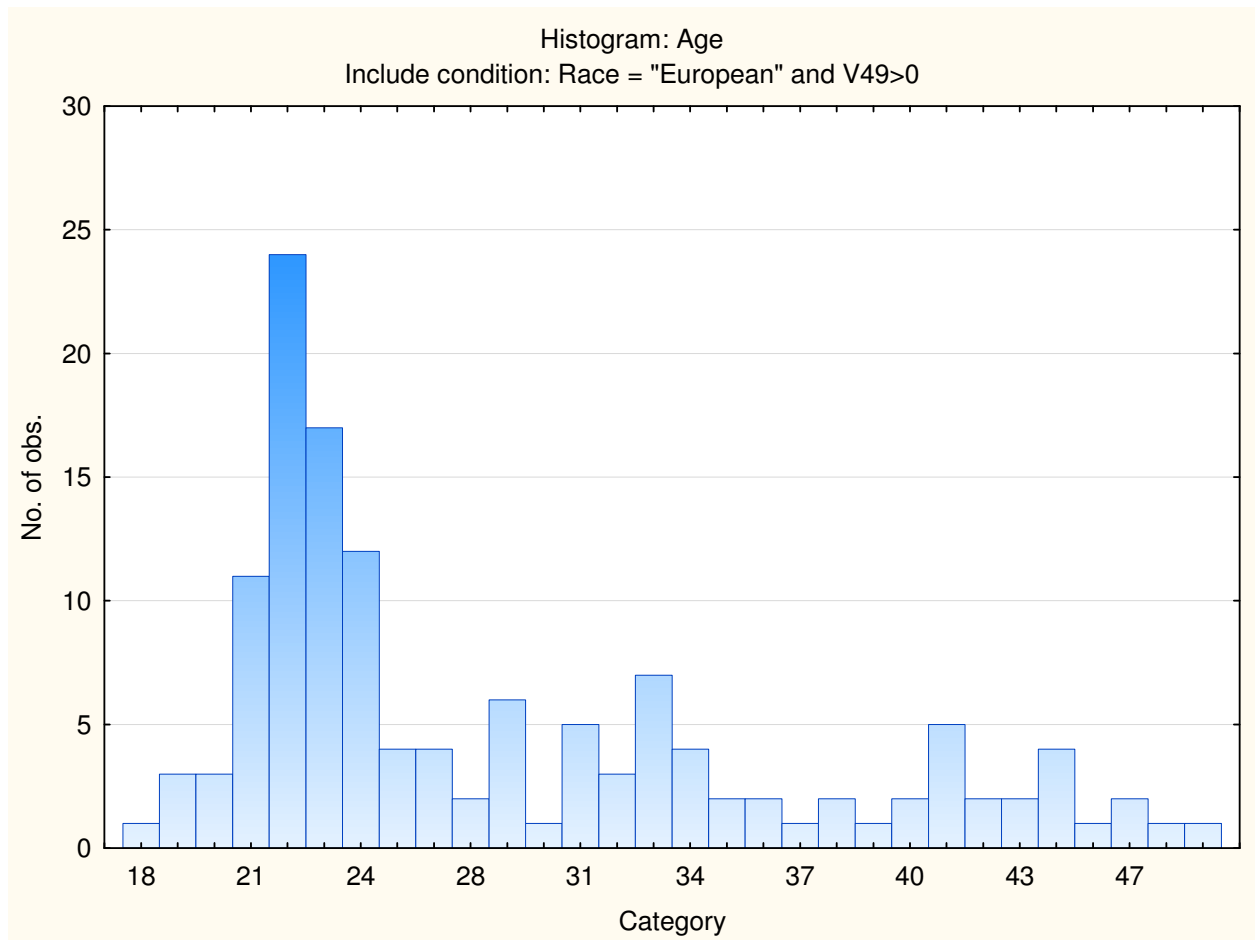
Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	49	49	34.50704	34.5070
M	93	142	65.49296	100.0000
Missing	0	142	0.00000	100.0000

Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	34	34	23.94366	23.9437
Grade 12	21	55	14.78873	38.7324
Diploma	9	64	6.33803	45.0704
Post Graduate	41	105	28.87324	73.9437
Certificate	4	109	2.81690	76.7606
Missing	33	142	23.23944	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	72	72	50.70423	50.7042
Afrikaans	59	131	41.54930	92.2535
Sepedi	1	132	0.70423	92.9577
Missing	10	142	7.04225	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	72	72	50.70423	50.7042
Afrikaans	59	131	41.54930	92.2535
Indigenous	1	132	0.70423	92.9577
Missing	10	142	7.04225	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	28.32593	8.037997	18.00000	52.00000	135	7



Sample composition: Graduate Abstract Reasoning Test

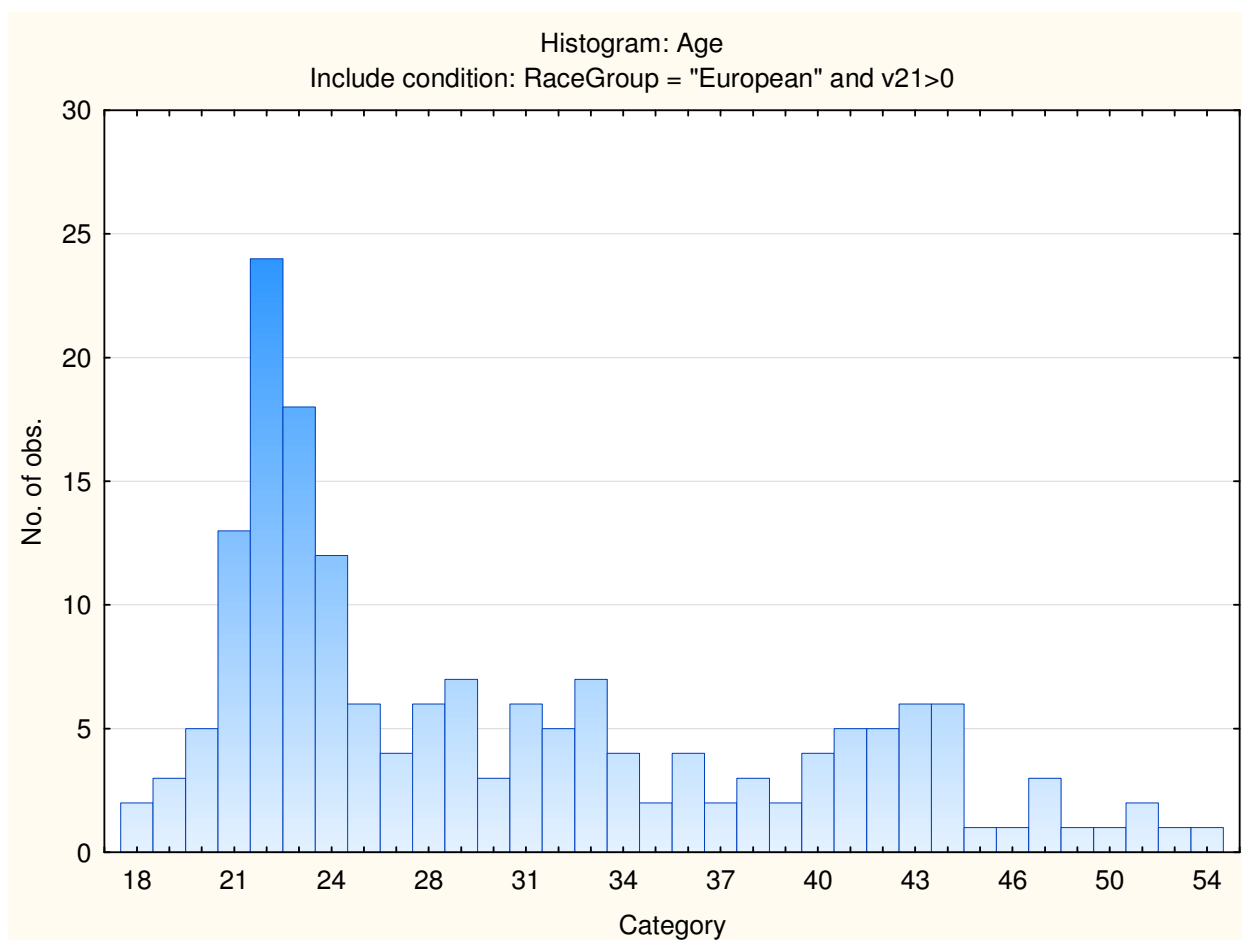
Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	69	69	37.70492	37.7049
M	114	183	62.29508	100.0000
Missing	0	183	0.00000	100.0000

Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	48	48	26.22951	26.2295
Grade 12	30	78	16.39344	42.6230
Diploma	17	95	9.28962	51.9126
Post Graduate	43	138	23.49727	75.4098
Certificate	4	142	2.18579	77.5956
Missing	41	183	22.40437	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	80	80	43.71585	43.7158
Afrikaans	88	168	48.08743	91.8033
Sepedi	1	169	0.54645	92.3497
Missing	14	183	7.65027	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	80	80	43.71585	43.7158
Afrikaans	88	168	48.08743	91.8033
Indigenous	1	169	0.54645	92.3497
Missing	14	183	7.65027	100.0000

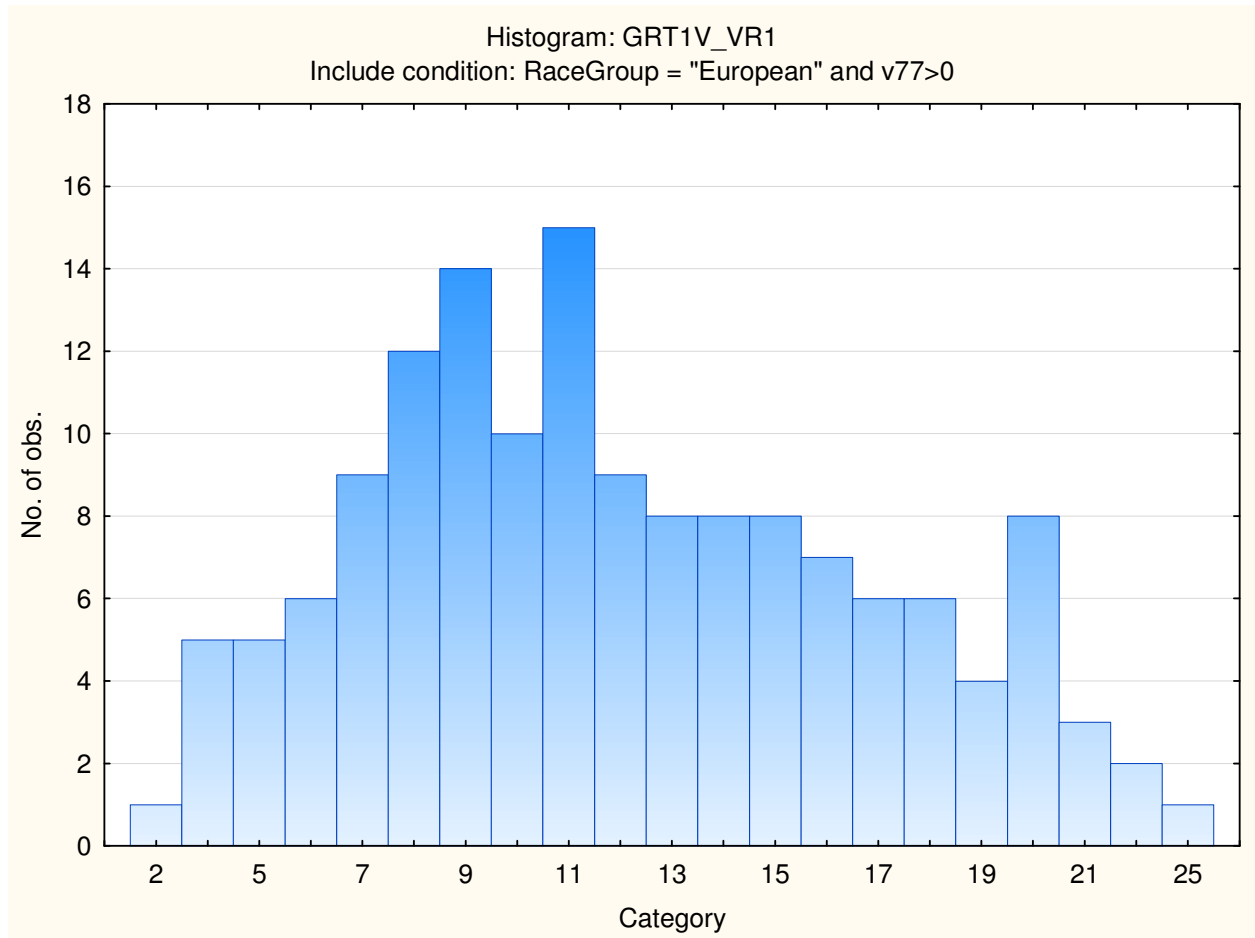
Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	29.96571	8.981397	18.00000	54.00000	175	8



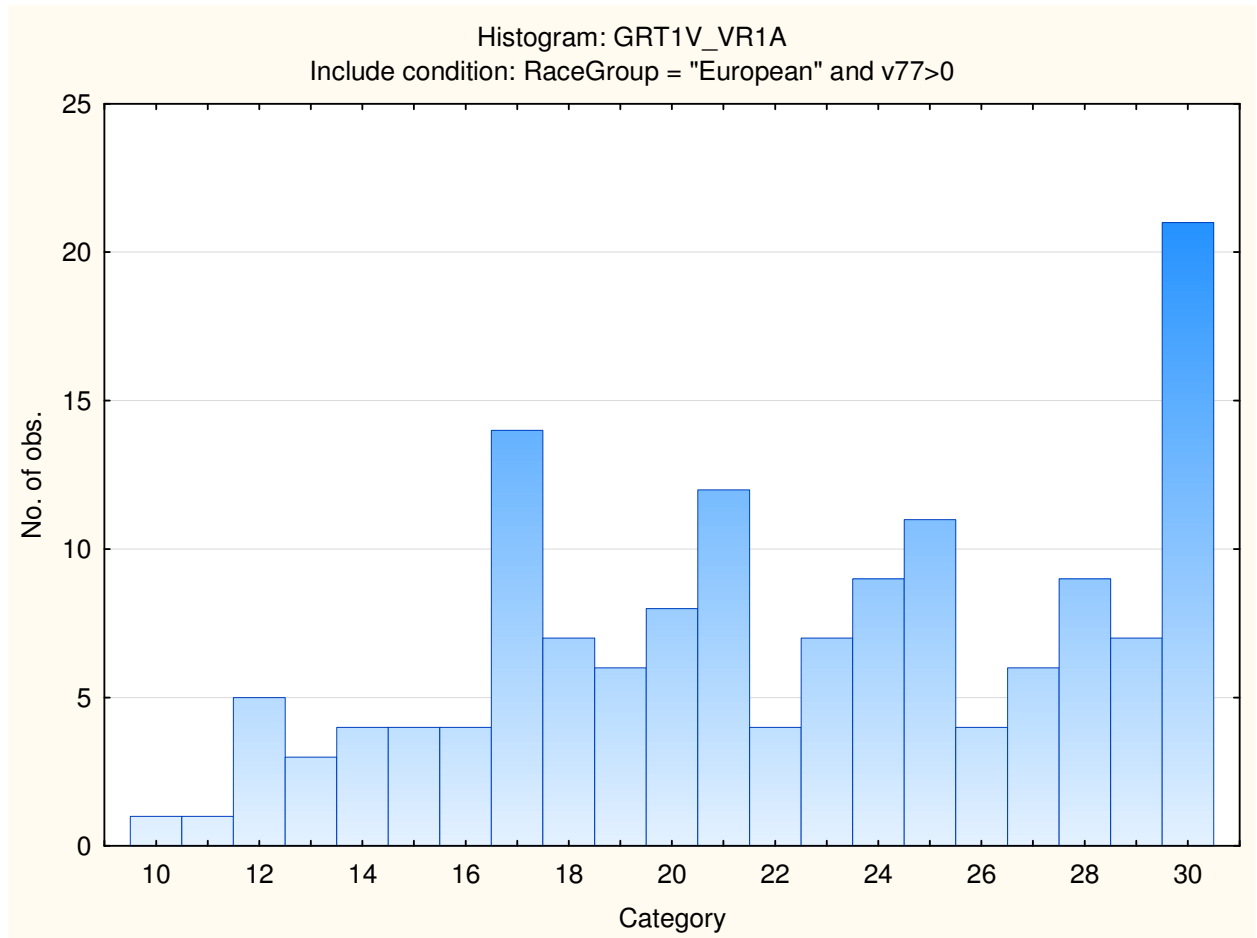
Descriptive statistics on Graduate Reasoning Test Battery subtests.

Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Graduate Verbal Reasoning	12.02041	4.817874	2.00000	25.00000	147	0
Graduate Verbal Reasoning items attempted	22.31973	5.561593	10.00000	30.00000	147	0
Graduate Numerical Reasoning	12.85915	5.410250	0.00000	25.00000	142	0
Graduate Numerical Reasoning Items Attempted	18.11972	4.526490	8.00000	25.00000	142	0
Graduate Abstract Reasoning	13.03825	4.037416	3.00000	25.00000	183	0
Graduate Abstract Reasoning items attempted	20.21311	4.221015	9.00000	25.00000	183	0

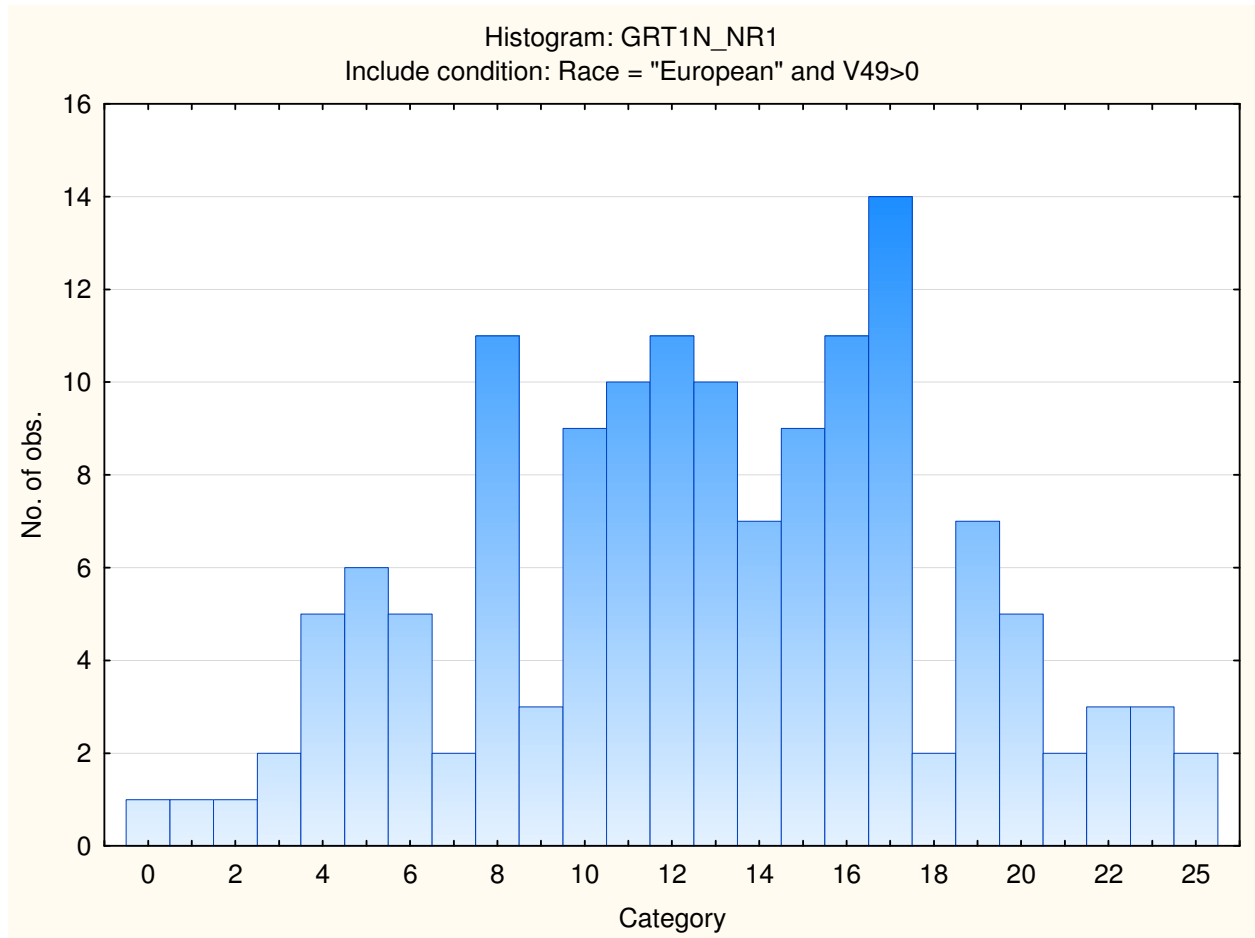
Frequency distribution: Graduate Verbal Reasoning Test



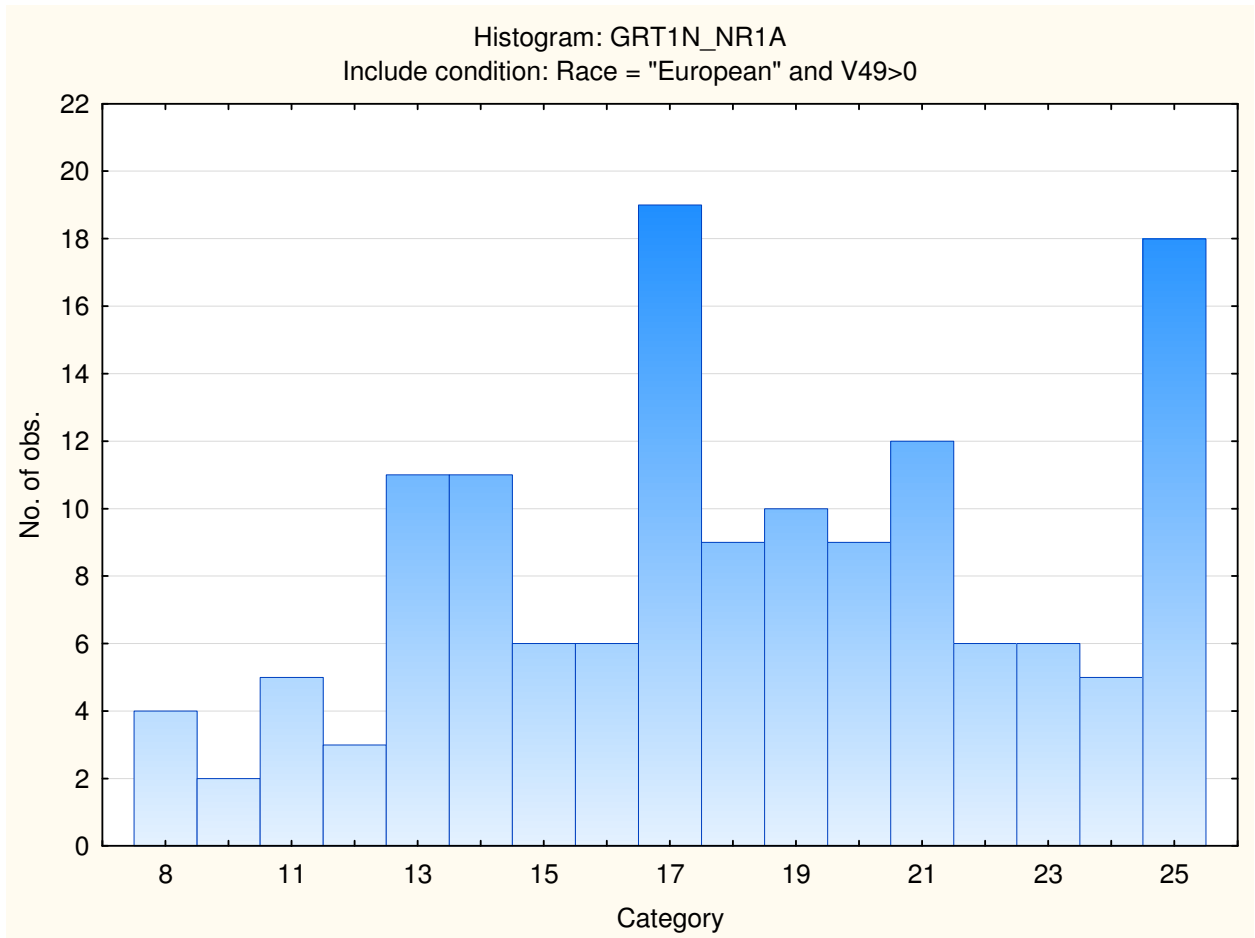
Frequency distribution: Graduate Verbal Reasoning Items Attempted



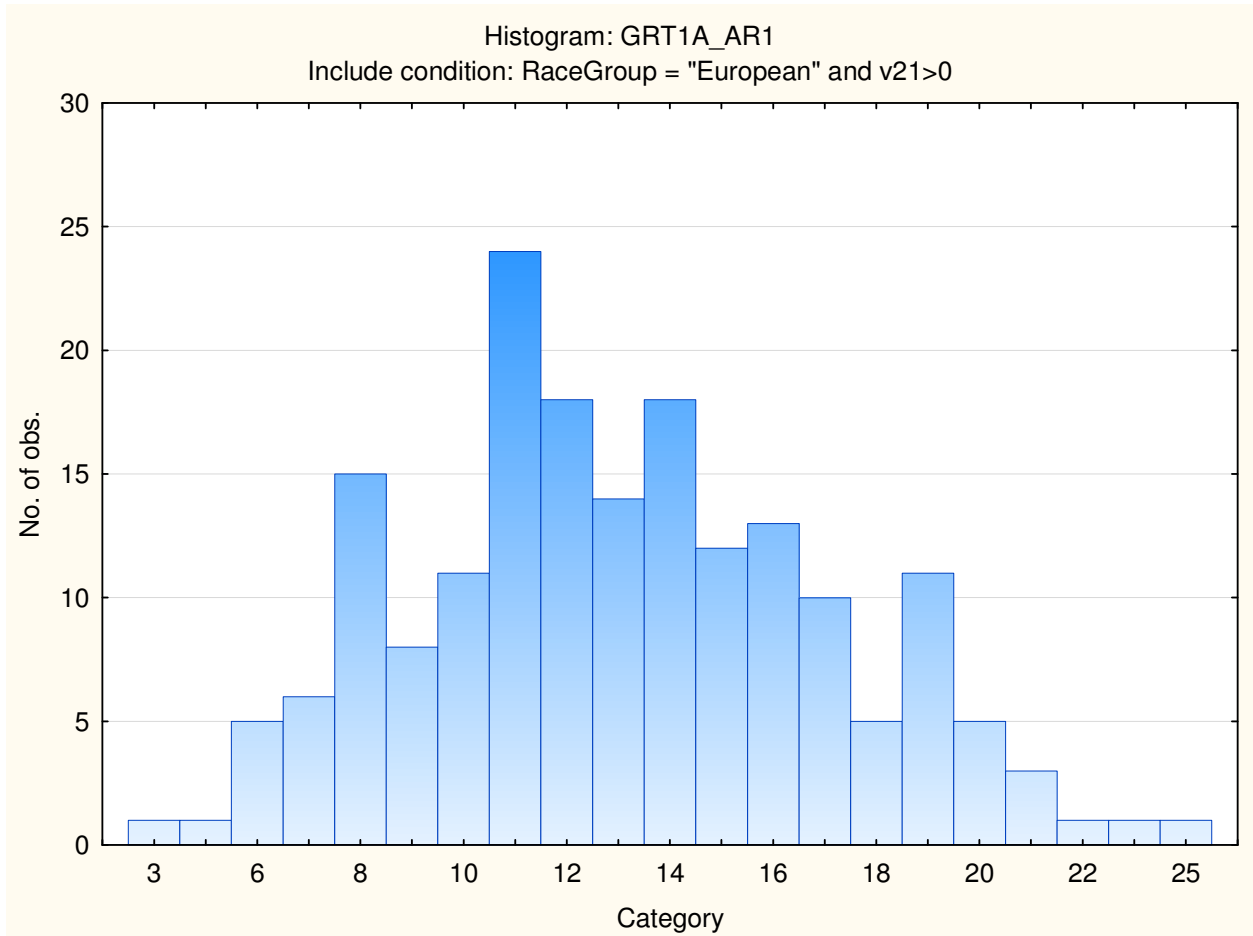
Frequency distribution: Graduate Numerical Reasoning Test



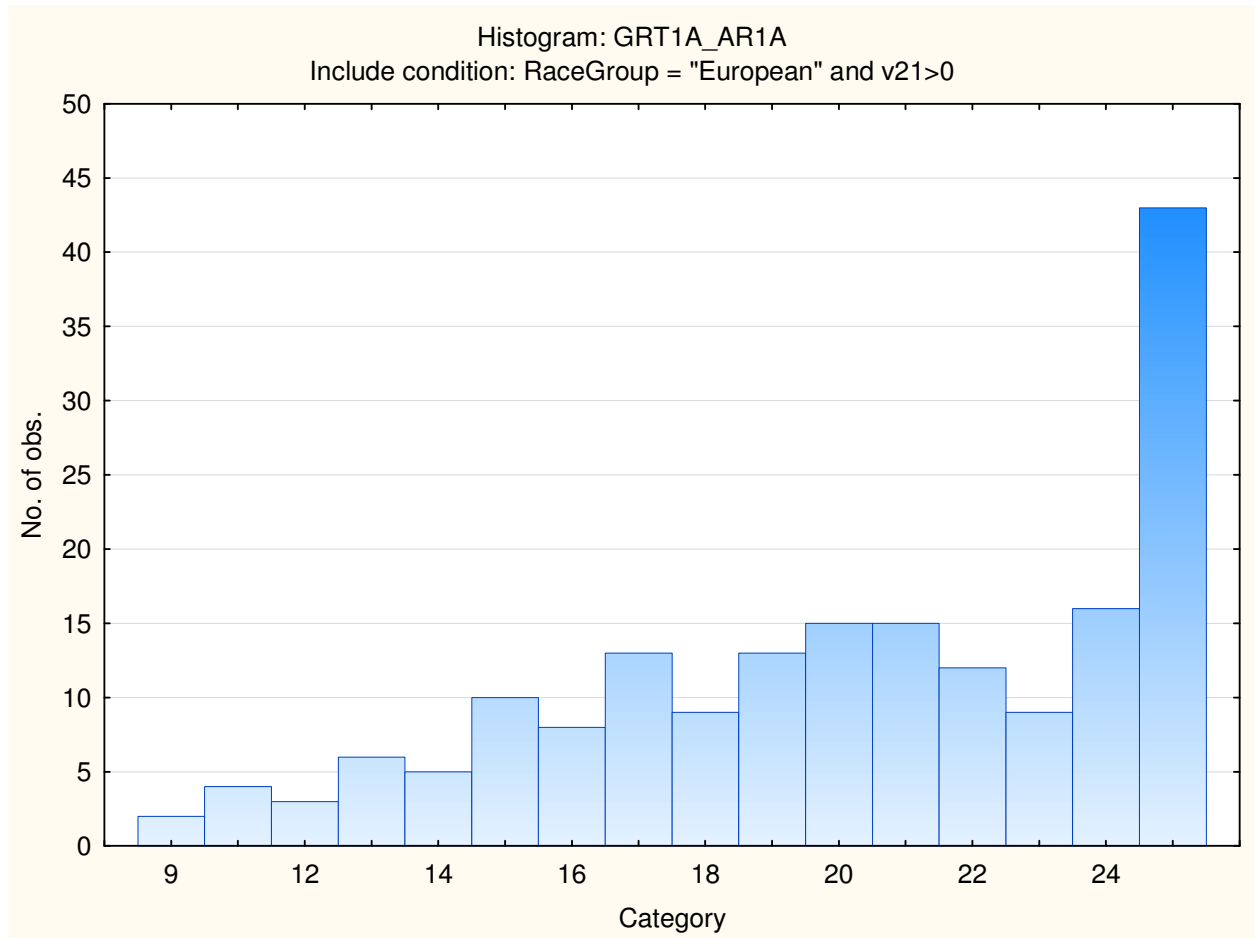
Frequency distribution: Graduate Numerical Reasoning items attempted



Frequency distribution: Graduate Abstract Reasoning Test



Frequency Distribution: Graduate Abstract Reasoning items attempted



Stanine table

	S9_1	S9_2	S9_3	S9_4	S9_5	S9_6	S9_7	S9_8	S9_9
Graduate Verbal Reasoning	2-3	4-5	6-8	9-10	11-13	14-15	16-18	19-20	21-25
Graduate Verbal Items Attempted	10-12	13-15	16-18	19-20	21-23	24-26	27-29	30-30	
Graduate Numerical Reasoning	0-3	4-6	7-8	9-11	12-14	15-16	17-19	20-22	23-25
Graduate Numerical Items Attempted	8-10	11-12	13-14	15-16	17-19	20-21	22-23	24-25	
Graduate Abstract Reasoning	3-5	6-7	8-10	11-12	13-14	15-16	17-18	19-20	21-25
Graduate Abstract Items Attempted	9-12	13-14	15-17	18-19	20-21	22-23	24-25		

Graduate Reasoning Test Battery norm group: South Africans of Asian race, updated 2010

Sample composition

The sample consisted of South Africans who described their race as Asian, tested by Psytech South Africa and collaborators during the period leading up to January 2010. Not all respondents completed the entire Graduate Reasoning Test battery, therefore the biographical particulars are reported separately for the Graduate Verbal, Numerical and Abstract reasoning tests.

Sample composition: Graduate Verbal Reasoning Test

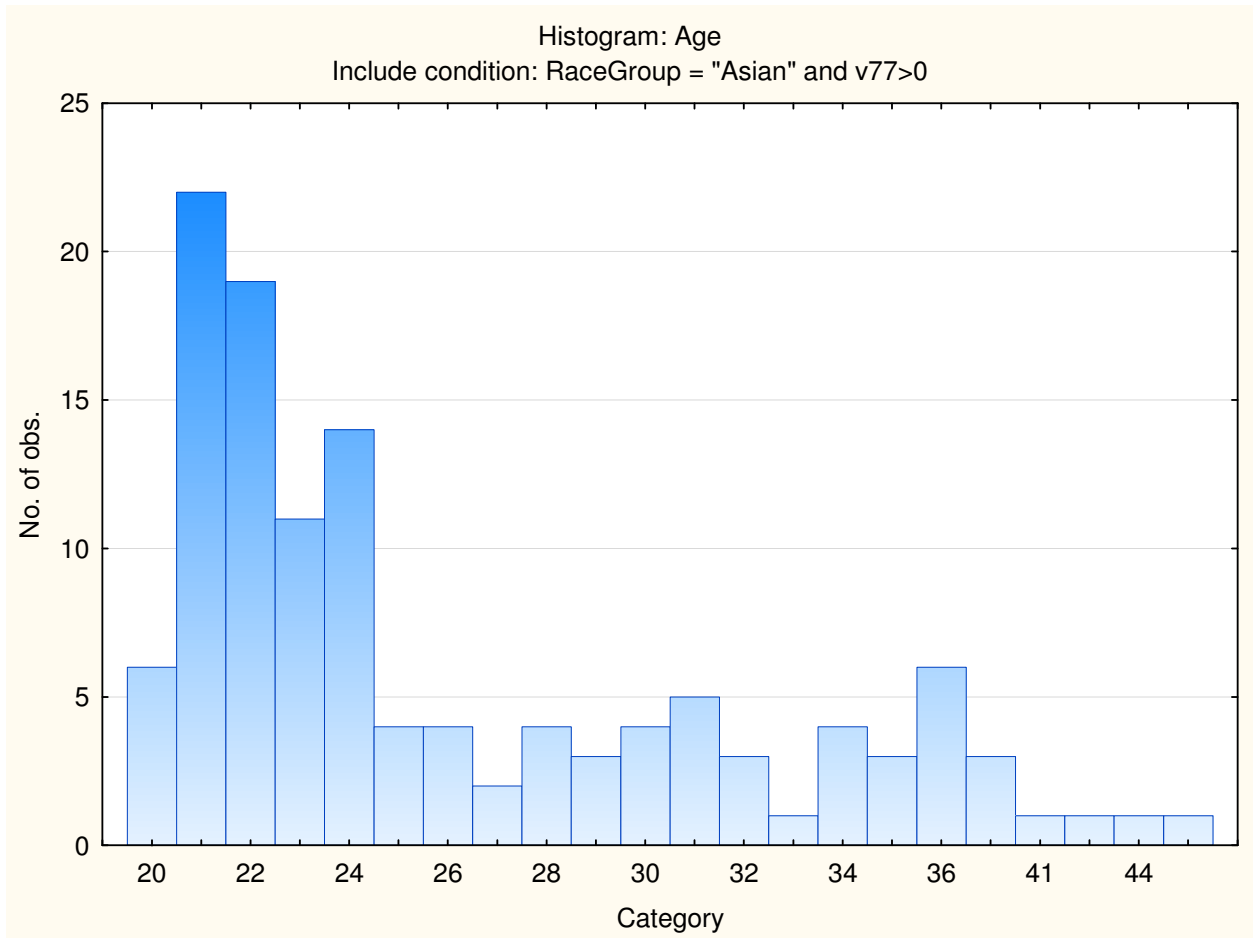
Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	54	54	42.85714	42.8571
M	72	126	57.14286	100.0000
Missing	0	126	0.00000	100.0000

Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	46	46	36.50794	36.5079
Grade 12	15	61	11.90476	48.4127
Diploma	10	71	7.93651	56.3492
<Grade 12	2	73	1.58730	57.9365
Post Graduate	28	101	22.22222	80.1587
Certificate	5	106	3.96825	84.1270
Missing	20	126	15.87302	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	78	78	61.90476	61.9048
Afrikaans	1	79	0.79365	62.6984
Missing	47	126	37.30159	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	78	78	61.90476	61.9048
Afrikaans	1	79	0.79365	62.6984
Missing	47	126	37.30159	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	26.15574	5.946067	20.00000	45.00000	122	4



Sample composition: Graduate Numerical Reasoning Test

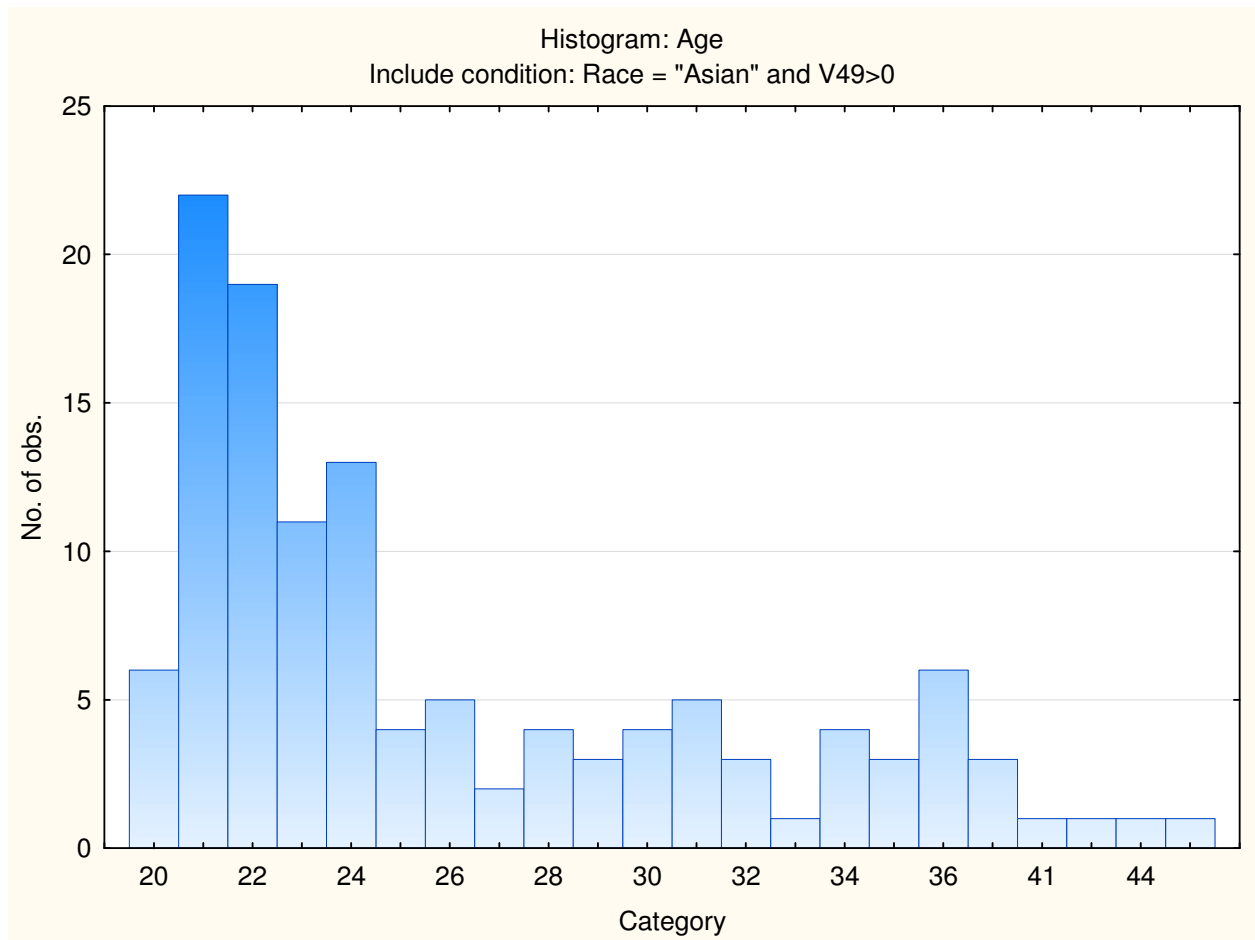
Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	54	54	42.85714	42.8571
M	72	126	57.14286	100.0000
Missing	0	126	0.00000	100.0000

Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	46	46	36.50794	36.5079
Grade 12	15	61	11.90476	48.4127
Diploma	10	71	7.93651	56.3492
<Grade 12	2	73	1.58730	57.9365
Post Graduate	27	100	21.42857	79.3651
Certificate	5	105	3.96825	83.3333
Missing	21	126	16.66667	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	78	78	61.90476	61.9048
Afrikaans	1	79	0.79365	62.6984
Missing	47	126	37.30159	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	78	78	61.90476	61.9048
Afrikaans	1	79	0.79365	62.6984
Missing	47	126	37.30159	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	26.17213	5.942830	20.00000	45.00000	122	4



Sample composition: Graduate Abstract Reasoning Test

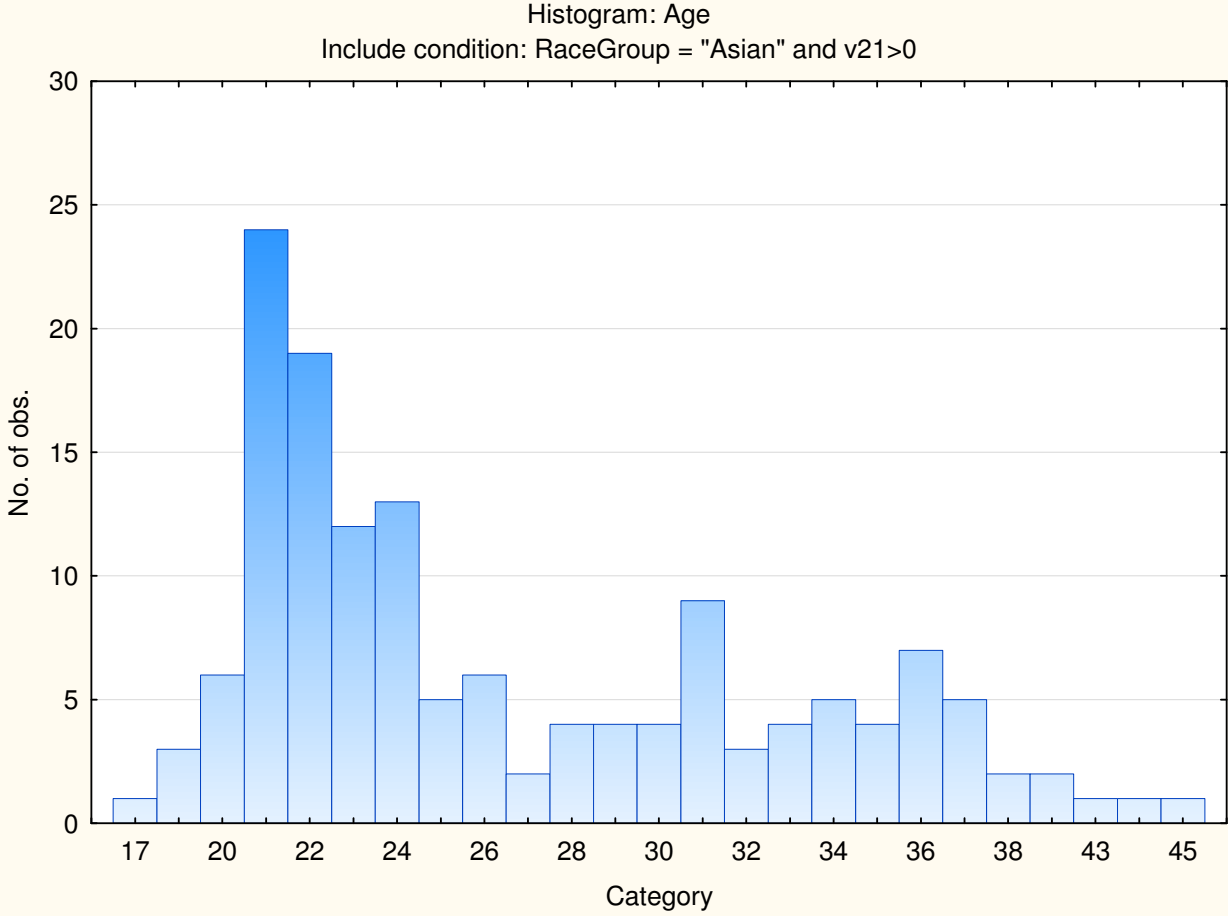
Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	60	60	39.47368	39.4737
M	92	152	60.52632	100.0000
Missing	0	152	0.00000	100.0000

Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	53	53	34.86842	34.8684
Grade 12	17	70	11.18421	46.0526
Diploma	16	86	10.52632	56.5789
<Grade 12	3	89	1.97368	58.5526
Post Graduate	28	117	18.42105	76.9737
Certificate	6	123	3.94737	80.9211
Missing	29	152	19.07895	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	102	102	67.10526	67.1053
Afrikaans	1	103	0.65789	67.7632
Missing	49	152	32.23684	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	102	102	67.10526	67.1053
Afrikaans	1	103	0.65789	67.7632
Missing	49	152	32.23684	100.0000

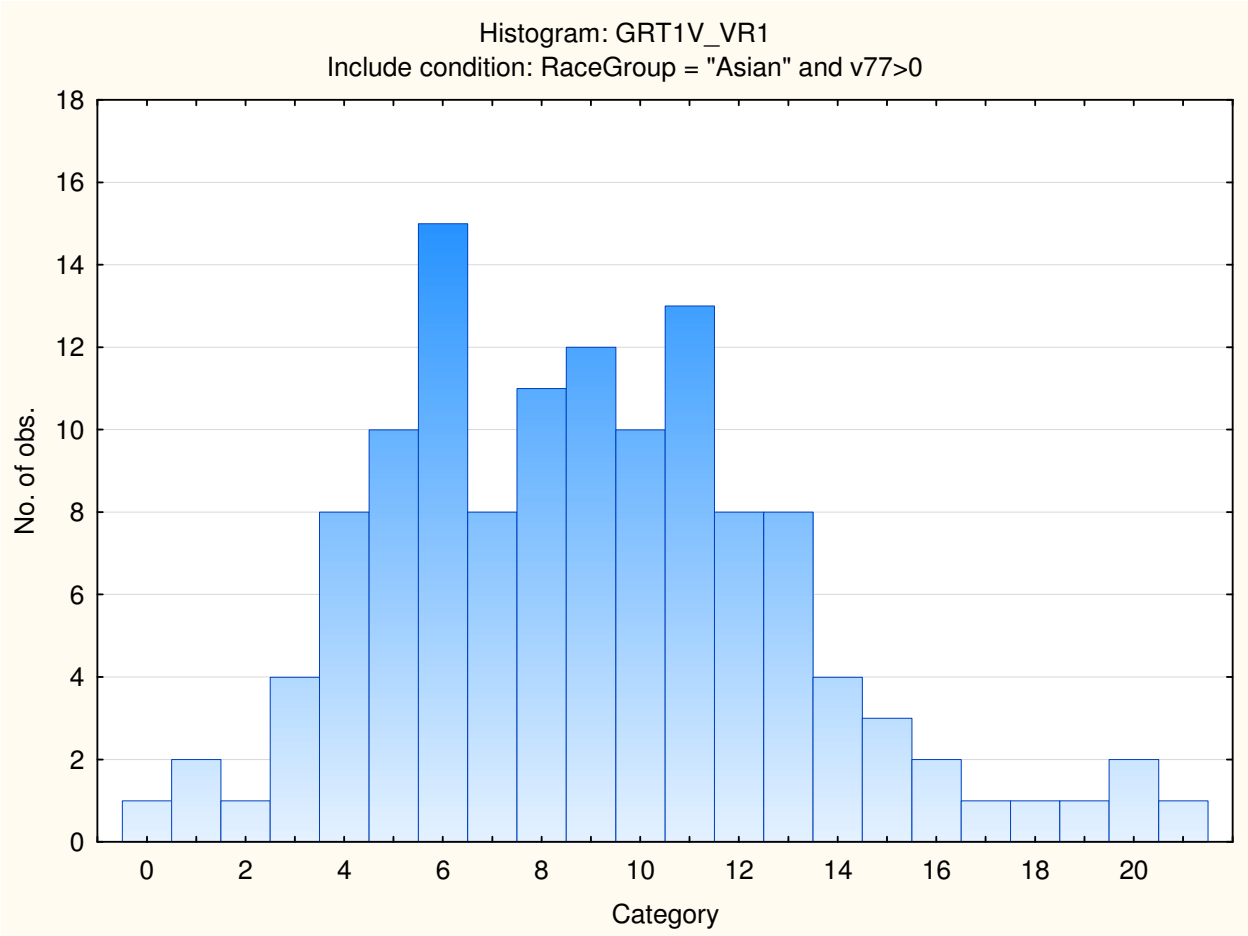
Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	26.74150	6.270270	17.00000	45.00000	147	5



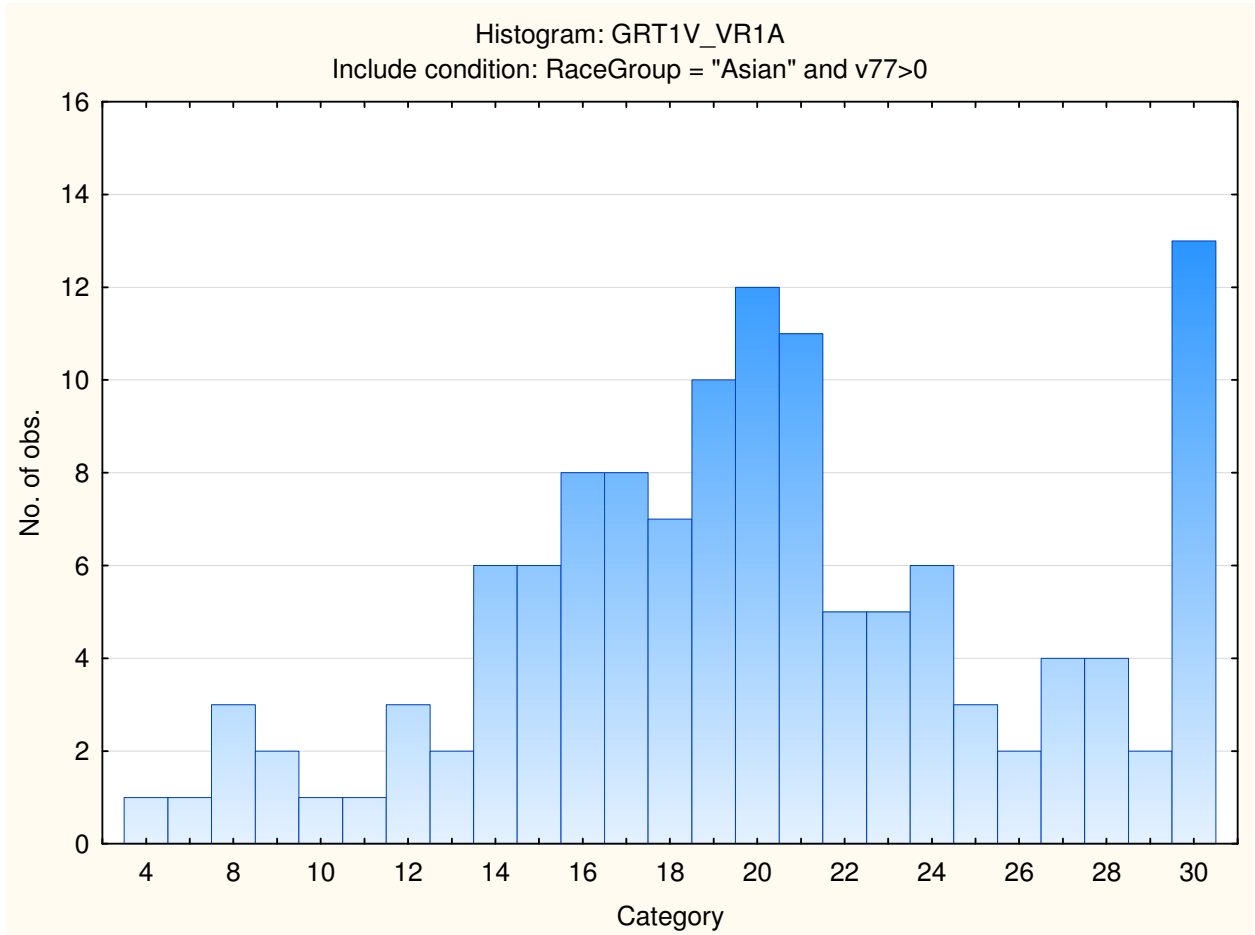
Descriptive statistics on Graduate Reasoning Test Battery subtests

Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Graduate Verbal Reasoning	8.97619	4.136596	0.000000	21.00000	126	0
Graduate Verbal Reasoning items attempted	20.03175	5.955752	4.000000	30.00000	126	0
Graduate Numerical Reasoning	11.88889	4.841855	1.000000	24.00000	126	0
Graduate Numerical Reasoning Items Attempted	17.74603	5.087925	6.000000	25.00000	126	0
Graduate Abstract Reasoning	11.71053	3.587380	2.000000	19.00000	152	0
Graduate Abstract Reasoning Items Attempted	19.79605	4.496266	7.000000	25.00000	152	0

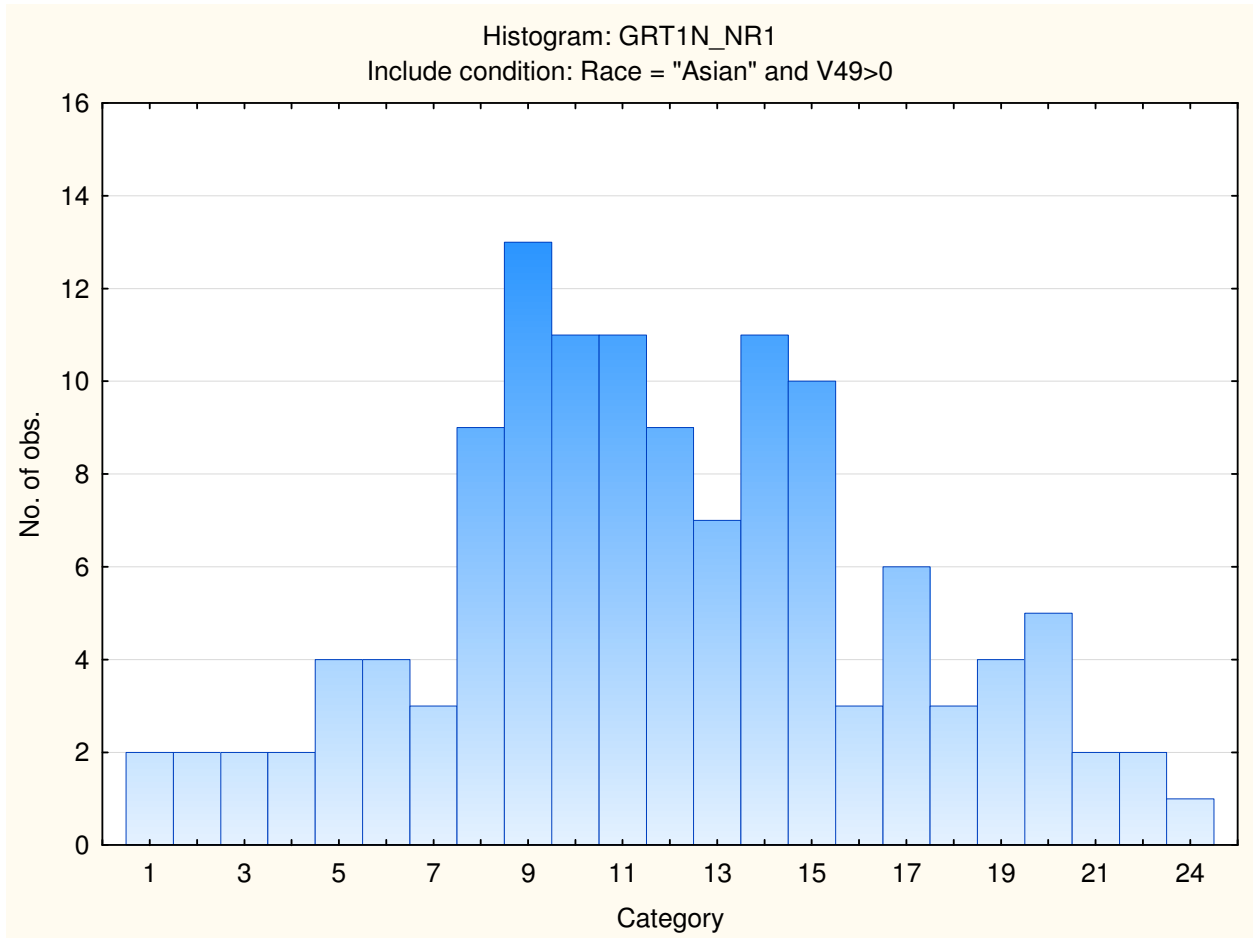
Frequency distribution: Graduate Verbal Reasoning Test



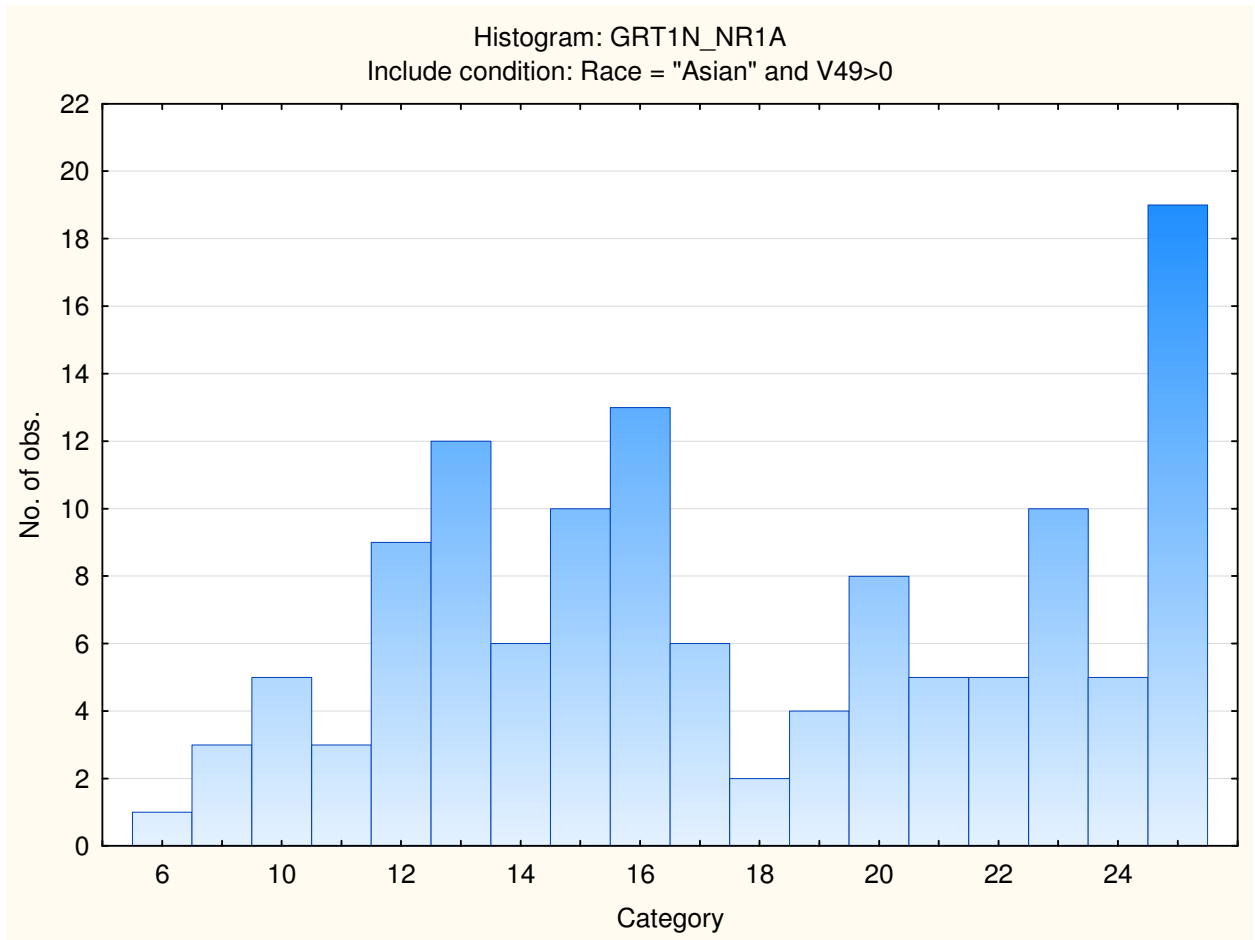
Frequency distribution: Graduate Verbal Reasoning items attempted



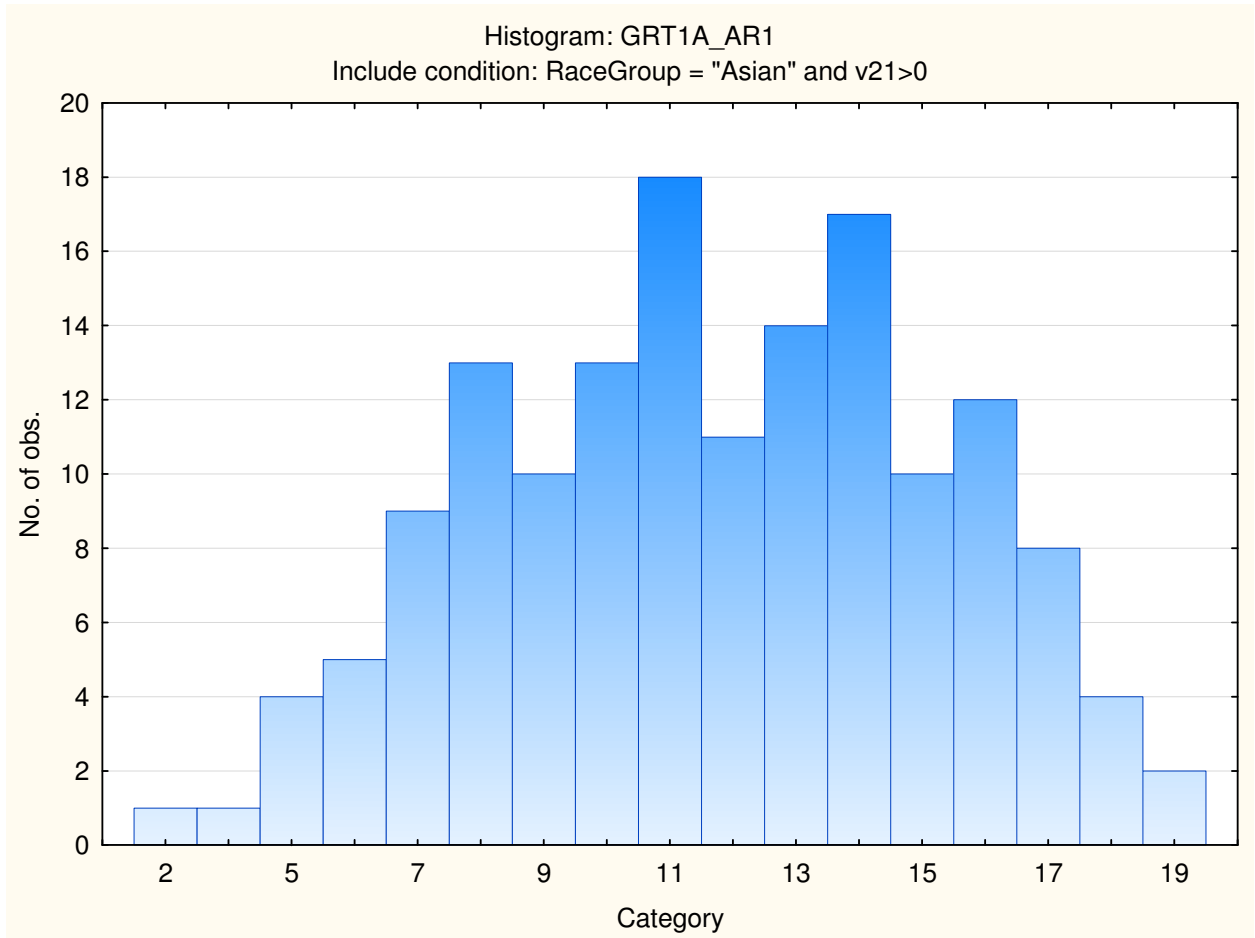
Frequency distribution: Graduate Numerical Reasoning Test



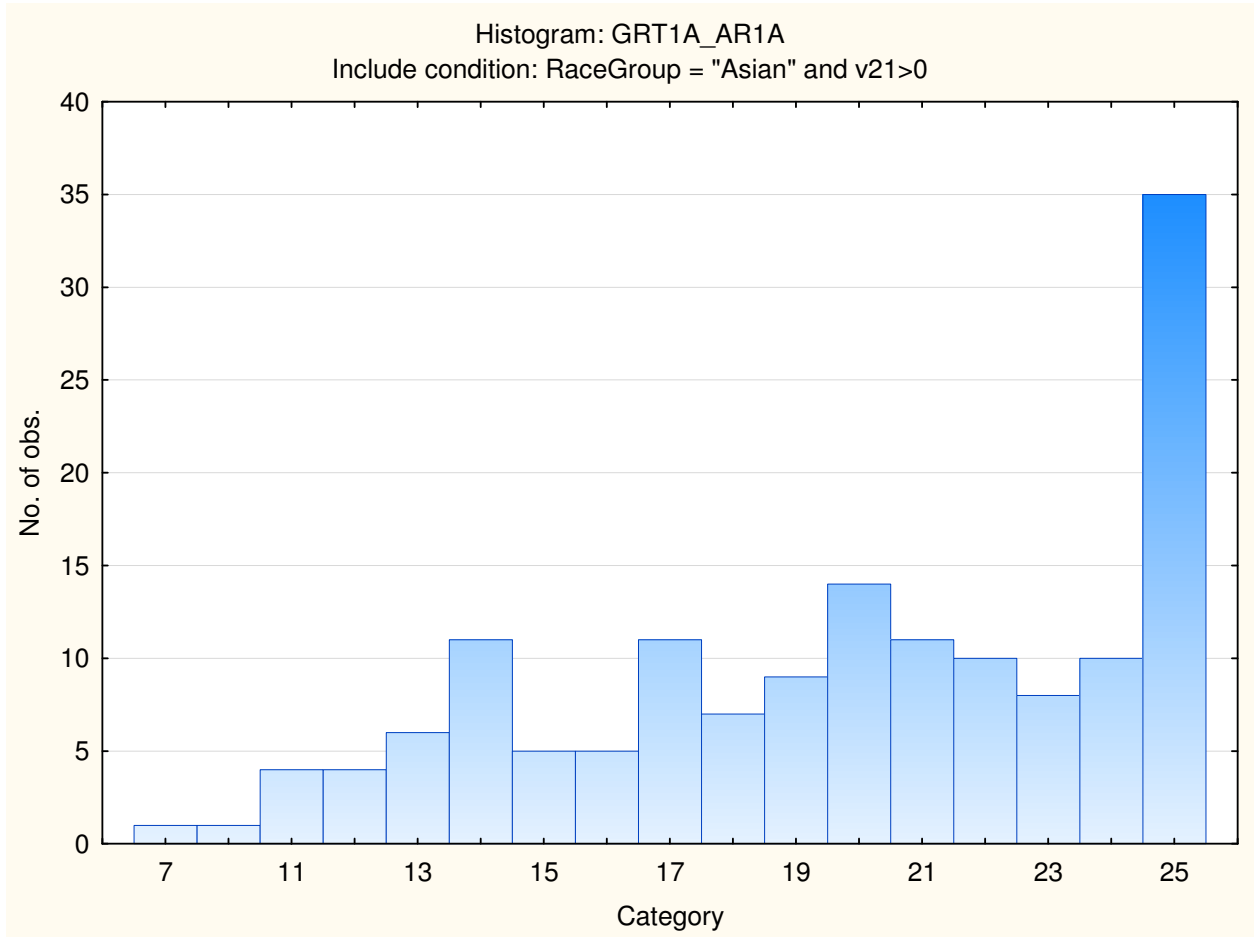
Frequency distribution: Graduate Numerical Reasoning items attempted



Frequency distribution: Graduate Abstract Reasoning



Frequency distribution: Graduate Abstract Reasoning Items Attempted



Stanine Table

	S9_1	S9_2	S9_3	S9_4	S9_5	S9_6	S9_7	S9_8	S9_9
Graduate Verbal Reasoning	0-1	2-3	4-5	6-7	8-10	11-12	13-14	15-16	17-21
Graduate Verbal Items Attempted	4-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30	
Graduate Numerical Reasoning	1-3	4-5	6-8	9-10	11-13	14-15	16-17	18-20	21-24
Graduate Numerical Items Attempted	6-8	9-11	12-13	14-16	17-19	20-21	22-24	25-25	
Graduate Abstract Reasoning	2-5	6-7	8-9	10-10	11-12	13-14	15-16	17-17	18-19
Graduate Abstract Items Attempted	7-11	12-14	15-16	17-18	19-20	21-23	24-25		

Graduate Reasoning Test Battery Norm Group: South African English speakers updated 2010

Composition of the sample

The sample consisted of South Africans who declared English to be their first language, tested by Psytech South Africa and collaborators in the period leading up to January 2010. Not all respondents completed all the subtests, therefore biographical particulars are reported separately for the different subtests.

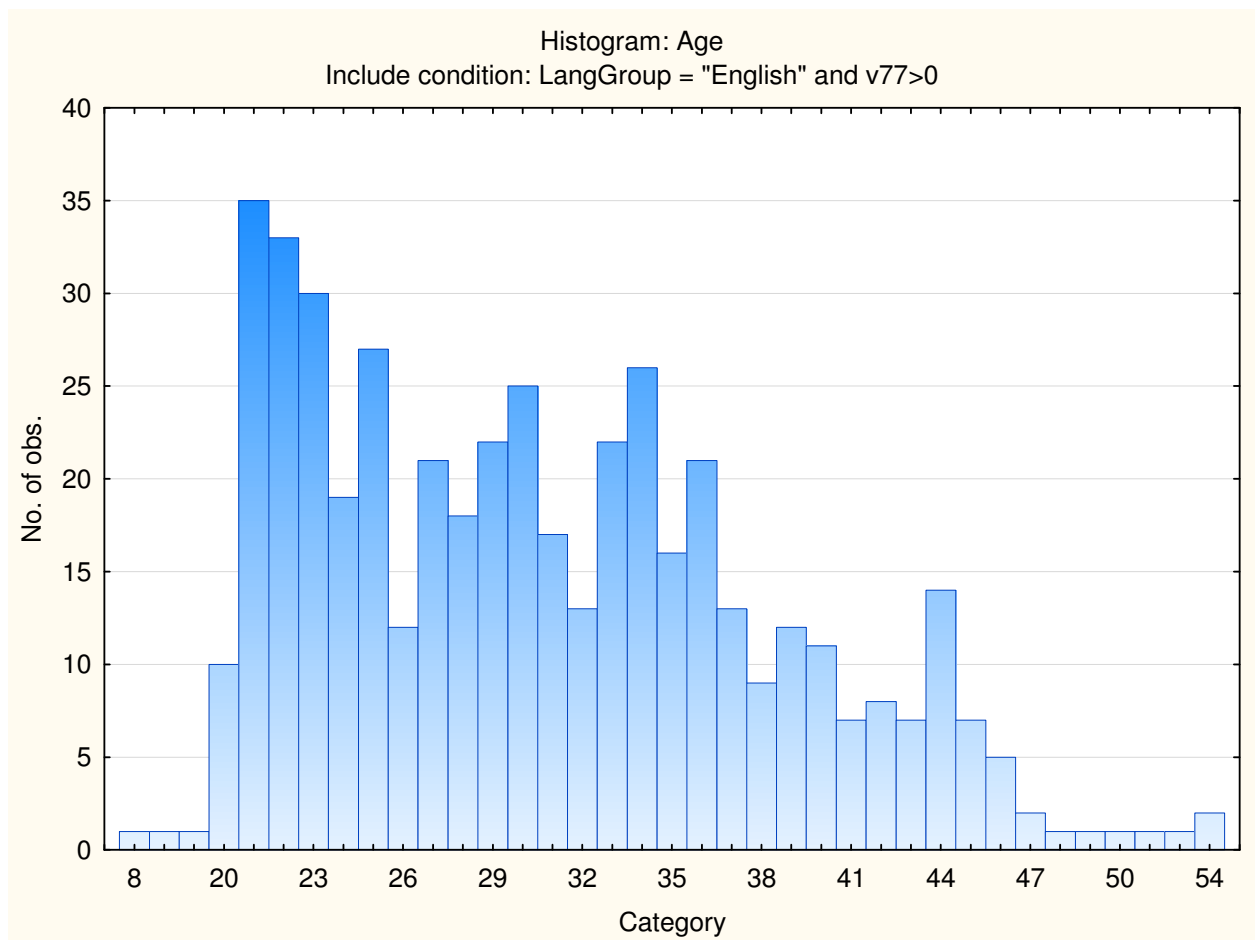
Sample composition: Graduate Verbal Reasoning Test

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	191	191	39.62656	39.6266
M	291	482	60.37344	100.0000
Missing	0	482	0.00000	100.0000

Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	126	126	26.14108	26.1411
Grade 12	139	265	28.83817	54.9793
Diploma	41	306	8.50622	63.4855
<Grade 12	28	334	5.80913	69.2946
Post Graduate	76	410	15.76763	85.0622
Certificate	14	424	2.90456	87.9668
Missing	58	482	12.03320	100.0000

Category	Frequency table: Race Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	234	234	48.54772	48.5477
European	74	308	15.35270	63.9004
Asian	78	386	16.18257	80.0830
African	74	460	15.35270	95.4357
Missing	22	482	4.56432	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	30.58051	7.652059	8.000000	54.00000	472	10



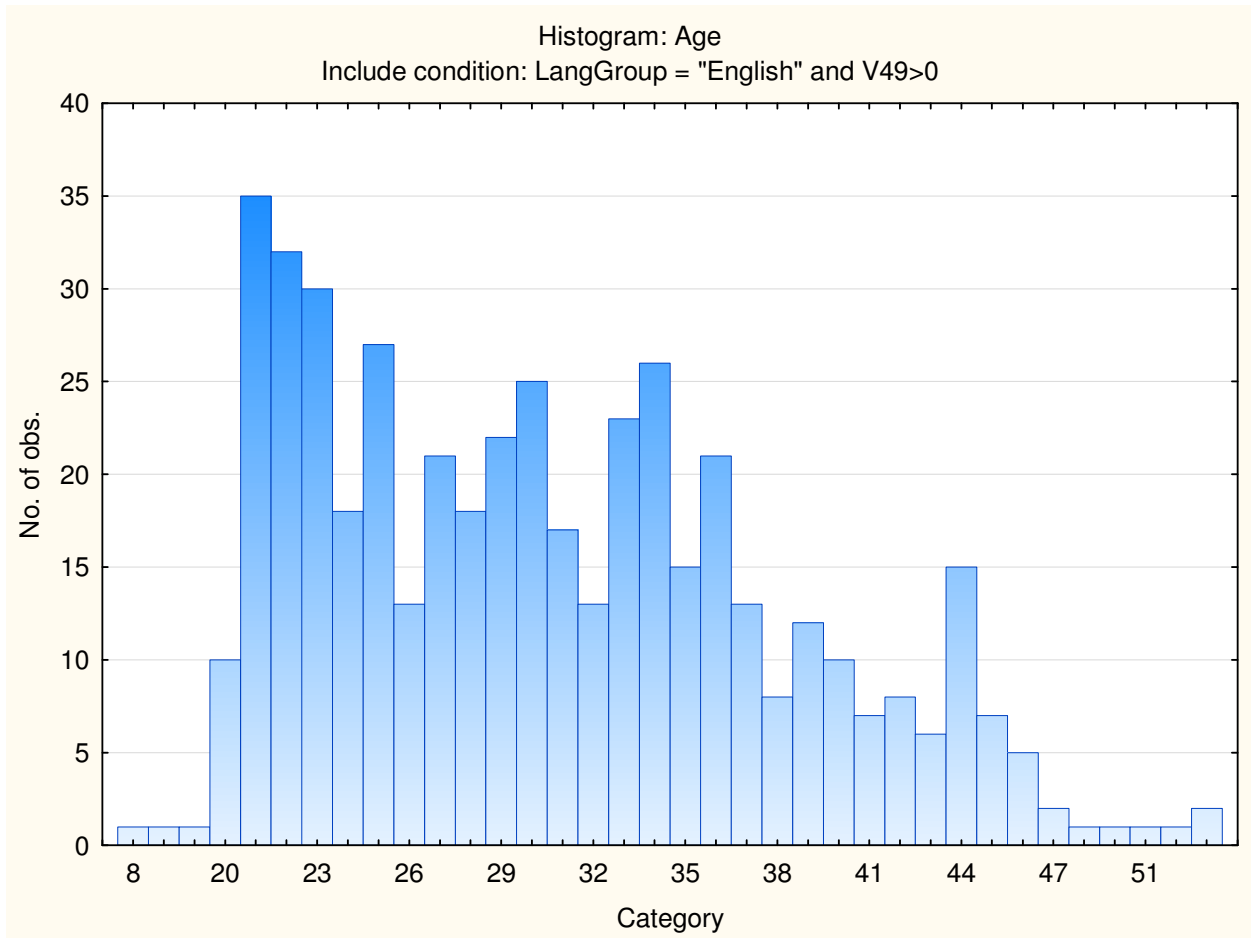
Sample composition: Graduate Numerical Reasoning Test

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	188	188	39.33054	39.3305
M	290	478	60.66946	100.0000
Missing	0	478	0.00000	100.0000

Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	122	122	25.52301	25.5230
Grade 12	139	261	29.07950	54.6025
Diploma	41	302	8.57741	63.1799
<Grade 12	29	331	6.06695	69.2469
Post Graduate	74	405	15.48117	84.7280
Certificate	14	419	2.92887	87.6569
Missing	59	478	12.34310	100.0000

Category	Frequency table: Race Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	234	234	48.95397	48.9540
European	72	306	15.06276	64.0167
Asian	78	384	16.31799	80.3347
African	74	458	15.48117	95.8159
Missing	20	478	4.18410	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	30.52564	7.605179	8.000000	54.00000	468	10



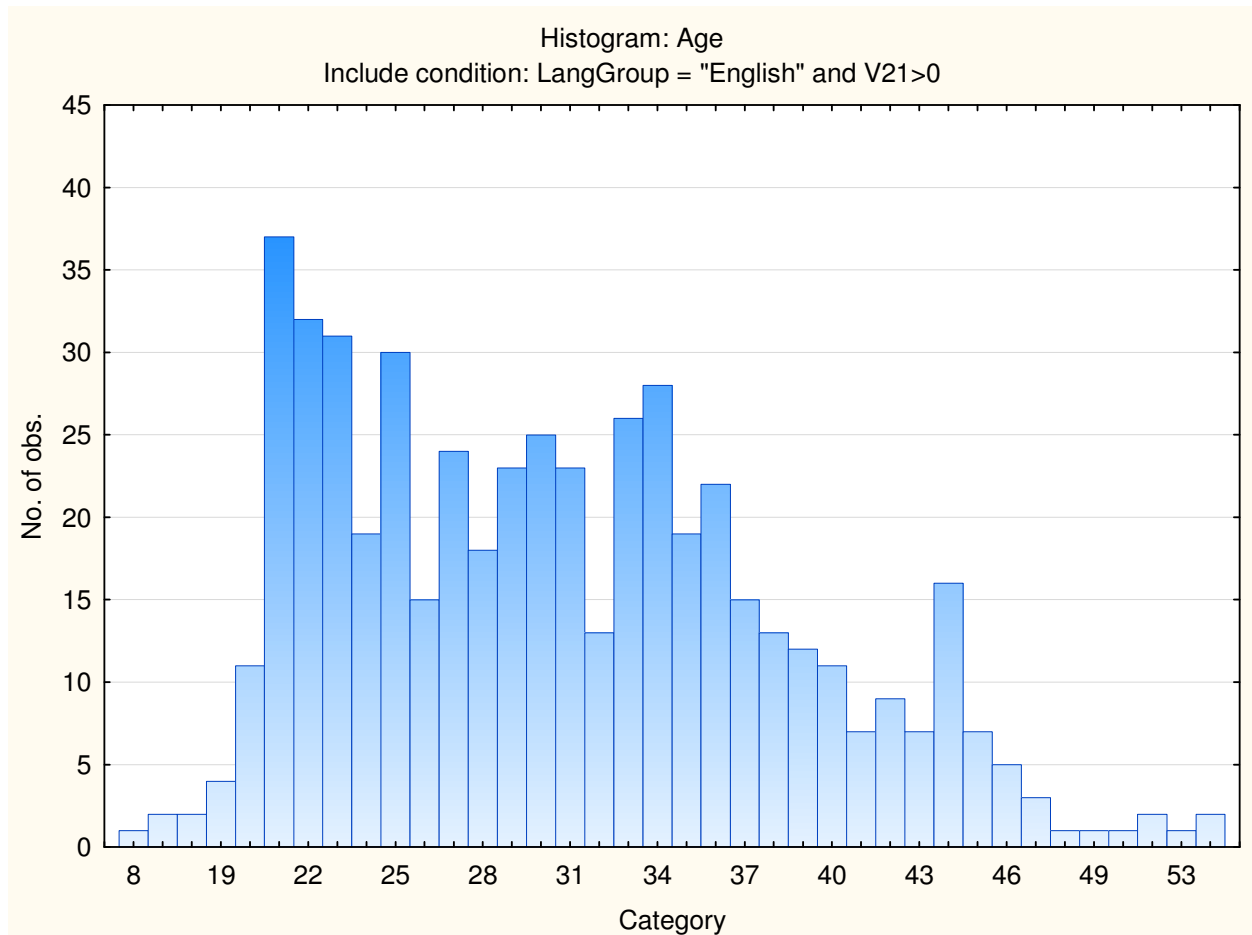
Sample composition: Graduate Abstract Reasoning Test

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	204	204	38.63636	38.6364
M	324	528	61.36364	100.0000
Missing	0	528	0.00000	100.0000

Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	141	141	26.70455	26.7045
Grade 12	146	287	27.65152	54.3561
Diploma	49	336	9.28030	63.6364
<Grade 12	30	366	5.68182	69.3182
Post Graduate	75	441	14.20455	83.5227
Certificate	15	456	2.84091	86.3636
Missing	72	528	13.63636	100.0000

Category	Frequency table: Race Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	241	241	45.64394	45.6439
European	80	321	15.15152	60.7955
Asian	102	423	19.31818	80.1136
African	82	505	15.53030	95.6439
Missing	23	528	4.35606	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	30.60232	7.687071	8.000000	54.00000	518	10

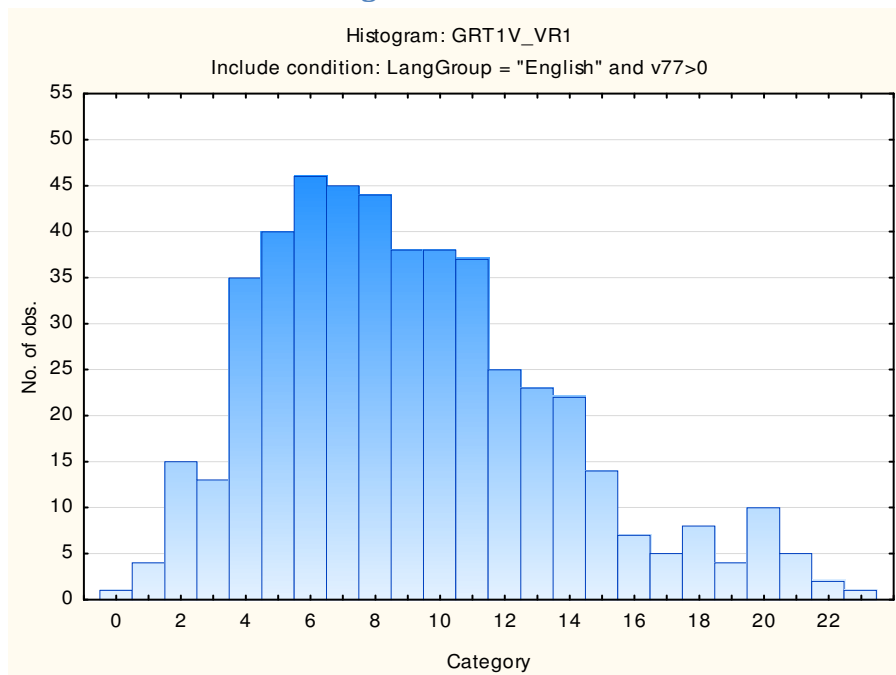


Descriptive statistics on Graduate Reasoning Test Battery Subtests

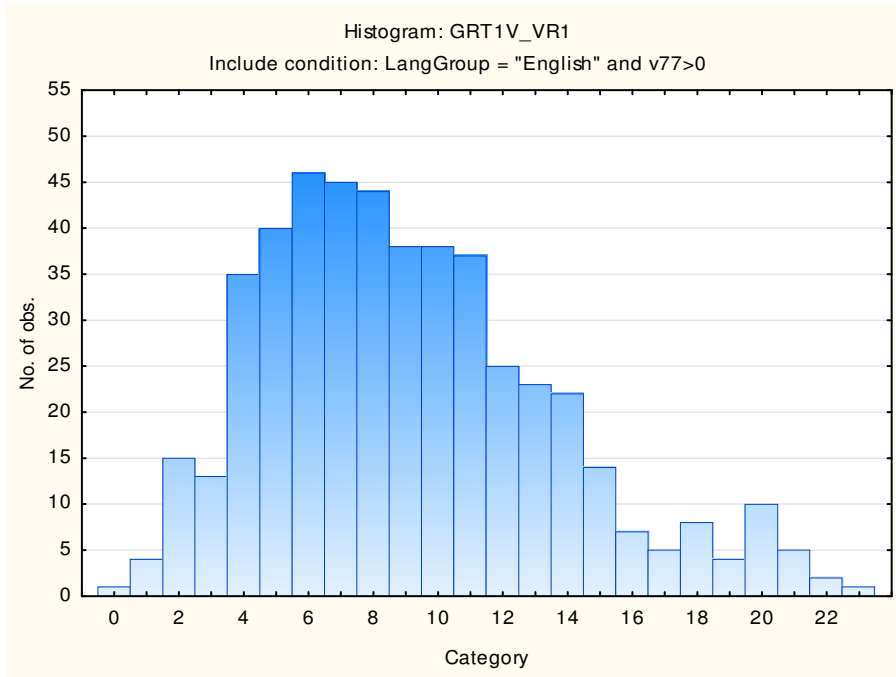
Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Graduate Verbal Reasoning	9.11411	4.503342	0.000000	25.00000	482	0
Graduate Verbal Reasoning Items Attempted	20.01452	5.940610	5.000000	30.00000	482	0
Graduate Numerical Reasoning	9.38494	5.129593	0.000000	25.00000	478	0
Graduate Numerical Reasoning Items Attempted	16.58159	5.207300	4.000000	25.00000	478	0
Graduate Abstract Reasoning	10.43750	3.990486	1.000000	21.00000	528	0
Graduate Abstract Reasoning Items Attempted	19.30682	4.656777	4.000000	25.00000	528	0

Frequency distributions of Graduate Reasoning Test Battery subtests

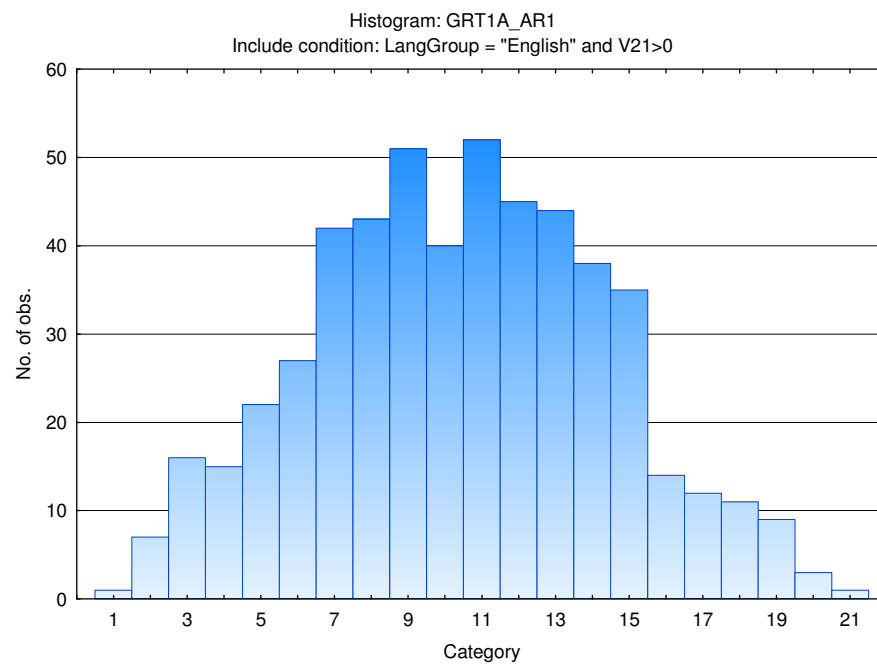
Graduate Verbal Reasoning



Graduate Numerical Reasoning



Graduate Abstract Reasoning



Stanine Table

	S9_1	S9_2	S9_3	S9_4	S9_5	S9_6	S9_7	S9_8	S9_9
Graduate Verbal Reasoning	0-1	2-3	4-5	6-7	8-10	11-12	13-14	15-16	17-25
Graduate Verbal Items Attempted	5-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30	
Graduate Numerical Reasoning	0-0	1-2	3-5	6-8	9-10	11-13	14-15	16-18	19-25
Graduate Numerical Items Attempted	4-7	8-10	11-12	13-15	16-17	18-20	21-23	24-25	
Graduate Abstract Reasoning	1-3	4-5	6-7	8-9	10-11	12-13	14-15	16-17	18-21
Graduate Abstract Items Attempted	4-11	12-13	14-15	16-18	19-20	21-22	23-25		

Graduate Reasoning Test Battery Norm Group: South African Afrikaans speakers, updated 2010

Composition of the sample

The sample consisted of South Africans who declared their home language to be Afrikaans, tested by Psytech South Africa and collaborators in the period leading up to January 2010. Not all respondents completed the entire Graduate Reasoning Test battery. Biographical information is reported separately for the different subtests.

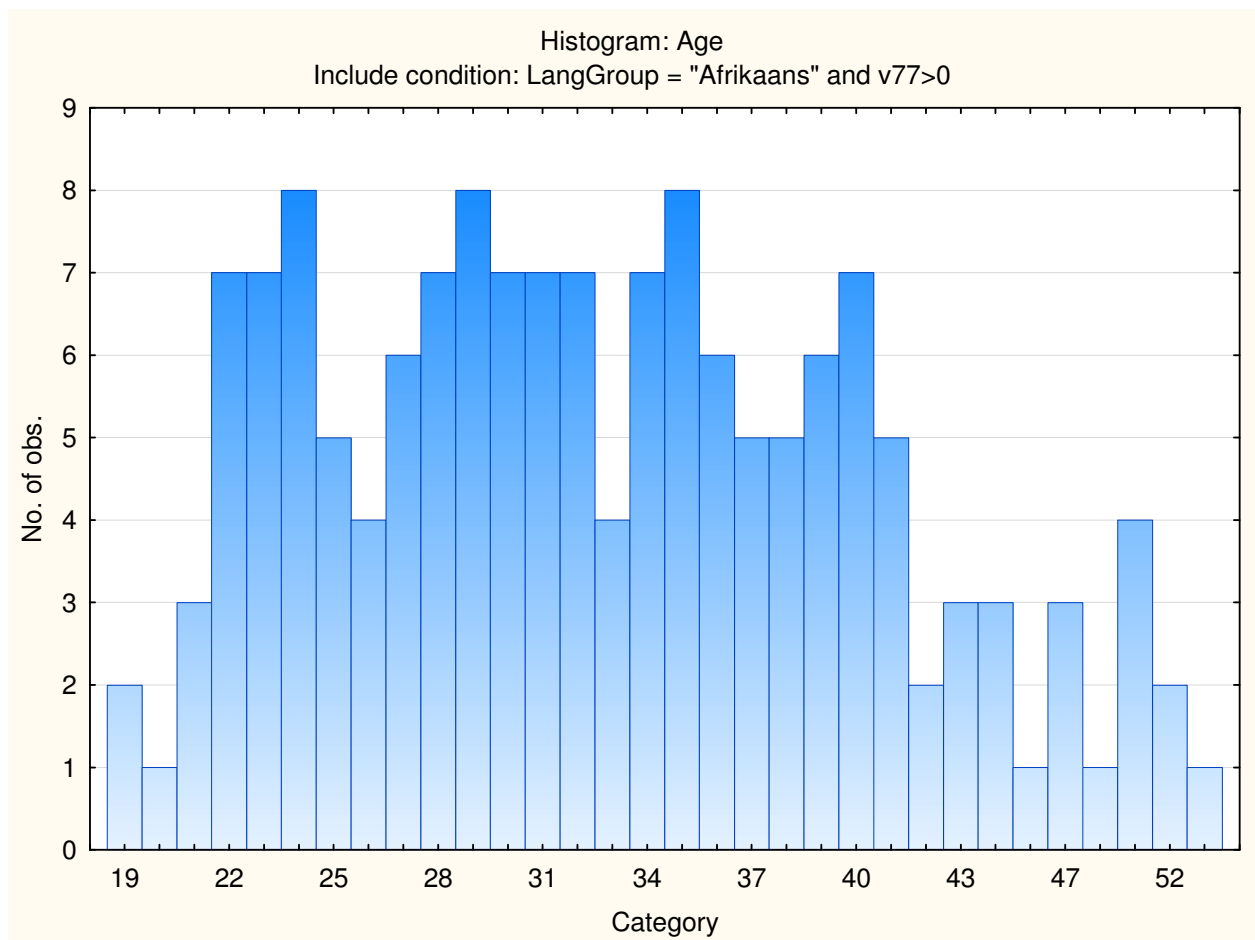
Sample composition: Graduate Verbal Reasoning Test

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	52	52	33.33333	33.3333
M	103	155	66.02564	99.3590
U	1	156	0.64103	100.0000
Missing	0	156	0.00000	100.0000

Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	24	24	15.38462	15.3846
Grade 12	51	75	32.69231	48.0769
Diploma	18	93	11.53846	59.6154
<Grade 12	8	101	5.12821	64.7436
Post Graduate	28	129	17.94872	82.6923
Certificate	3	132	1.92308	84.6154
Missing	24	156	15.38462	100.0000

Category	Frequency table: Race Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	80	80	51.28205	51.2821
European	61	141	39.10256	90.3846
Asian	1	142	0.64103	91.0256
African	5	147	3.20513	94.2308
Missing	9	156	5.76923	100.0000

Variable	Descriptive Statistics					N	No.cases Missing
	Mean	Std.Dev	Minimum	Maximum			
Age	32.87500	8.025054	19.00000	59.00000		152	4



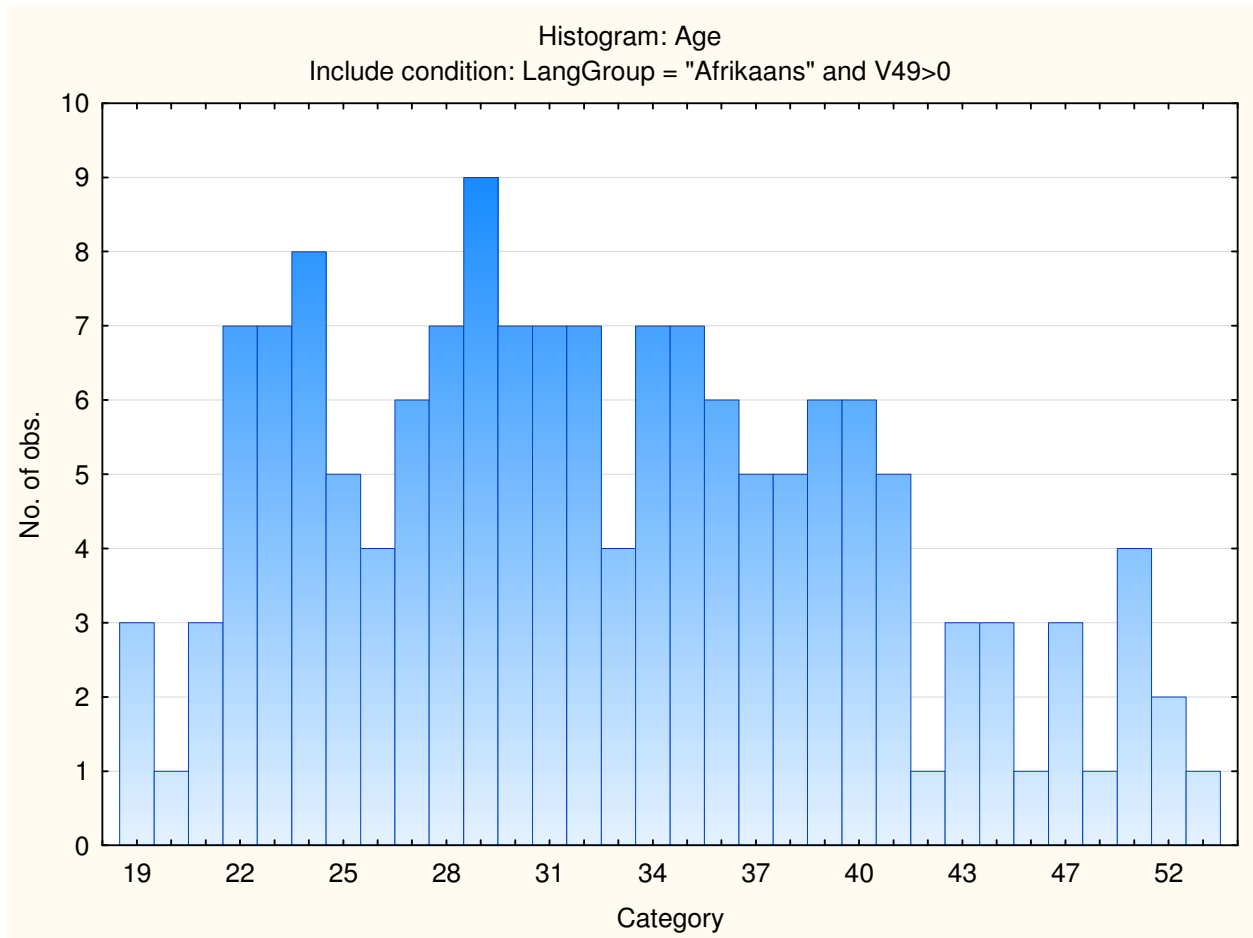
Sample composition: Graduate Numerical Reasoning

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	51	51	32.90323	32.9032
M	103	154	66.45161	99.3548
U	1	155	0.64516	100.0000
Missing	0	155	0.00000	100.0000

Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	21	21	13.54839	13.5484
Grade 12	52	73	33.54839	47.0968
Diploma	17	90	10.96774	58.0645
<Grade 12	8	98	5.16129	63.2258
Post Graduate	28	126	18.06452	81.2903
Certificate	3	129	1.93548	83.2258
Missing	26	155	16.77419	100.0000

Category	Frequency table: Race Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	79	79	50.96774	50.9677
European	61	140	39.35484	90.3226
Asian	1	141	0.64516	90.9677
African	5	146	3.22581	94.1935
Missing	9	155	5.80645	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	32.63576	8.076702	19.00000	59.00000	151	4



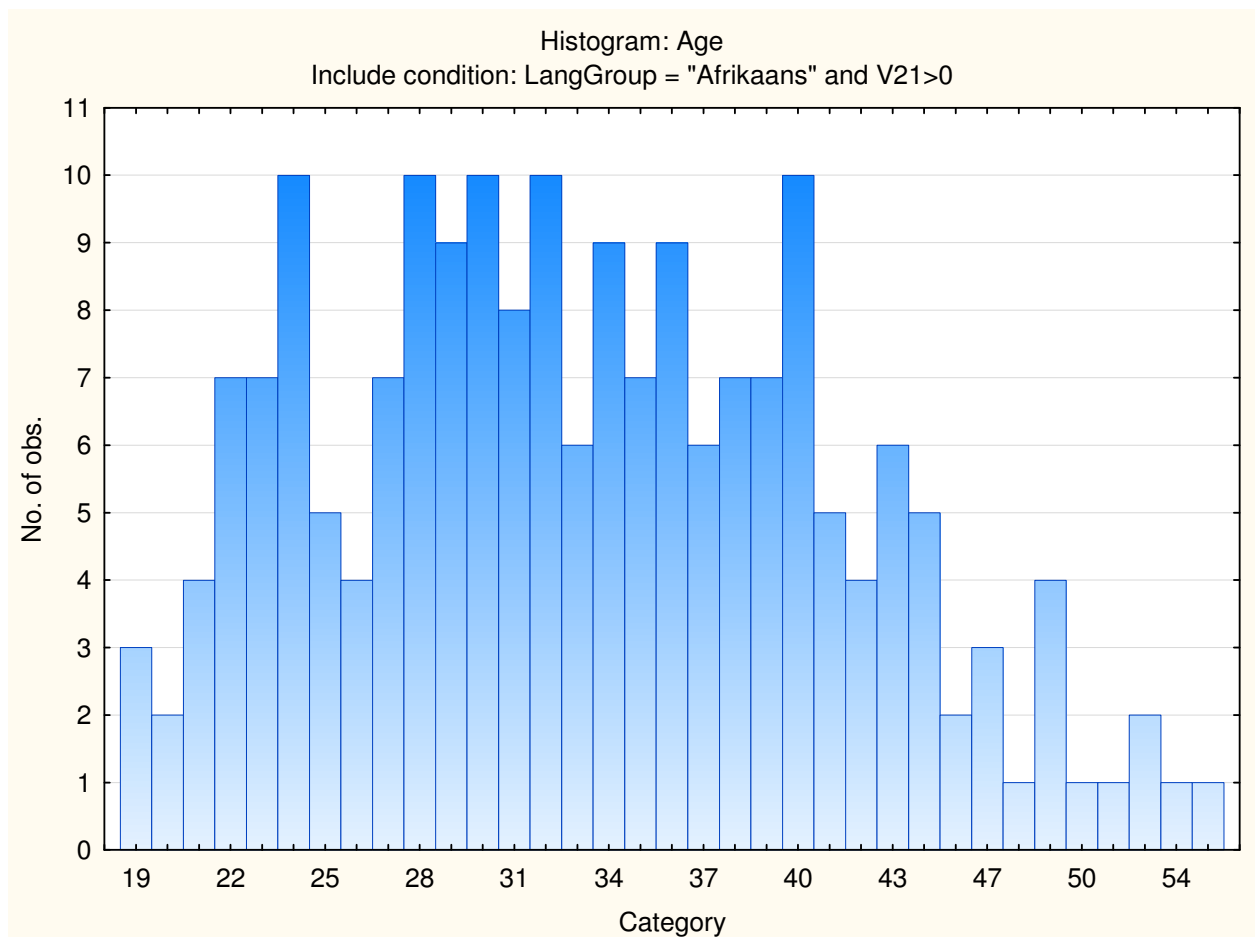
Sample composition: Graduate Abstract Reasoning Test

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	72	72	36.36364	36.3636
M	125	197	63.13131	99.4949
U	1	198	0.50505	100.0000
Missing	0	198	0.00000	100.0000

Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	31	31	15.65657	15.6566
Grade 12	63	94	31.81818	47.4747
Diploma	28	122	14.14141	61.6162
<Grade 12	8	130	4.04040	65.6566
Post Graduate	32	162	16.16162	81.8182
Certificate	3	165	1.51515	83.3333
Missing	33	198	16.66667	100.0000

Category	Frequency table: Race Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	94	94	47.47475	47.4747
European	88	182	44.44444	91.9192
Asian	1	183	0.50505	92.4242
African	5	188	2.52525	94.9495
Missing	10	198	5.05051	100.0000

Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	33.38342	8.143129	19.00000	59.00000	193	5

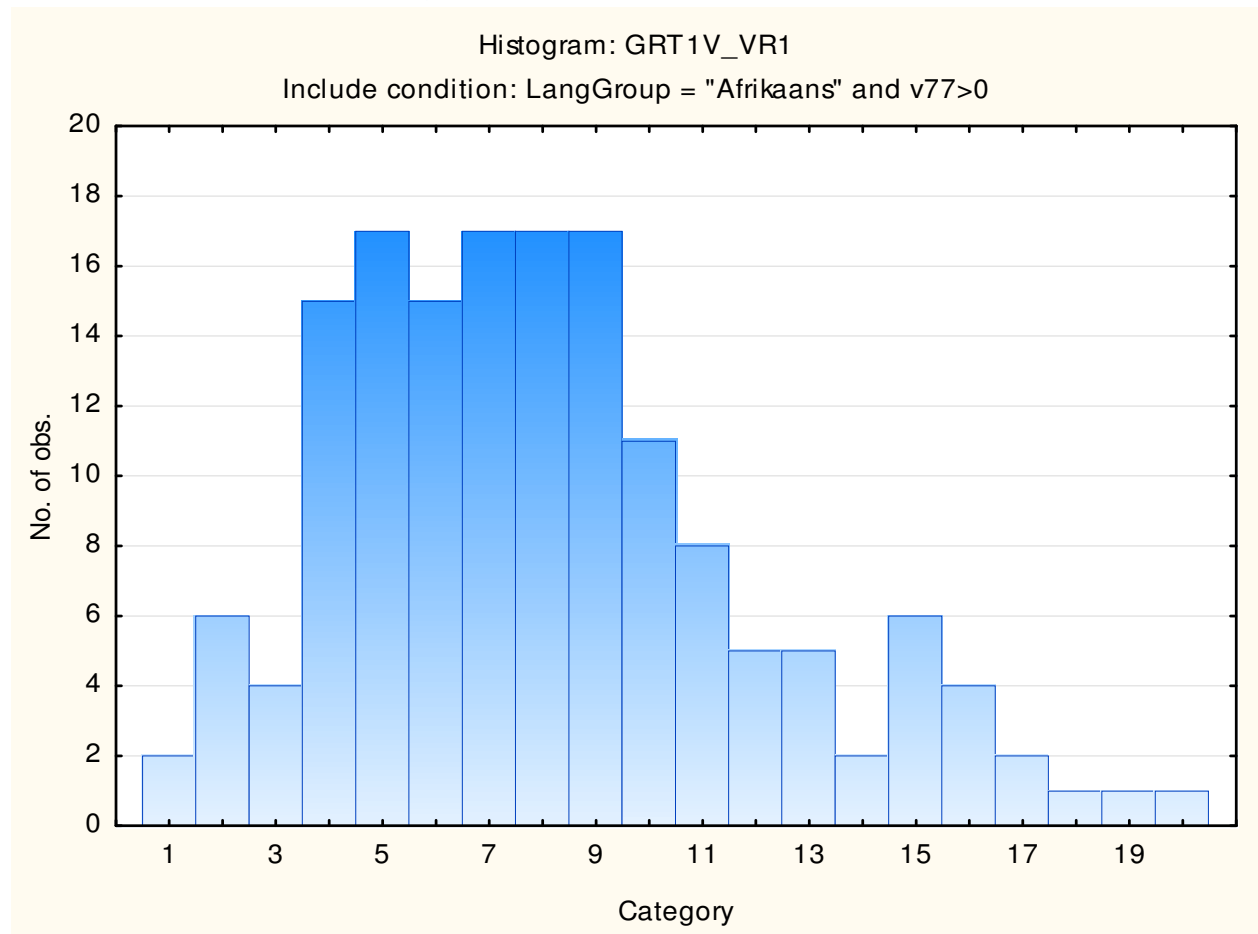


Descriptive statistics on Graduate Reasoning Test Battery subtests

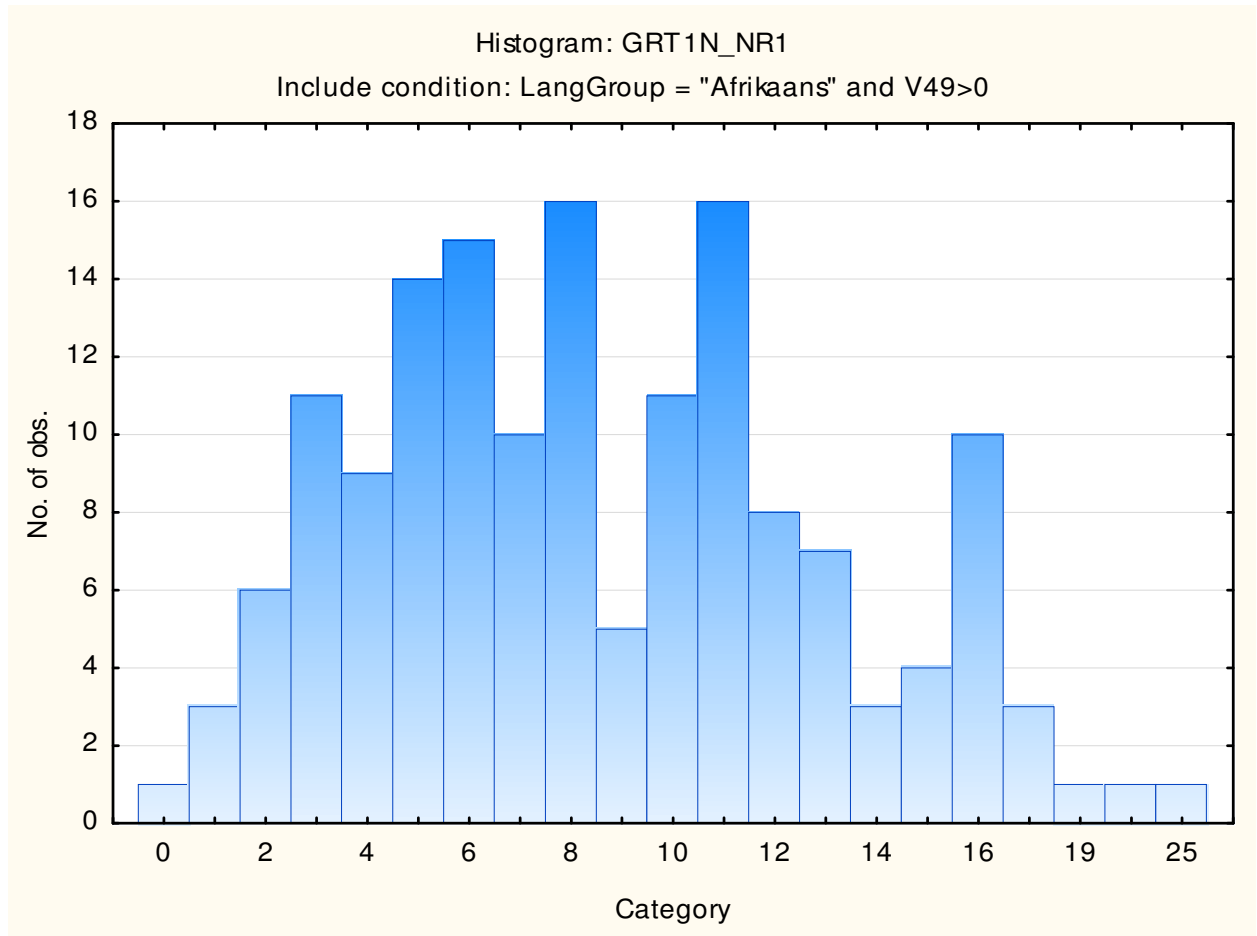
Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Graduate verbal reasoning	8.10897	3.909581	1.000000	20.00000	156	0
Graduate verbal reasoning items attempted	20.10897	6.226451	7.000000	30.00000	156	0
Graduate numerical reasoning	8.65161	4.646733	0.000000	25.00000	155	0
Graduate numerical reasoning items attempted	16.39355	5.036873	5.000000	25.00000	155	0
Graduate abstract reasoning	10.61616	4.462380	1.000000	25.00000	198	0
Graduate abstract reasoning items attempted	19.50000	4.562872	5.000000	25.00000	198	0

Frequency distributions of Graduate Reasoning Test Battery subtests

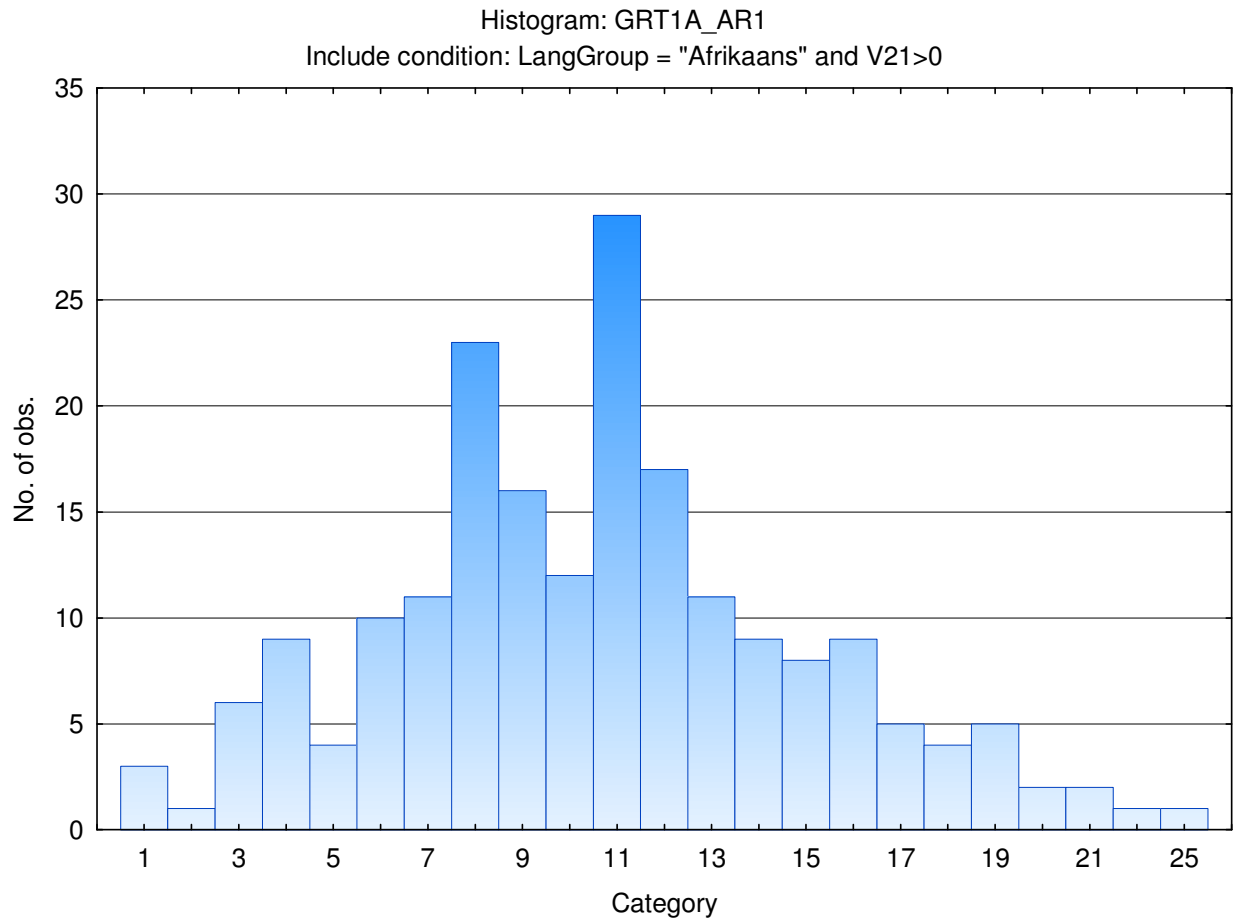
Graduate verbal reasoning



Graduate numerical reasoning



Graduate abstract reasoning



Stanine table

	S9_1	S9_2	S9_3	S9_4	S9_5	S9_6	S9_7	S9_8	S9_9
Graduate Verbal Reasoning	1-1	2-3	4-5	6-7	8-9	10-11	12-12	13-14	15-20
Graduate Verbal Items Attempted	7-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30	
Graduate Numerical Reasoning	0-0	1-2	3-5	6-7	8-9	10-12	13-14	15-16	17-25
Graduate Numerical Items Attempted	5-7	8-10	11-12	13-15	16-17	18-20	21-22	23-25	
Graduate Abstract Reasoning	1-2	3-5	6-7	8-9	10-11	12-13	14-16	17-18	19-25
Graduate Abstract Items Attempted	5-11	12-13	14-16	17-18	19-20	21-22	23-25		

Graduate Reasoning Test Battery norm group: South African indigenous language speakers, updated 2010

Composition of the sample

The sample consisted of South Africans who declared their home language to be one of the indigenous languages South African languages, tested by Psytech South Africa and collaborators in the period leading up to January 2010. Not all respondents completed the entire Graduate Reasoning Test battery. Biographical particulars are reported separately for the different subtests.

Sample composition: Graduate verbal reasoning test

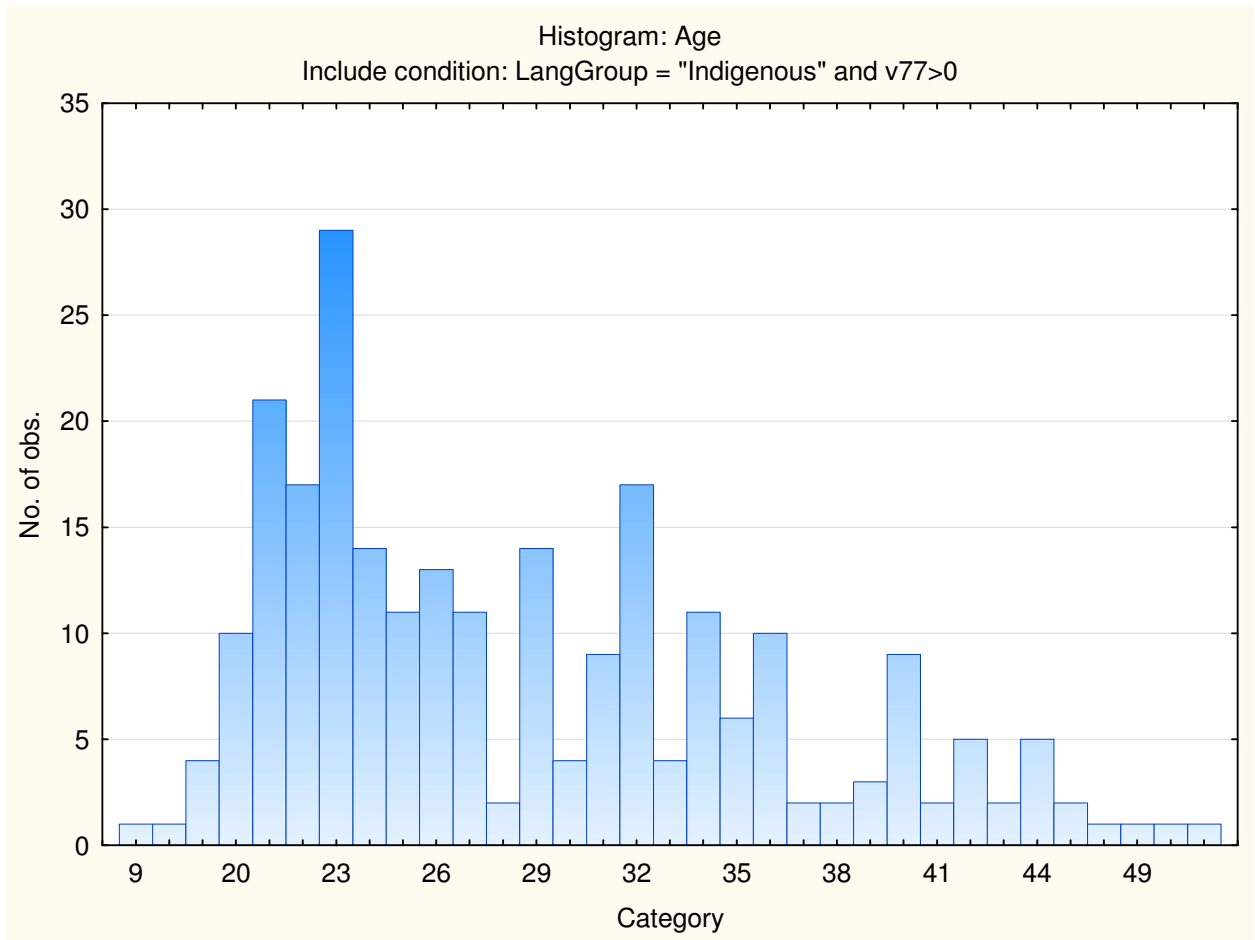
Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	112	112	44.44444	44.4444
M	140	252	55.55556	100.0000
Missing	0	252	0.00000	100.0000

Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	79	79	31.34921	31.3492
Grade 12	55	134	21.82540	53.1746
Diploma	26	160	10.31746	63.4921
<Grade 12	6	166	2.38095	65.8730
Post Graduate	27	193	10.71429	76.5873
Certificate	3	196	1.19048	77.7778
Missing	56	252	22.22222	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
Setswana	28	28	11.111111	11.11111
isiXhosa	127	155	50.39683	61.5079
Xitsonga	6	161	2.38095	63.8889
isiZulu	42	203	16.66667	80.5556
Sesotho	21	224	8.333333	88.8889
Sepedi	14	238	5.55556	94.4444
isiNdebele	3	241	1.19048	95.6349
Tshivenda	5	246	1.98413	97.6190
siSwati	3	249	1.19048	98.8095
Missing	3	252	1.19048	100.0000

Category	Frequency table: Race Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	3	3	1.19048	1.1905
European	1	4	0.39683	1.5873
African	248	252	98.41270	100.0000
Missing	0	252	0.00000	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	28.68571	7.445100	9.000000	53.00000	245	7



Sample composition: Graduate Numerical Reasoning Test

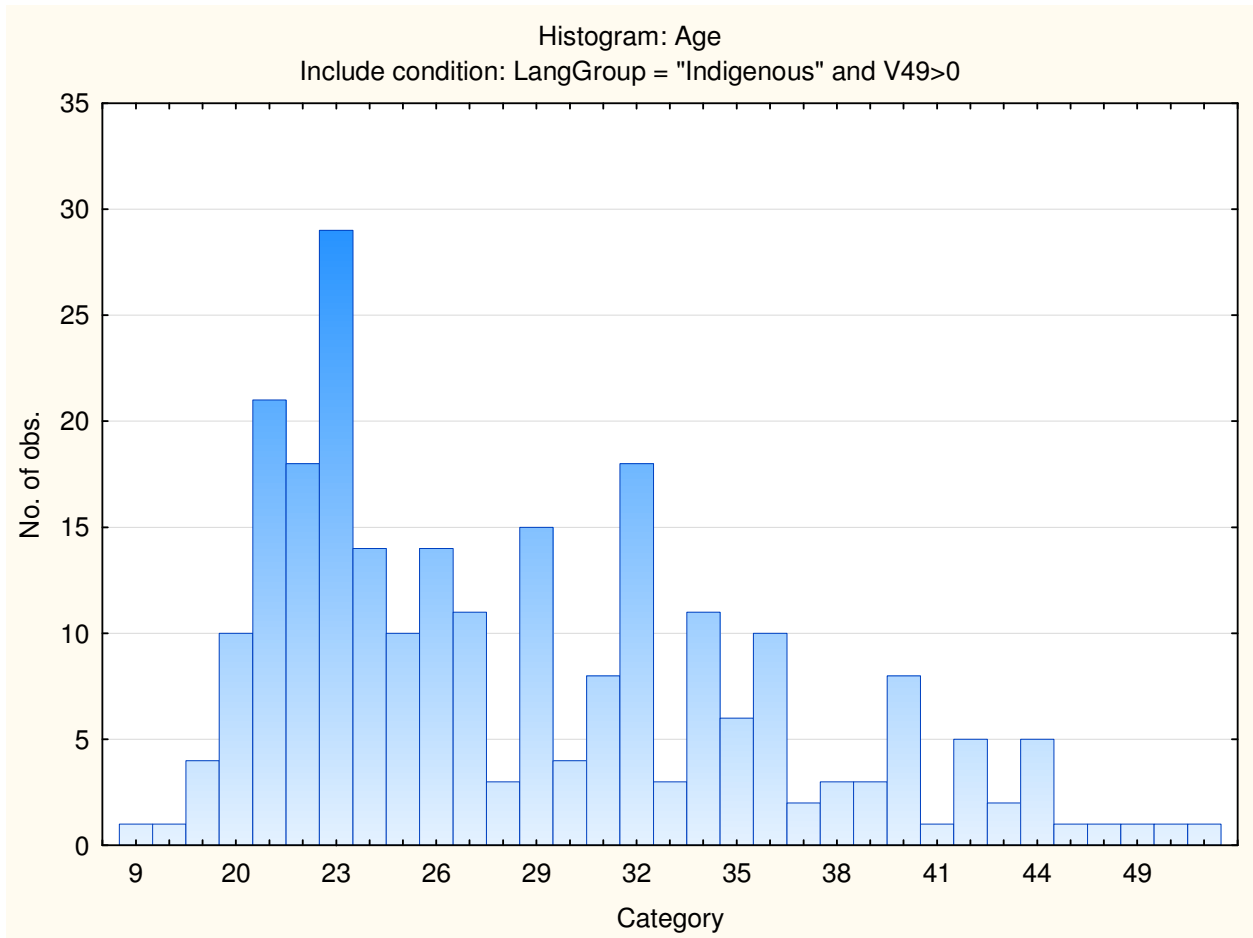
Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	113	113	45.20000	45.2000
M	137	250	54.80000	100.0000
Missing	0	250	0.00000	100.0000

Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	73	73	29.20000	29.2000
Grade 12	58	131	23.20000	52.4000
Diploma	26	157	10.40000	62.8000
<Grade 12	6	163	2.40000	65.2000
Post Graduate	27	190	10.80000	76.0000
Certificate	3	193	1.20000	77.2000
Missing	57	250	22.80000	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
Setswana	26	26	10.40000	10.4000
isiXhosa	125	151	50.00000	60.4000
Xitsonga	5	156	2.00000	62.4000
isiZulu	47	203	18.80000	81.2000
Sesotho	20	223	8.00000	89.2000
Sepedi	14	237	5.60000	94.8000
isiNdebele"	3	240	1.20000	96.0000
Tshivenda	4	244	1.60000	97.6000
siSwati	3	247	1.20000	98.8000
Missing	3	250	1.20000	100.0000

Category	Frequency table: Race Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	3	3	1.20000	1.2000
European	1	4	0.40000	1.6000
African	246	250	98.40000	100.0000
Missing	0	250	0.00000	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	28.52245	7.323085	9.000000	53.00000	245	5



Sample composition: Graduate abstract reasoning test

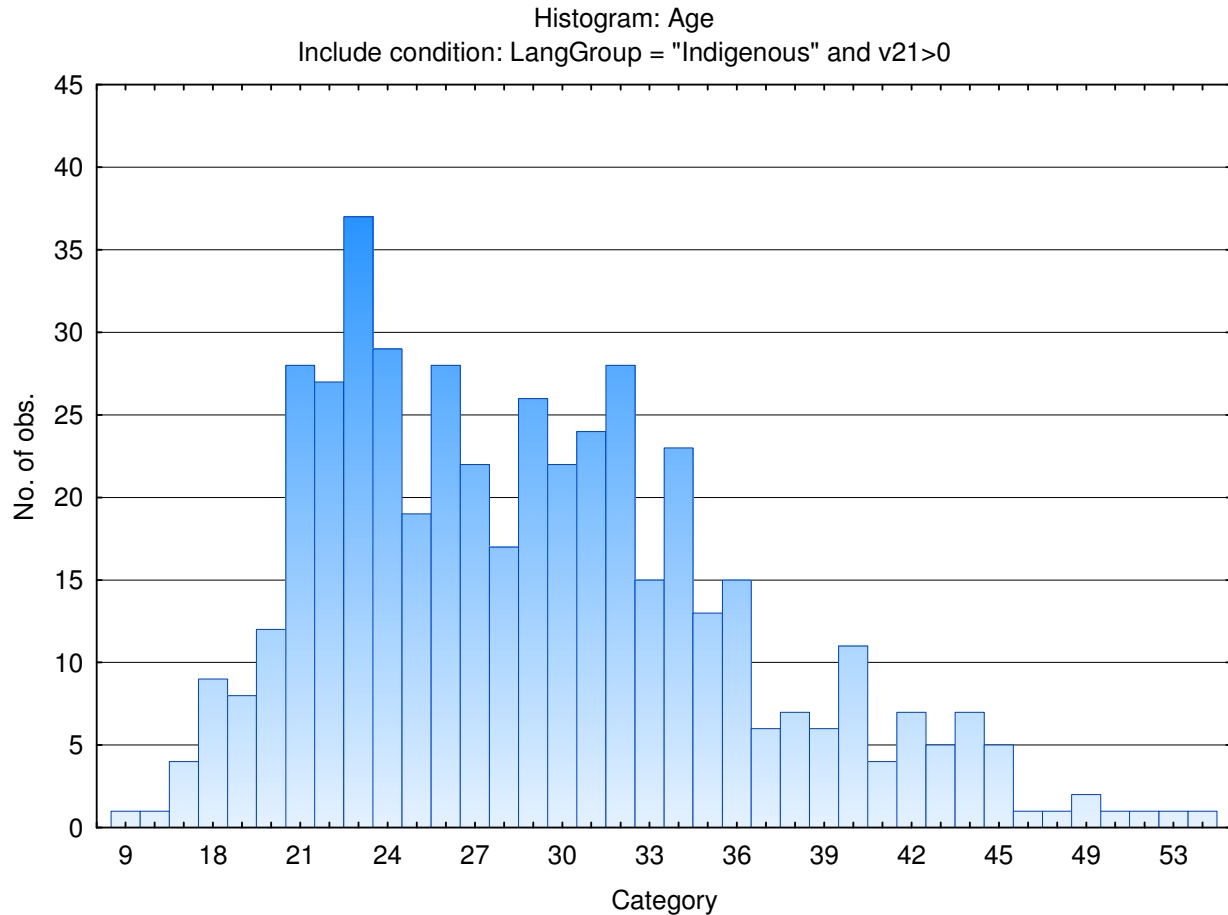
Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	210	210	43.65904	43.6590
M	270	480	56.13306	99.7921
U	1	481	0.20790	100.0000
Missing	0	481	0.00000	100.0000

Category	Frequency table: Education Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	116	116	24.11642	24.1164
Grade 12	99	215	20.58212	44.6985
Diploma	94	309	19.54262	64.2412
<Grade 12	10	319	2.07900	66.3202
Post Graduate	50	369	10.39501	76.7152
Certificate	4	373	0.83160	77.5468
Missing	108	481	22.45322	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
Setswana	58	58	12.05821	12.0582
isiXhosa	206	264	42.82744	54.8857
Xitsonga	13	277	2.70270	57.5884
isiZulu	106	383	22.03742	79.6258
Sesotho	50	433	10.39501	90.0208
Sepedi	23	456	4.78170	94.8025
isiNdebele"	3	459	0.62370	95.4262
Tshivenda	6	465	1.24740	96.6736
siSwati	8	473	1.66320	98.3368
Missing	8	481	1.66320	100.0000

Category	Frequency table: Race Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	3	3	0.62370	0.6237
European	1	4	0.20790	0.8316
African	475	479	98.75260	99.5842
Missing	2	481	0.41580	100.0000

Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	29.00000	7.194078	9.000000	55.00000	474	7

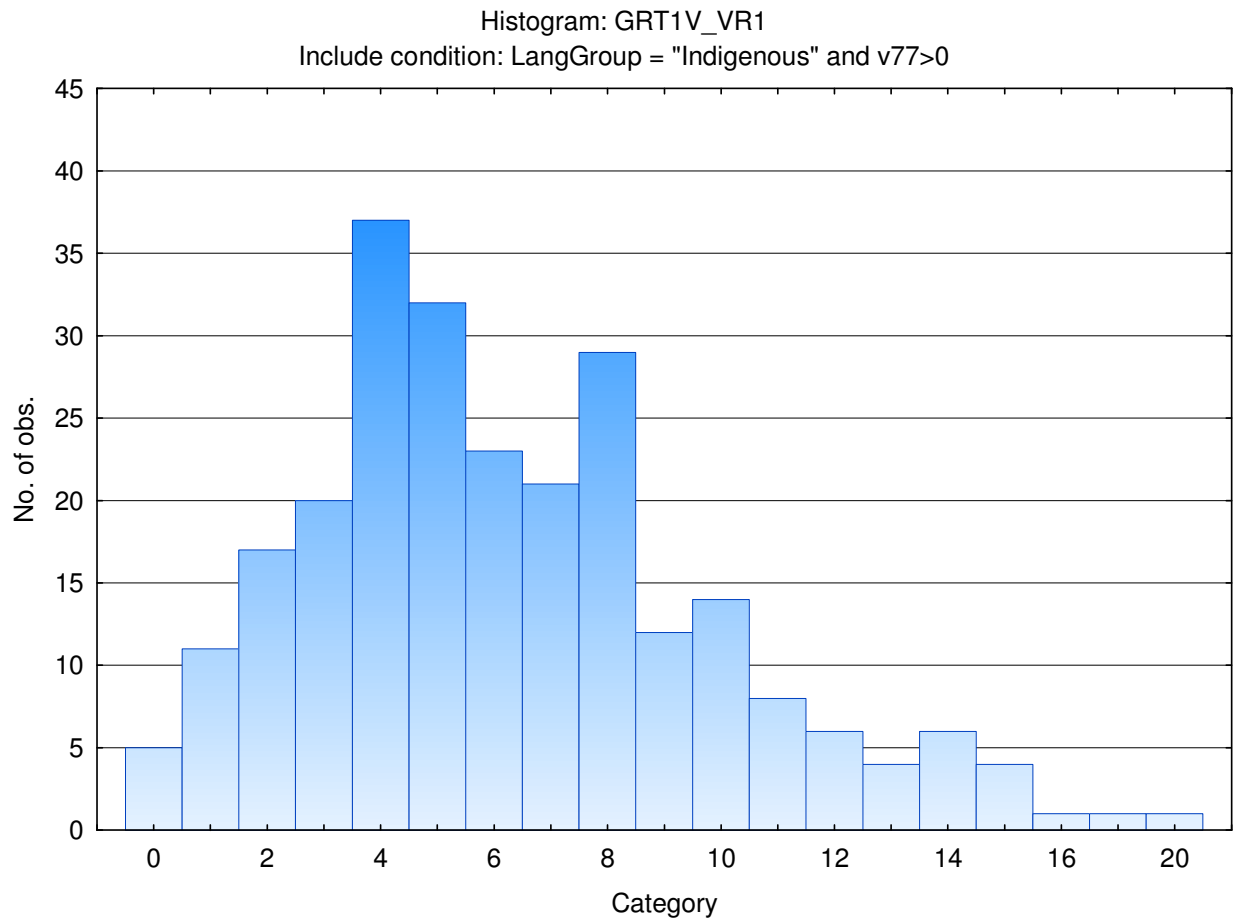


Descriptive statistics on Graduate Reasoning Test Battery subtests

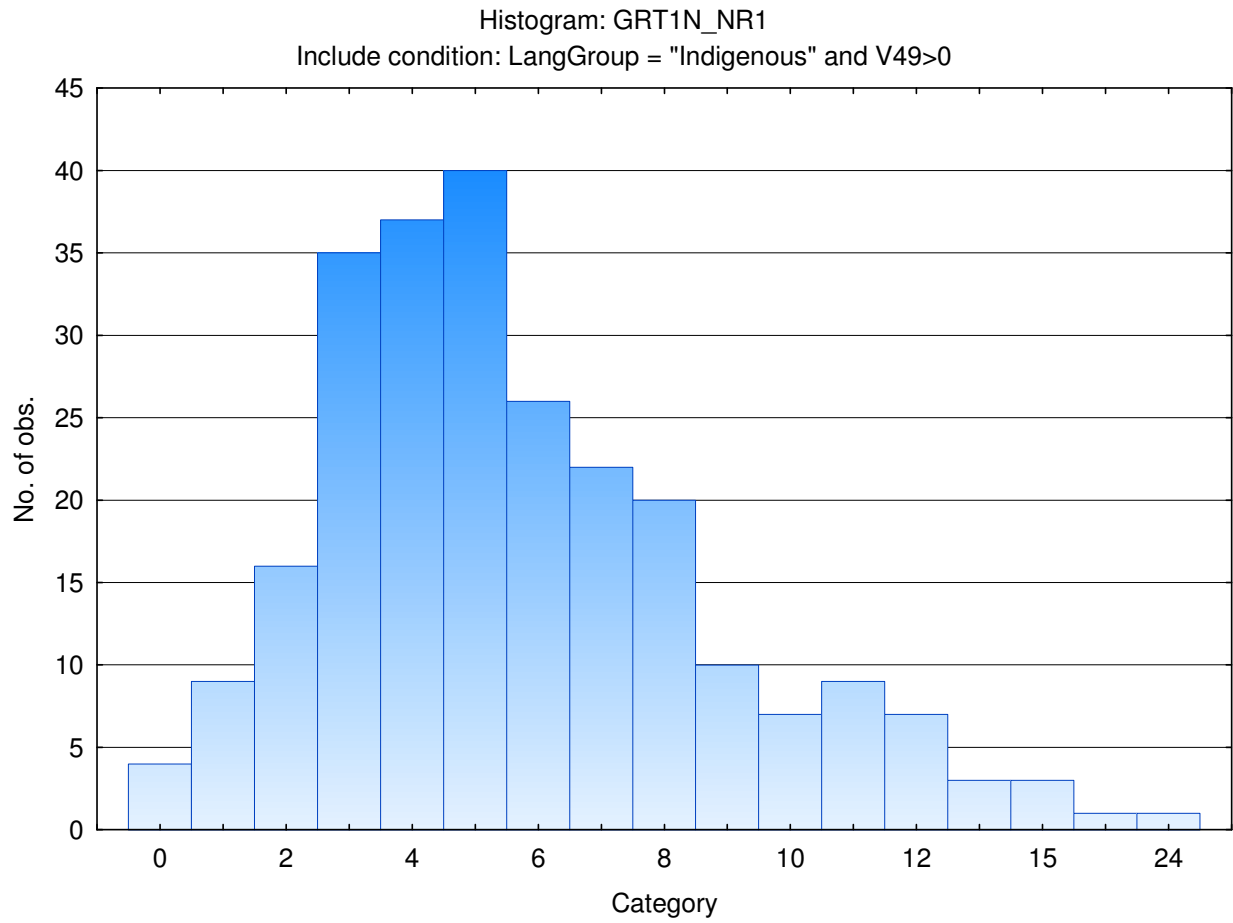
Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Graduate verbal reasoning	6.30556	3.635522	0.000000	20.00000	252	0
Graduate verbal reasoning items attempted	19.13492	5.993826	7.000000	30.00000	252	0
Graduate numerical reasoning	5.72800	3.308444	0.000000	24.00000	250	0
Graduate numerical reasoning items attempted	15.26400	5.396182	2.000000	25.00000	250	0
Graduate abstract reasoning	8.34304	3.370336	0.000000	19.00000	481	0
Graduate abstract reasoning items attempted	19.28690	4.633305	1.000000	25.00000	481	0

Frequency distributions of Graduate Reasoning Test Battery subtests

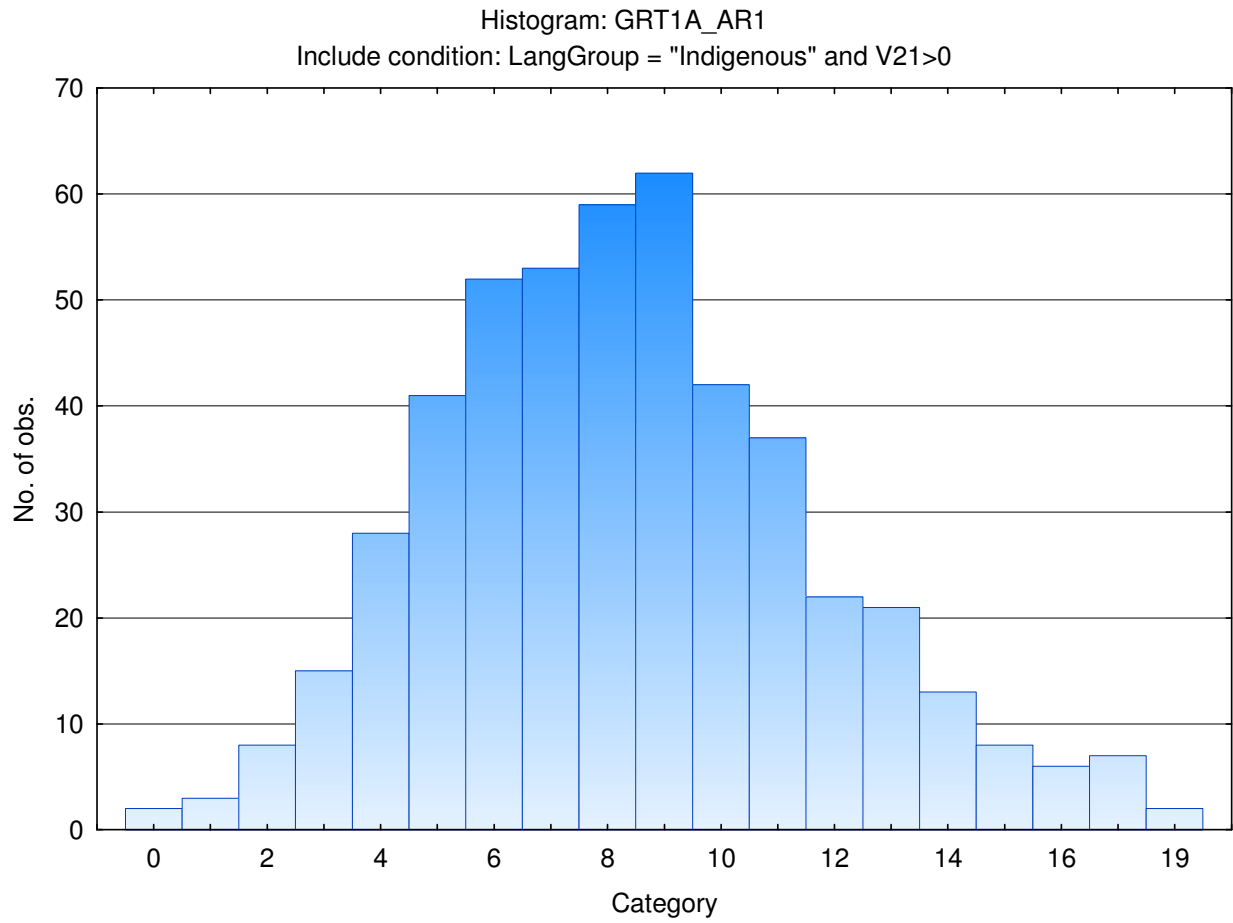
Graduate verbal reasoning



Graduate Numerical Reasoning



Graduate Abstract Reasoning



Stanine table

	S9_1	S9_2	S9_3	S9_4	S9_5	S9_6	S9_7	S9_8	S9_9
Graduate Verbal Reasoning	0--1	0-1	2-3	4-5	6-7	8-9	10-10	11-12	13-20
Graduate Verbal Items Attempted	7-8	9-11	12-14	15-17	18-20	21-23	24-26	27-29	30-30
Graduate Numerical Reasoning	0--1	0-1	2-3	4-4	5-6	7-8	9-9	10-11	12-24
Graduate Numerical Items Attempted	2-5	6-8	9-11	12-13	14-16	17-19	20-22	23-24	25-25
Graduate Abstract Reasoning	0-2	3-4	5-5	6-7	8-9	10-10	11-12	13-14	15-19
Graduate Abstract Items Attempted	1-11	12-13	14-15	16-18	19-20	21-22	23-25		

Graduate Reasoning Test (GRT1)

Norm Group: South Africans, African Race Group, Updated 2012

Norm Type

Standard deviation norm

Graduate Abstract Reasoning Test: Biographical Composition

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	255	255	40.22082	40.2208
M	376	631	59.30599	99.5268
U	3	634	0.47319	100.0000
Missing	0	634	0.00000	100.0000

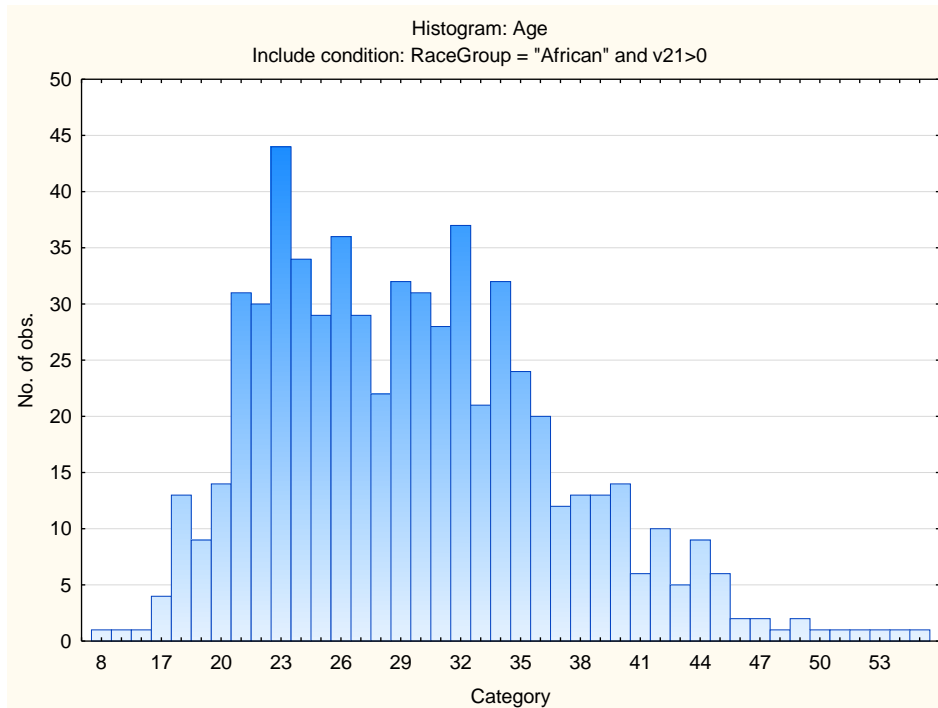
Category	Frequency table: Education			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	169	169	26.65615	26.6562
Grade 12	129	298	20.34700	47.0032
Diploma	108	406	17.03470	64.0379
<Grade 12	13	419	2.05047	66.0883
Post Graduate	65	484	10.25237	76.3407
Certificate	7	491	1.10410	77.4448
Missing	143	634	22.55521	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	82	82	12.93375	12.9338
Afrikaans	5	87	0.78864	13.7224
Setswana	58	145	9.14826	22.8707
isiXhosa	203	348	32.01893	54.8896
Xitsonga	13	361	2.05047	56.9401
isiZulu	104	465	16.40379	73.3438
Sesotho	50	515	7.88644	81.2303
Sepedi	22	537	3.47003	84.7003
isiNdebele"	3	540	0.47319	85.1735
Tshivenda	6	546	0.94637	86.1199
siSwati	8	554	1.26183	87.3817
Missing	80	634	12.61830	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	82	82	12.93375	12.9338
Afrikaans	5	87	0.78864	13.7224
Indigenous	475	562	74.92114	88.6435
Missing	72	634	11.35647	100.0000

Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
African	634	634	100.0000	100.0000
Missing	0	634	0.0000	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	29.54968	7.300527	8.000000	59.00000	624	10



Graduate Numerical Reasoning Test: Biographical Composition

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	152	152	40.10554	40.1055
M	226	378	59.63061	99.7361
U	1	379	0.26385	100.0000
Missing	0	379	0.00000	100.0000

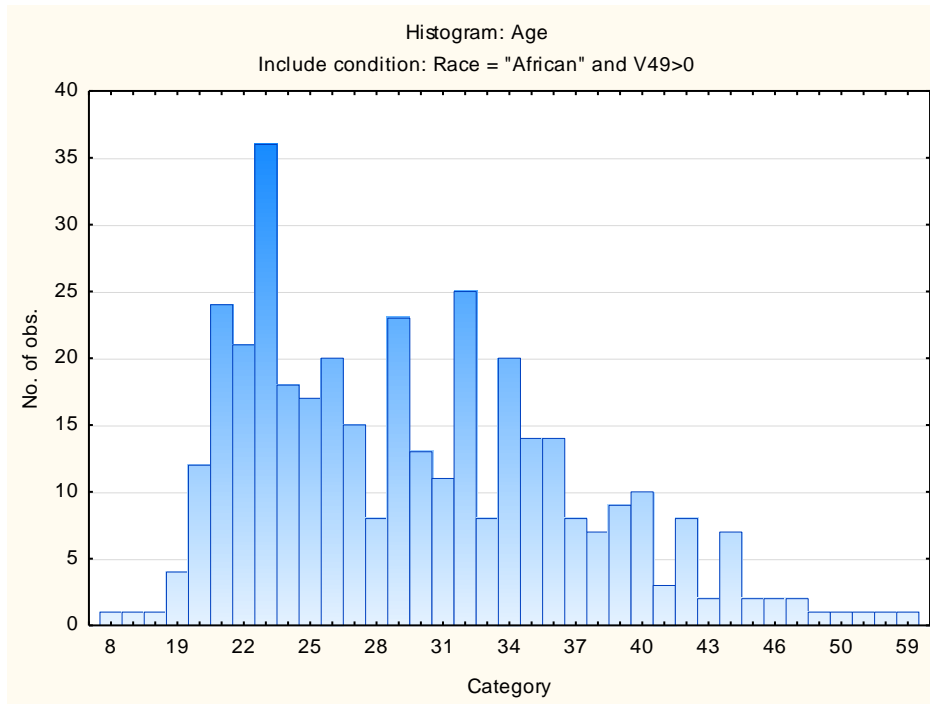
Category	Frequency table: Education			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	122	122	32.18997	32.1900
Grade 12	83	205	21.89974	54.0897
Diploma	37	242	9.76253	63.8522
<Grade 12	9	251	2.37467	66.2269
Post Graduate	39	290	10.29024	76.5172
Certificate	6	296	1.58311	78.1003
Missing	83	379	21.89974	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	74	74	19.52507	19.5251
Afrikaans	5	79	1.31926	20.8443
Setswana	26	105	6.86016	27.7045
isiXhosa	123	228	32.45383	60.1583
Xitsonga	5	233	1.31926	61.4776
isiZulu	46	279	12.13720	73.6148
Sesotho	20	299	5.27704	78.8918
Sepedi	13	312	3.43008	82.3219
isiNdebele"	3	315	0.79156	83.1135
Tshivenda	4	319	1.05541	84.1689
siSwati	3	322	0.79156	84.9604
Missing	57	379	15.03958	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	74	74	19.52507	19.5251
Afrikaans	5	79	1.31926	20.8443
Indigenous	246	325	64.90765	85.7520
Missing	54	379	14.24802	100.0000

Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
African	379	379	100.0000	100.0000
Missing	0	379	0.0000	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	29.62803	7.469337	8.000000	59.00000	371	8



Graduate Verbal Reasoning Test: Biographical Composition

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	152	152	39.68668	39.6867
M	230	382	60.05222	99.7389
U	1	383	0.26110	100.0000
Missing	0	383	0.00000	100.0000

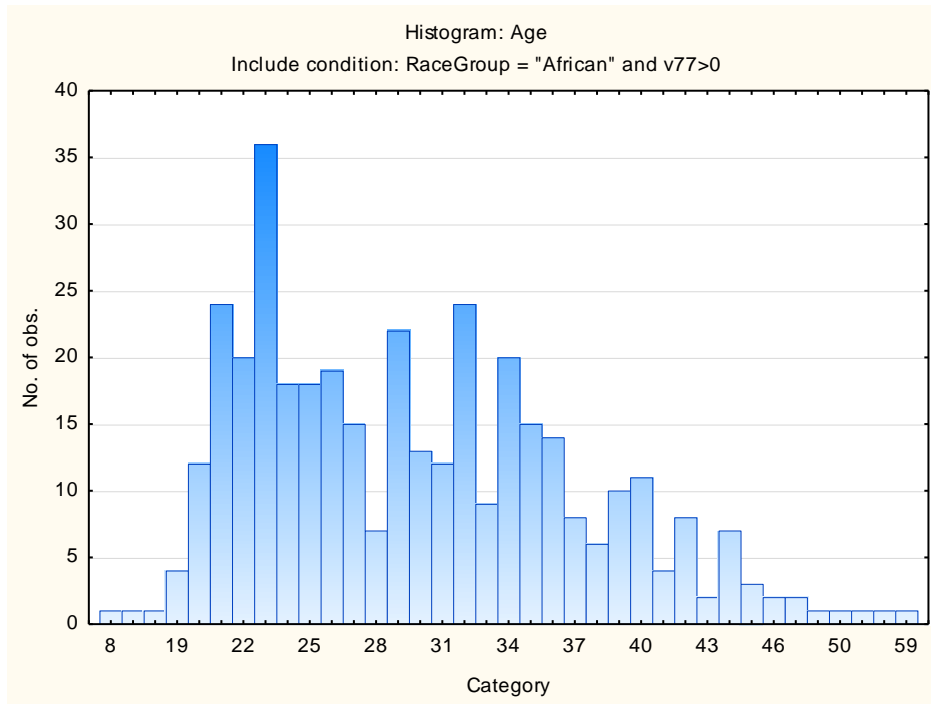
Category	Frequency table: Education			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	129	129	33.68146	33.6815
Grade 12	80	209	20.88773	54.5692
Diploma	37	246	9.66057	64.2298
<Grade 12	9	255	2.34987	66.5796
Post Graduate	40	295	10.44386	77.0235
Certificate	6	301	1.56658	78.5901
Missing	82	383	21.40992	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	74	74	19.32115	19.3211
Afrikaans	5	79	1.30548	20.6266
Setswana	28	107	7.31070	27.9373
isiXhosa	125	232	32.63708	60.5744
Xitsonga	6	238	1.56658	62.1410
isiZulu	41	279	10.70496	72.8460
Sesotho	21	300	5.48303	78.3290
Sepedi	13	313	3.39426	81.7232
isiNdebele"	3	316	0.78329	82.5065
Tshivenda	5	321	1.30548	83.8120
siSwati	3	324	0.78329	84.5953
Missing	59	383	15.40470	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	74	74	19.32115	19.3211
Afrikaans	5	79	1.30548	20.6266
Indigenous	248	327	64.75196	85.3786
Missing	56	383	14.62141	100.0000

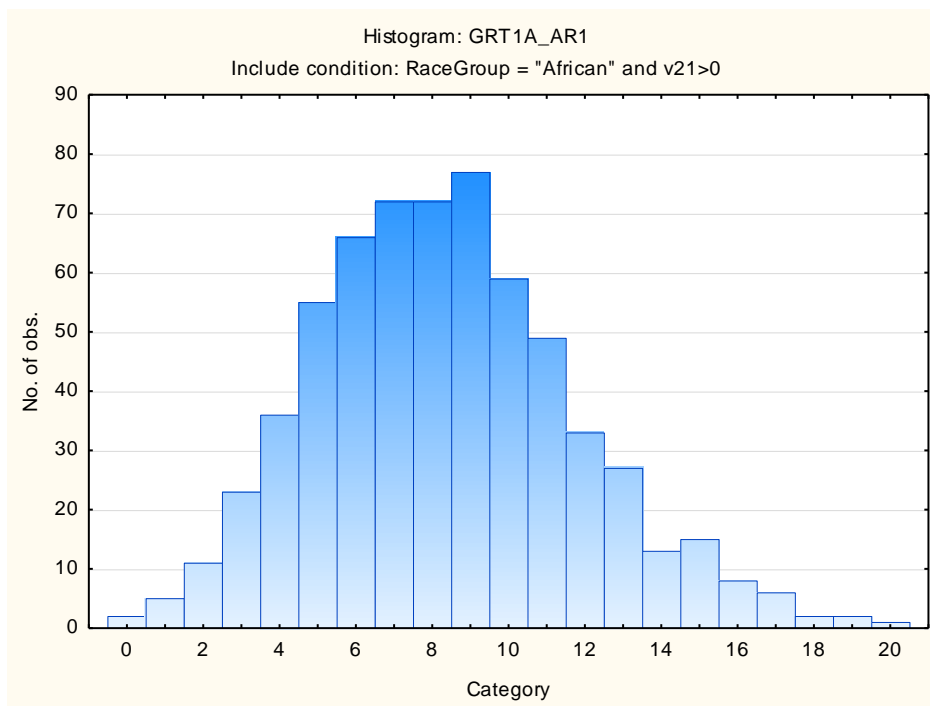
Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
African	383	383	100.0000	100.0000
Missing	0	383	0.0000	100.0000

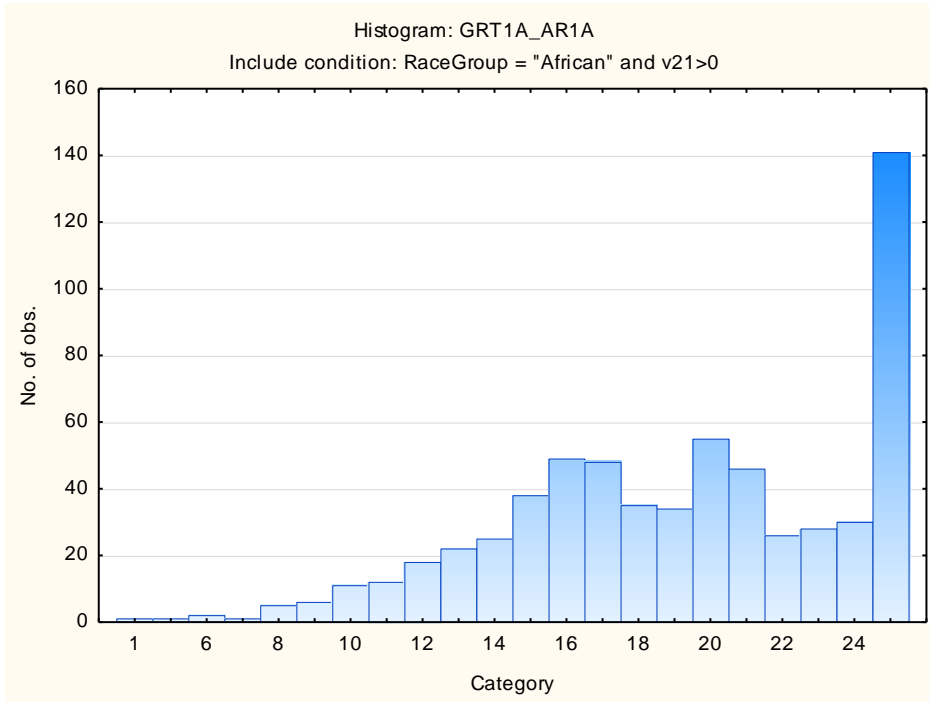
Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	29.77480	7.532918	8.000000	59.00000	373	10



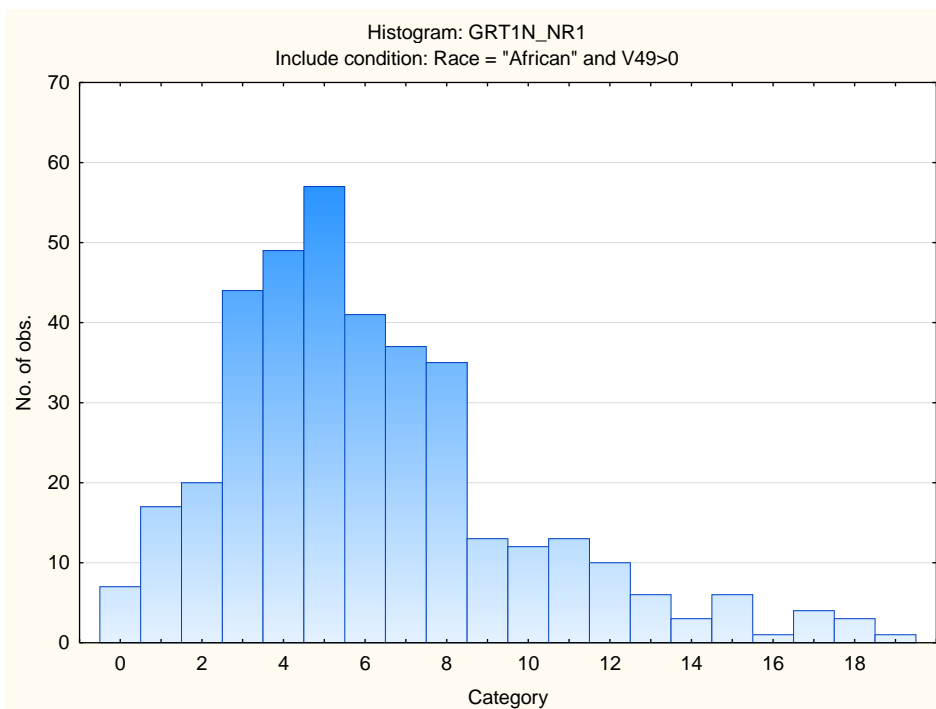
Descriptive Statistics on Graduate Reasoning Test Battery Subtests

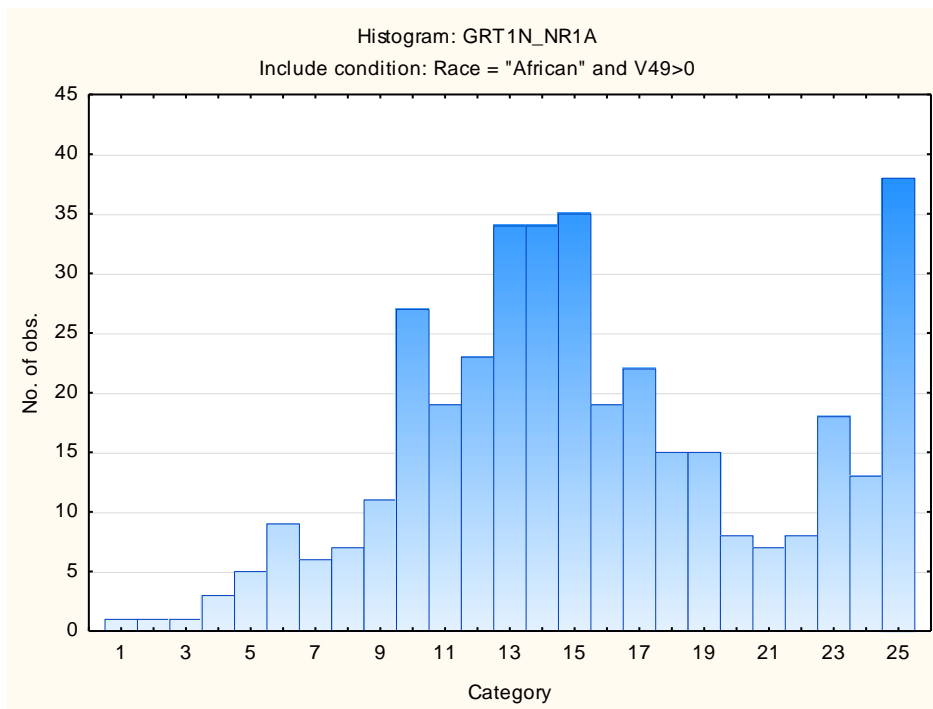
Variable	Descriptive Statistics: Graduate Abstract Reasoning					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
GRT1A_AR1	8.34543	3.423585	0.000000	20.00000	634	0
GRT1A_AR1A	19.21924	4.734086	1.000000	25.00000	634	0



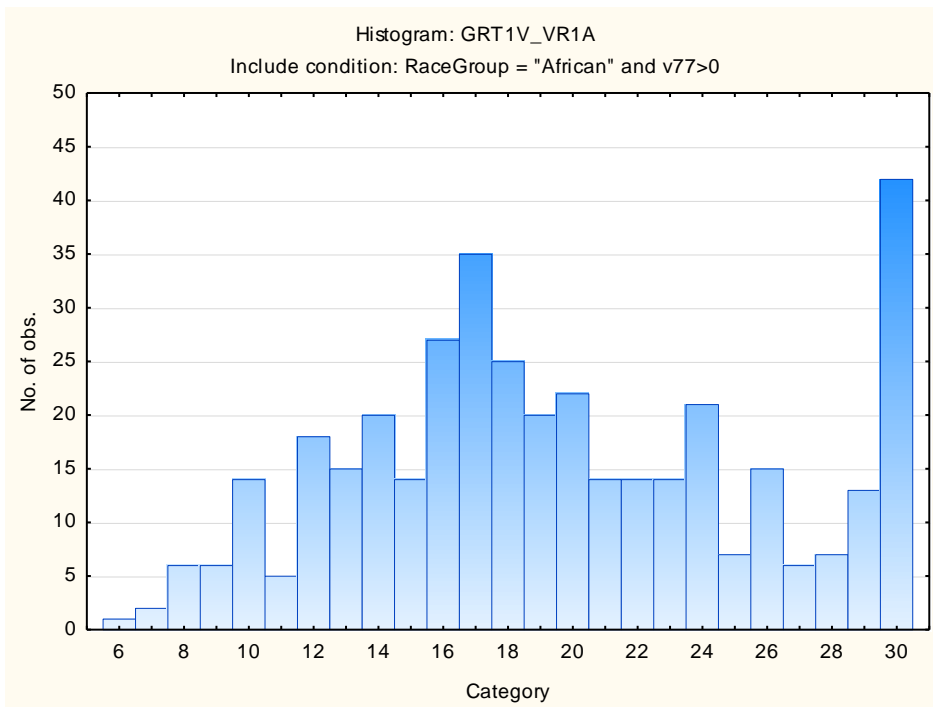
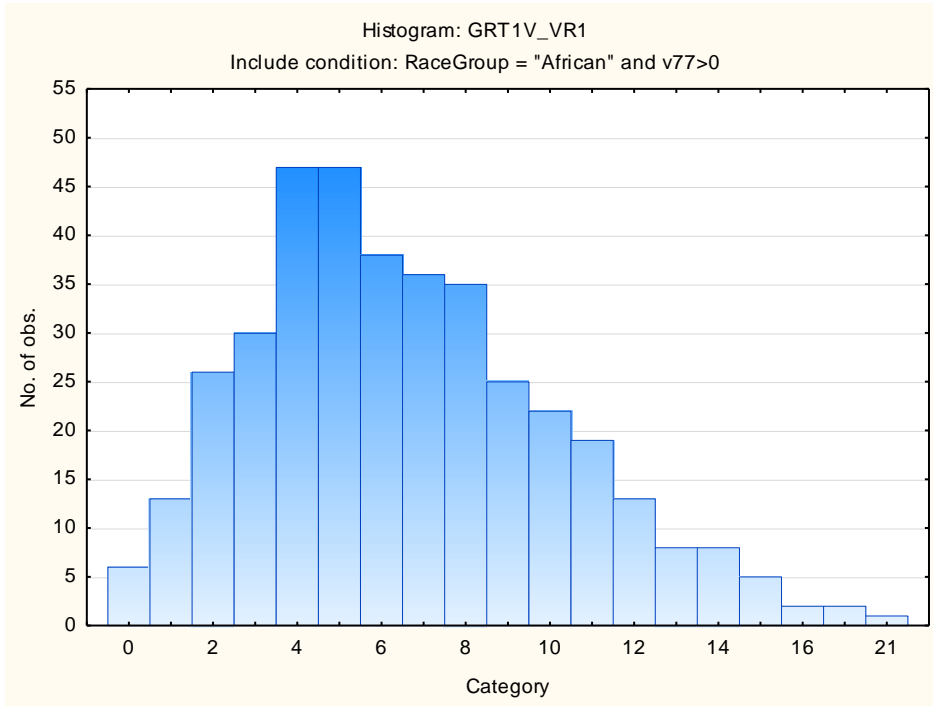


Variable	Descriptive Statistics Graduate Numerical Reasoning					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
GRT1N_NR1	6.12929	3.635024	0.000000	20.00000	379	0
GRT1N_NR1A	15.52507	5.588753	1.000000	25.00000	379	0





Variable	Descriptive Statistics: Graduate Verbal Reasoning					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
GRT1V_VR1	6.61097	3.668542	0.000000	21.00000	383	0
GRT1V_VR1A	19.59008	6.251836	6.000000	30.00000	383	0



Stanine Table

Subtest	S9_1	S9_2	S9_3	S9_4	S9_5	S9_6	S9_7	S9_8	S9_9
Graduate Verbal Reasoning	0-0	1-2	3-3	4-5	6-7	8-9	10-11	12-13	14-21
Graduate Verbal Items Attempted	6-8	9-11	12-14	15-18	19-21	22-24	25-27	28-30	
Graduate Numerical Reasoning	0-1	0-1	2-3	4-5	6-7	8-8	9-10	11-12	13-20
Graduate Numerical Items Attempted	1-5	6-8	9-11	12-14	15-16	17-19	20-22	23-25	
Graduate Abstract Reasoning	0-2	3-4	5-5	6-7	8-9	10-10	11-12	13-14	15-20
Graduate Abstract Items Attempted	1-10	11-13	14-15	16-18	19-20	21-22	23-25		

Graduate Reasoning Test (GRT1)

Norm group: South Africans, Afrikaans Language Group, updated 2012

Norm Type

Standard Deviation Norm

Graduate Abstract Reasoning Test: Biographical Composition

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	72	72	36.36364	36.3636
M	125	197	63.13131	99.4949
U	1	198	0.50505	100.0000
Missing	0	198	0.00000	100.0000

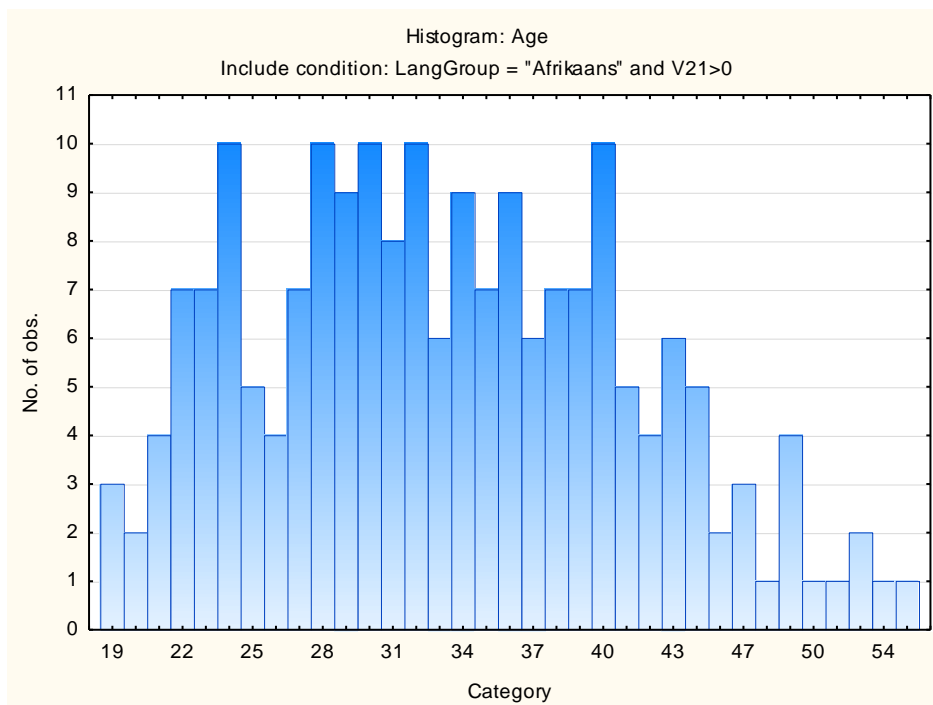
Category	Frequency table: Education			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	31	31	15.65657	15.6566
Grade 12	63	94	31.81818	47.4747
Diploma	28	122	14.14141	61.6162
<Grade 12	8	130	4.04040	65.6566
Post Graduate	32	162	16.16162	81.8182
Certificate	3	165	1.51515	83.3333
Missing	33	198	16.66667	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
Afrikaans	198	198	100.0000	100.0000
Missing	0	198	0.0000	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Afrikaans	198	198	100.0000	100.0000
Missing	0	198	0.0000	100.0000

Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	94	94	47.47475	47.4747
European	88	182	44.44444	91.9192
Asian	1	183	0.50505	92.4242
African	5	188	2.52525	94.9495
Missing	10	198	5.05051	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	33.38342	8.143129	19.00000	59.00000	193	5



Graduate Numerical Reasoning Test: Biographical Composition

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	51	51	32.90323	32.9032
M	103	154	66.45161	99.3548
U	1	155	0.64516	100.0000
Missing	0	155	0.00000	100.0000

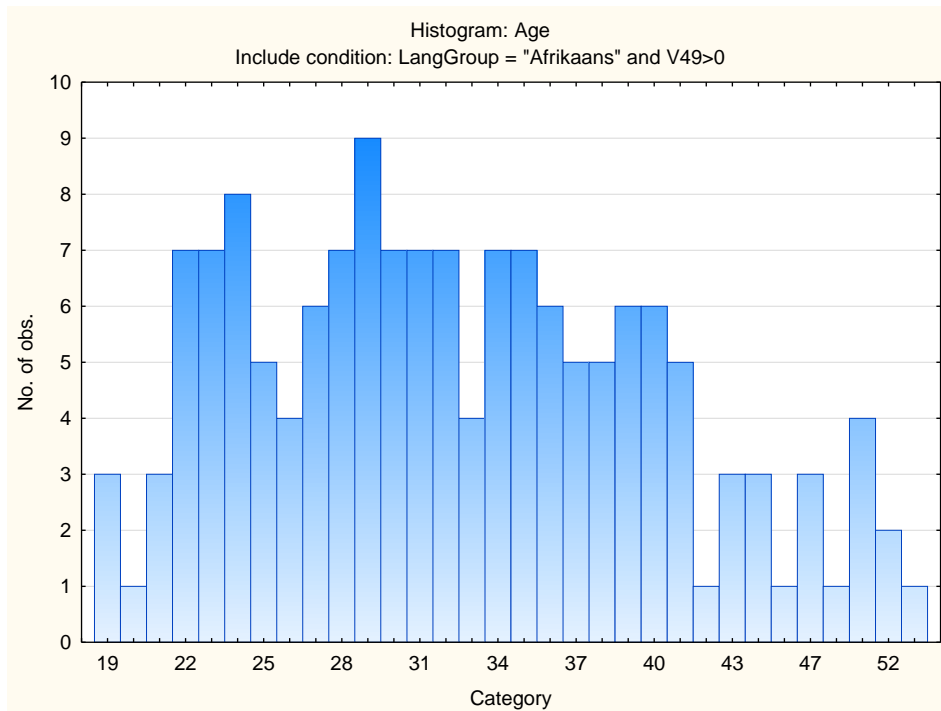
Category	Frequency table: Education			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	21	21	13.54839	13.5484
Grade 12	52	73	33.54839	47.0968
Diploma	17	90	10.96774	58.0645
<Grade 12	8	98	5.16129	63.2258
Post Graduate	28	126	18.06452	81.2903
Certificate	3	129	1.93548	83.2258
Missing	26	155	16.77419	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
Afrikaans	155	155	100.0000	100.0000
Missing	0	155	0.0000	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Afrikaans	155	155	100.0000	100.0000
Missing	0	155	0.0000	100.0000

Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	79	79	50.96774	50.9677
European	61	140	39.35484	90.3226
Asian	1	141	0.64516	90.9677
African	5	146	3.22581	94.1935
Missing	9	155	5.80645	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	32.63576	8.076702	19.00000	59.00000	151	4



Graduate Verbal Reasoning Test: Biographical Composition

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	52	52	33.33333	33.3333
M	103	155	66.02564	99.3590
U	1	156	0.64103	100.0000
Missing	0	156	0.00000	100.0000

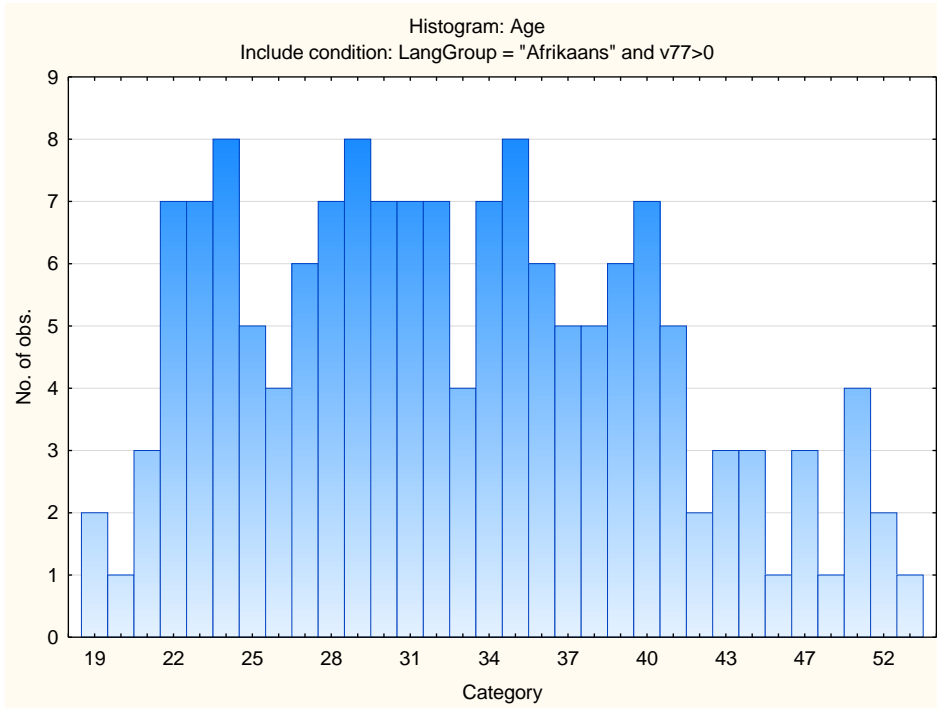
Category	Frequency table: Education			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	24	24	15.38462	15.3846
Grade 12	51	75	32.69231	48.0769
Diploma	18	93	11.53846	59.6154
<Grade 12	8	101	5.12821	64.7436
Post Graduate	28	129	17.94872	82.6923
Certificate	3	132	1.92308	84.6154
Missing	24	156	15.38462	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
Afrikaans	156	156	100.0000	100.0000
Missing	0	156	0.0000	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Afrikaans	156	156	100.0000	100.0000
Missing	0	156	0.0000	100.0000

Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	80	80	51.28205	51.2821
European	61	141	39.10256	90.3846
Asian	1	142	0.64103	91.0256
African	5	147	3.20513	94.2308
Missing	9	156	5.76923	100.0000

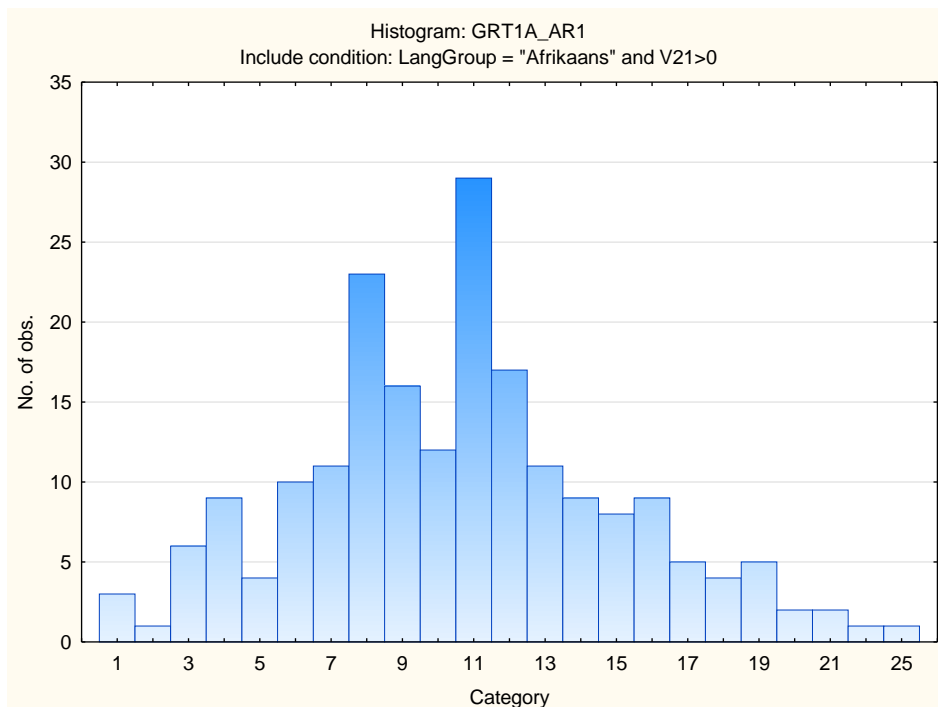
Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	32.87500	8.025054	19.00000	59.00000	152	4

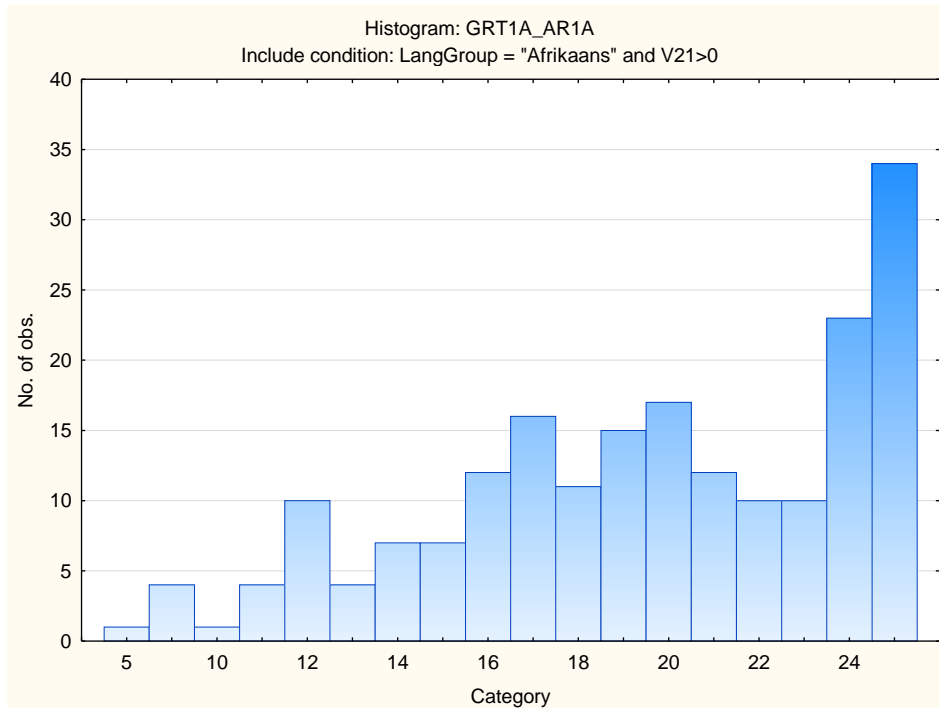


Descriptive Statistics and Frequency Distributions on Graduate Reasoning Test Battery Subtests

Graduate Abstract Reasoning Test

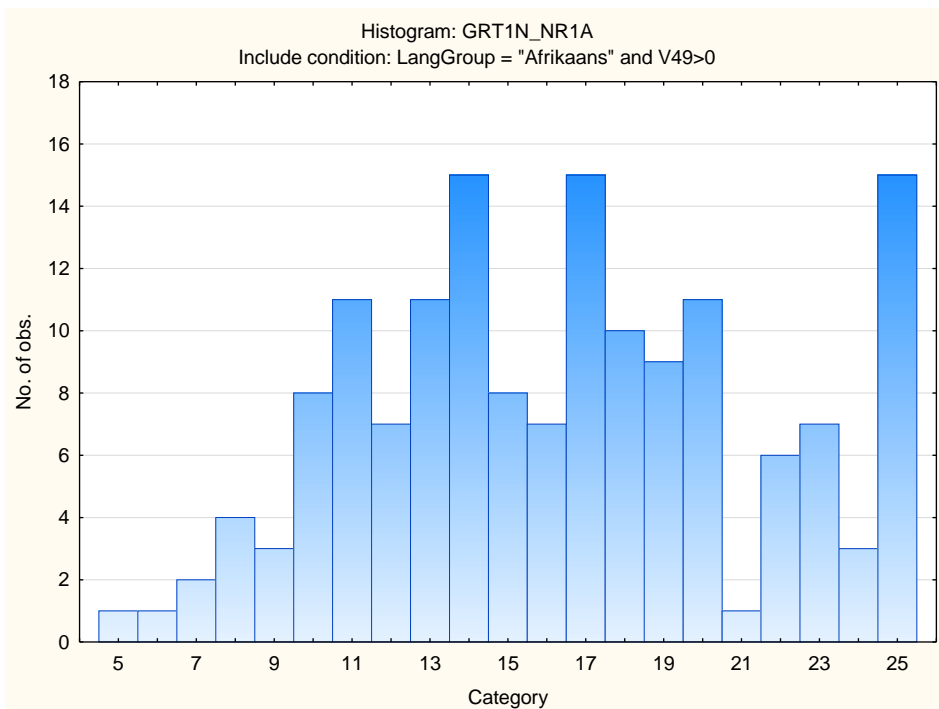
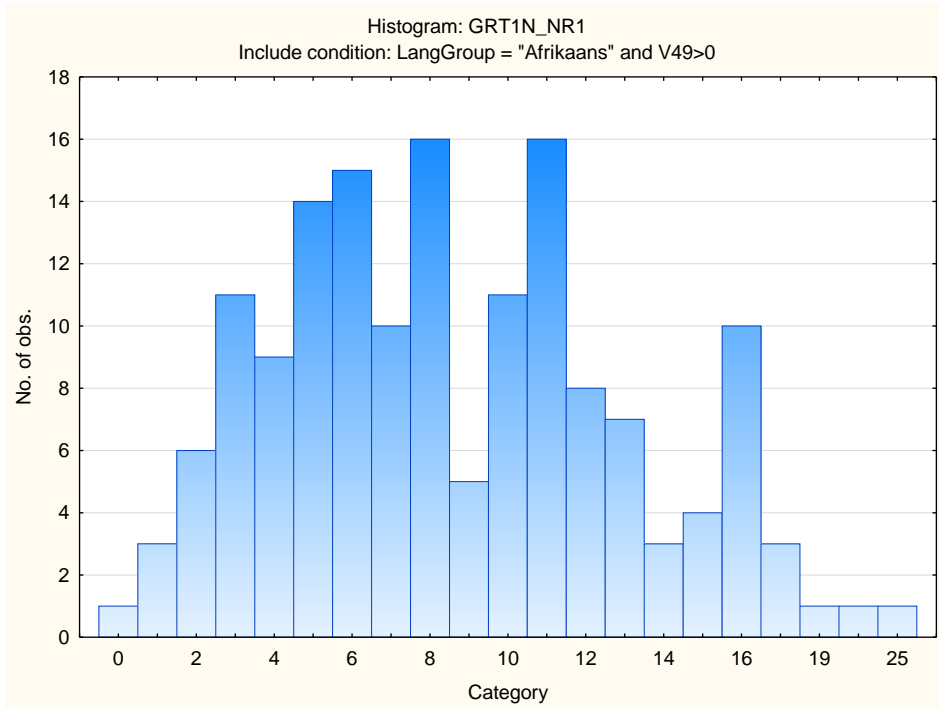
Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
GRT1A_AR1	10.61616	4.462380	1.000000	25.00000	198	0
GRT1A_AR1A	19.50000	4.562872	5.000000	25.00000	198	0





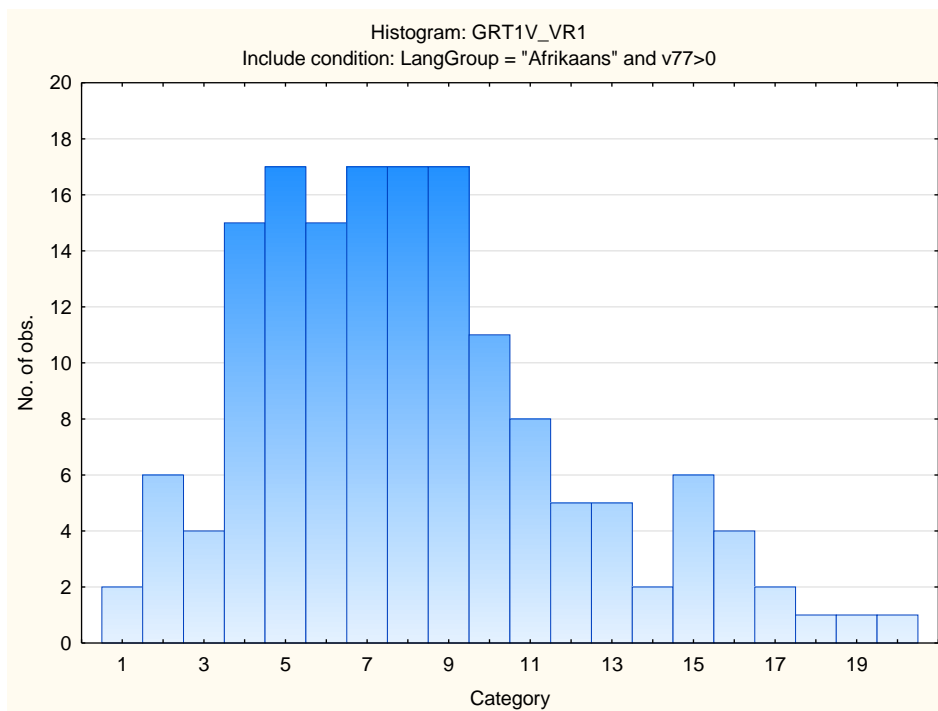
Graduate Numerical Reasoning Test

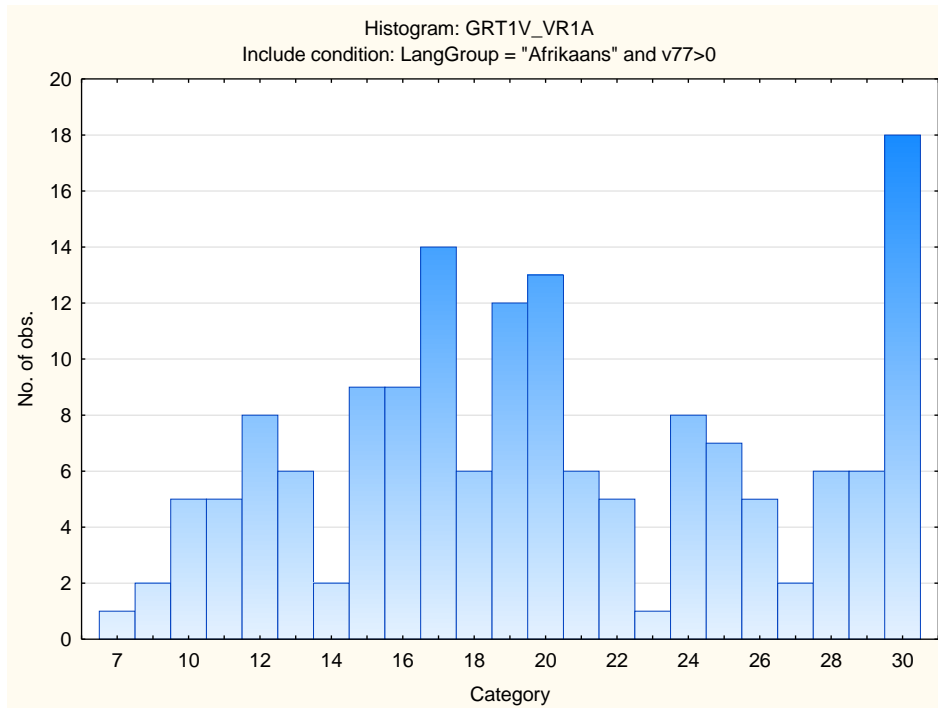
Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
GRT1N_NR1	8.65161	4.646733	0.000000	25.00000	155	0
GRT1N_NR1A	16.39355	5.036873	5.000000	25.00000	155	0



Graduate Verbal Reasoning Test

Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
GRT1V_VR1	8.10897	3.909581	1.000000	20.00000	156	0
GRT1V_VR1A	20.10897	6.226451	7.000000	30.00000	156	0





Stanine Table

Subtest	S9_1	S9_2	S9_3	S9_4	S9_5	S9_6	S9_7	S9_8	S9_9
Graduate Verbal Reasoning	1-1	2-3	4-5	6-7	8-9	10-11	12-12	13-14	15-20
Graduate Verbal Items Attempted	7-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30	
Graduate Numerical Reasoning	0-0	1-2	3-5	6-7	8-9	10-12	13-14	15-16	17-25
Graduate Numerical Items Attempted	5-7	8-10	11-12	13-15	16-17	18-20	21-22	23-25	
Graduate Abstract Reasoning	1-2	3-5	6-7	8-9	10-11	12-13	14-16	17-18	19-25
Graduate Abstract Items Attempted	5-11	12-13	14-16	17-18	19-20	21-22	23-25		

Graduate Reasoning Test (GRT1)

Norm group: South Africans, isiXhosa speaking, updated 2012

Norm Type

Standard Deviation Norm

Graduate Abstract Reasoning Test: Biographical Composition

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	60	60	39.47368	39.4737
M	92	152	60.52632	100.0000
Missing	0	152	0.00000	100.0000

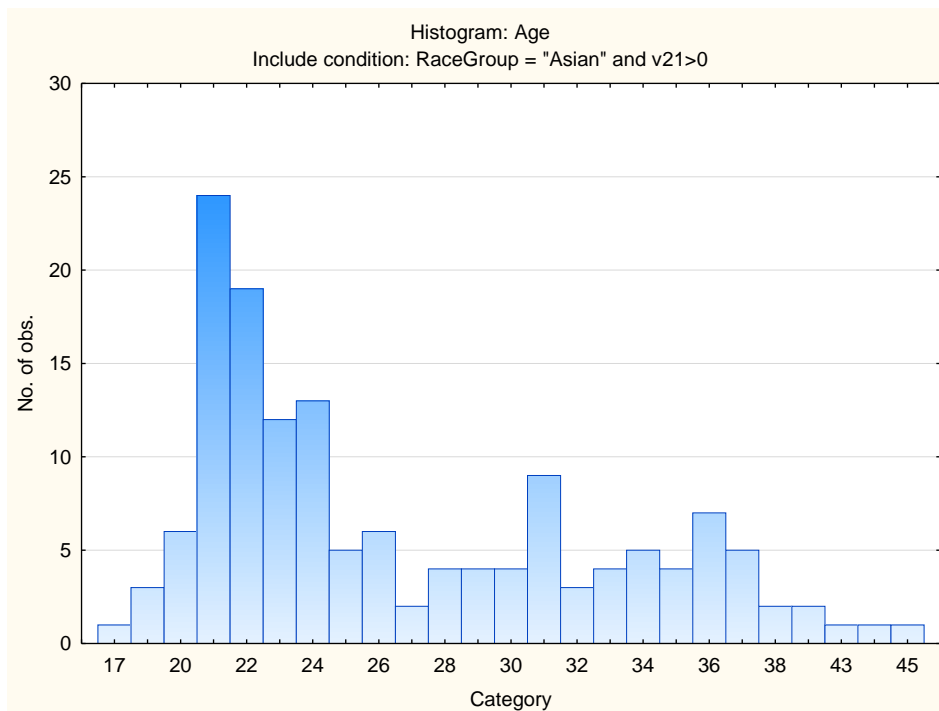
Category	Frequency table: Education			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	53	53	34.86842	34.8684
Grade 12	17	70	11.18421	46.0526
Diploma	16	86	10.52632	56.5789
<Grade 12	3	89	1.97368	58.5526
Post Graduate	28	117	18.42105	76.9737
Certificate	6	123	3.94737	80.9211
Missing	29	152	19.07895	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	102	102	67.10526	67.1053
Afrikaans	1	103	0.65789	67.7632
Missing	49	152	32.23684	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	102	102	67.10526	67.1053
Afrikaans	1	103	0.65789	67.7632
Missing	49	152	32.23684	100.0000

Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
Asian	152	152	100.0000	100.0000
Missing	0	152	0.0000	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	26.74150	6.270270	17.00000	45.00000	147	5



Graduate Numerical Reasoning Test: Biographical Composition

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	54	54	42.85714	42.8571
M	72	126	57.14286	100.0000
Missing	0	126	0.00000	100.0000

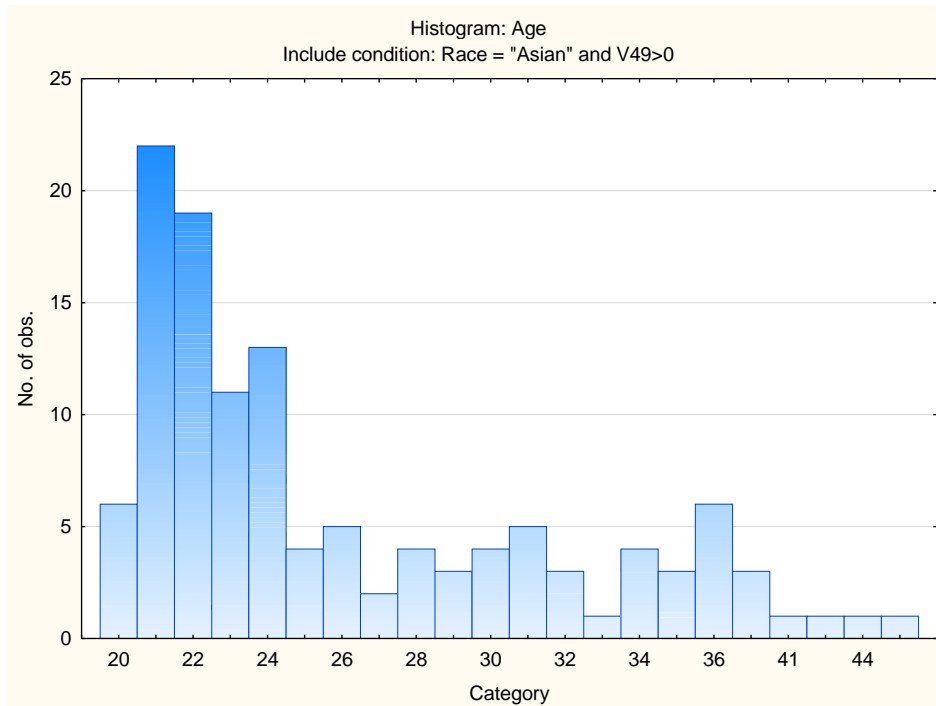
Category	Frequency table: Education			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	46	46	36.50794	36.5079
Grade 12	15	61	11.90476	48.4127
Diploma	10	71	7.93651	56.3492
<Grade 12	2	73	1.58730	57.9365
Post Graduate	27	100	21.42857	79.3651
Certificate	5	105	3.96825	83.3333
Missing	21	126	16.66667	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	78	78	61.90476	61.9048
Afrikaans	1	79	0.79365	62.6984
Missing	47	126	37.30159	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	78	78	61.90476	61.9048
Afrikaans	1	79	0.79365	62.6984
Missing	47	126	37.30159	100.0000

Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
Asian	126	126	100.0000	100.0000
Missing	0	126	0.0000	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	26.17213	5.942830	20.00000	45.00000	122	4



Graduate Verbal Reasoning Test: Biographical Composition

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	54	54	42.85714	42.8571
M	72	126	57.14286	100.0000
Missing	0	126	0.00000	100.0000

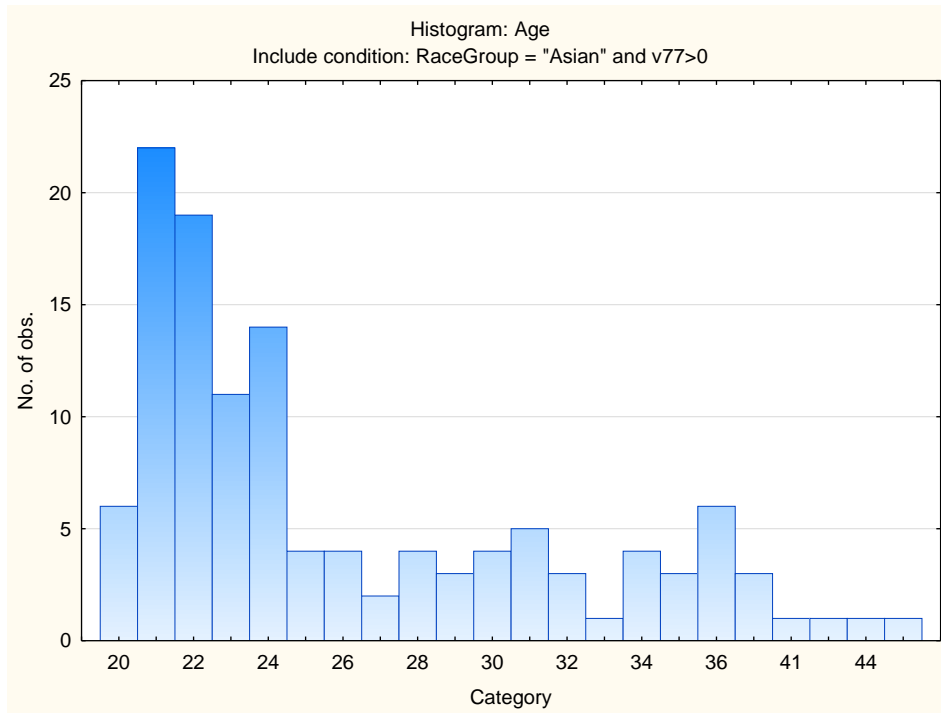
Category	Frequency table: Education			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	46	46	36.50794	36.5079
Grade 12	15	61	11.90476	48.4127
Diploma	10	71	7.93651	56.3492
<Grade 12	2	73	1.58730	57.9365
Post Graduate	28	101	22.22222	80.1587
Certificate	5	106	3.96825	84.1270
Missing	20	126	15.87302	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	78	78	61.90476	61.9048
Afrikaans	1	79	0.79365	62.6984
Missing	47	126	37.30159	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	78	78	61.90476	61.9048
Afrikaans	1	79	0.79365	62.6984
Missing	47	126	37.30159	100.0000

Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
Asian	126	126	100.0000	100.0000
Missing	0	126	0.0000	100.0000

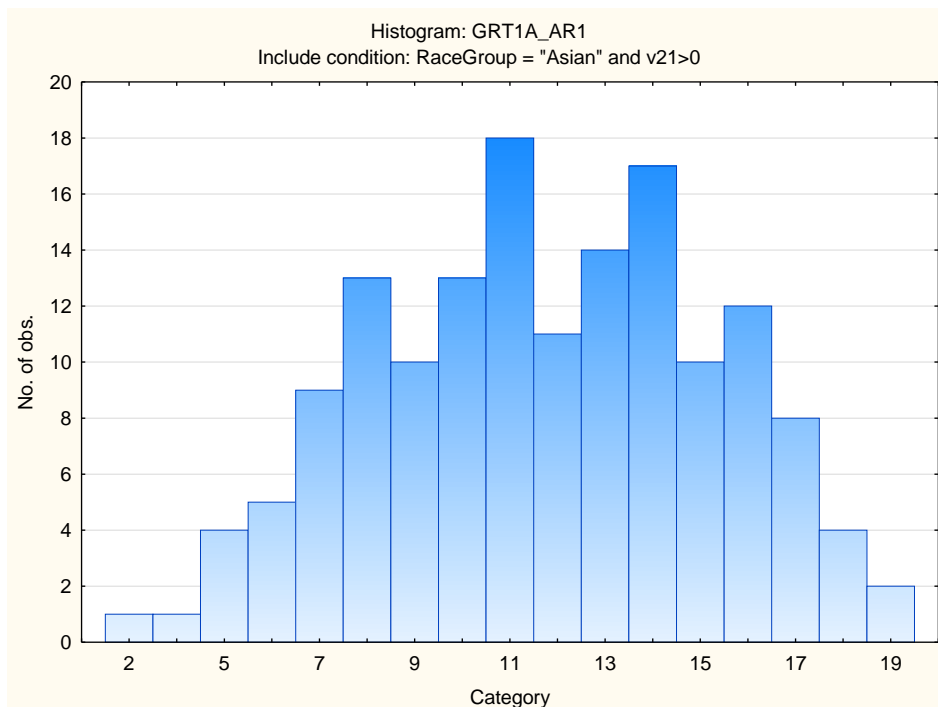
Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	26.15574	5.946067	20.00000	45.00000	122	4

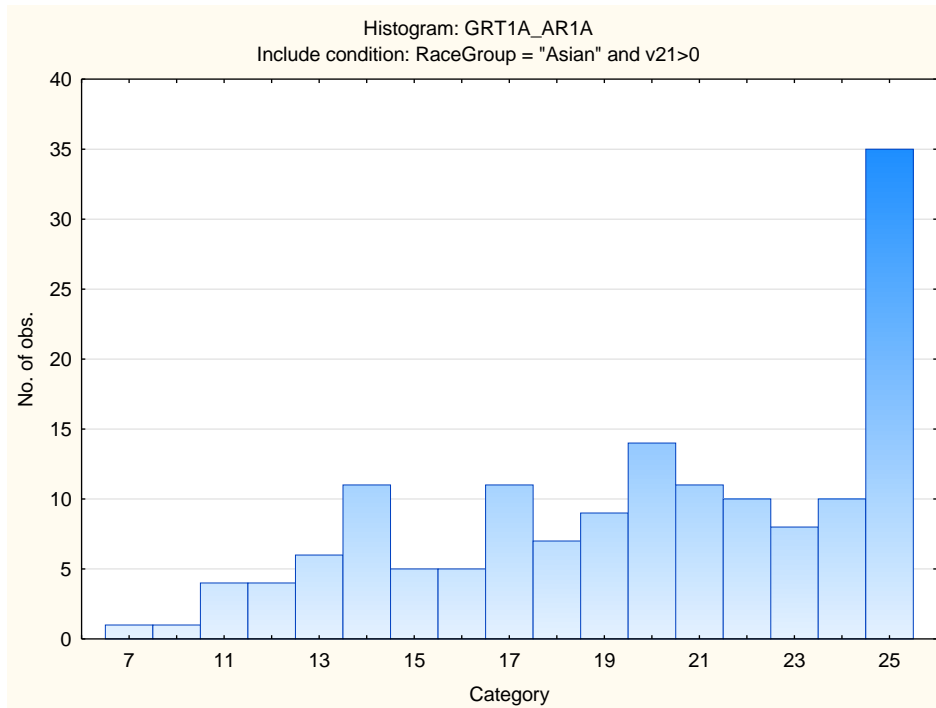


Descriptive Statistics and Frequency Distributions on Graduate Reasoning Test Battery Subtests

Graduate Abstract Reasoning Test

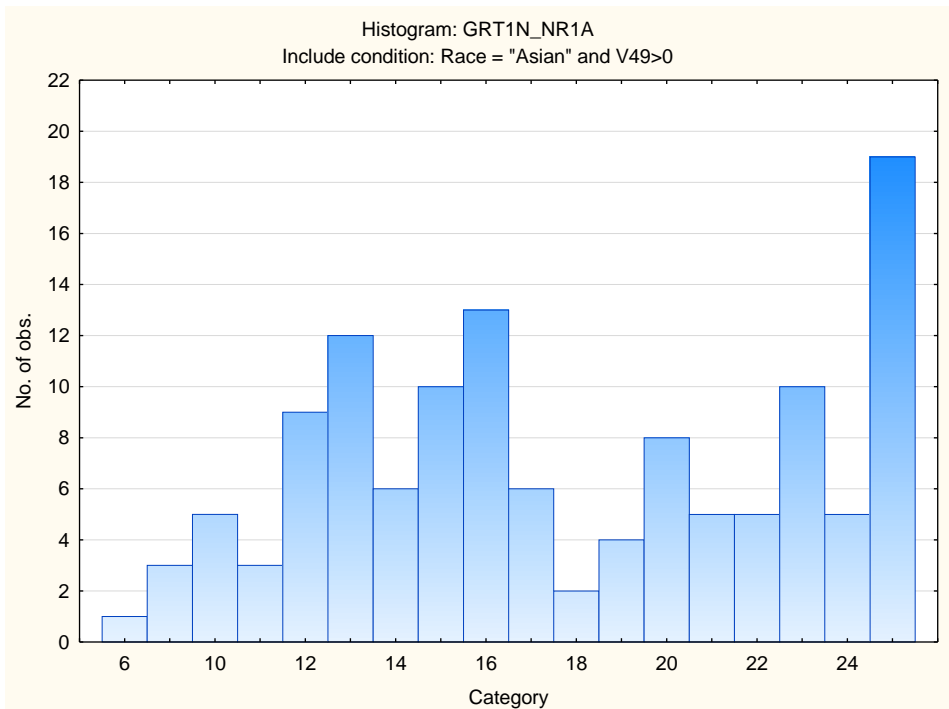
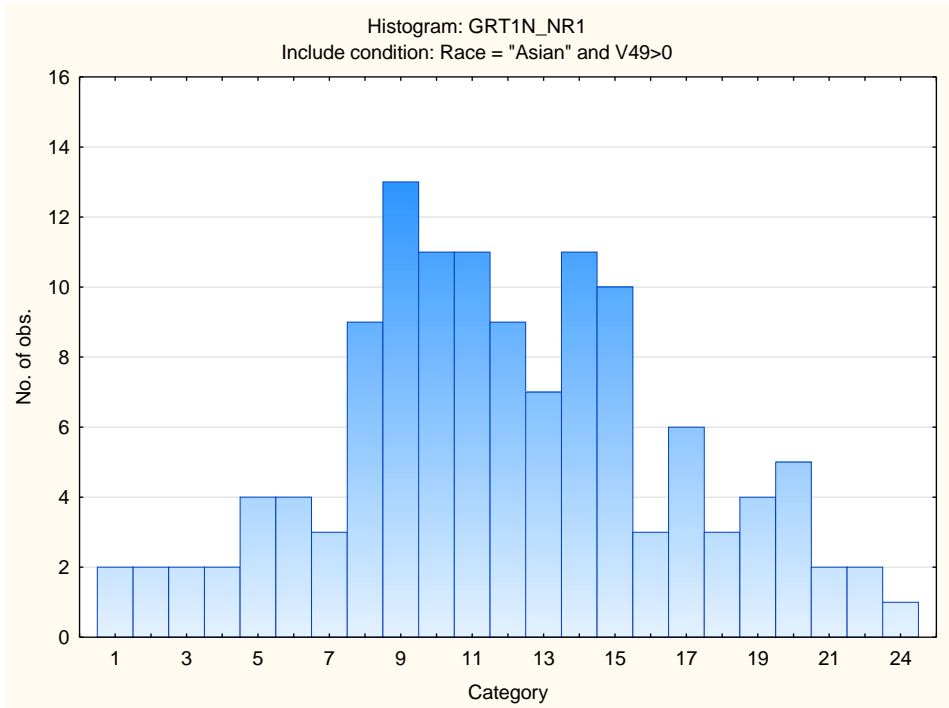
Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
GRT1A_AR1	11.71053	3.587380	2.000000	19.00000	152	0
GRT1A_AR1A	19.79605	4.496266	7.000000	25.00000	152	0





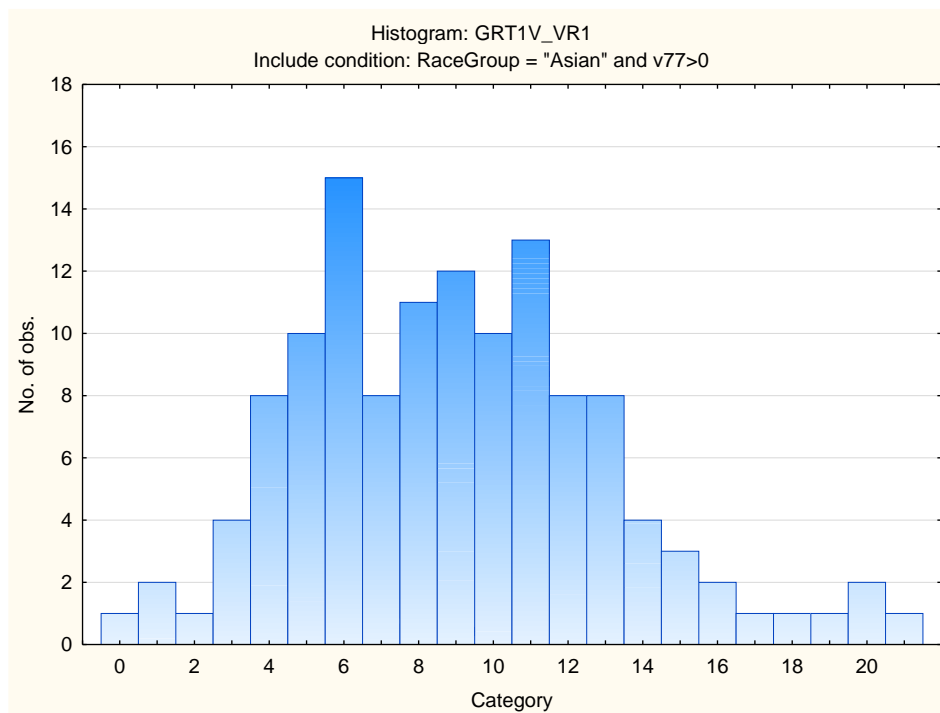
Graduate Numerical Reasoning Test

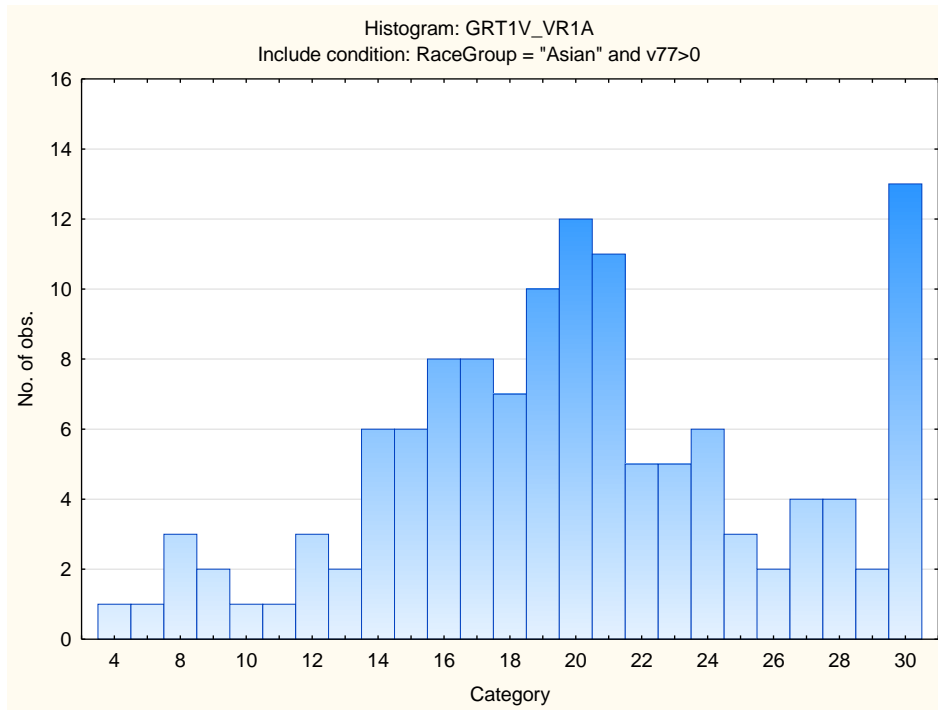
Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
GRT1N_NR1	11.88889	4.841855	1.000000	24.00000	126	0
GRT1N_NR1A	17.74603	5.087925	6.000000	25.00000	126	0



Graduate Verbal Reasoning Test

Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
GRT1V_VR1	8.97619	4.136596	0.000000	21.00000	126	0
GRT1V_VR1A	20.03175	5.955752	4.000000	30.00000	126	0





Stanine table

Subtests	S9_1	S9_2	S9_3	S9_4	S9_5	S9_6	S9_7	S9_8	S9_9
Graduate Verbal Reasoning	0-1	2-3	4-5	6-7	8-10	11-12	13-14	15-16	17-21
Graduate Verbal Items Attempted	4-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30	
Graduate Numerical Reasoning	1-3	4-5	6-8	9-10	11-13	14-15	16-17	18-20	21-24
Graduate Numerical Items Attempted	6-8	9-11	12-13	14-16	17-19	20-21	22-24	25-25	
Graduate Abstract Reasoning	2-5	6-7	8-9	10-10	11-12	13-14	15-16	17-17	18-19
Graduate Abstract Items Attempted	7-11	12-14	15-16	17-18	19-20	21-23	24-25		

Graduate Reasoning Test (GRT1)

Norm group: South Africans, Coloured Language Group, updated 2012

Norm Type

Standard Deviation Norm

Graduate Abstract Reasoning Test: Biographical Composition

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	140	140	38.46154	38.4615
M	223	363	61.26374	99.7253
U	1	364	0.27473	100.0000
Missing	0	364	0.00000	100.0000

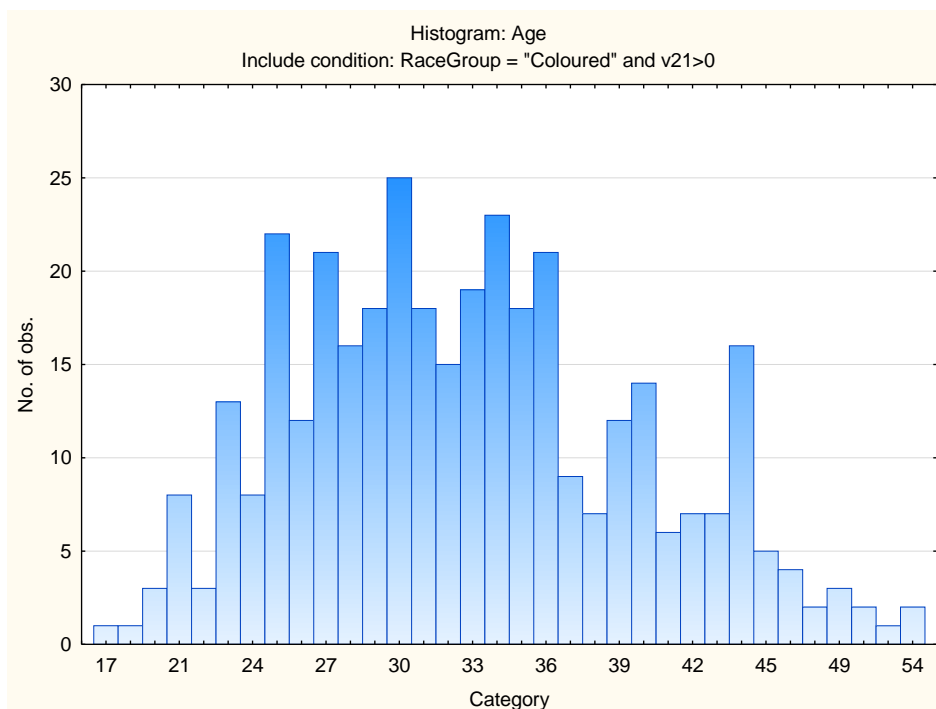
Category	Frequency table: Education			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	55	55	15.10989	15.1099
Grade 12	151	206	41.48352	56.5934
Diploma	45	251	12.36264	68.9560
<Grade 12	36	287	9.89011	78.8462
Post Graduate	29	316	7.96703	86.8132
Certificate	11	327	3.02198	89.8352
Missing	37	364	10.16484	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	241	241	66.20879	66.2088
Afrikaans	94	335	25.82418	92.0330
isiXhosa	2	337	0.54945	92.5824
isiZulu	1	338	0.27473	92.8571
Missing	26	364	7.14286	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	241	241	66.20879	66.2088
Afrikaans	94	335	25.82418	92.0330
Indigenous	3	338	0.82418	92.8571
Missing	26	364	7.14286	100.0000

Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	364	364	100.0000	100.0000
Missing	0	364	0.0000	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	32.83702	7.045437	17.00000	54.00000	362	2



Graduate Numerical Reasoning Test: Biographical Composition

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	131	131	38.30409	38.3041
M	210	341	61.40351	99.7076
U	1	342	0.29240	100.0000
Missing	0	342	0.00000	100.0000

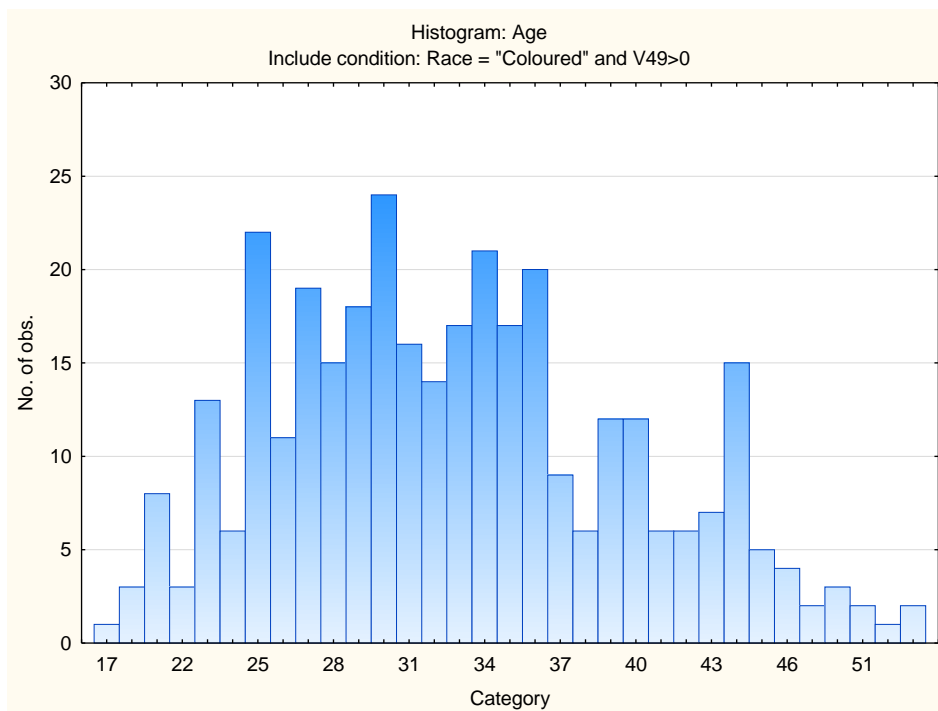
Category	Frequency table: Education			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	49	49	14.32749	14.3275
Grade 12	145	194	42.39766	56.7251
Diploma	41	235	11.98830	68.7135
<Grade 12	36	271	10.52632	79.2398
Post Graduate	27	298	7.89474	87.1345
Certificate	11	309	3.21637	90.3509
Missing	33	342	9.64912	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	234	234	68.42105	68.4211
Afrikaans	79	313	23.09942	91.5205
isiXhosa	2	315	0.58480	92.1053
isiZulu	1	316	0.29240	92.3977
Missing	26	342	7.60234	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	234	234	68.42105	68.4211
Afrikaans	79	313	23.09942	91.5205
Indigenous	3	316	0.87719	92.3977
Missing	26	342	7.60234	100.0000

Category	Frequency table: Race Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	342	342	100.0000	100.0000
Missing	0	342	0.0000	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	32.87941	7.094403	17.00000	54.00000	340	2



Graduate Verbal Reasoning Test: Biographical Composition

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	131	131	38.19242	38.1924
M	211	342	61.51603	99.7085
U	1	343	0.29155	100.0000
Missing	0	343	0.00000	100.0000

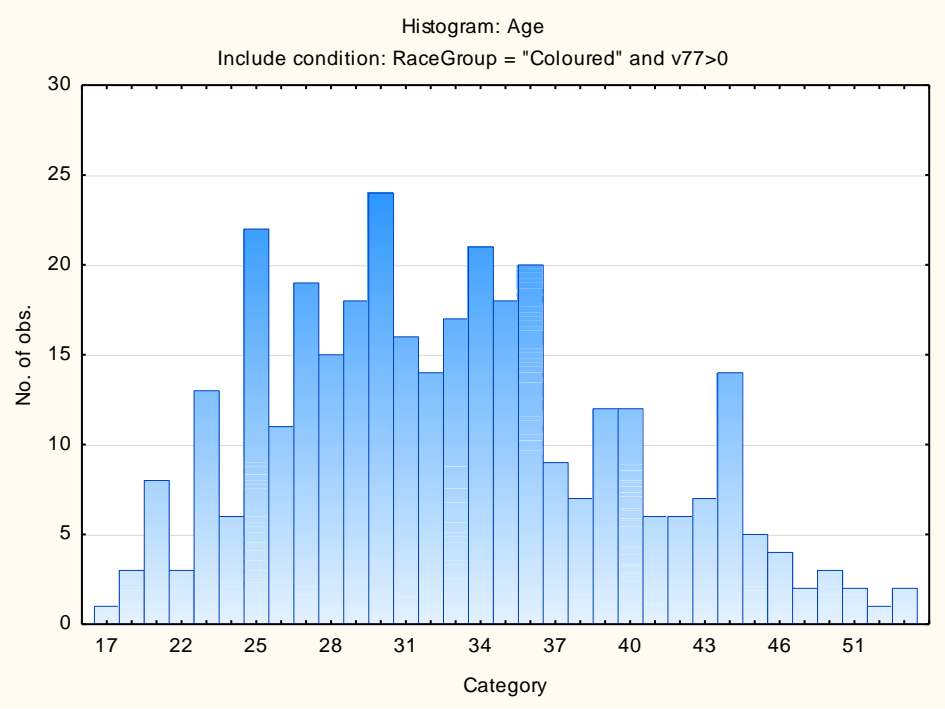
Category	Frequency table: Education			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	50	50	14.57726	14.5773
Grade 12	145	195	42.27405	56.8513
Diploma	42	237	12.24490	69.0962
<Grade 12	35	272	10.20408	79.3003
Post Graduate	27	299	7.87172	87.1720
Certificate	11	310	3.20700	90.3790
Missing	33	343	9.62099	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	234	234	68.22157	68.2216
Afrikaans	80	314	23.32362	91.5452
isiXhosa	2	316	0.58309	92.1283
isiZulu	1	317	0.29155	92.4198
Missing	26	343	7.58017	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	234	234	68.22157	68.2216
Afrikaans	80	314	23.32362	91.5452
Indigenous	3	317	0.87464	92.4198
Missing	26	343	7.58017	100.0000

Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	343	343	100.0000	100.0000
Missing	0	343	0.0000	100.0000

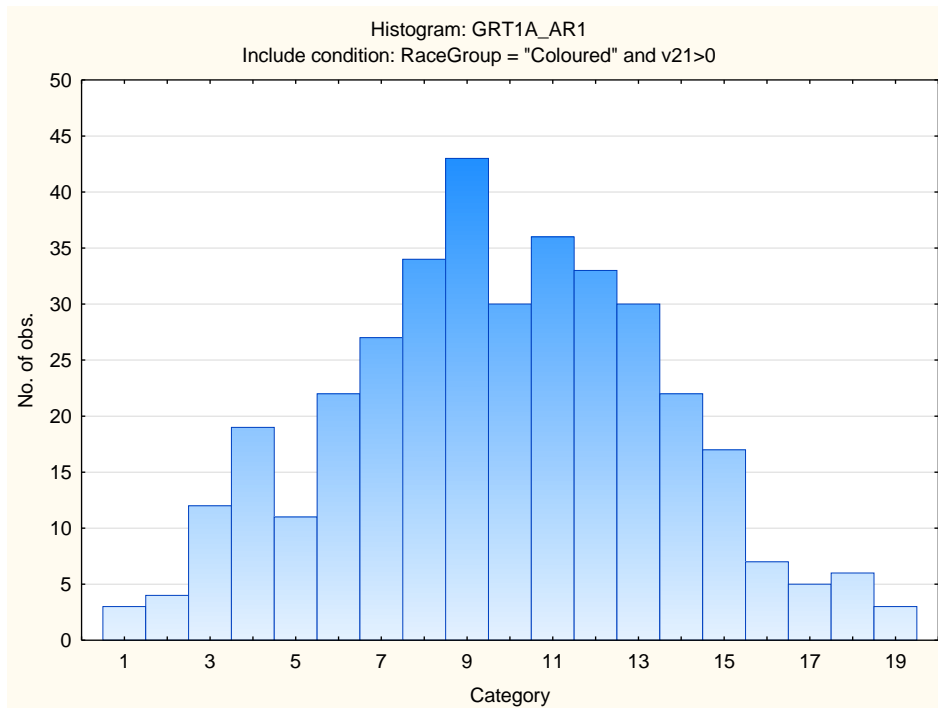
Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	32.86804	7.064631	17.00000	54.00000	341	2

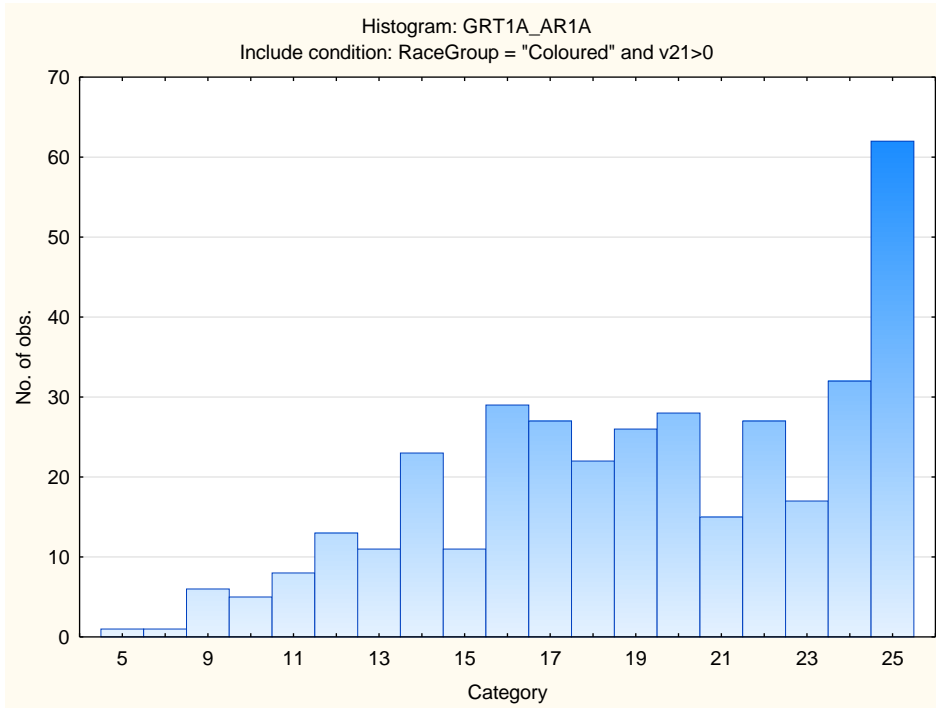


Descriptive Statistics and Frequency Distributions on Graduate Reasoning Test Battery Subtests

Graduate Abstract Reasoning Test

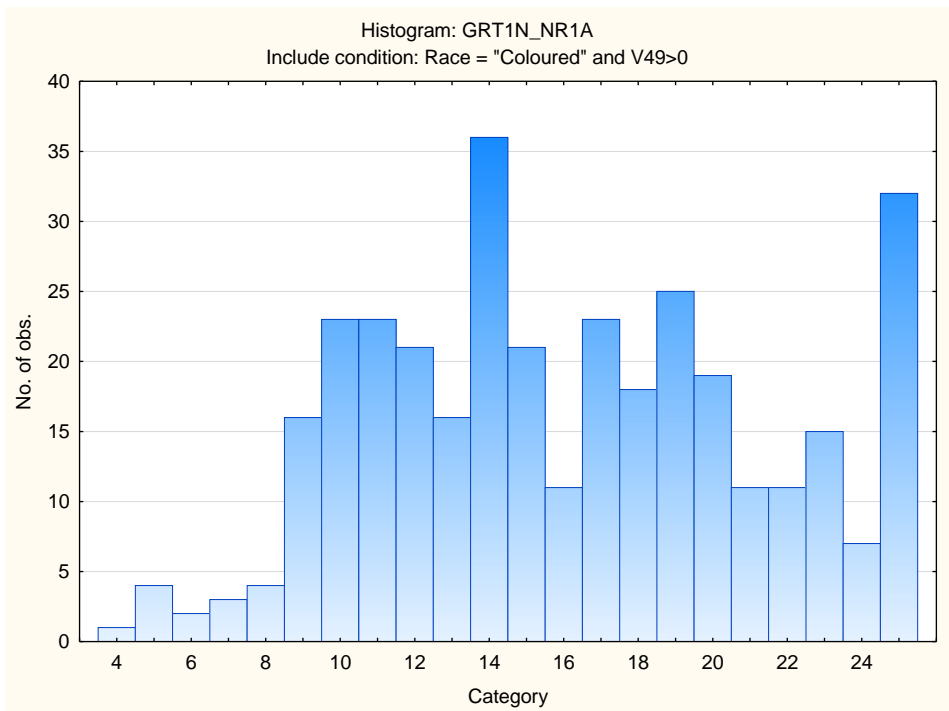
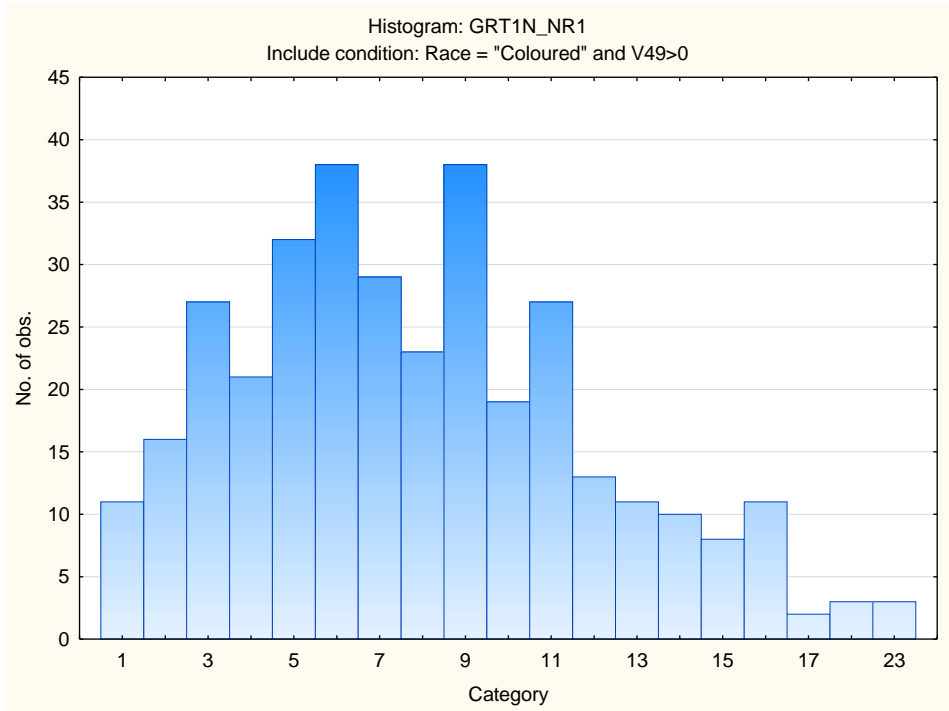
Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
GRT1A_AR1	9.79396	3.764246	1.000000	19.00000	364	0
GRT1A_AR1A	19.18132	4.585290	5.000000	25.00000	364	0





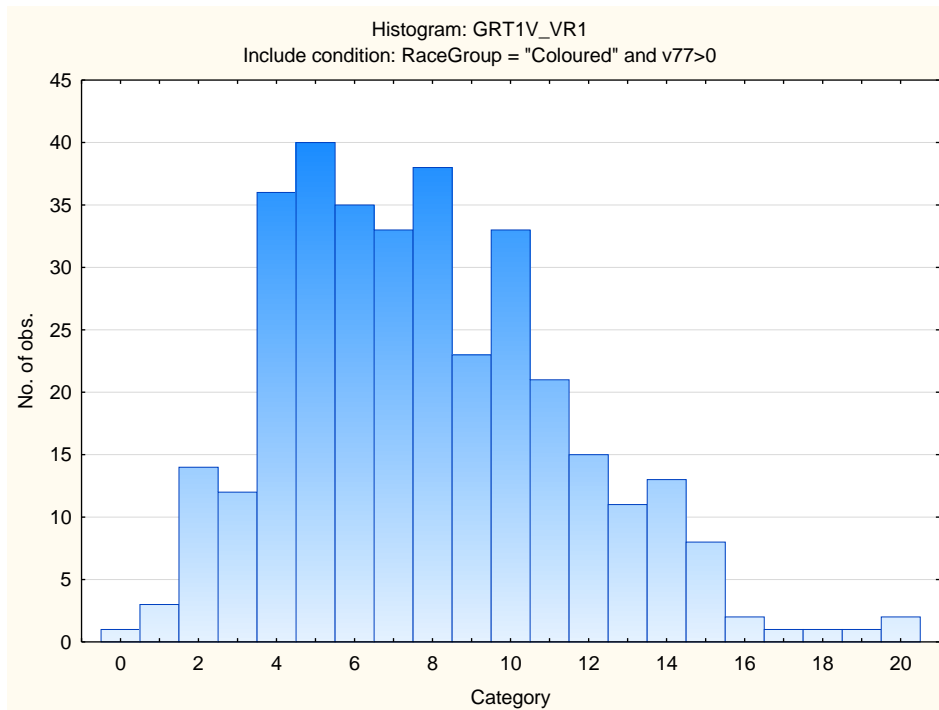
Graduate Numerical Reasoning Test

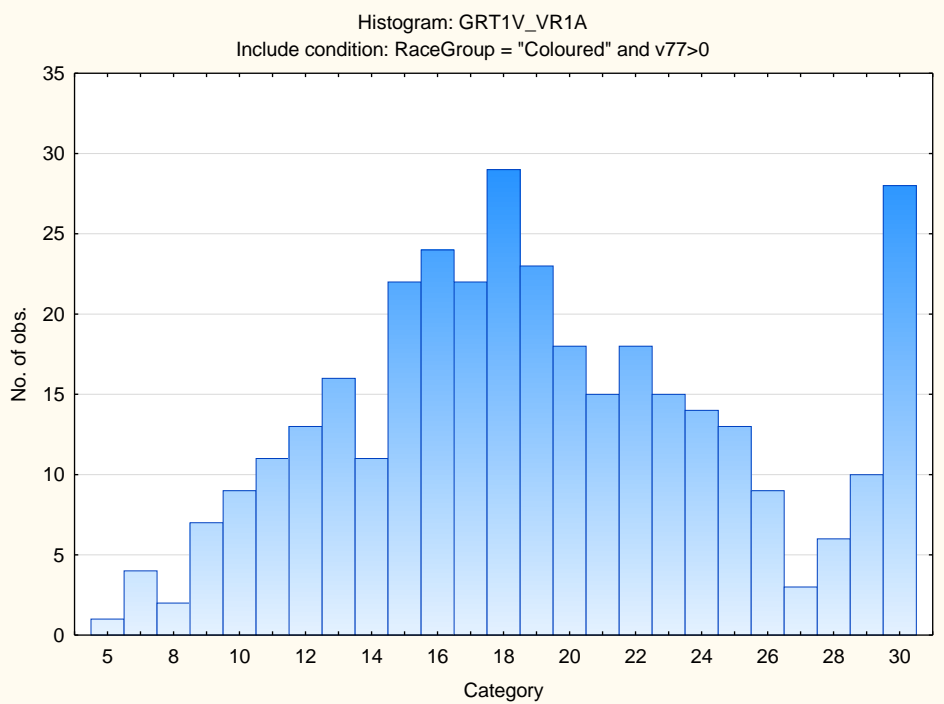
Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
GRT1N_NR1	7.91520	4.225513	1.000000	23.00000	342	0
GRT1N_NR1A	16.16082	5.199863	4.000000	25.00000	342	0



Graduate Verbal Reasoning Test

Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
GRT1V_VR1	7.79883	3.646323	0.000000	20.00000	343	0
GRT1V_VR1A	19.17784	5.951596	5.000000	30.00000	343	0





Stanine table

Subtests	S9_1	S9_2	S9_3	S9_4	S9_5	S9_6	S9_7	S9_8	S9_9
Graduate Verbal Reasoning	0-1	2-3	4-5	6-6	7-8	9-10	11-12	13-14	15-20
Graduate Verbal Items Attempted	5-8	9-11	12-14	15-17	18-20	21-23	24-26	27-29	30-30
Graduate Numerical Reasoning	1-0	1-2	3-4	5-6	7-8	9-11	12-13	14-15	16-23
Graduate Numerical Items Attempted	4-7	8-9	10-12	13-14	15-17	18-20	21-22	23-25	
Graduate Abstract Reasoning	1-3	4-5	6-6	7-8	9-10	11-12	13-14	15-16	17-19
Graduate Abstract Items Attempted	5-11	12-13	14-15	16-18	19-20	21-22	23-24	25-25	

Graduate Reasoning Test (GRT1)

Norm group: South Africans, English Language Group, updated 2012

Norm Type

Standard Deviation Norm

Graduate Abstract Reasoning Test: Biographical Composition

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	204	204	38.63636	38.6364
M	324	528	61.36364	100.0000
Missing	0	528	0.00000	100.0000

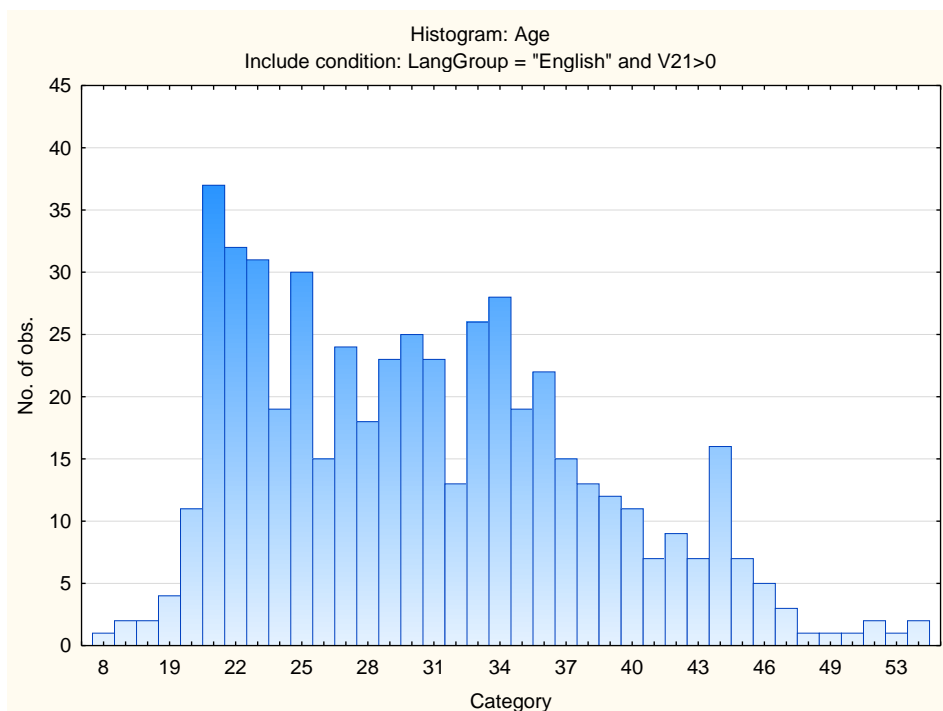
Category	Frequency table: Education			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	141	141	26.70455	26.7045
Grade 12	146	287	27.65152	54.3561
Diploma	49	336	9.28030	63.6364
<Grade 12	30	366	5.68182	69.3182
Post Graduate	75	441	14.20455	83.5227
Certificate	15	456	2.84091	86.3636
Missing	72	528	13.63636	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	528	528	100.0000	100.0000
Missing	0	528	0.0000	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	528	528	100.0000	100.0000
Missing	0	528	0.0000	100.0000

Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	241	241	45.64394	45.6439
European	80	321	15.15152	60.7955
Asian	102	423	19.31818	80.1136
African	82	505	15.53030	95.6439
Missing	23	528	4.35606	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	30.60232	7.687071	8.000000	54.00000	518	10



Graduate Numerical Reasoning Test: Biographical Composition

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	188	188	39.33054	39.3305
M	290	478	60.66946	100.0000
Missing	0	478	0.00000	100.0000

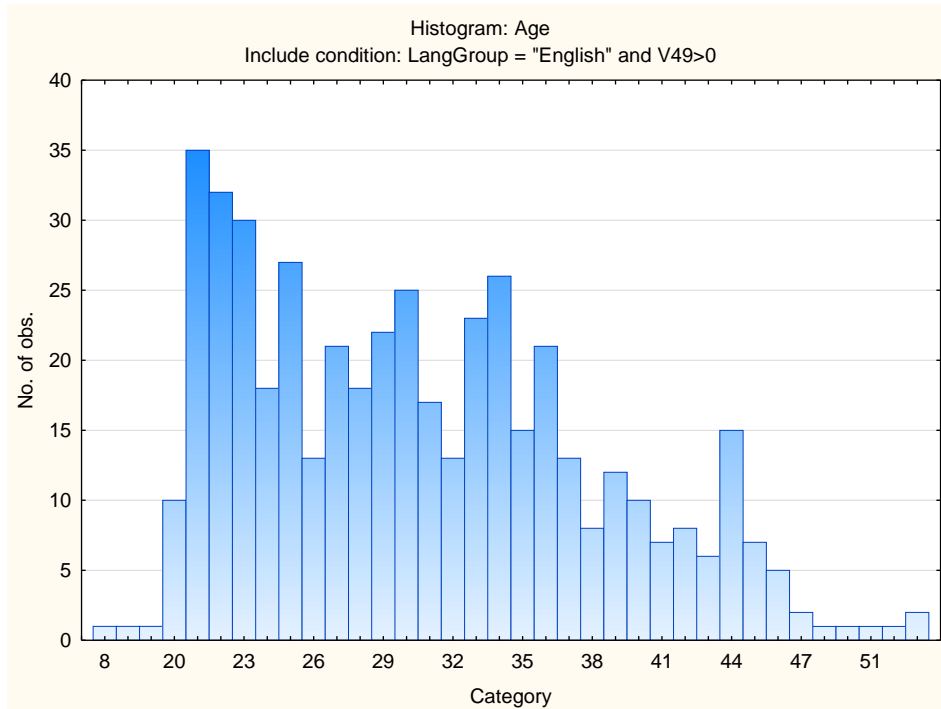
Category	Frequency table: Education			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	122	122	25.52301	25.5230
Grade 12	139	261	29.07950	54.6025
Diploma	41	302	8.57741	63.1799
<Grade 12	29	331	6.06695	69.2469
Post Graduate	74	405	15.48117	84.7280
Certificate	14	419	2.92887	87.6569
Missing	59	478	12.34310	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	478	478	100.0000	100.0000
Missing	0	478	0.0000	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	478	478	100.0000	100.0000
Missing	0	478	0.0000	100.0000

Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	234	234	48.95397	48.9540
European	72	306	15.06276	64.0167
Asian	78	384	16.31799	80.3347
African	74	458	15.48117	95.8159
Missing	20	478	4.18410	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	30.52564	7.605179	8.000000	54.00000	468	10



Graduate Verbal Reasoning Test: Biographical Composition

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	191	191	39.62656	39.6266
M	291	482	60.37344	100.0000
Missing	0	482	0.00000	100.0000

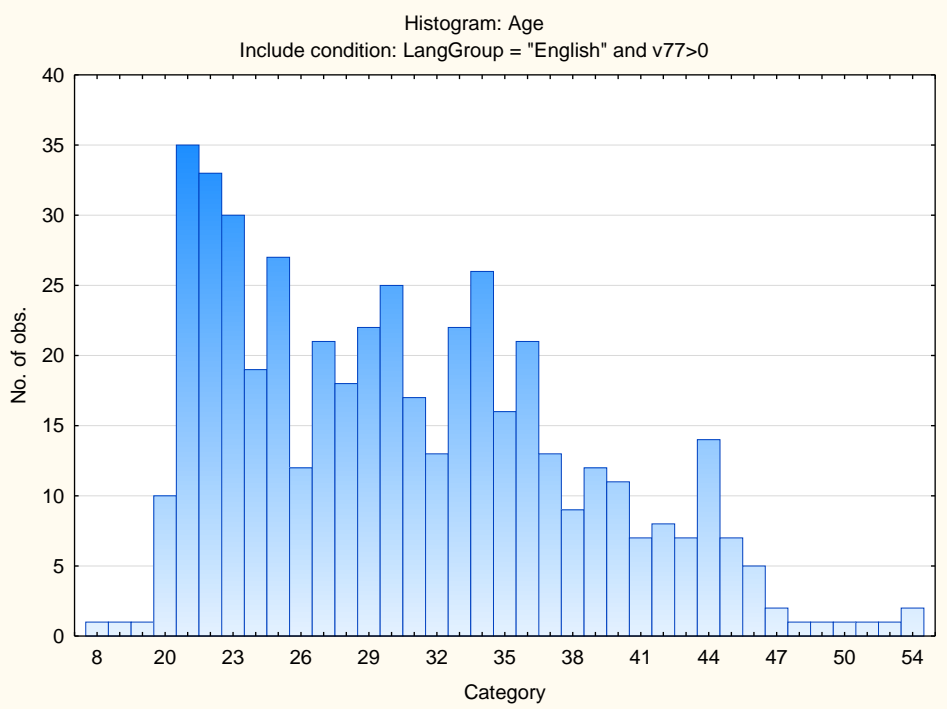
Category	Frequency table: Education			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	126	126	26.14108	26.1411
Grade 12	139	265	28.83817	54.9793
Diploma	41	306	8.50622	63.4855
<Grade 12	28	334	5.80913	69.2946
Post Graduate	76	410	15.76763	85.0622
Certificate	14	424	2.90456	87.9668
Missing	58	482	12.03320	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	482	482	100.0000	100.0000
Missing	0	482	0.0000	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	482	482	100.0000	100.0000
Missing	0	482	0.0000	100.0000

Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	234	234	48.54772	48.5477
European	74	308	15.35270	63.9004
Asian	78	386	16.18257	80.0830
African	74	460	15.35270	95.4357
Missing	22	482	4.56432	100.0000

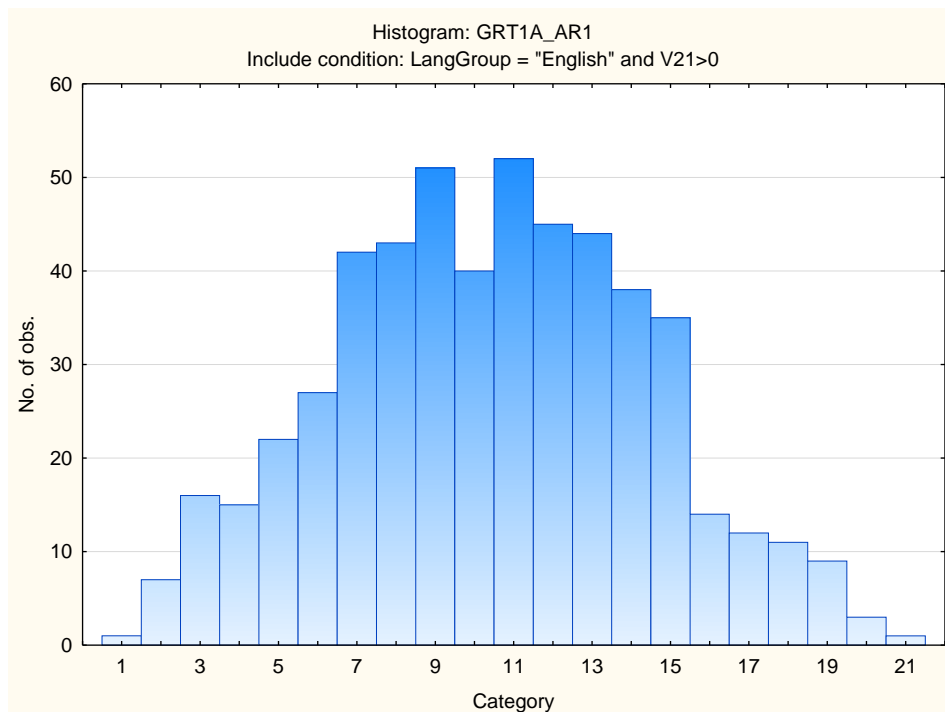
Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	30.58051	7.652059	8.000000	54.00000	472	10

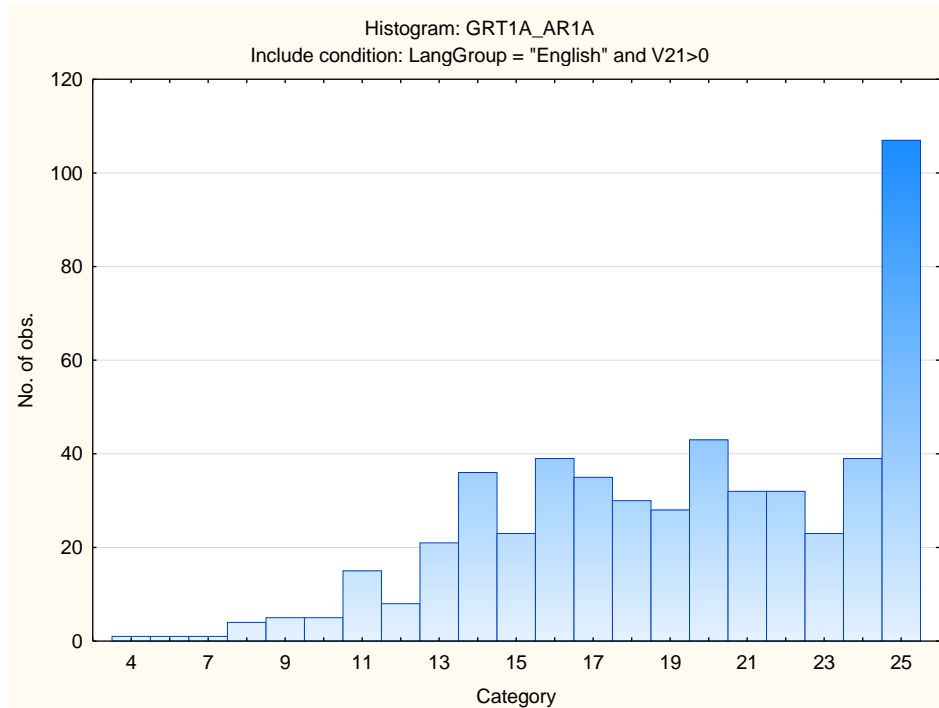


Descriptive Statistics and Frequency Distributions on Graduate Reasoning Test Battery Subtests

Graduate Abstract Reasoning Test

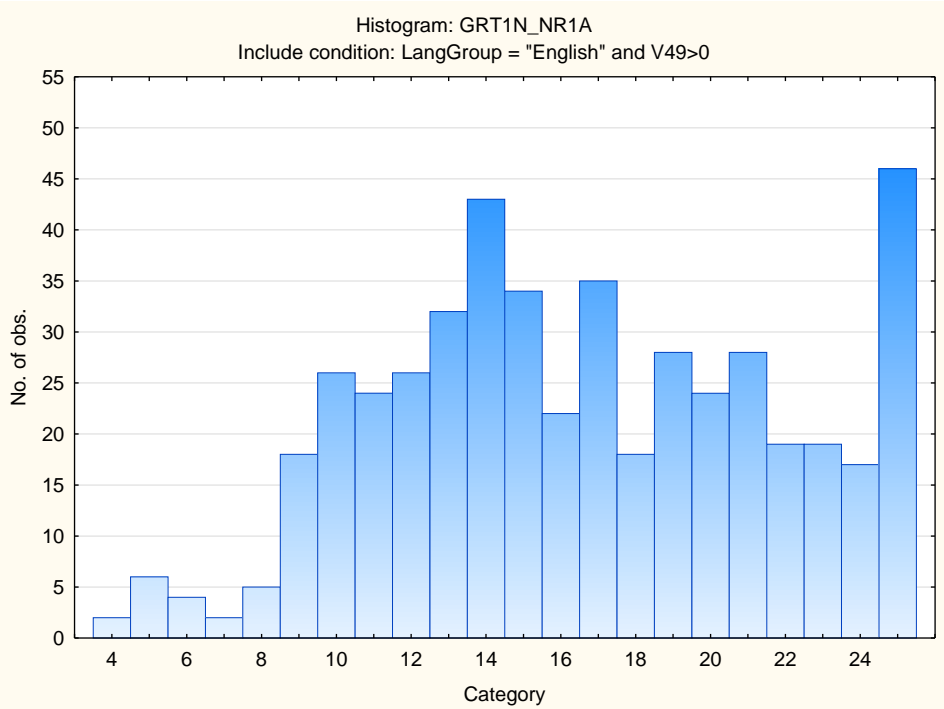
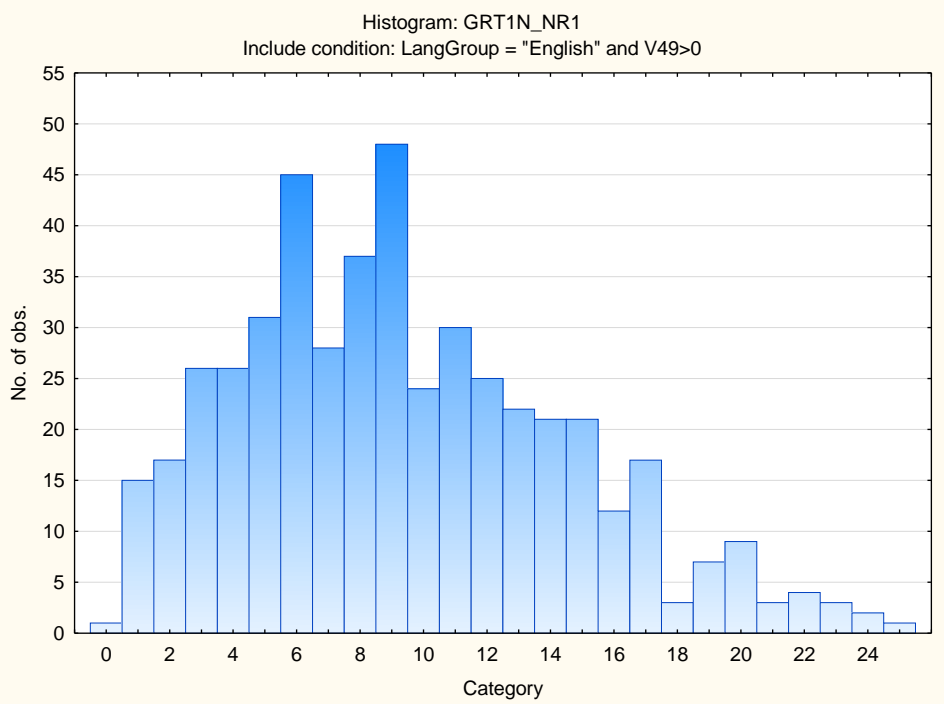
Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
GRT1A_AR1	10.43750	3.990486	1.000000	21.00000	528	0
GRT1A_AR1A	19.30682	4.656777	4.000000	25.00000	528	0





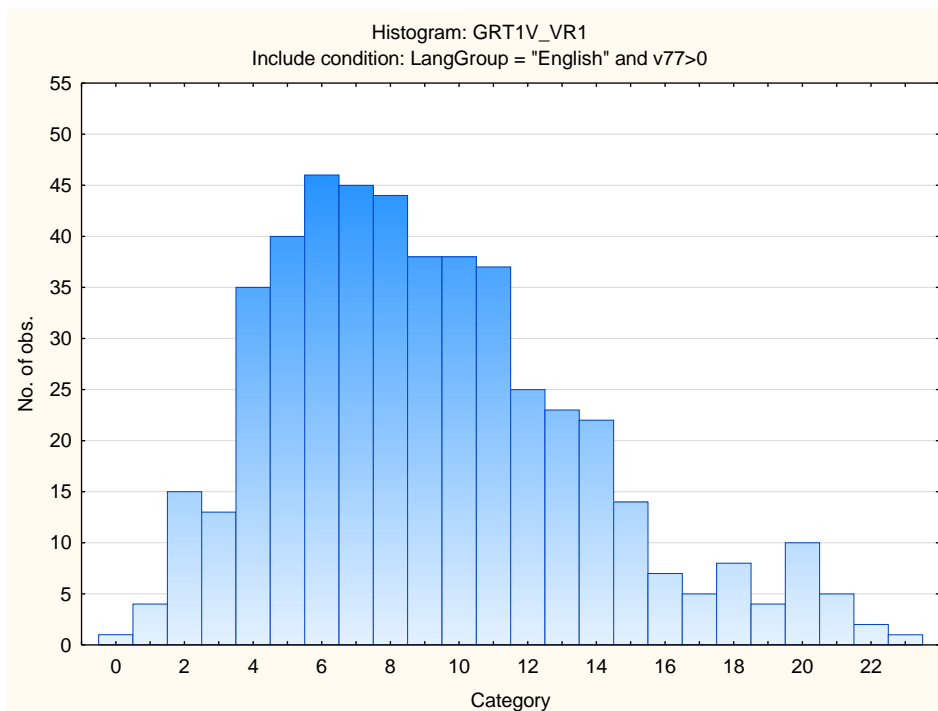
Graduate Numerical Reasoning Test

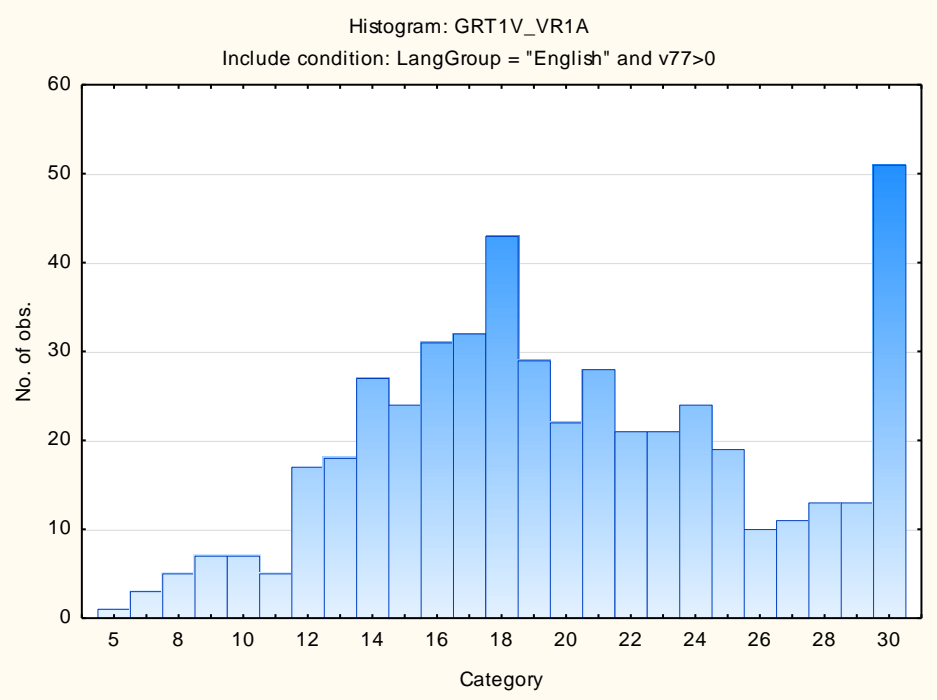
Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
GRT1N_NR1	9.38494	5.129593	0.000000	25.00000	478	0
GRT1N_NR1A	16.58159	5.207300	4.000000	25.00000	478	0



Graduate Verbal Reasoning Test

Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
GRT1V_VR1	9.11411	4.503342	0.000000	25.00000	482	0
GRT1V_VR1A	20.01452	5.940610	5.000000	30.00000	482	0





Stanine table

Subtest	S9_1	S9_2	S9_3	S9_4	S9_5	S9_6	S9_7	S9_8	S9_9
Graduate Verbal Reasoning	0-1	2-3	4-5	6-7	8-10	11-12	13-14	15-16	17-25
Graduate Verbal Items Attempted	5-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30	
Graduate Numerical Reasoning	0-0	1-2	3-5	6-8	9-10	11-13	14-15	16-18	19-25
Graduate Numerical Items Attempted	4-7	8-10	11-12	13-15	16-17	18-20	21-23	24-25	
Graduate Abstract Reasoning	1-3	4-5	6-7	8-9	10-11	12-13	14-15	16-17	18-21
Graduate Abstract Items Attempted	4-11	12-13	14-15	16-18	19-20	21-22	23-25		

Graduate Reasoning Test (GRT1)

Norm Group: South Africans, European Race Group, Updated 2012

Norm Type

Standard Deviation Norm

Graduate Abstract Reasoning Test: Biographical Composition

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	69	69	37.70492	37.7049
M	114	183	62.29508	100.0000
Missing	0	183	0.00000	100.0000

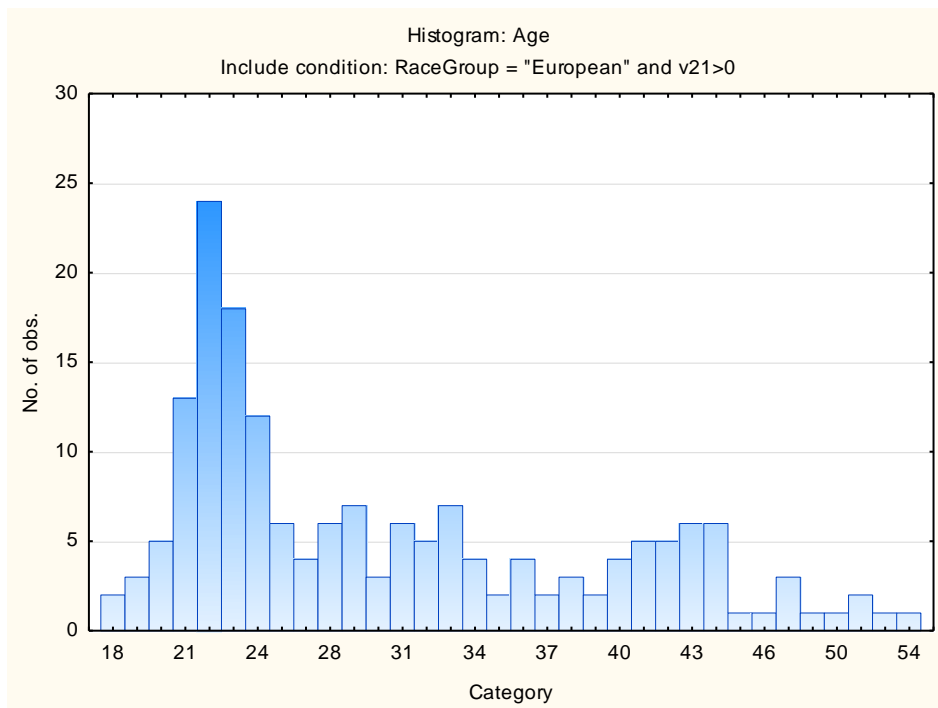
Category	Frequency table: Education			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	48	48	26.22951	26.2295
Grade 12	30	78	16.39344	42.6230
Diploma	17	95	9.28962	51.9126
Post Graduate	43	138	23.49727	75.4098
Certificate	4	142	2.18579	77.5956
Missing	41	183	22.40437	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	80	80	43.71585	43.7158
Afrikaans	88	168	48.08743	91.8033
Sepedi	1	169	0.54645	92.3497
Missing	14	183	7.65027	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	80	80	43.71585	43.7158
Afrikaans	88	168	48.08743	91.8033
Indigenous	1	169	0.54645	92.3497
Missing	14	183	7.65027	100.0000

Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
European	183	183	100.0000	100.0000
Missing	0	183	0.0000	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	29.96571	8.981397	18.00000	54.00000	175	8



Graduate Numerical Reasoning Test: Biographical Composition

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	49	49	34.50704	34.5070
M	93	142	65.49296	100.0000
Missing	0	142	0.00000	100.0000

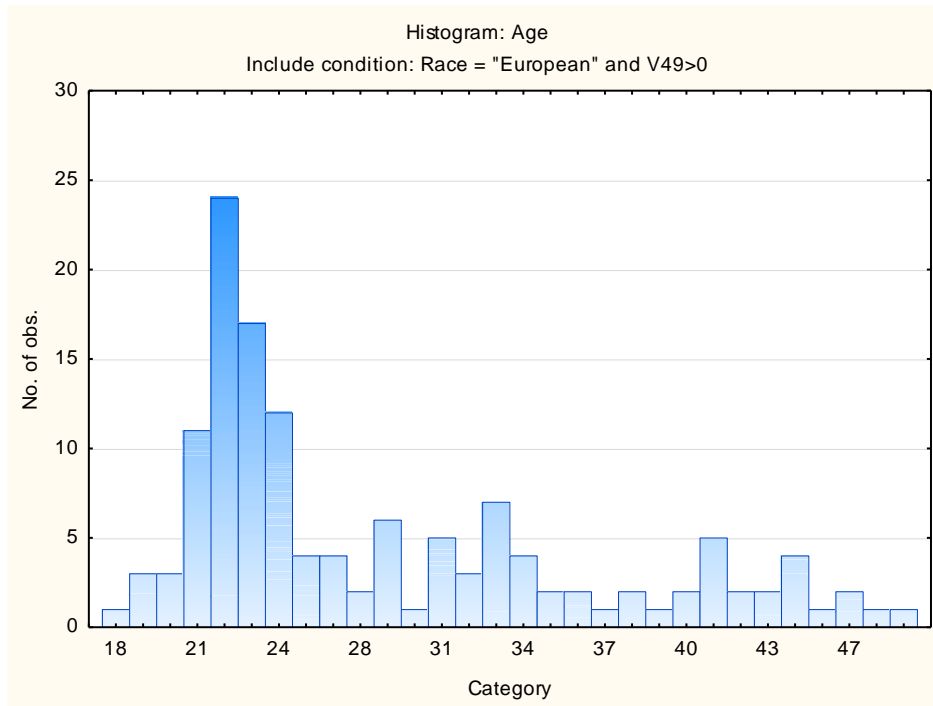
Category	Frequency table: Education			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	34	34	23.94366	23.9437
Grade 12	21	55	14.78873	38.7324
Diploma	9	64	6.33803	45.0704
Post Graduate	41	105	28.87324	73.9437
Certificate	4	109	2.81690	76.7606
Missing	33	142	23.23944	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	72	72	50.70423	50.7042
Afrikaans	59	131	41.54930	92.2535
Sepedi	1	132	0.70423	92.9577
Missing	10	142	7.04225	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	72	72	50.70423	50.7042
Afrikaans	59	131	41.54930	92.2535
Indigenous	1	132	0.70423	92.9577
Missing	10	142	7.04225	100.0000

Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
European	142	142	100.0000	100.0000
Missing	0	142	0.0000	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	28.32593	8.037997	18.00000	52.00000	135	7



Graduate Verbal Reasoning Test: Biographical Composition

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	53	53	36.05442	36.0544
M	94	147	63.94558	100.0000
Missing	0	147	0.00000	100.0000

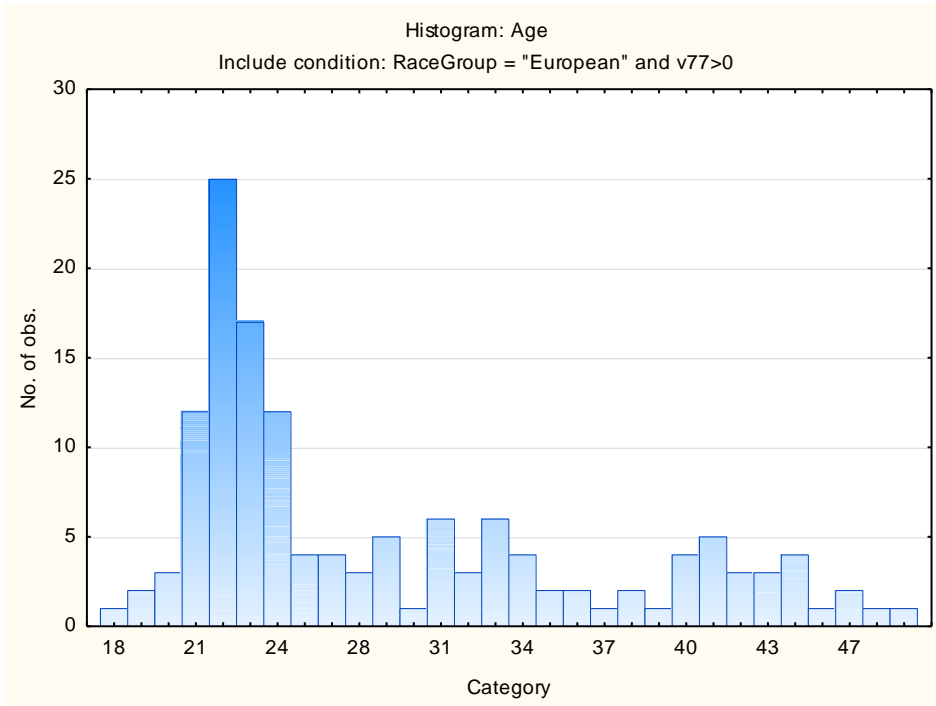
Category	Frequency table: Education			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	40	40	27.21088	27.2109
Grade 12	21	61	14.28571	41.4966
Diploma	9	70	6.12245	47.6190
Post Graduate	43	113	29.25170	76.8707
Certificate	4	117	2.72109	79.5918
Missing	30	147	20.40816	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	74	74	50.34014	50.3401
Afrikaans	61	135	41.49660	91.8367
Sepedi	1	136	0.68027	92.5170
Missing	11	147	7.48299	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	74	74	50.34014	50.3401
Afrikaans	61	135	41.49660	91.8367
Indigenous	1	136	0.68027	92.5170
Missing	11	147	7.48299	100.0000

Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
European	147	147	100.0000	100.0000
Missing	0	147	0.0000	100.0000

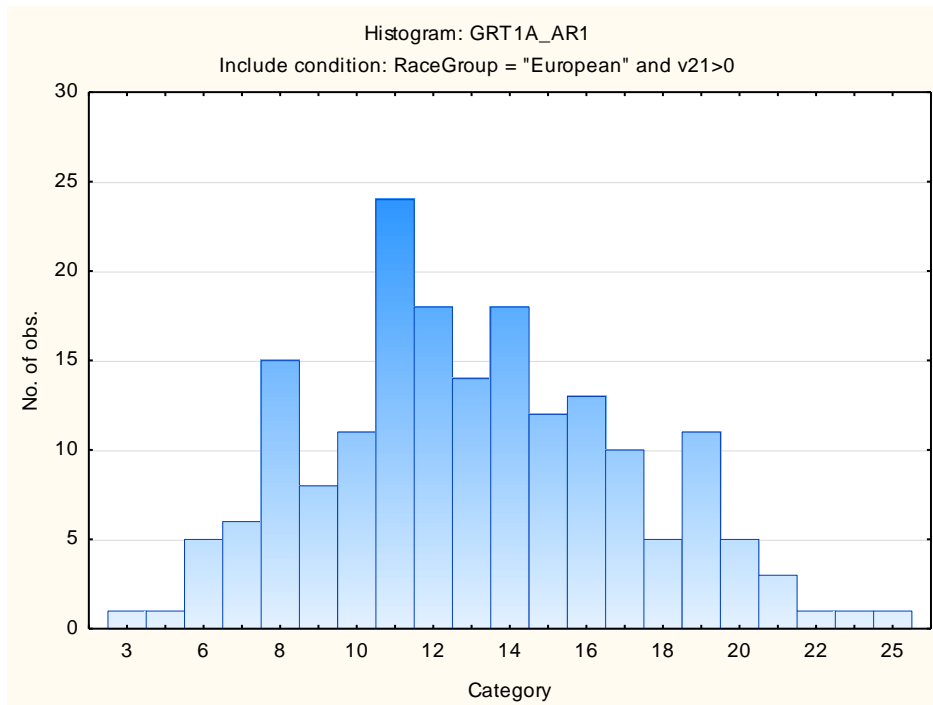
Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	28.64286	8.184097	18.00000	52.00000	140	7

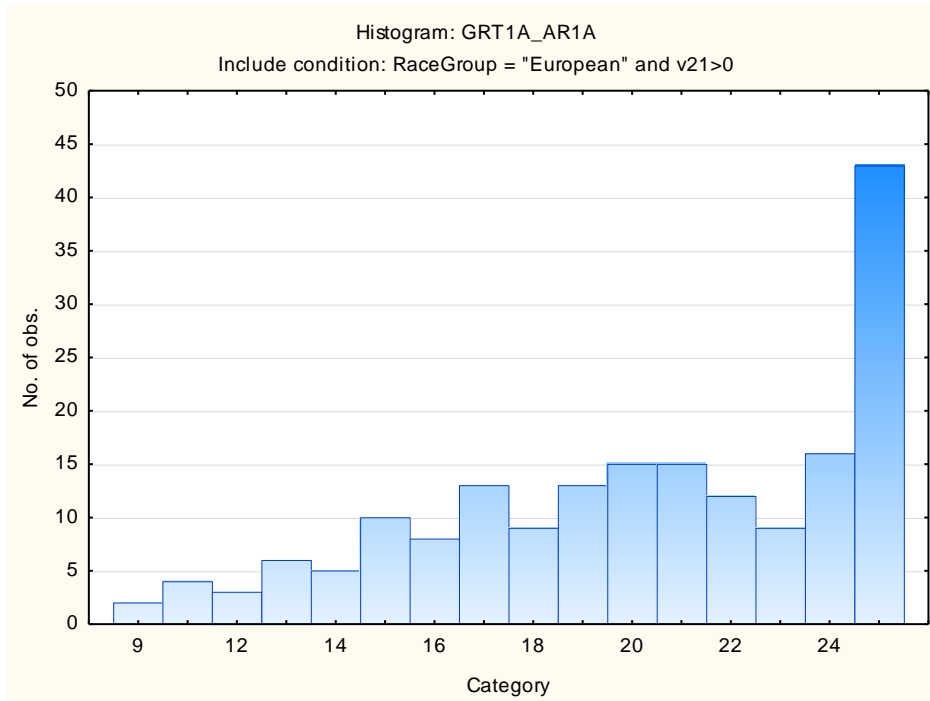


Descriptive Statistics and Frequency Distributions on Graduate Reasoning Test Battery Subtests

Graduate Abstract Reasoning Test

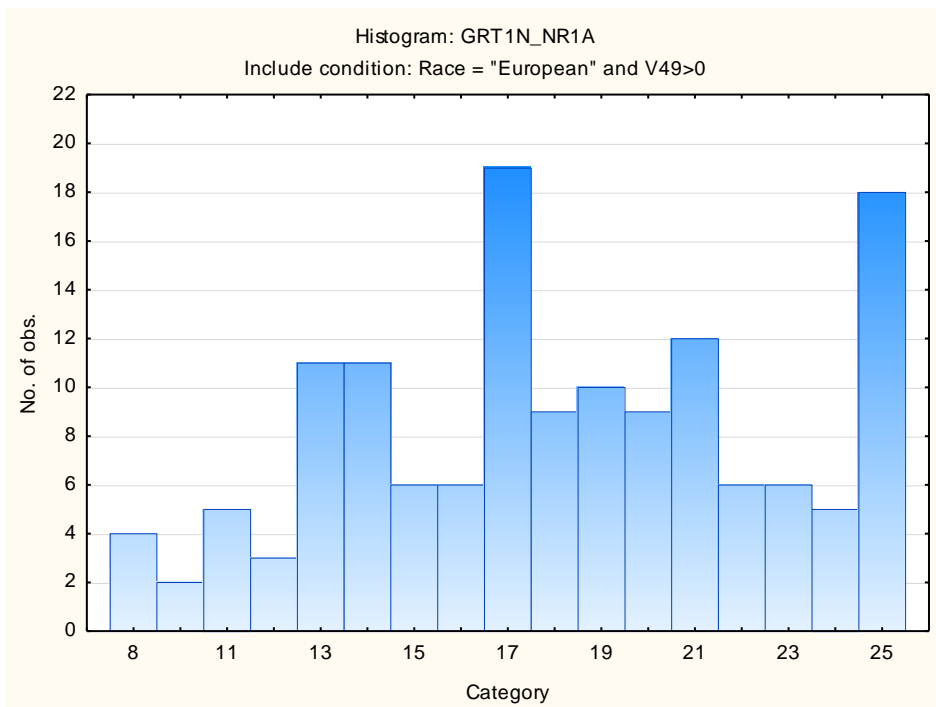
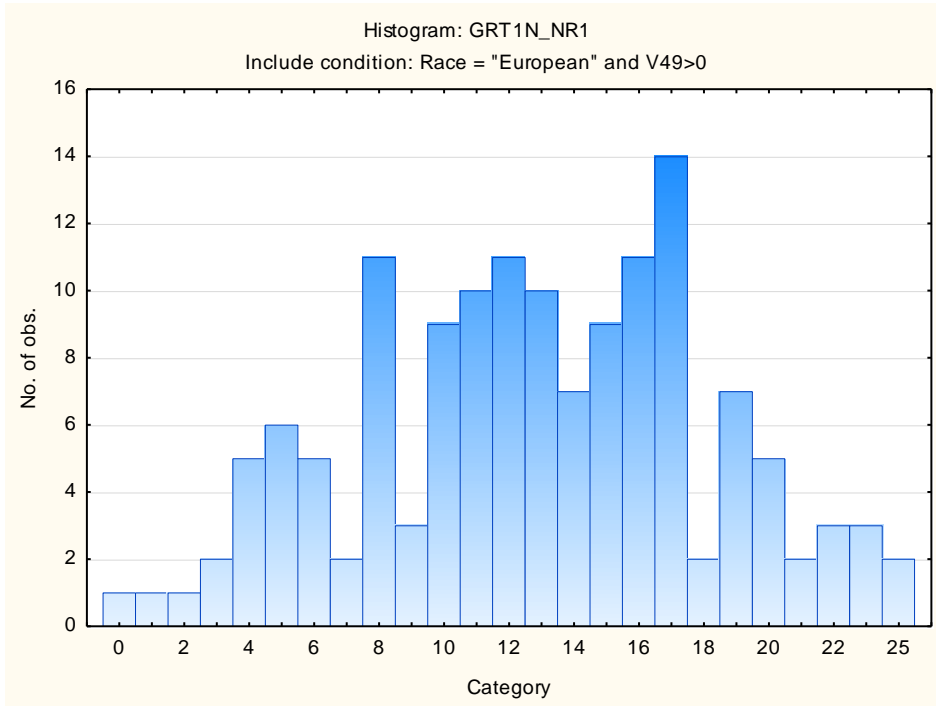
Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
GRT1A_AR1	13.03825	4.037416	3.000000	25.00000	183	0
GRT1A_AR1A	20.21311	4.221015	9.000000	25.00000	183	0





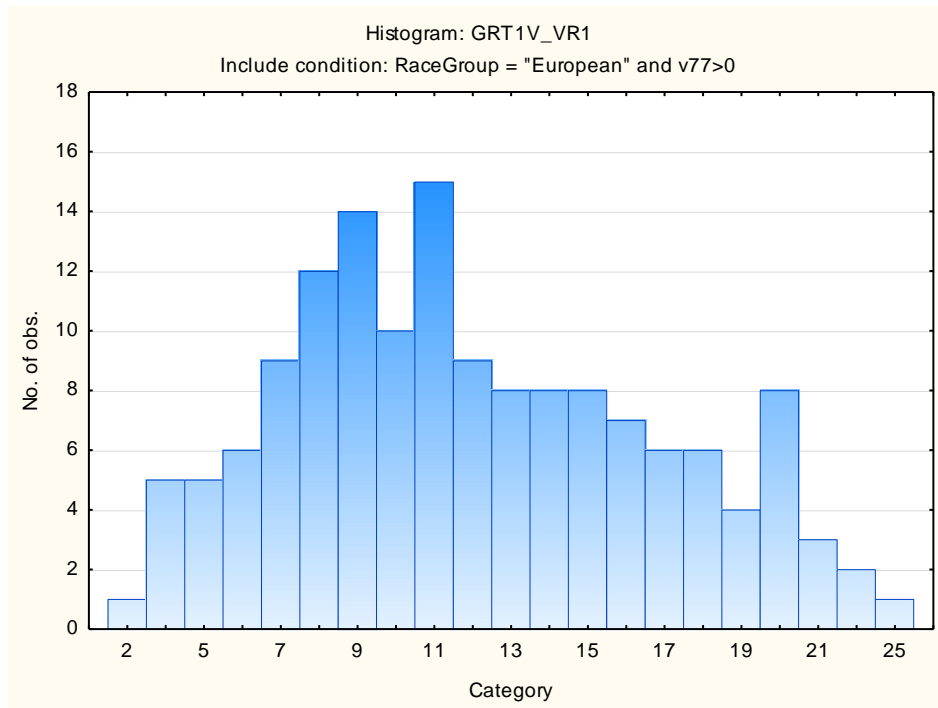
Graduate Numerical Reasoning Test

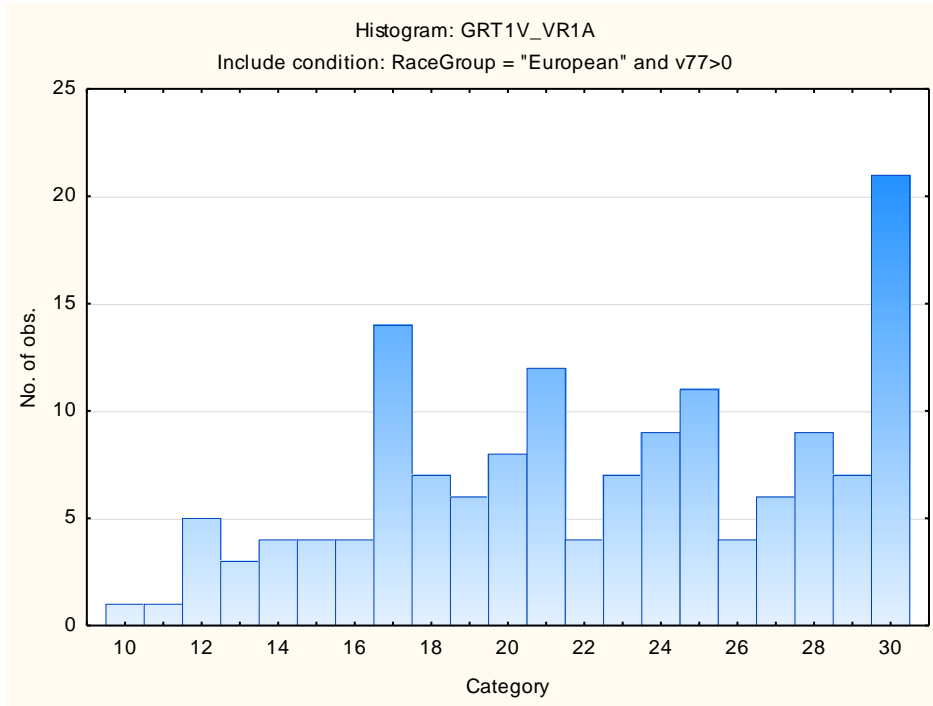
Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
GRT1N_NR1	12.85915	5.410250	0.000000	25.00000	142	0
GRT1N_NR1A	18.11972	4.526490	8.000000	25.00000	142	0



Graduate Verbal Reasoning Test

Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
GRT1V_VR1	12.02041	4.817874	2.00000	25.00000	147	0
GRT1V_VR1A	22.31973	5.561593	10.00000	30.00000	147	0





Stanine table

Subtest	S9_1	S9_2	S9_3	S9_4	S9_5	S9_6	S9_7	S9_8	S9_9
Graduate Verbal Reasoning	2-3	4-5	6-8	9-10	11-13	14-15	16-18	19-20	21-25
Graduate Verbal Items Attempted	10-12	13-15	16-18	19-20	21-23	24-26	27-29	30-30	
Graduate Numerical Reasoning	0-3	4-6	7-8	9-11	12-14	15-16	17-19	20-22	23-25
Graduate Numerical Items Attempted	8-10	11-12	13-14	15-16	17-19	20-21	22-23	24-25	
Graduate Abstract Reasoning	3-5	6-7	8-10	11-12	13-14	15-16	17-18	19-20	21-25
Graduate Abstract Items Attempted	9-12	13-14	15-17	18-19	20-21	22-23	24-25		

Graduate Reasoning Test (GRT1)

Norm group: South Africans, General Population, Updated 2012

Norm Type

Standard Deviation Norm

Graduate Abstract Reasoning Test: Biographical Composition

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	1522	1522	41.77875	41.7788
M	2104	3626	57.75460	99.5334
U	17	3643	0.46665	100.0000
Missing	0	3643	0.00000	100.0000

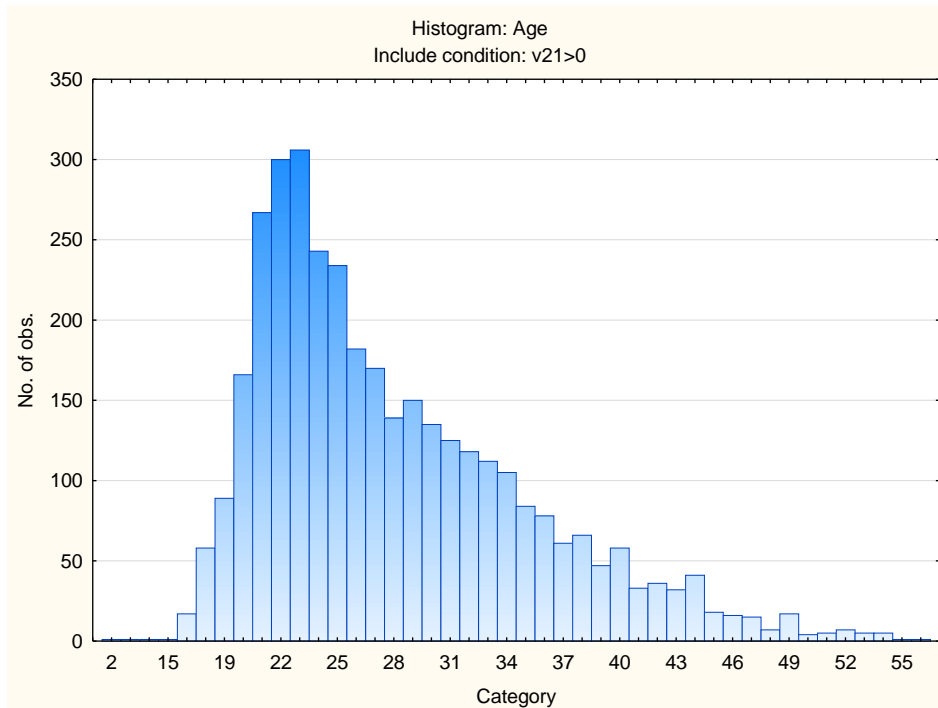
Category	Frequency table: Education			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	333	333	9.14082	9.1408
Grade 12	345	678	9.47022	18.6110
Diploma	191	869	5.24293	23.8540
<Grade 12	54	923	1.48229	25.3363
Post Graduate	171	1094	4.69393	30.0302
Certificate	28	1122	0.76860	30.7988
Missing	2521	3643	69.20121	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	528	528	14.49355	14.4935
Afrikaans	198	726	5.43508	19.9286
Setswana	58	784	1.59209	21.5207
isiXhosa	206	990	5.65468	27.1754
Xitsonga	13	1003	0.35685	27.5323
isiZulu	106	1109	2.90969	30.4419
Sesotho	50	1159	1.37250	31.8144
Sepedi	23	1182	0.63135	32.4458
isiNdebele"	3	1185	0.08235	32.5281
Tshivenda	6	1191	0.16470	32.6928
siSwati	8	1199	0.21960	32.9124
Missing	2444	3643	67.08757	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	528	528	14.49355	14.4935
Afrikaans	198	726	5.43508	19.9286
Indigenous	481	1207	13.20340	33.1320
Missing	2436	3643	66.86797	100.0000

Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	364	364	9.99177	9.9918
European	183	547	5.02333	15.0151
Asian	152	699	4.17239	19.1875
African	634	1333	17.40324	36.5907
Missing	2310	3643	63.40928	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	27.95474	7.191728	2.000000	59.00000	3557	86



Graduate Numerical Reasoning Test: Biographical Composition

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	1180	1180	40.32809	40.3281
M	1732	2912	59.19344	99.5215
U	14	2926	0.47847	100.0000
Missing	0	2926	0.00000	100.0000

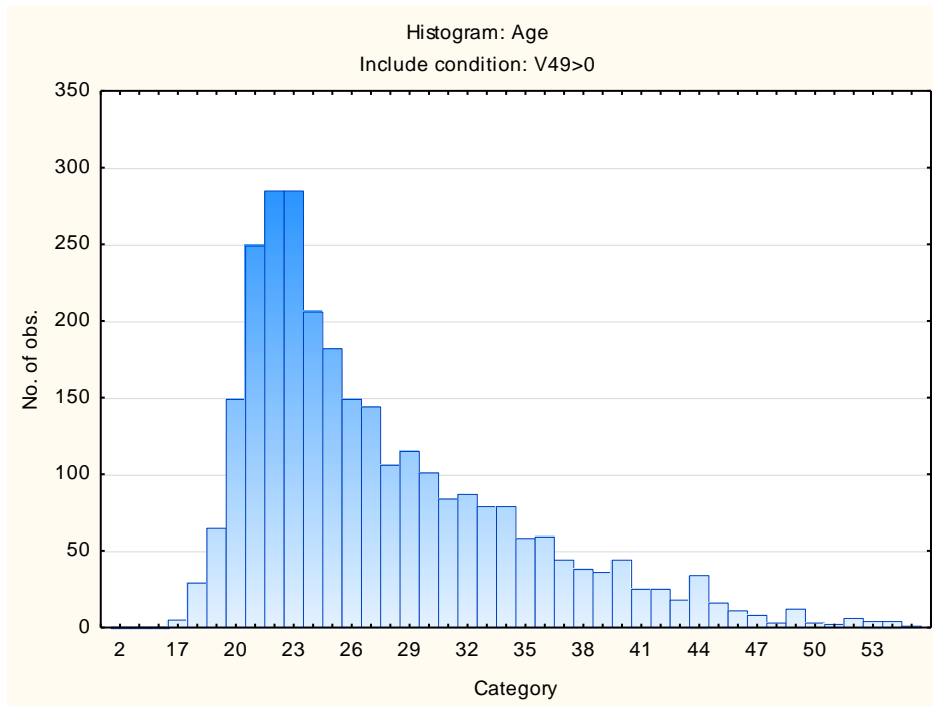
Category	Frequency table: Education			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	257	257	8.78332	8.7833
Grade 12	282	539	9.63773	18.4211
Diploma	101	640	3.45181	21.8729
<Grade 12	49	689	1.67464	23.5475
Post Graduate	141	830	4.81887	28.3664
Certificate	26	856	0.88859	29.2550
Missing	2070	2926	70.74504	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	478	478	16.33630	16.3363
Afrikaans	155	633	5.29733	21.6336
Setswana	26	659	0.88859	22.5222
isiXhosa	125	784	4.27204	26.7943
Xitsonga	5	789	0.17088	26.9651
isiZulu	47	836	1.60629	28.5714
Sesotho	20	856	0.68353	29.2550
Sepedi	14	870	0.47847	29.7334
isiNdebele"	3	873	0.10253	29.8360
Tshivenda	4	877	0.13671	29.9727
siSwati	3	880	0.10253	30.0752
Missing	2046	2926	69.92481	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	478	478	16.33630	16.3363
Afrikaans	155	633	5.29733	21.6336
Indigenous	250	883	8.54409	30.1777
Missing	2043	2926	69.82228	100.0000

Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	342	342	11.68831	11.6883
European	145	487	4.95557	16.6439
Asian	126	613	4.30622	20.9501
African	379	992	12.95284	33.9029
Missing	1934	2926	66.09706	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	27.43954	6.952171	2.000000	59.00000	2853	73



Graduate Verbal Reasoning Test: Biographical Composition

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	1174	1174	40.38528	40.3853
M	1719	2893	59.13313	99.5184
U	14	2907	0.48160	100.0000
Missing	0	2907	0.00000	100.0000

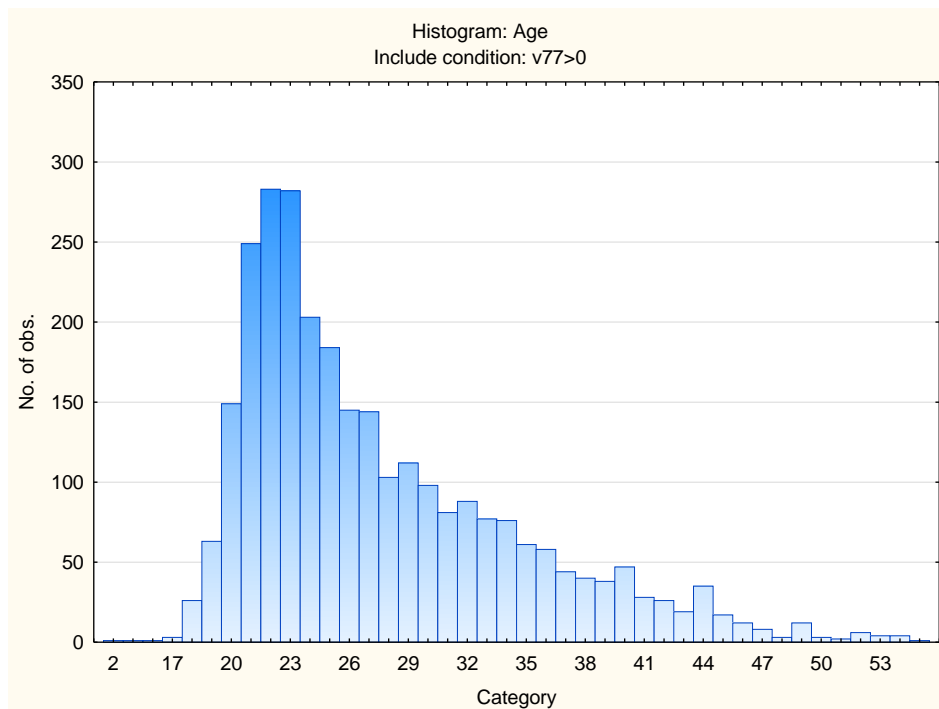
Category	Frequency table: Education			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	271	271	9.32233	9.3223
Grade 12	278	549	9.56312	18.8854
Diploma	102	651	3.50877	22.3942
<Grade 12	48	699	1.65119	24.0454
Post Graduate	144	843	4.95356	28.9990
Certificate	26	869	0.89439	29.8934
Missing	2038	2907	70.10664	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	482	482	16.58067	16.5807
Afrikaans	156	638	5.36636	21.9470
Setswana	28	666	0.96319	22.9102
isiXhosa	127	793	4.36877	27.2790
Xitsonga	6	799	0.20640	27.4854
isiZulu	42	841	1.44479	28.9302
Sesotho	21	862	0.72239	29.6526
Sepedi	14	876	0.48160	30.1342
isiNdebele"	3	879	0.10320	30.2374
Tshivenda	5	884	0.17200	30.4094
siSwati	3	887	0.10320	30.5126
Missing	2020	2907	69.48744	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
English	482	482	16.58067	16.5807
Afrikaans	156	638	5.36636	21.9470
Indigenous	252	890	8.66873	30.6158
Missing	2017	2907	69.38424	100.0000

Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	343	343	11.79911	11.7991
European	147	490	5.05676	16.8559
Asian	126	616	4.33437	21.1902
African	383	999	13.17509	34.3653
Missing	1908	2907	65.63467	100.0000

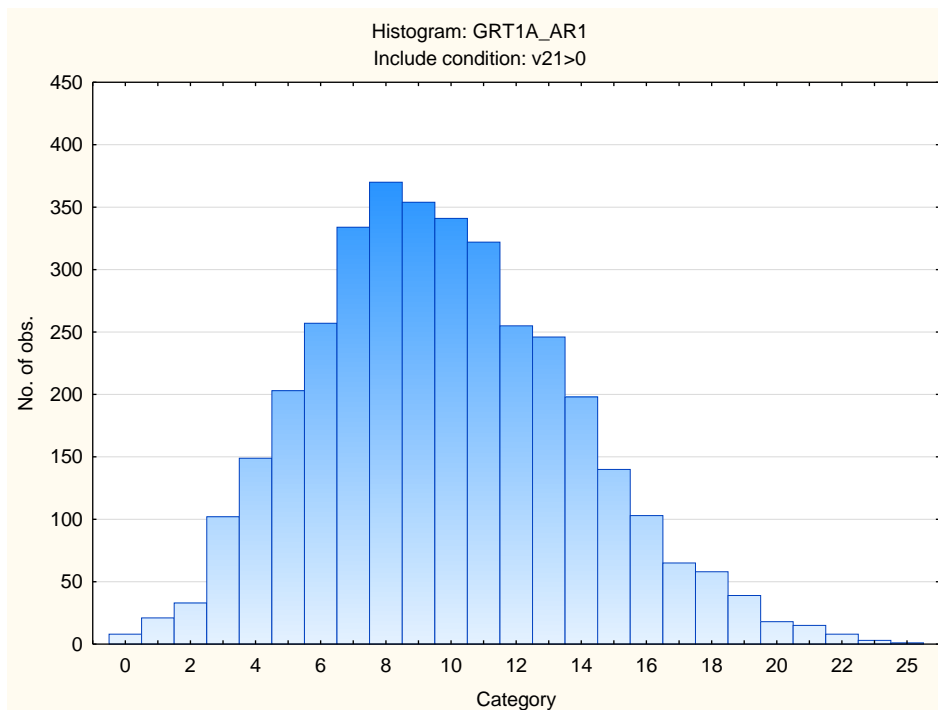
Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	27.53472	7.021020	2.000000	59.00000	2837	70

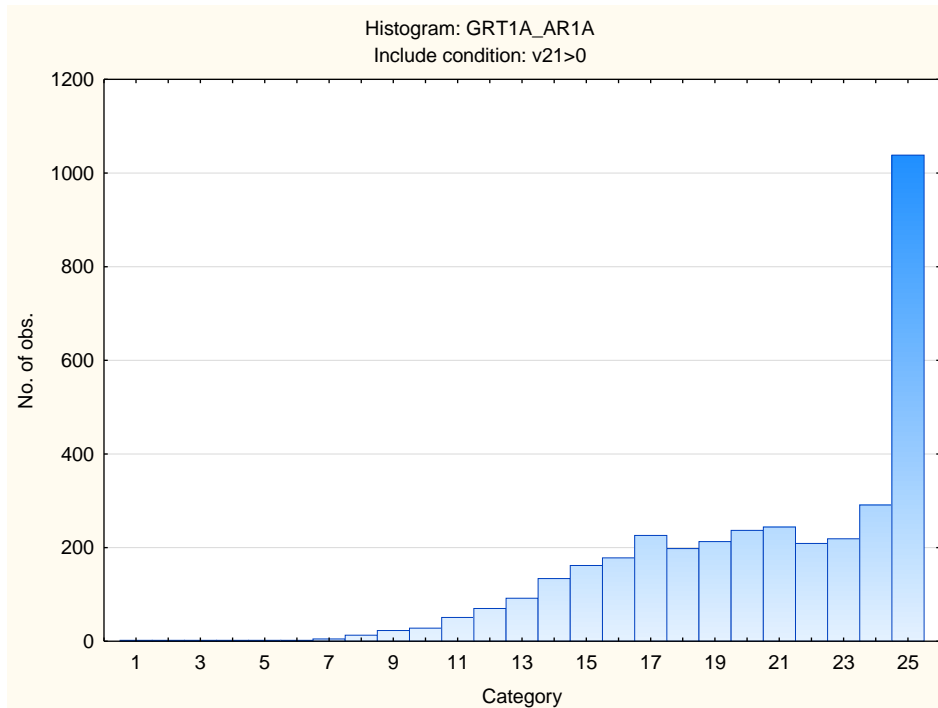


Descriptive Statistics and Frequency Distributions on Graduate Reasoning Test Battery Subtests

Graduate Abstract Reasoning Test

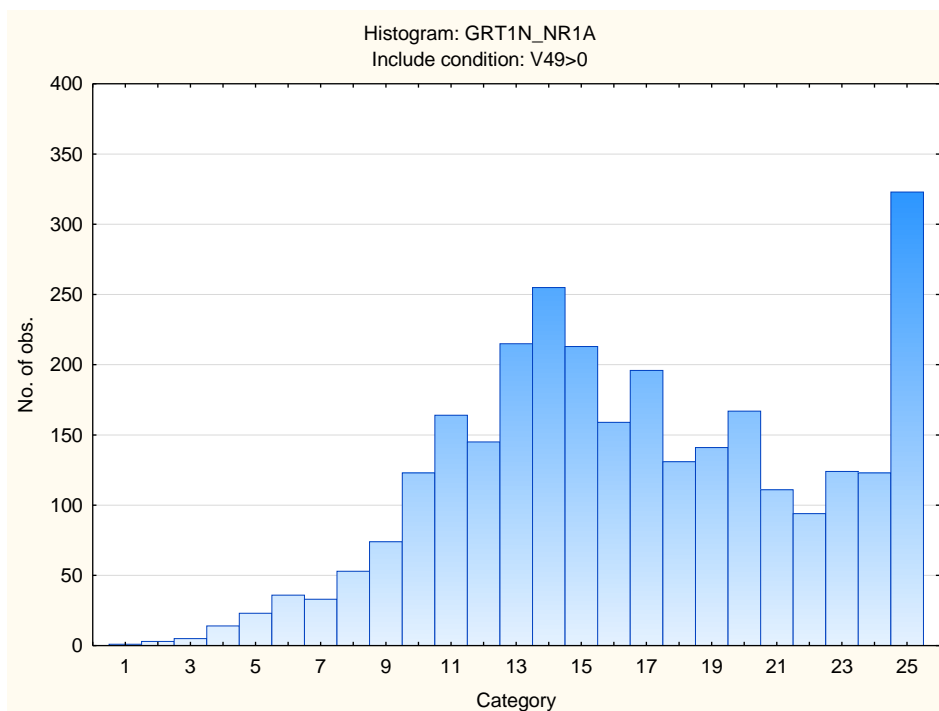
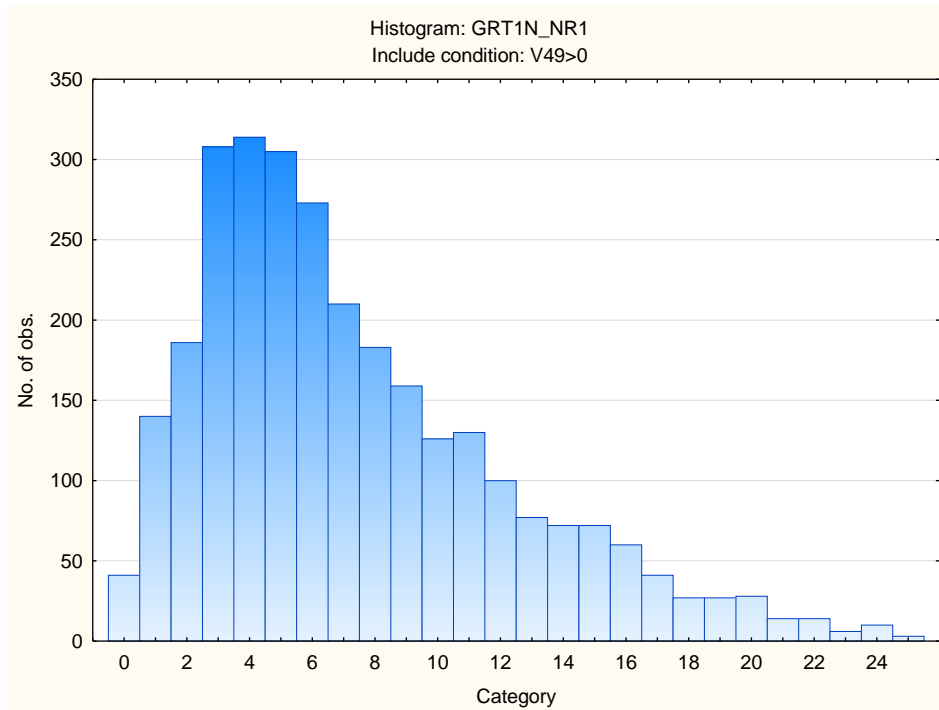
Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
GRT1A_AR1	9.77079	4.000879	0.000000	25.00000	3643	0
GRT1A_AR1A	20.39665	4.463712	1.000000	25.00000	3643	0





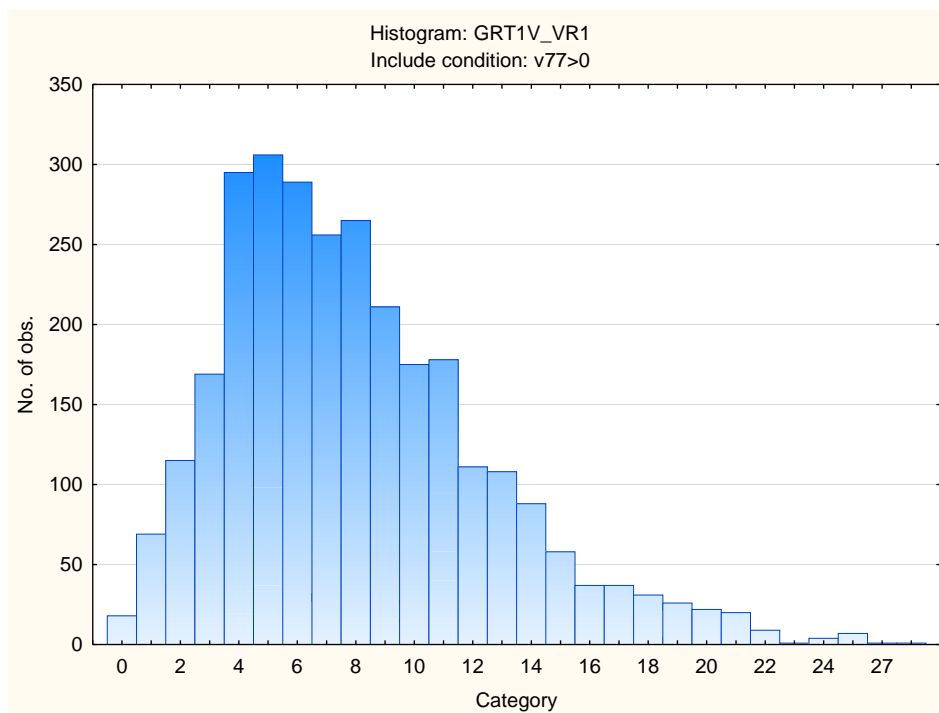
Graduate Numerical Reasoning Test

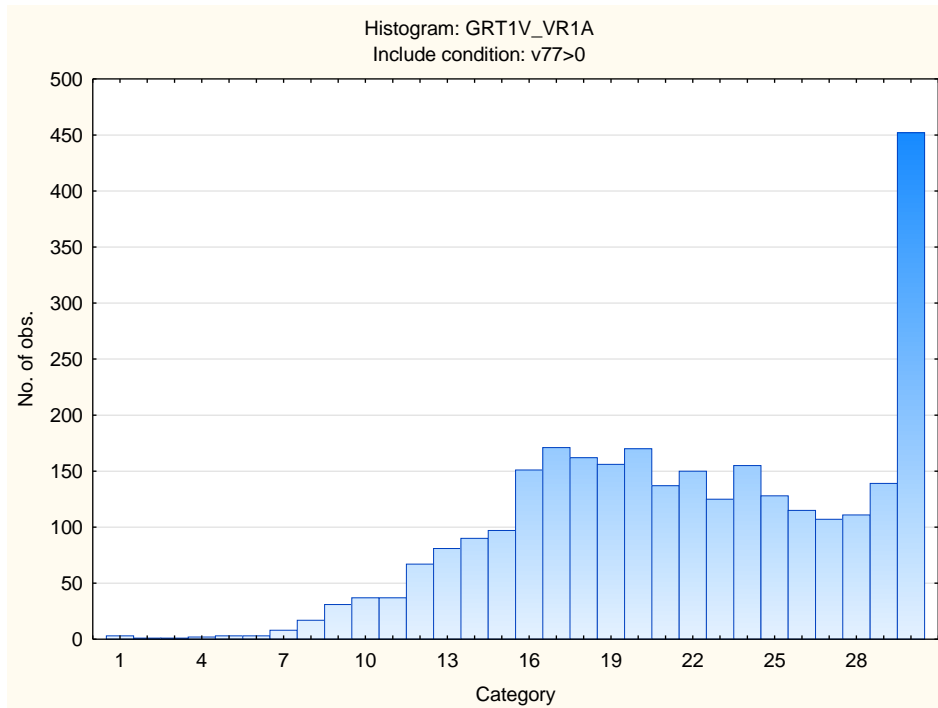
Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
GRT1N_NR1	7.33766	4.898714	0.000000	25.00000	2926	0
GRT1N_NR1A	16.60800	5.346566	1.000000	25.00000	2926	0



Graduate Verbal Reasoning Test

Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
GRT1V_VR1	8.01066	4.495875	0.000000	28.00000	2907	0
GRT1V_VR1A	21.67939	6.115689	1.000000	30.00000	2907	0





Stanine table

Subtest	S9_1	S9_2	S9_3	S9_4	S9_5	S9_6	S9_7	S9_8	S9_9
Graduate Verbal Reasoning	0-0	1-2	3-4	5-6	7-9	10-11	12-13	14-15	16-28
Graduate Verbal Items Attempted	1-10	11-14	15-17	18-20	21-23	24-26	27-29	30-30	
Graduate Numerical Reasoning	0-1	0-1	2-3	4-6	7-8	9-11	12-13	14-15	16-25
Graduate Numerical Items Attempted	1-7	8-9	10-12	13-15	16-17	18-20	21-23	24-25	
Graduate Abstract Reasoning	0-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16	17-25
Graduate Abstract Items Attempted	1-12	13-14	15-17	18-19	20-21	22-23	24-25		

Graduate Reasoning Test (GRT1)

Norm group: South Africans, Indigenous Language Group, Updated 2012

Norm Type

Standard Deviation Norm

Graduate Abstract Reasoning Test: Biographical Composition

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	210	210	43.65904	43.6590
M	270	480	56.13306	99.7921
U	1	481	0.20790	100.0000
Missing	0	481	0.00000	100.0000

Category	Frequency table: Education			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	116	116	24.11642	24.1164
Grade 12	99	215	20.58212	44.6985
Diploma	94	309	19.54262	64.2412
<Grade 12	10	319	2.07900	66.3202
Post Graduate	50	369	10.39501	76.7152
Certificate	4	373	0.83160	77.5468
Missing	108	481	22.45322	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
Setswana	58	58	12.05821	12.0582
isiXhosa	206	264	42.82744	54.8857
Xitsonga	13	277	2.70270	57.5884
isiZulu	106	383	22.03742	79.6258
Sesotho	50	433	10.39501	90.0208
Sepedi	23	456	4.78170	94.8025
isiNdebele"	3	459	0.62370	95.4262
Tshivenda	6	465	1.24740	96.6736
siSwati	8	473	1.66320	98.3368
Missing	8	481	1.66320	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Indigenous	481	481	100.0000	100.0000
Missing	0	481	0.0000	100.0000

Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	3	3	0.62370	0.6237
European	1	4	0.20790	0.8316
African	475	479	98.75260	99.5842
Missing	2	481	0.41580	100.0000

Graduate Numerical Reasoning Test: Biographical Composition

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	113	113	45.20000	45.2000
M	137	250	54.80000	100.0000
Missing	0	250	0.00000	100.0000

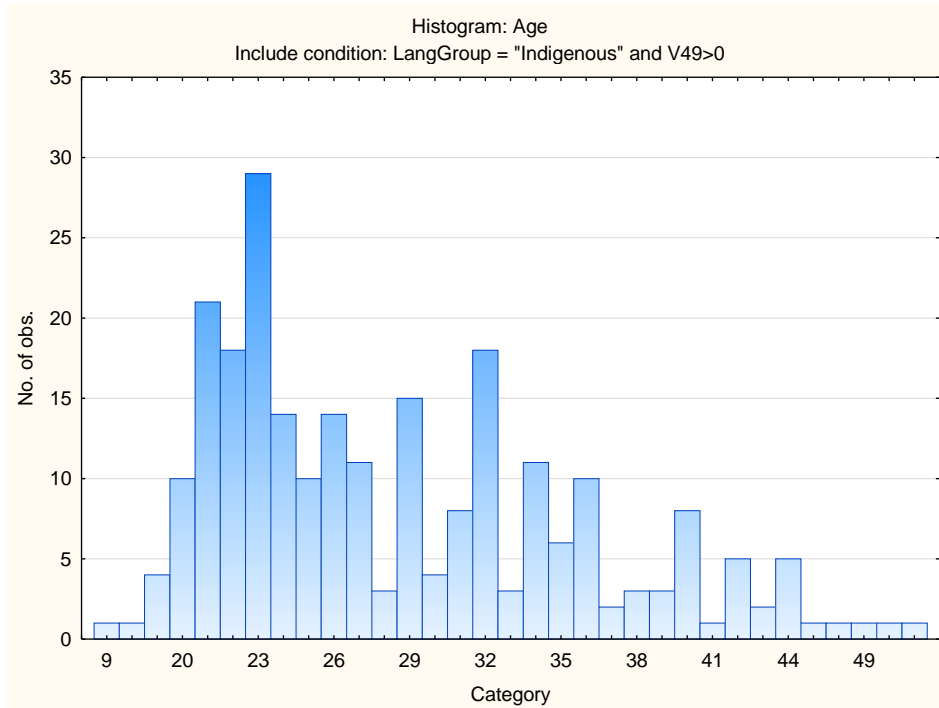
Category	Frequency table: Education			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	73	73	29.20000	29.2000
Grade 12	58	131	23.20000	52.4000
Diploma	26	157	10.40000	62.8000
<Grade 12	6	163	2.40000	65.2000
Post Graduate	27	190	10.80000	76.0000
Certificate	3	193	1.20000	77.2000
Missing	57	250	22.80000	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
Setswana	26	26	10.40000	10.4000
isiXhosa	125	151	50.00000	60.4000
Xitsonga	5	156	2.00000	62.4000
isiZulu	47	203	18.80000	81.2000
Sesotho	20	223	8.00000	89.2000
Sepedi	14	237	5.60000	94.8000
isiNdebele"	3	240	1.20000	96.0000
Tshivenda	4	244	1.60000	97.6000
siSwati	3	247	1.20000	98.8000
Missing	3	250	1.20000	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Indigenous	250	250	100.0000	100.0000
Missing	0	250	0.0000	100.0000

Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	3	3	1.20000	1.2000
European	1	4	0.40000	1.6000
African	246	250	98.40000	100.0000
Missing	0	250	0.00000	100.0000

Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	28.52245	7.323085	9.000000	53.00000	245	5



Graduate Verbal Reasoning Test: Biographical Composition

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	112	112	44.44444	44.4444
M	140	252	55.55556	100.0000
Missing	0	252	0.00000	100.0000

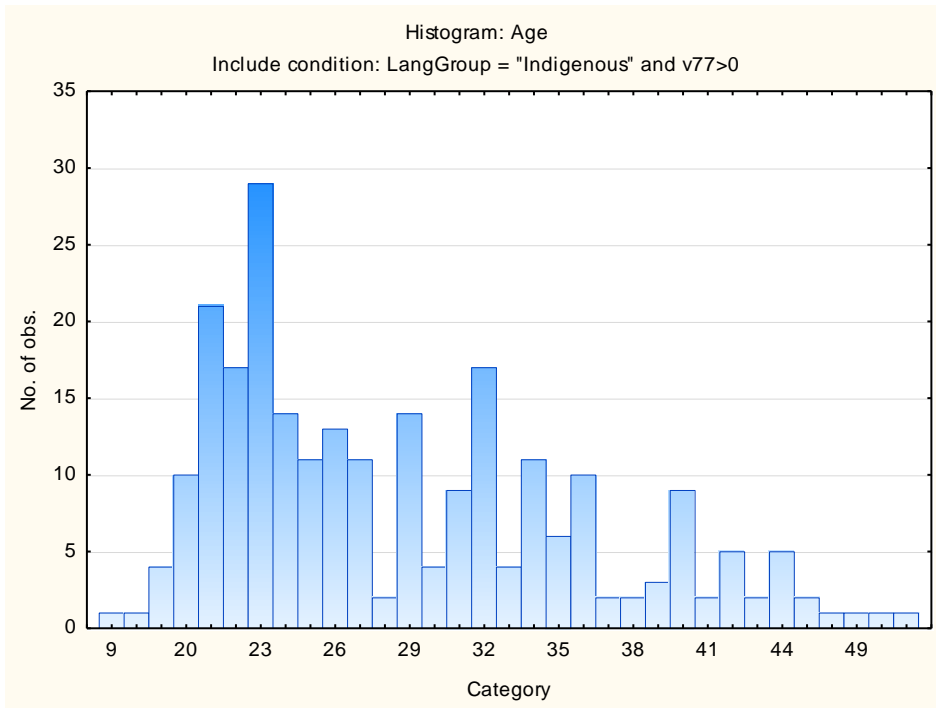
Category	Frequency table: Education			
	Count	Cumulative Count	Percent	Cumulative Percent
Degree	79	79	31.34921	31.3492
Grade 12	55	134	21.82540	53.1746
Diploma	26	160	10.31746	63.4921
<Grade 12	6	166	2.38095	65.8730
Post Graduate	27	193	10.71429	76.5873
Certificate	3	196	1.19048	77.7778
Missing	56	252	22.22222	100.0000

Category	Frequency table: Language			
	Count	Cumulative Count	Percent	Cumulative Percent
Setswana	28	28	11.11111	11.11111
isiXhosa	127	155	50.39683	61.5079
Xitsonga	6	161	2.38095	63.8889
isiZulu	42	203	16.66667	80.5556
Sesotho	21	224	8.33333	88.8889
Sepedi	14	238	5.55556	94.4444
isiNdebele"	3	241	1.19048	95.6349
Tshivenda	5	246	1.98413	97.6190
siSwati	3	249	1.19048	98.8095
Missing	3	252	1.19048	100.0000

Category	Frequency table: Language Group			
	Count	Cumulative Count	Percent	Cumulative Percent
Indigenous	252	252	100.0000	100.0000
Missing	0	252	0.0000	100.0000

Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	3	3	1.19048	1.1905
European	1	4	0.39683	1.5873
African	248	252	98.41270	100.0000
Missing	0	252	0.00000	100.0000

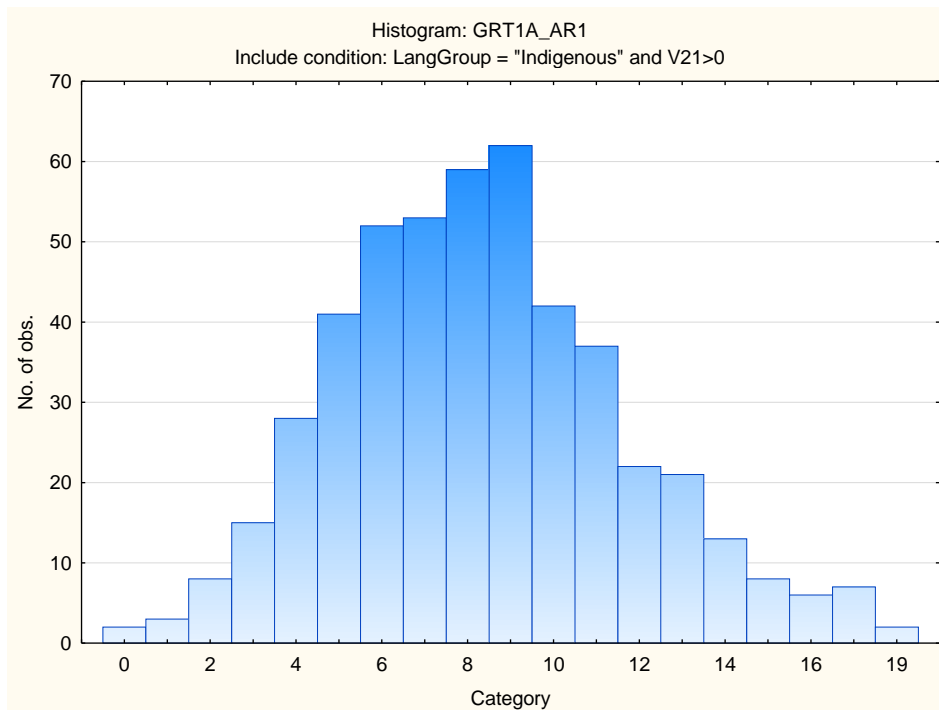
Variable	Descriptive Statistics: Age					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	28.68571	7.445100	9.000000	53.00000	245	7

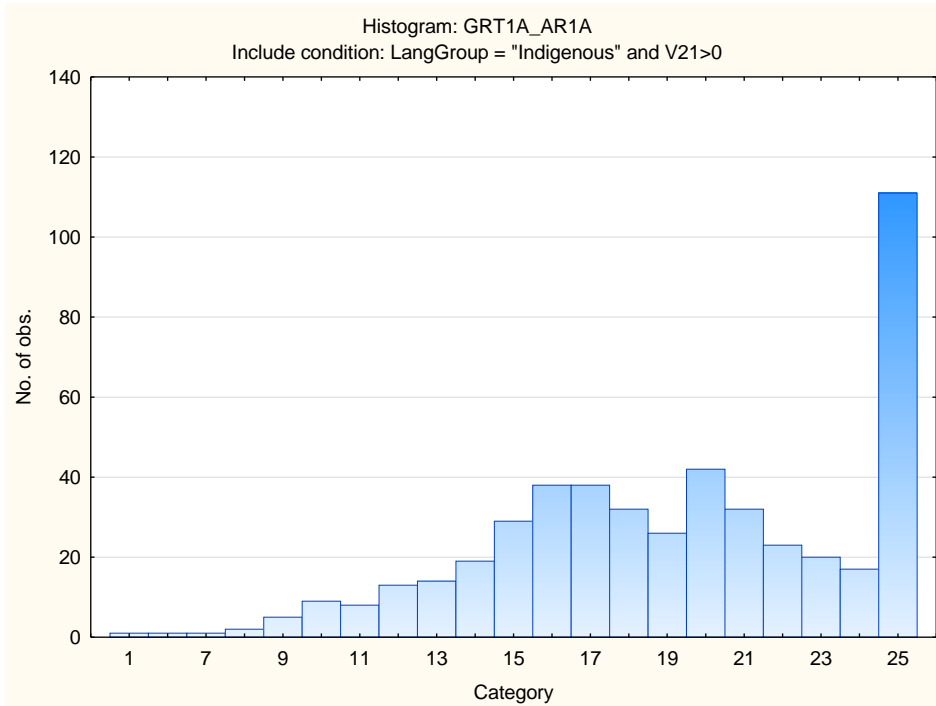


Descriptive Statistics and Frequency Distributions on Graduate Reasoning Test Battery Subtests

Graduate Abstract Reasoning Test

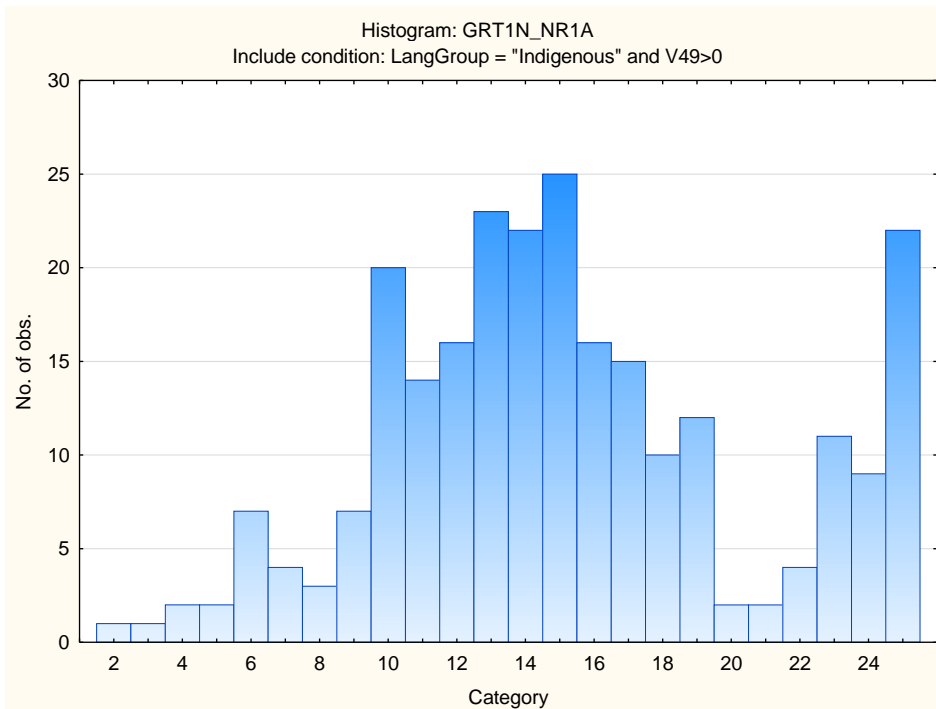
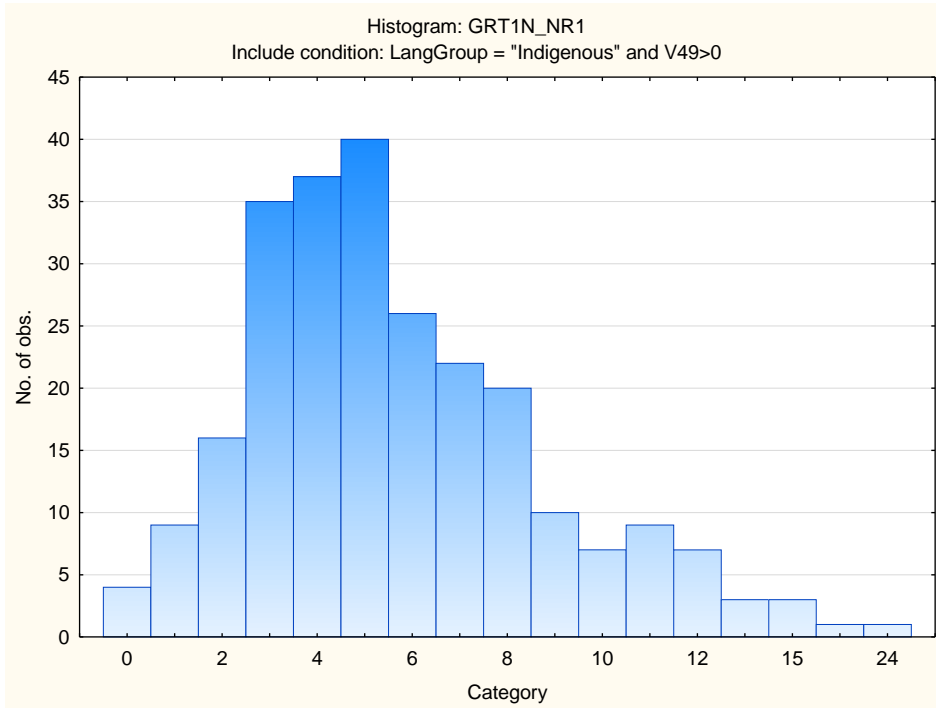
Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
GRT1A_AR1	8.34304	3.370336	0.000000	19.00000	481	0
GRT1A_AR1A	19.28690	4.633305	1.000000	25.00000	481	0





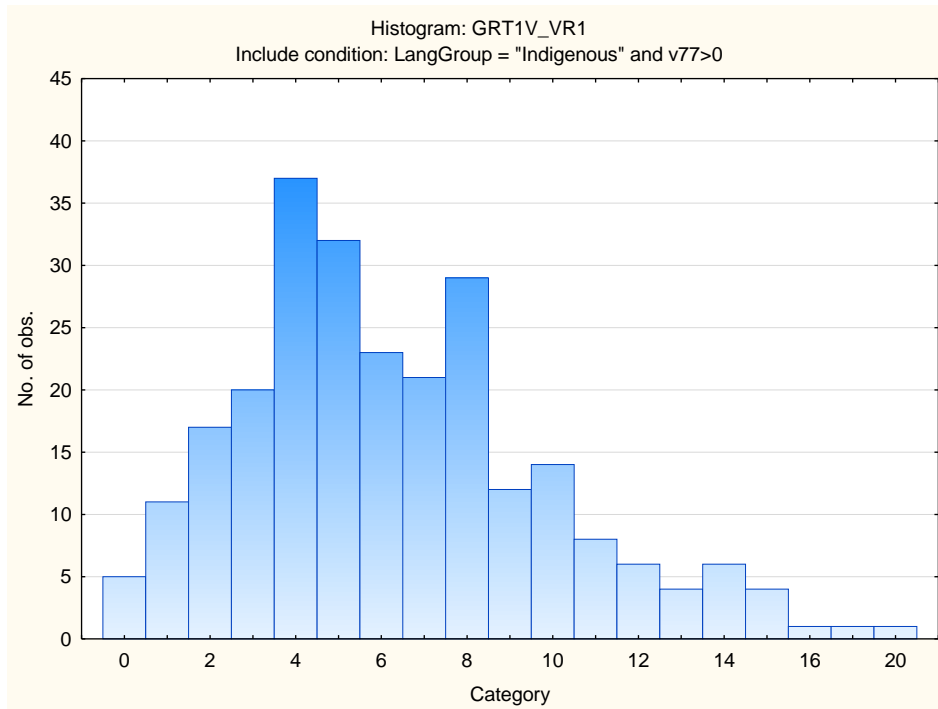
Graduate Numerical Reasoning Test

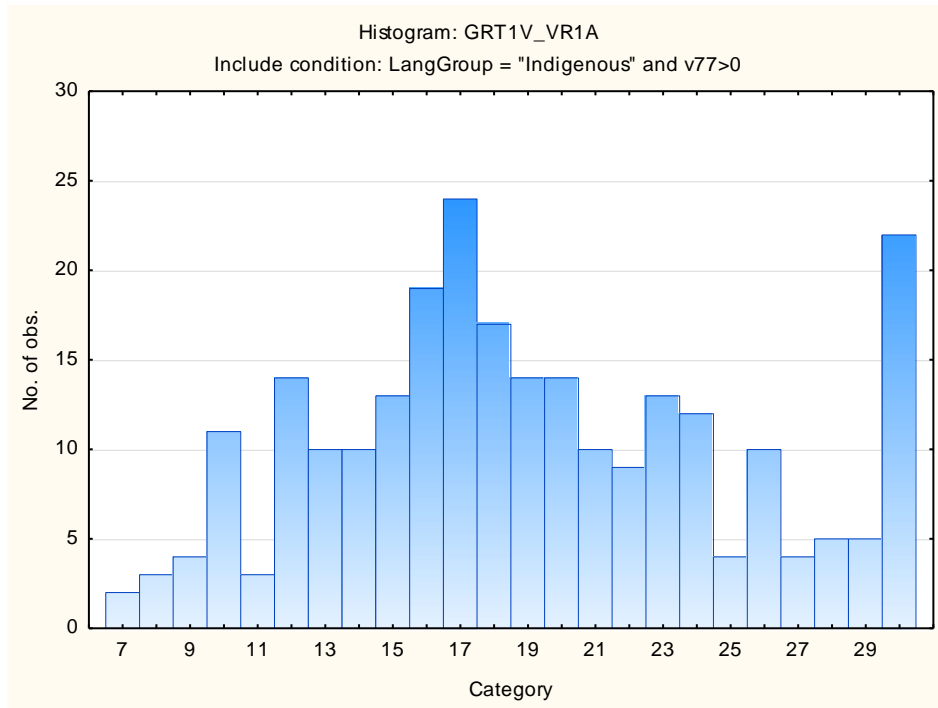
Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
GRT1N_NR1	5.72800	3.308444	0.000000	24.00000	250	0
GRT1N_NR1A	15.26400	5.396182	2.000000	25.00000	250	0



Graduate Verbal Reasoning Test

Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
GRT1V_VR1	6.30556	3.635522	0.000000	20.00000	252	0
GRT1V_VR1A	19.13492	5.993826	7.000000	30.00000	252	0





Stanine table

Subtest	S9_1	S9_2	S9_3	S9_4	S9_5	S9_6	S9_7	S9_8	S9_9
Graduate Verbal Reasoning	0--1	0-1	2-3	4-5	6-7	8-9	10-10	11-12	13-20
Graduate Verbal Items Attempted	7-8	9-11	12-14	15-17	18-20	21-23	24-26	27-29	30-30
Graduate Numerical Reasoning	0--1	0-1	2-3	4-4	5-6	7-8	9-9	10-11	12-24
Graduate Numerical Items Attempted	2-5	6-8	9-11	12-13	14-16	17-19	20-22	23-24	25-25
Graduate Abstract Reasoning	0-2	3-4	5-5	6-7	8-9	10-10	11-12	13-14	15-19
Graduate Abstract Items Attempted	1-11	12-13	14-15	16-18	19-20	21-22	23-25		

Graduate Reasoning Test Battery (GRT1)

Reliability introduction

Graduate Reasoning Test Battery (GRT1)	1
Reliability introduction	1
Reliability studies	3
Availability of biographical information	3
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Choosing an appropriate comparison group for reliability	3
The effect of reliability on validity	3
What Does It Mean If A Test Has Low Reliability?	3
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Reliability studies

Reliability studies are done whenever we receive a substantial body of data that contains item responses. Reliability calculation is one of the services offered by Psytech SA to its clients. In almost all cases, clients have been willing to share the results of these calculations with other users.

Availability of biographical information

Frequently full biographical information is not collected, which makes it very difficult to calculate separate reliabilities on different racial and language groups. In some cases, it has been necessary to do a post-hoc classification of respondents based on their names. In such situations it is usually not possible to distinguish between Whites and Coloureds, and they have had to be classified together in one group.

Relationship between reliability groups and norm groups

It is not possible to create a norm group for each reliability sample, because of sample size constraints. It is also not possible to report Coefficient Alpha for every norm sample, because item response data are not always available. In some cases, we have used the Kuder-Richardson Formula 21 to calculate an index of reliability in the absence of detailed item response information. For ease of reference, we have included as much information as possible about the composition of the samples, rather than refer the user to the description of a related norm group.

Standard error of measurement (SEM)

Where data are available, the standard error of measurement is reported for every group for which we have calculated reliabilities. This is usually done for samples that are also used as norm groups. In some cases, the Standard Error of Measurement is reported for a group that has been screened for English comprehension, and for the total group as well.

Choosing an appropriate comparison group for reliability

If a larger, more diverse group is available that conforms to the demographic characteristics of the group you are interested in, use that table for comparison purposes.

The effect of reliability on validity

The reliability of a test places an upper limit on its validity. If a test is not reliable, it can not be valid.

What Does It Mean If A Test Has Low Reliability?

On an ability measure, Reliability is considered low if it is below 0.75. In cases where the reliability is below 0.65, the results should be interpreted with extreme caution by using additional information for this purpose. The interview prompts report can assist the user in obtaining additional information for the purpose of triangulation, directly from the respondent. There are various reasons why the reliability of a test, or of a specific sample of the overall sample group, might be low:

- Respondents guessing the answers to items which they may not know. Results should therefore be interpreted with caution.

- Respondents may have rushed to complete the assessment or may have been lacking in motivation at the time of test completion. In this instance, a lower reliability could be attributed to guessing or hasty decision making.
- Respondents finding the test items too difficult.
- Shorter tests, although economic and quick to administer, tend to be less reliable.

It is best practice to always rely on multiple sources of information when making an informed decision utilising an assessment process. This is of particular importance when the reliability of an assessment is lower than usual.

Advice to users

- Collect full biographical information on the respondents.
- Verify whether the scales you are interested in for decision-making purposes, are reliable for the persons you want to test.
- Where available, bear the Standard Error of Measurement in mind when making decisions on test results.
- Do not use unreliable scales for decision making.
- Do not rely on a single test when reliability is doubtful.

List of reliability studies for the Graduate Reasoning Test Battery

Sample	Study No
SA Applicants for admission to Business School courses	R1
SA Bank applicants and incumbents	R2
SA Applicants for training in the Information Technology industry	R3
SA Managers and professionals	R4
SA Applicants for learnerships in the services sector	R5
SA Graduate vocational guidance clients	R6

GRT1 Reliability: SA Applicants for admission to Business School courses

Sample composition

The sample consisted of applicants to postgraduate courses at the Graduate Business School of a South African University.

Sample composition

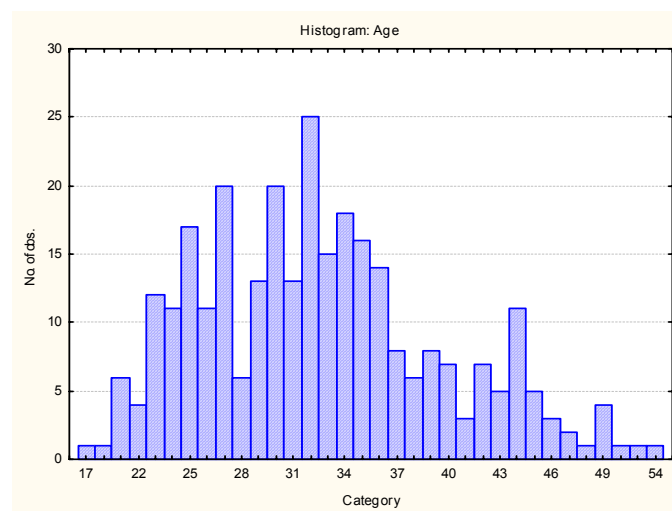
Frequency table: Sex				
Category	Count	Cumulative Count	Percent	Cumulative Percent
M	202	202	67.78523	67.7852
F	95	297	31.87919	99.6644
U	1	298	0.33557	100.0000
Missing	0	298	0.00000	100.0000

Frequency table: Education				
Category	Count	Cumulative Count	Percent	Cumulative Percent
Degree	65	65	21.81208	21.8121
Grade 12	109	174	36.57718	58.3893
Grade 10 or 11	17	191	5.70470	64.0940
Technikon	32	223	10.73826	74.8322
Post Graduate	19	242	6.37584	81.2081
University diploma	17	259	5.70470	86.9128
Vocational Training	13	272	4.36242	91.2752
University entrance matric	1	273	0.33557	91.6107
University entrance matri	1	274	0.33557	91.9463
Missing	24	298	8.05369	100.0000

Frequency table: First Language				
Category	Count	Cumulative Count	Percent	Cumulative Percent
English	133	133	44.63087	44.6309
Afrikaans	41	174	13.75839	58.3893
isiXhosa	45	219	15.10067	73.4899
Other	12	231	4.02685	77.5168
Setswana	1	232	0.33557	77.8523
isiNdebele	3	235	1.00671	78.8591
Sesotho	2	237	0.67114	79.5302
Missing	61	298	20.46980	100.0000

Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	159	159	53.35570	53.3557
African	91	250	30.53691	83.8926
Asian	23	273	7.71812	91.6107
European	9	282	3.02013	94.6309
Missing	16	298	5.36913	100.0000

Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	32.60811	7.015851	17.00000	54.00000	296	2



Internal consistency reliabilities on GRT1 subtests

Subtest	Coefficient Alpha
Graduate Verbal Reasoning	.67
Graduate Numerical Reasoning	.81
Graduate Abstract Reasoning	.70

Standard Error of Measurement

	1 ScaleName	2 SEM	3 SD	4 Reliability
1	Verbal Reasoning	2.085276	3.63	0.67
2	Numerical Reasoning	1.992017	4.57	0.81
3	Abstract Reasoning	2.15255	3.93	0.7

GRT1 Reliability: SA Bank Applicants

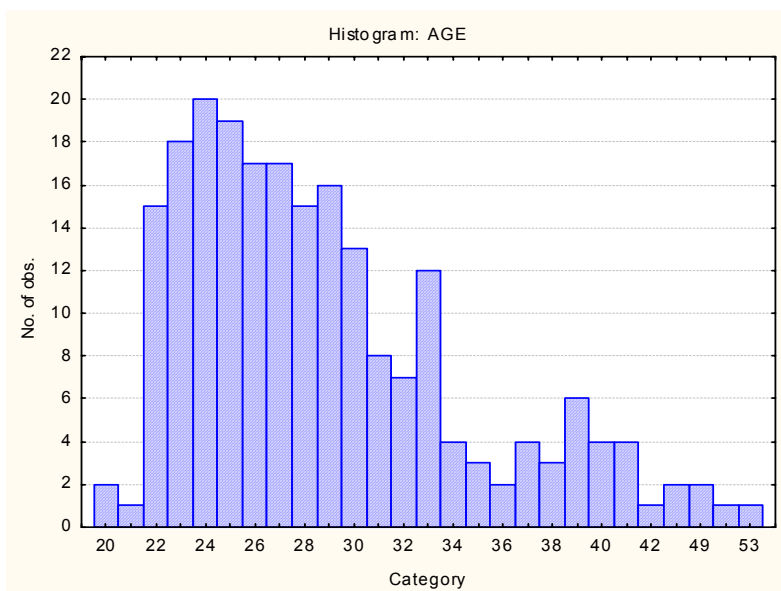
Sample composition

Applicants and incumbents in a major SA Bank (Positions that require graduate qualifications).
Data were collected between 1997 and 2000

Frequency table: RACE				
Category	Count	Cumulative Count	Percent	Cumulative Percent
Whites/coloureds	123	123	53.71179	53.7118
Asians	26	149	11.35371	65.0655
Blacks	78	227	34.06114	99.1266
Missing	2	229	0.87336	100.0000

Frequency table: GENDER				
Category	Count	Cumulative Count	Percent	Cumulative Percent
Female	98	98	42.79476	42.7948
Male	131	229	57.20524	100.0000
Missing	0	229	0.00000	100.0000

Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
AGE	28.88018	6.027285	20.00000	53.00000	217	12



Internal consistency reliabilities on GRT1 subtests

Test	Coefficient Alpha
Graduate Verbal Reasoning	.791727
Graduate Numerical Reasoning	.813345
Graduate Abstract Reasoning	.728689
Mean alpha	0.77792

GRT1 Reliability: SA IT Applicants

Sample composition

Applicants for training in the SA Information Technology Industry.
Data were collected between 2001-2002.

Age			
Mean	Min	Max	Missing
25.33	18	52	0

Sex		
Male	Female	Missing
210	94	10

Race and language data were not collected

Internal Consistency Reliabilities on GRT1 subtests

Subtest	Kuder 21 Reliability Coefficient
Graduate Verbal Reasoning	.73
Graduate Numerical Reasoning	.81
Graduate Abstract Reasoning	.60

GRT1 reliability: SA Managers and Professionals

Sample composition

Sample composition

These reliabilities were calculated from raw data submitted by various clients of Psytech SA in 2001.

Graduate Verbal Reasoning

Age			
Mean	Min	Max	Missing
29.39	2	53	48

Sex		
Male	Female	Missing
309	166	0

Graduate Numerical Reasoning

Age			
Mean	Min	Max	Missing
29.37	2	53	47

Sex		
Male	Female	Missing
303	165	0

Graduate Abstract Reasoning

Age			
Mean	Min	Max	Missing
28.97	2	53	40

Sex		
Male	Female	Missing
214	134	0

Race and language data were not collected

Descriptive statistics on GRT1 subtests

Dim	Sample Size	Mean	SD
Grad Verbal Reasoning	475	10.64	5.74
Grad Numerical Reasoning	468	9.27	5.39
Grad Abstract Reasoning	348	11.18	4.26

Internal consistency Reliabilities on GRT1 subtests

Subtest	Kuder Richardson 21 Reliability Coefficient
Graduate Verbal Reasoning	.81
Graduate Numerical Reasoning	.83
Graduate Abstract Reasoning	.70

GRT1 Reliability: SA Learnership applicants

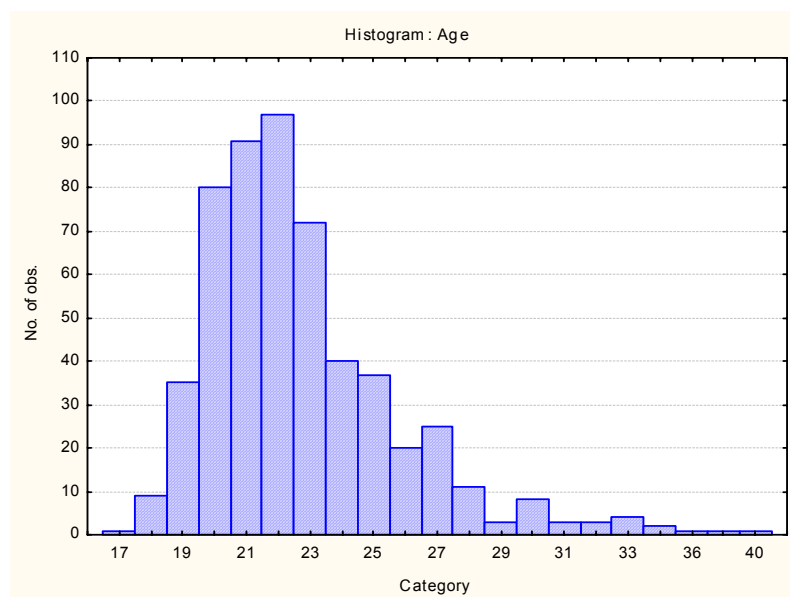
Sample Composition

Applicants for learnerships in the Services Sector. Tested in Gauteng during 2003. Applicants had at least a Grade 12 education.

Category	Frequency table: Race			
	Count	Cumulative Count	Percent	Cumulative Percent
Asian	4	4	0.73529	0.7353
White/coloured	37	41	6.80147	7.5368
Black	500	541	91.91176	99.4485
Missing	3	544	0.55147	100.0000

Category	Frequency table: Sex			
	Count	Cumulative Count	Percent	Cumulative Percent
F	272	272	50.00000	50.0000
M	272	544	50.00000	100.0000
Missing	0	544	0.00000	100.0000

Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	22.72610	3.113622	17.00000	40.00000	544	0



Internal consistency reliabilities on GRT1 subtests

Subtest	Coefficient alpha
Graduate Verbal Reasoning	.45
Graduate Numerical Reasoning	.54
Graduate Abstract Reasoning	.59

Comments: This test battery was clearly too difficult for the respondent group, hence the low reliabilities.

GRT1 Reliability: Graduate vocational guidance clients

Sample composition

The sample consisted of clients at a University career counseling center in Gauteng. All respondents in the group had tertiary qualifications.

Frequency table: Race				
Category	Count	Cumulative Count	Percent	Cumulative Percent
Whites/coloureds	25	25	75.75758	75.7576
Asians	6	31	18.18182	93.9394
Blacks	2	33	6.06061	100.0000
Missing	0	33	0.00000	100.0000

Frequency table: Sex				
Category	Count	Cumulative Count	Percent	Cumulative Percent
Male	19	19	57.57576	57.5758
Female	14	33	42.42424	100.0000
Missing	0	33	0.00000	100.0000

Descriptive Statistics						
Variable	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	29.00000	5.545268	22.00000	43.00000	33	0



Internal consistency reliabilities on GRT1 subtests

Subtest	Cronbach coefficient alpha
Graduate Verbal Reasoning	.67
Graduate Numerical Reasoning	.88
Graduate Abstract Reasoning	.76

Graduate Reasoning Test Battery (GRT1)

Validity Introduction

Recommendations

Users are strongly encouraged to do validation studies on the instruments they use within their organisations or within their industry sectors, by co-operating with other organisations in the same industry. In some cases this may mean sharing information with organisations that are potential competitors. In the interest of professionalism, users are encouraged to overcome their reservations in this regard, since co-operation is in their interest. Psytech South Africa provides extensive support for validation studies done on its instruments, and users are welcome to contact their representatives in this regard.

For construct validation studies, it is necessary to assess a particular ability with more than one instrument on the same respondents. This may seem like an unnecessary expense at first, but it is worthwhile to verify how ability measures relate to one another, particularly if one is still introducing a new measure.

Predictive validation studies can be done against competency ratings, or against 'hard' data like production or sales figures. It is preferable to use both types of criterion information, because that enables one to validate the competency ratings as well.

At the time of writing, there was still a shortage of validity information, particularly predictive validity, regarding the Graduate Reasoning Test Battery in South Africa. More information is being sought, and this section will shortly be updated.

Index of validity studies on the Graduate Reasoning Test Battery (GRT1)

Description	Study number
Correlations with business school subjects	V1
Correlations with GRT2	V2

GRT1 Predictive Validity: Correlations with business school subjects

Sample description:

Students at the graduate business school of a university in South Africa, studying management development courses.

Frequency table: Sex				
Category	Count	Cumulative Count	Percent	Cumulative Percent
Female	54	54	38.02817	38.0282
Male	88	142	61.97183	100.0000
Missing	0	142	0.00000	100.0000

Frequency table: Education				
Category	Count	Cumulative Count	Percent	Cumulative Percent
Post Graduate	9	9	6.33803	6.3380
Grade 12	53	62	37.32394	43.6620
Technikon	20	82	14.08451	57.7465
Degree	29	111	20.42254	78.1690
Vocational Training	5	116	3.52113	81.6901
University diploma	10	126	7.04225	88.7324
Grade 10 or 11	6	132	4.22535	92.9577
Missing	10	142	7.04225	100.0000

Frequency table: Race				
Category	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	78	78	54.92958	54.9296
African	39	117	27.46479	82.3944
Asian	14	131	9.85915	92.2535
European	5	136	3.52113	95.7746
Missing	6	142	4.22535	100.0000

Category	Frequency table: First Language			
	Count	Cumulative Count	Percent	Cumulative Percent
English	51	51	35.91549	35.9155
Afrikaans	18	69	12.67606	48.5915
isiXhosa	19	88	13.38028	61.9718
Sesotho	2	90	1.40845	63.3803
Other	7	97	4.92958	68.3099
isiNdebele	1	98	0.70423	69.0141
Missing	44	142	30.98592	100.0000

Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	32.55634	6.753538	21.00000	51.00000	142	0



Correlations of GRT1 subtests with business school subjects

Variable	Correlations Marked correlations are significant at $p < .05000$		
	Graduate Abstract Reasoning	Graduate Numerical Reasoning	Graduate Verbal Reasoning
Introduction to Finance	.0524 N=53 p=.710	.1479 N=53 p=.291	.1232 N=53 p=.379
Quantitative Management Techniques	.4146 N=21 p=.062	.8844 N=21 p=.000	.3344 N=21 p=.138
Economics for Managers	.5845 N=8 p=.128	.6275 N=8 p=.096	.5616 N=8 p=.147
Introduction to Information systems	1.0000 N=2 p=---	-- N=2 p=---	-- N=2 p=---
Principles of Management Practice	.0269 N=50 p=.853	-.0904 N=50 p=.532	.2250 N=50 p=.116
Principles of Management Accounting	.4518 N=24 p=.027	.3245 N=24 p=.122	.2956 N=24 p=.161
Principles of Marketing Management	.0344 N=72 p=.774	-.0744 N=72 p=.535	.2958 N=72 p=.012
Human Resources Management	.2262 N=11 p=.504	.4649 N=11 p=.150	.4249 N=11 p=.193
Financial Management	.4350 N=12 p=.158	.5502 N=12 p=.064	.5321 N=12 p=.075
Operations Management	.0691 N=59 p=.603	.1151 N=59 p=.385	.2593 N=59 p=.047
Strategic Management	.2016 N=21 p=.381	.1996 N=21 p=.386	.0995 N=21 p=.668
Industrial Relations	1.0000 N=2 p=---	1.0000 N=2 p=---	-1.0000 N=2 p=---
Contemporary Business Communication	.3147 N=29 p=.096	.1297 N=29 p=.502	.1701 N=29 p=.378
Management Skills A	-.2713 N=16 p=.310	-.5227 N=16 p=.038	.2818 N=16 p=.290
Management Skills B	.3781 N=22 p=.083	.5448 N=22 p=.009	.1832 N=22 p=.414

Comments

The groups of students studying particular subjects were small. The correlations with the business school subjects were on the whole low, with only a few subjects attaining statistical significance. This could be ascribed to the fact that the Graduate Reasoning Tests were possibly too difficult for the sample concerned, since better results were obtained for the General Reasoning Tests on the same criteria.

GRT1 Construct validity: Correlations with GRT2

Sample composition

The sample consisted of 184 students selected to attend business development courses at a graduate business school in SA, who had completed both the GRT1 and GRT2. Because of the implementation of Recognition of Prior Learning at the university, persons without post-matric qualifications, but with work experience, were also considered for admission.

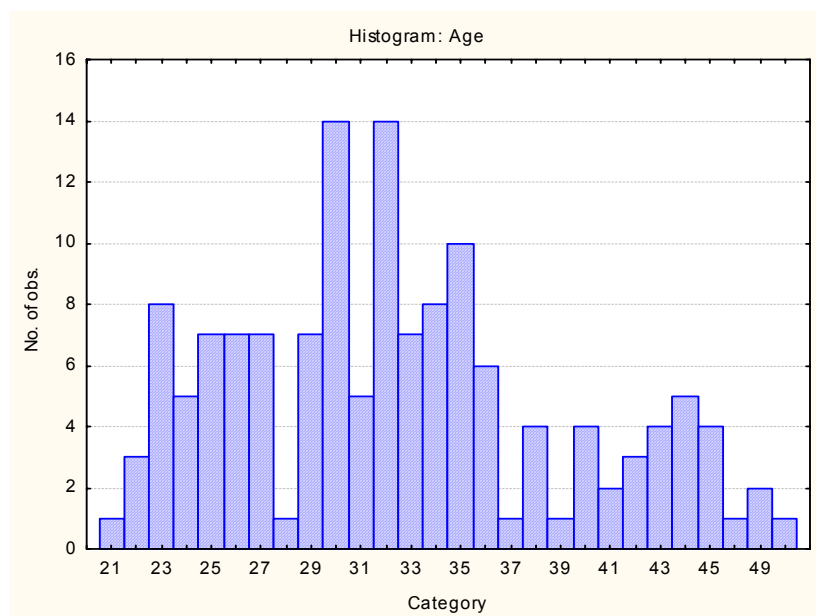
Frequency table: Sex				
Category	Count	Cumulative Count	Percent	Cumulative Percent
Female	54	54	38.02817	38.0282
Male	88	142	61.97183	100.0000
Missing	0	142	0.00000	100.0000

Frequency table: Education				
Category	Count	Cumulative Count	Percent	Cumulative Percent
Post Graduate	9	9	6.33803	6.3380
Grade 12	53	62	37.32394	43.6620
Technikon	20	82	14.08451	57.7465
Degree	29	111	20.42254	78.1690
Vocational Training	5	116	3.52113	81.6901
University diploma	10	126	7.04225	88.7324
Grade 10 or 11	6	132	4.22535	92.9577
Missing	10	142	7.04225	100.0000

Frequency table: First Language				
Category	Count	Cumulative Count	Percent	Cumulative Percent
English	51	51	35.91549	35.9155
Afrikaans	18	69	12.67606	48.5915
isiXhosa	19	88	13.38028	61.9718
Sesotho	2	90	1.40845	63.3803
Other	7	97	4.92958	68.3099
isiNdebele	1	98	0.70423	69.0141
Missing	44	142	30.98592	100.0000

Frequency table: Race				
Category	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	78	78	54.92958	54.9296
African	39	117	27.46479	82.3944
Asian	14	131	9.85915	92.2535
European	5	136	3.52113	95.7746
Missing	6	142	4.22535	100.0000

Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	32.55634	6.753538	21.00000	51.00000	142	0



Correlations with Graduate Reasoning Test Battery

Variable	Correlations Marked correlations are significant at $p < .05000$ N=142 (Casewise deletion of missing data)		
	Graduate Abstract Reasoning	Graduate Numerical Reasoning	Graduate Verbal Reasoning
General Abstract Reasoning	0.61	0.54	0.28
General Numerical Reasoning	0.63	0.72	0.32
General Verbal Reasoning	0.51	0.48	0.59

These correlations are uncorrected.

Comments

The correlations of the General Reasoning Test Battery subtests with their counterparts in the Graduate Reasoning Test Battery are significant, and support the construct validity of both tests. While the Graduate Verbal Reasoning test did not correlate highly with the Abstract and Numerical subtests of the General Reasoning test battery, the correlation with the General Verbal Reasoning test was satisfactory, though not high enough to consider it a parallel form. It should be borne in mind that the difficulty levels of the Graduate Reasoning Test Battery tests are considerably higher than the General Reasoning Test Battery's subtest, and the restricted range would depress these correlations.

Graduate Reasoning Test Battery (GRT1)

Differential Item Functioning

Introduction

Graduate Reasoning Test Battery (GRT1)	1
Differential Item Functioning	1
Introduction	1
What is Differential Item Functioning?	2
Ways of calculating Differential Item Functioning	2
Dividing the samples into score levels	2
Grouping respondents	2
Direction and magnitude of differences	2
List of Differential item functioning studies reported for the Graduate Reasoning Test Battery:	3

What is Differential Item Functioning?

Differential item functioning is found when a test item behaves differently for different population groups. Normally this means that the item shows a different relationship to the construct in question for different population groups. Normally one groups the respondents in terms of their level of score achieved on the construct, and then compares the likelihood of getting an item correct for the different population groups and the different score levels.

There are two different forms of Differential Item Functioning that are of interest to us:

Uniform bias means that one population group consistently has a better chance of answering an item correctly, irrespective of their total score.

Non-uniform bias means that the relative chance of answering the item correctly is not the same across all score levels, for different groups. This can be seen clearly on a graph, when the lines plotting the mean item score for a group are not parallel and may cross in places.

Ways of calculating Differential Item Functioning

There are many different ways of investigating Differential Item Functioning.

For the purpose of this manual, **Factorial Analysis of Variance** was used. This technique allows us to investigate the effect of combinations of continuous and categorical variables on predictor variables. It produces a particularly informative graph which is useful for visualising the effect of non-uniform bias.

The Factorial Analysis of Variance can also indicate uniform bias when a significant effect for the race group variable is found. Non-uniform bias is indicated by a significant interaction effect for the race group variable and score level.

Dividing the samples into score levels

The samples were divided into score levels in such a way that there would be sufficient persons of each group in every score category. To do this, stanine scores were calculated and the frequency tables for every race group examined for the stanine scores. To avoid creating cells with very few cases, resulting in meaningless output, the groups could not always be divided up evenly. It should also be pointed out that the low end and high end of the distributions could not be examined in great detail, because there are few persons in any group that score at the extremes of the scale. Only if one has an extremely large sample can the high end and low end of a scale be fully studied for bias. The score level variable used in the study can only be considered ordinal data (the intervals are not of uniform size). This should be borne in mind when interpreting the graphs.

Grouping respondents

Ideally, one would want to examine all race groups in detail, but in practice this is not always possible. The grouping of respondents according to race group had to be determined by the availability of data. Grouping is usually done with all Black candidates on one group, and all the other groups in the other.

Direction and magnitude of differences

If DIF is found, the bias is not necessarily in favour of the Non-Black or Advantaged group. The size of the differences in item means scores must also be considered. In some cases the differences are very small. For every study, a summary of the findings is given, as well as a detailed report of the findings for every item. The differences between race groups, where bias is found, is graphically depicted.

List of Differential item functioning studies reported for the Graduate Reasoning Test Battery (GRT1):

Tests	Grouping	Sample	Study number
Graduate Verbal Reasoning Graduate Numerical Reasoning Graduate Abstract Reasoning	Black-NonBlack	Applicants to business school courses	D1
Graduate Verbal Reasoning Graduate Numerical Reasoning Graduate Abstract Reasoning	Black-NonBlack	Applicants and incumbents in a South African Bank	D2

GRT1 Differential Item Functioning: SA Business school applicants

Sample composition

Frequency table: Sex				
Category	Count	Cumulative Count	Percent	Cumulative Percent
M	202	202	67.78523	67.7852
F	95	297	31.87919	99.6644
U	1	298	0.33557	100.0000
Missing	0	298	0.00000	100.0000

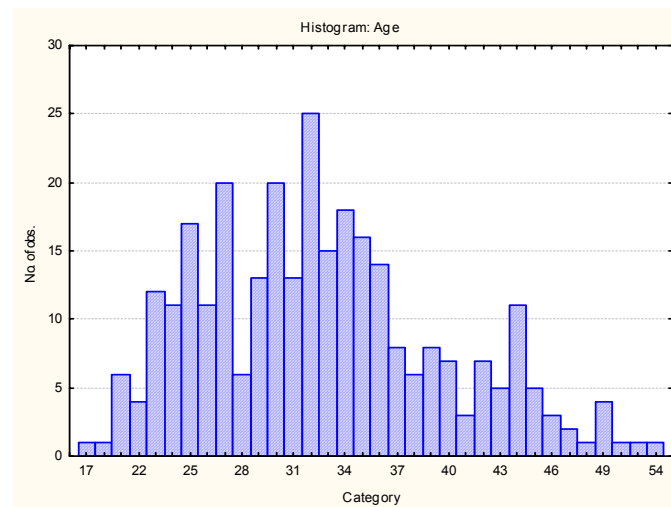
Frequency table: Education				
Category	Count	Cumulative Count	Percent	Cumulative Percent
Degree	65	65	21.81208	21.8121
Grade 12	109	174	36.57718	58.3893
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Technikon	32	223	10.73826	74.8322
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Frequency table: First Language				
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Missing	61	298	20.46980	100.0000

Frequency table: Race				
Category	Count	Cumulative Count	Percent	Cumulative Percent
Coloured	159	159	53.35570	53.3557
African	92	251	30.87248	84.2282
Asian	23	274	7.71812	91.9463
European	9	283	3.02013	94.9664
Missing	15	298	5.03356	100.0000

Frequency table: Racegroup				
Category	Count	Cumulative Count	Percent	Cumulative Percent
Black	92	92	30.87248	30.8725
Non-Black	206	298	69.12752	100.0000
Missing	0	298	0.00000	100.0000

Descriptive Statistics						
Variable	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
Age	32.60811	7.015851	17.00000	54.00000	296	2



Method

Applicants were classified into Black and non-Black for the purpose of the analysis, since the size of the sample did not allow for finer distinctions.

Applicants were classified into score levels for the test being evaluated. The cut-offs for the levels were determined by examining the frequency distributions for both race groups, trying to ensure a sufficient number of cases for both race groups in each category.

The statistical technique used in this study was factorial analysis of variance. For every item a factorial analysis of variance was done, using the scored item response as dependent variable, and the race group and score level (on the overall test score for the subtest being investigated) as predictor variables. If a significant effect was found for race, that was taken as an indication of uniform item bias, and the least-square difference in the means for that item was plotted graphically to illustrate which race group had a higher probability of getting the item right. If a significant interaction effect was found for race group and score level, that was taken as an indication of non-uniform item bias, and the means at all levels for both race groups were plotted to illustrate the severity of the non-uniform bias that was found.

Detailed results by item for Graduate Verbal Reasoning Test

Item number	Uniform bias	In favour of group	Non-uniform bias
1	No		No
2	Yes	Non-Black	No
3	Yes	Non-Black	No
4	No		No
5	No		No
6	No		No
7	Yes	Non-Black	No
8	No		No
9	No		No
10	No		No
11	No		No
12	No		No
13	No		No
14	No		No
15	No		No
16	No		No
17	Yes	Black	No
18	No		No
19	No		Yes
20	No		Yes
21	No		No
22	No		No
23	No		No
24	Yes	Black	No
25	No		No
26	Yes	Black	No
27	No		Yes
28	No		No
29	No		No
30	No		No

Uniform bias was found in 6 items out of 30.

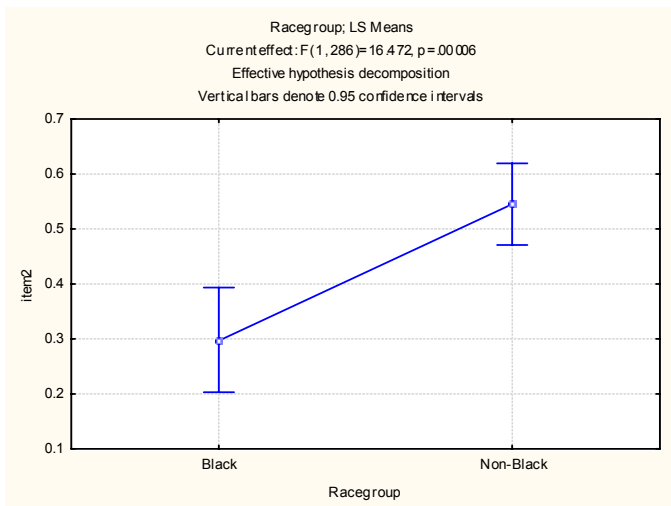
Three items were biased in favour of the Non-Black group, and three in favour of the Black group.

Non-uniform bias was found in three items. None of these also exhibited Uniform bias.

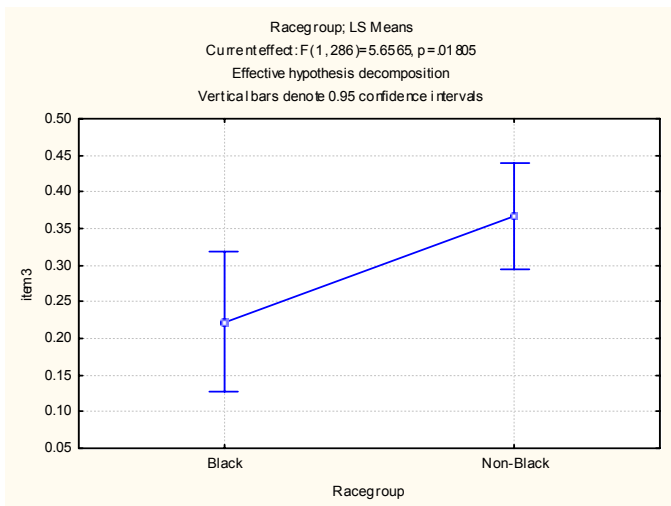
The detailed results that follow contain graphic illustrations of the items where bias was found.

Univariate Tests of Significance for item1 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	9.79471	1	9.794706	59.28422	0.000000
Racegroup	0.19093	1	0.190929	1.15563	0.283280
scorelevel	3.75903	5	0.751806	4.55044	0.000522
Racegroup*scorelevel	0.13553	5	0.027107	0.16407	0.975514
Error	47.25180	286	0.165216		

Univariate Tests of Significance for item2 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup					
scorelevel					
Racegroup*scorelevel	0.44594	5	0.08919	0.4483	0.814421
Error	56.90461	286	0.19897		



Univariate Tests of Significance for item3 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup					
scorelevel					
Racegroup*scorelevel	1.46827	5	0.29365	1.49683	0.190803
Error	56.10858	286	0.19618		

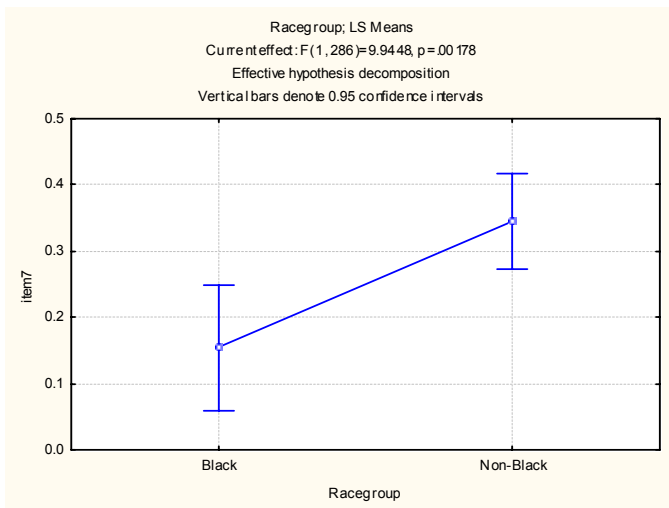


Univariate Tests of Significance for item4 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	0.49056	1	0.490560	10.13782	0.001613
Racegroup	0.00057	1	0.000571	0.01181	0.913539
scorelevel	0.09896	5	0.019793	0.40904	0.842385
Racegroup*scorelevel	0.31371	5	0.062742	1.29661	0.265364
Error	13.83929	286	0.048389		

Univariate Tests of Significance for item5 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.26150	1	0.26150	1.2793	0.258980
scorelevel					
Racegroup*scorelevel	1.82949	5	0.36590	1.7900	0.114825
Error	58.46113	286	0.20441		

Univariate Tests of Significance for item6 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.14835	1	0.14835	0.8564	0.355536
scorelevel					
Racegroup*scorelevel	0.46016	5	0.09203	0.5313	0.752546
Error	49.54390	286	0.17323		

Univariate Tests of Significance for item7 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	13.33299	1	13.33299	67.76437	0.000000
Racegroup	1.95669	1	1.95669	9.94478	0.001785
scorelevel	2.87759	5	0.57552	2.92505	0.013600
Racegroup*scorelevel	0.72241	5	0.14448	0.73433	0.598232
Error	56.27198	286	0.19676		



Univariate Tests of Significance for item8 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.01753	1	0.01753	0.0870	0.768260
scorelevel					
Racegroup*scorelevel	0.47376	5	0.09475	0.4703	0.798317
Error	57.62622	286	0.20149		

Univariate Tests of Significance for item9 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.07405	1	0.074046	0.61925	0.431977
scorelevel					
Racegroup*scorelevel	0.78491	5	0.156982	1.31284	0.258521
Error	34.19815	286	0.119574		

Univariate Tests of Significance for item10 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	5.52546	1	5.525459	38.02489	0.000000
Racegroup	0.08517	1	0.085167	0.58610	0.444562
scorelevel	1.22033	5	0.244066	1.67961	0.139444
Racegroup*scorelevel	0.28881	5	0.057762	0.39750	0.850389
Error	41.55914	286	0.145312		

Univariate Tests of Significance for item11 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.00020	1	0.00020	0.00112	0.973337
scorelevel					
Racegroup*scorelevel	0.65907	5	0.13181	0.72538	0.604876
Error	51.97110	286	0.18172		

Univariate Tests of Significance for item12 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.00488	1	0.00488	0.02859	0.865849
scorelevel					
Racegroup*scorelevel	1.32281	5	0.26456	1.54851	0.174806
Error	48.86283	286	0.17085		

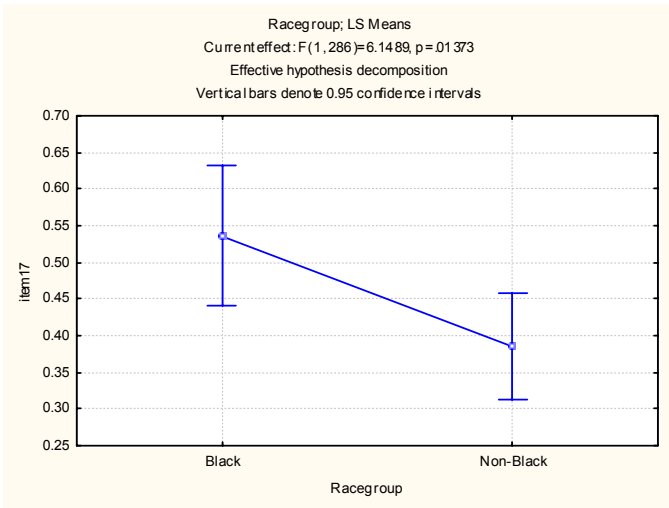
Univariate Tests of Significance for item13 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.00178	1	0.00178	0.0074	0.931722
scorelevel					
Racegroup*scorelevel	1.08694	5	0.21739	0.8972	0.483304
Error	69.29587	286	0.24229		

Univariate Tests of Significance for item14 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	3.41273	1	3.412734	39.82181	0.000000
Racegroup	0.12779	1	0.127788	1.49110	0.223051
scorelevel	2.92122	5	0.584243	6.81730	0.000005
Racegroup*scorelevel	0.70336	5	0.140673	1.64145	0.149006
Error	24.51024	286	0.085700		

Univariate Tests of Significance for item15 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.01438	1	0.014379	0.20915	0.647781
scorelevel	0.64005	5	0.128010	1.86204	0.100987
Racegroup*scorelevel	0.31618	5	0.063236	0.91984	0.468402
Error	19.66177	286	0.068747		

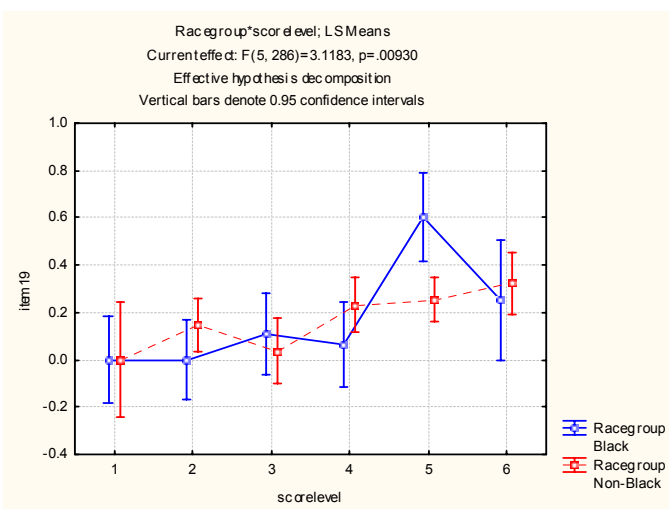
Univariate Tests of Significance for item16 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.29534	1	0.29534	1.6456	0.200599
scorelevel					
Racegroup*scorelevel	1.77479	5	0.35496	1.9778	0.081946
Error	51.32972	286	0.17947		

Univariate Tests of Significance for item17 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup					
scorelevel					
Racegroup*scorelevel	0.38850	5	0.07770	0.3908	0.854955
Error	56.85564	286	0.19880		

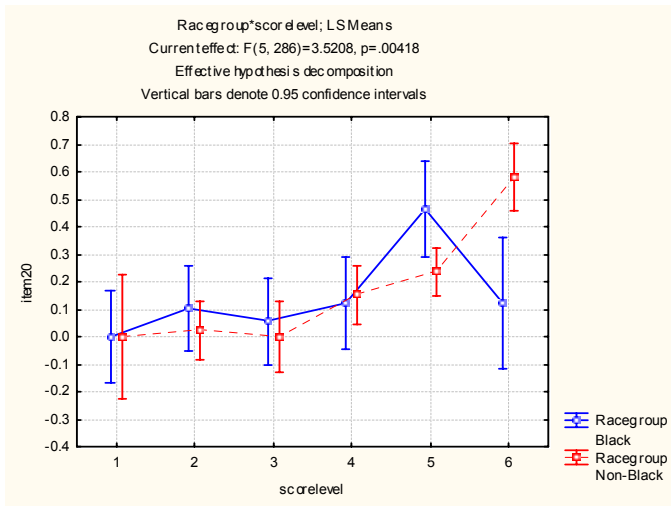


Univariate Tests of Significance for item18 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	15.74739	1	15.74739	86.80207	0.000000
Racegroup	0.23927	1	0.23927	1.31891	0.251747
scorelevel	6.01698	5	1.20340	6.63331	0.000007
Racegroup*scorelevel	1.31607	5	0.26321	1.45087	0.206094
Error	51.88531	286	0.18142		

Univariate Tests of Significance for item19 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.00159	1	0.001585	0.01169	0.913974
scorelevel					
Racegroup*scorelevel					
Error	38.78390	286	0.135608		



Univariate Tests of Significance for item20 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	5.22221	1	5.222214	44.75584	0.000000
Racegroup	0.02095	1	0.020954	0.17958	0.672053
scorelevel	4.53756	5	0.907512	7.77763	0.000001
Racegroup*scorelevel	2.05407	5	0.410814	3.52079	0.004184
Error	33.37114	286	0.116682		

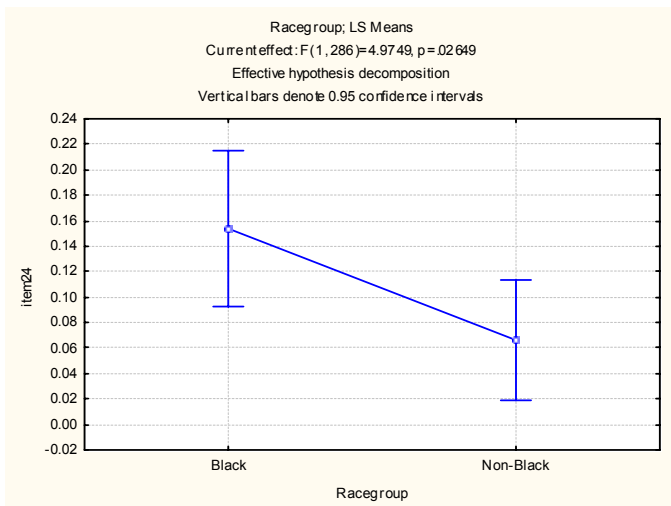


Univariate Tests of Significance for item21 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.05679	1	0.056790	0.84116	0.359838
scorelevel					
Racegroup*scorelevel	0.53150	5	0.106299	1.57448	0.167225
Error	19.30905	286	0.067514		

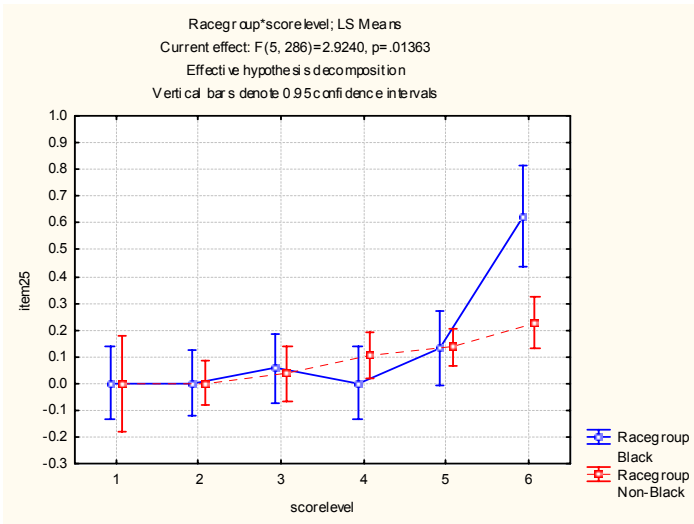
Univariate Tests of Significance for item22 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.05593	1	0.055927	0.62613	0.429435
scorelevel					
Racegroup*scorelevel	0.68048	5	0.136096	1.52367	0.182342
Error	25.54598	286	0.089322		

Univariate Tests of Significance for item23 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	0.490723	1	0.490723	14.77866	0.000149
Racegroup	0.050351	1	0.050351	1.51637	0.219181
scorelevel	0.894787	5	0.178957	5.38950	0.000094
Racegroup*scorelevel	0.060374	5	0.012075	0.36365	0.873191
Error	9.496585	286	0.033205		

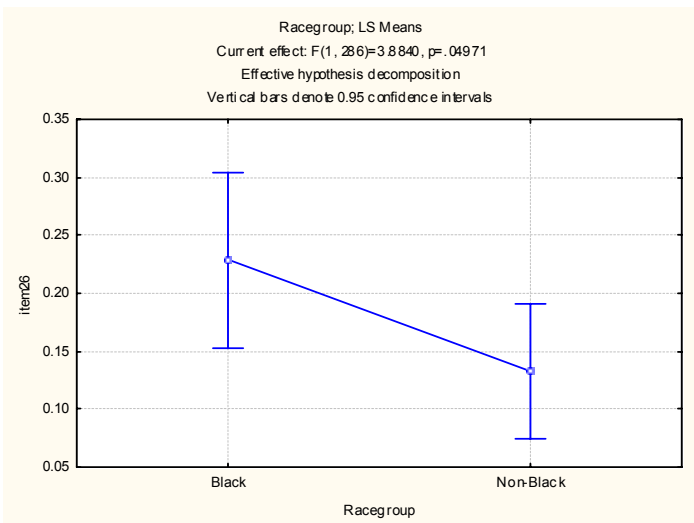
Univariate Tests of Significance for item24 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup					
scorelevel					
Racegroup*scorelevel	0.35617	5	0.071233	0.86087	0.507827
Error	23.66538	286	0.082746		



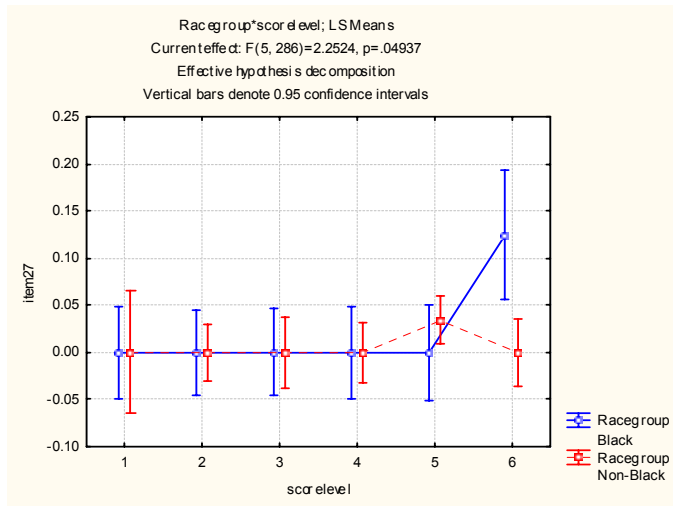
Univariate Tests of Significance for item25 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.14563	1	0.145631	1.94264	0.164464
scorelevel					
Racegroup*scorelevel					
Error	21.44009	286	0.074965		



Univariate Tests of Significance for item26 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	7.00886	1	7.008865	55.63544	0.000000
Racegroup	0.48930	1	0.489297	3.88398	0.049713
scorelevel	4.41153	5	0.882306	7.00363	0.000003
Racegroup*scorelevel	0.64592	5	0.129185	1.02545	0.402795
Error	36.02983	286	0.125978		



Univariate Tests of Significance for item27					
Sigma-restricted parameterization					
Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	0.037559	1	0.037559	3.826538	0.051420
Racegroup	0.012346	1	0.012346	1.257826	0.263004
scorelevel	0.088769	5	0.017754	1.808769	0.111064
Racegroup*scorelevel	0.110540	5	0.022108	2.252372	0.049368
Error	2.807203	286	0.009815		



Univariate Tests of Significance for item28					
Sigma-restricted parameterization					
Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.00001	1	0.000011	0.00022	0.988091
scorelevel	0.23717	5	0.047434	0.99248	0.422558
Racegroup*scorelevel	0.17184	5	0.034367	0.71908	0.609566
Error	13.66893	286	0.047793		

Univariate Tests of Significance for item29					
Sigma-restricted parameterization					
Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.00092	1	0.000921	0.01563	0.900595
scorelevel	0.53945	5	0.107890	1.83106	0.106740
Racegroup*scorelevel	0.07457	5	0.014913	0.25310	0.938057
Error	16.85169	286	0.058922		

Effect	Univariate Tests of Significance for item30 Sigma-restricted parameterization Effective hypothesis decomposition				
	SS	Degr. of Freedom	MS	F	p
Intercept	0.028892	1	0.028892	1.770513	0.184379
Racegroup	0.028892	1	0.028892	1.770513	0.184379
scorelevel	0.049676	5	0.009935	0.608829	0.693219
Racegroup*scorelevel	0.049676	5	0.009935	0.608829	0.693219
Error	4.667087	286	0.016318		

Detailed results by item for Graduate Numerical Reasoning Test

Item number	Uniform bias	In favour of group	Non-uniform bias
1	No		No
2	Yes	Black	No
3	No		No
4	Yes	Non-Black	No
5	No		No
6	No		No
7	No		No
8	No		No
9	No		No
10	No		No
11	No		No
12	No		No
13	No		No
14	No		No
15	No		No
16	No		No
17	No		Yes
18	No		No
19	No		No
20	No		No
21	No		No
22	No		Yes
23	No		No
24	No		No
25	No		No

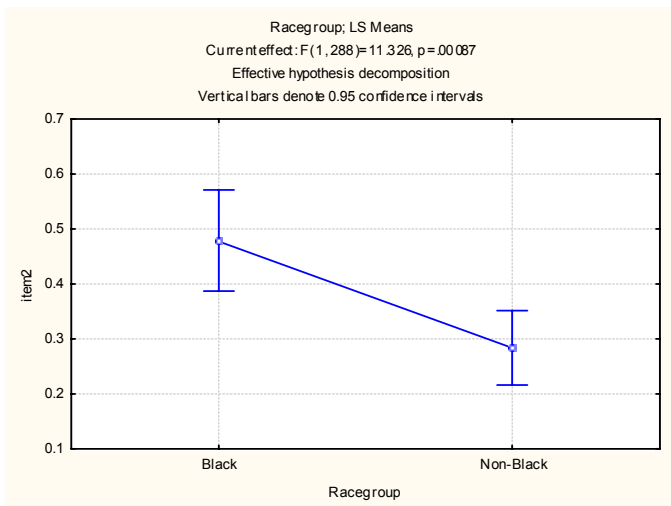
Uniform bias was found in two items. One item was biased in favour of the Black group, and one item in favour of the Non-black group.

Non-uniform bias was found in two items, neither of which also exhibited uniform bias.

The graphs in the detailed results that follow illustrate this.

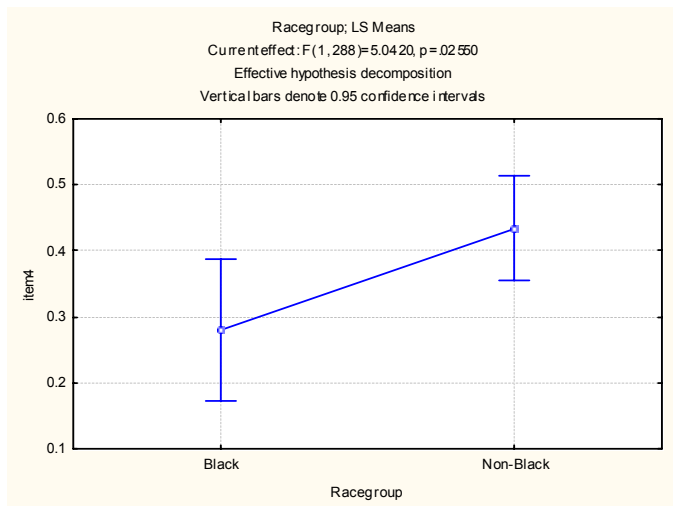
Univariate Tests of Significance for item1 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	29.60388	1	29.60388	172.0767	0.000000
Racegroup	0.18774	1	0.18774	1.0912	0.297073
Scorelevel	14.46589	4	3.61647	21.0213	0.000000
Racegroup*Scorelevel	0.76016	4	0.19004	1.1046	0.354548
Error	49.54719	288	0.17204		

Univariate Tests of Significance for item2 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup					
Scorelevel					
Racegroup*Scorelevel	1.26300	4	0.31575	1.9086	0.109043
Error	47.64454	288	0.16543		



Univariate Tests of Significance for item3 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.00435	1	0.00435	0.02519	0.874000
Scorelevel					
Racegroup*Scorelevel	1.39916	4	0.34979	2.02759	0.090633
Error	49.68418	288	0.17251		

Univariate Tests of Significance for item4 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	25.28916	1	25.28916	109.5632	0.000000
Racegroup	1.16378	1	1.16378	5.0420	0.025499
Scorelevel	3.47306	4	0.86826	3.7617	0.005325
Racegroup*Scorelevel	0.91712	4	0.22928	0.9933	0.411464
Error	66.47557	288	0.23082		



Univariate Tests of Significance for item5 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.06719	1	0.06719	0.3431	0.558496
Scorelevel					
Racegroup*Scorelevel	0.69181	4	0.17295	0.8832	0.474302
Error	56.39550	288	0.19582		

Univariate Tests of Significance for item6 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.11299	1	0.11299	0.5272	0.468362
Scorelevel					
Racegroup*Scorelevel	1.28693	4	0.32173	1.5012	0.201878
Error	61.72295	288	0.21432		

Univariate Tests of Significance for item7 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	53.83543	1	53.83543	315.2770	0.000000
Racegroup	0.21342	1	0.21342	1.2498	0.264517
Scorelevel	10.77782	4	2.69445	15.7796	0.000000
Racegroup*Scorelevel	0.99830	4	0.24957	1.4616	0.213967
Error	49.17772	288	0.17076		

Univariate Tests of Significance for item8 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.02539	1	0.02539	0.1146	0.735258
Scorelevel					
Racegroup*Scorelevel	1.50748	4	0.37687	1.7006	0.149892
Error	63.82212	288	0.22160		

Univariate Tests of Significance for item9 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.05485	1	0.05485	0.29228	0.589184
Scorelevel					
Racegroup*Scorelevel	0.38675	4	0.09669	0.51524	0.724589
Error	54.04487	288	0.18766		

Univariate Tests of Significance for item10 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.40183	1	0.40183	1.9321	0.165599
Scorelevel					
Racegroup*Scorelevel	0.34927	4	0.08732	0.4199	0.794288
Error	59.89609	288	0.20797		

Univariate Tests of Significance for item11					
Sigma-restricted parameterization					
Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	9.02678	1	9.026781	52.53284	0.000000
Racegroup	0.21703	1	0.217031	1.26305	0.262011
Scorelevel	7.45895	4	1.864737	10.85214	0.000000
Racegroup*Scorelevel	0.28715	4	0.071787	0.41777	0.795791
Error	49.48739	288	0.171831		

Univariate Tests of Significance for item12 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	16.42064	1	16.42064	90.45693	0.000000
Racegroup	0.25842	1	0.25842	1.42356	0.233800
Scorelevel	7.54751	4	1.88688	10.39430	0.000000
Racegroup*Scorelevel	1.42426	4	0.35606	1.96147	0.100469
Error	52.28062	288	0.18153		

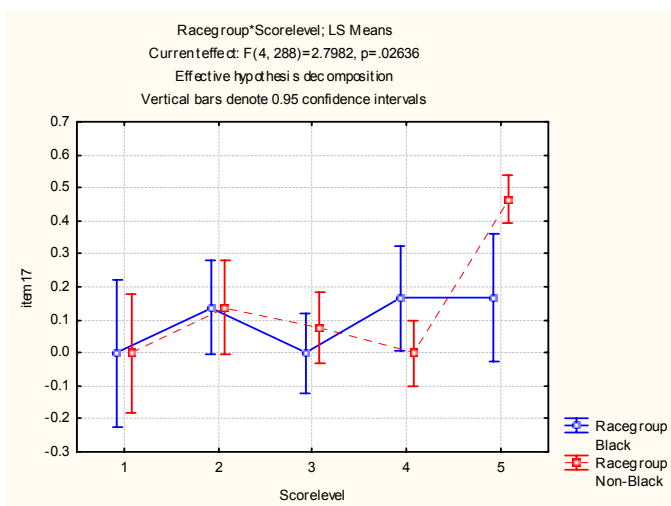
Univariate Tests of Significance for item13 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.01419	1	0.014193	0.09912	0.753115
Scorelevel					
Racegroup*Scorelevel	0.56245	4	0.140614	0.98205	0.417611
Error	41.23706	288	0.143184		

Univariate Tests of Significance for item14 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.15362	1	0.15362	0.85099	0.357044
Scorelevel					
Racegroup*Scorelevel	0.01881	4	0.00470	0.02605	0.998680
Error	51.98824	288	0.18051		

Univariate Tests of Significance for item15 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.00342	1	0.003420	0.02813	0.866930
Scorelevel					
Racegroup*Scorelevel	0.61830	4	0.154576	1.27132	0.281361
Error	35.01694	288	0.121587		

Univariate Tests of Significance for item16					
Sigma-restricted parameterization					
Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	12.48001	1	12.48001	74.25318	0.000000
Racegroup	0.29632	1	0.29632	1.76306	0.185295
Scorelevel	6.36395	4	1.59099	9.46601	0.000000
Racegroup*Scorelevel	1.20015	4	0.30004	1.78515	0.131827
Error	48.40525	288	0.16807		

Univariate Tests of Significance for item17					
Sigma-restricted parameterization					
Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.08641	1	0.086410	0.74258	0.389553
Scorelevel					
Racegroup*Scorelevel					
Error	33.51306	288	0.116365		



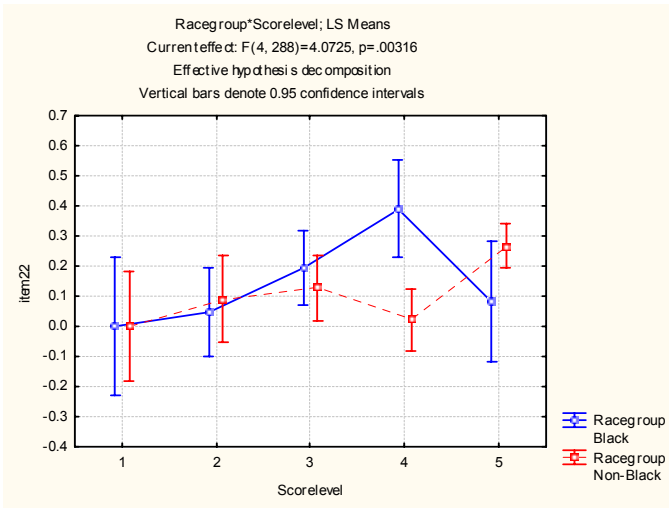
Univariate Tests of Significance for item18					
Sigma-restricted parameterization					
Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.49309	1	0.493090	2.90276	0.089507
Scorelevel					
Racegroup*Scorelevel	0.44650	4	0.111624	0.65712	0.622295
Error	48.92238	288	0.169869		

Univariate Tests of Significance for item19 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	8.55804	1	8.558038	50.58931	0.000000
Racegroup	0.29171	1	0.291710	1.72439	0.190174
Scorelevel	5.16214	4	1.290536	7.62877	0.000007
Racegroup*Scorelevel	0.45919	4	0.114799	0.67861	0.607275
Error	48.72008	288	0.169167		

Univariate Tests of Significance for item20 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.07167	1	0.071675	0.74017	0.390323
Scorelevel					
Racegroup*Scorelevel	0.12989	4	0.032472	0.33533	0.854063
Error	27.88866	288	0.096836		

Univariate Tests of Significance for item21 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.01013	1	0.010133	0.144482	0.704146
Scorelevel	0.39533	4	0.098831	1.409224	0.230928
Racegroup*Scorelevel	0.17087	4	0.042718	0.609114	0.656381
Error	20.19792	288	0.070132		

Univariate Tests of Significance for item22 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.08130	1	0.081305	0.66919	0.414012
Scorelevel	0.96029	4	0.240073	1.97594	0.098234
Racegroup*Scorelevel					
Error	34.99147	288	0.121498		



Univariate Tests of Significance for item23 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	0.29848	1	0.298480	6.068046	0.014350
Racegroup	0.00590	1	0.005905	0.120046	0.729238
Scorelevel	0.62598	4	0.156495	3.181526	0.014020
Racegroup*Scorelevel	0.04447	4	0.011118	0.226028	0.923724
Error	14.16637	288	0.049189		

Univariate Tests of Significance for item24 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.16392	1	0.163924	1.97299	0.161208
Scorelevel	0.78840	4	0.197100	2.37230	0.052521
Racegroup*Scorelevel					
Error	23.92824	288	0.083084		

Univariate Tests of Significance for item25 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.09481	1	0.094813	1.28249	0.258378
Scorelevel	0.43511	4	0.108778	1.47139	0.210916
Racegroup*Scorelevel	0.09108	4	0.022770	0.30800	0.872530
Error	21.29152	288	0.073929		

Detailed results by item for Graduate Abstract Reasoning Test

Item number	Uniform bias	In favour of group	Non-Uniform bias
1	No		No
2	No		No
3	No		No
4	No		No
5	No		No
6	No		Yes
7	No		No
8	No		No
9	No		No
10	No		No
11	No		No
12	No		No
13	No		No
14	No		No
15	No		No
16	No		No
17	No		No
18	No		No
19	No		No
20	No		No
21	No		No
22	No		No
23	No		No
24	No		No
25	No		No

No items were found with uniform bias.
One item was found with Non-uniform bias.

Univariate Tests of Significance for item1 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	24.33245	1	24.33245	111.4176	0.000000
Racegroup	0.00573	1	0.00573	0.0262	0.871412
Scorelevel	7.28541	5	1.45708	6.6719	0.000007
Racegroup*Scorelevel	0.26932	5	0.05386	0.2466	0.941277
Error	62.45944	286	0.21839		

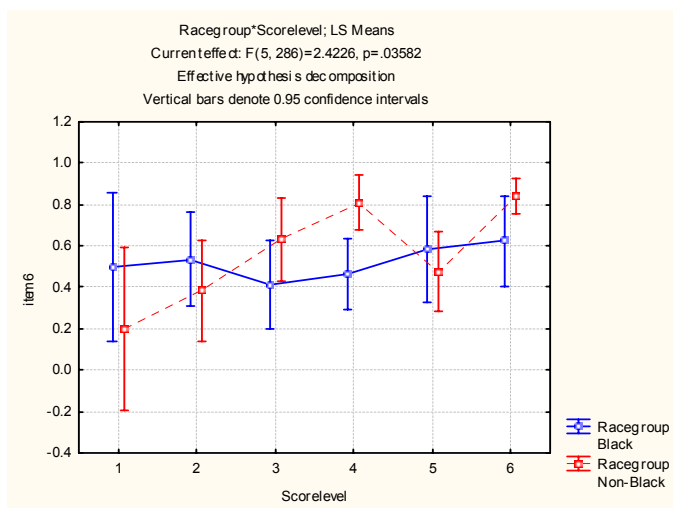
Univariate Tests of Significance for item2 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.14248	1	0.14248	1.545	0.214915
Scorelevel					
Racegroup*Scorelevel	0.42282	5	0.08456	0.917	0.470305
Error	26.37676	286	0.09223		

Univariate Tests of Significance for item3 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.13711	1	0.13711	0.7446	0.388923
Scorelevel					
Racegroup*Scorelevel	0.37399	5	0.07480	0.4062	0.844370
Error	52.66561	286	0.18415		

Univariate Tests of Significance for item4 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.08448	1	0.08448	0.4058	0.524637
Scorelevel					
Racegroup*Scorelevel	0.64766	5	0.12953	0.6221	0.683029
Error	59.54799	286	0.20821		

Univariate Tests of Significance for item5 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	16.72442	1	16.72442	87.48191	0.000000
Racegroup	0.27542	1	0.27542	1.44068	0.231023
Scorelevel	11.47674	5	2.29535	12.00648	0.000000
Racegroup*Scorelevel	0.17540	5	0.03508	0.18350	0.968695
Error	54.67627	286	0.19118		

Univariate Tests of Significance for item6 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.05788	1	0.05788	0.2916	0.589613
Scorelevel					
Racegroup*Scorelevel					
Error	56.76503	286	0.19848		



Univariate Tests of Significance for item7 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.00048	1	0.00048	0.0026	0.959733
Scorelevel					
Racegroup*Scorelevel	1.74041	5	0.34808	1.8529	0.102646
Error	53.72620	286	0.18785		

Univariate Tests of Significance for item8 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	10.21470	1	10.21470	53.50274	0.000000
Racegroup	0.02000	1	0.02000	0.10477	0.746416
Scorelevel	10.28877	5	2.05775	10.77814	0.000000
Racegroup*Scorelevel	0.44156	5	0.08831	0.46257	0.803976
Error	54.60289	286	0.19092		

Univariate Tests of Significance for item9 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.30407	1	0.30407	1.2745	0.259861
Scorelevel					
Racegroup*Scorelevel	2.04821	5	0.40964	1.7171	0.130595
Error	68.23064	286	0.23857		

Univariate Tests of Significance for item10 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.00226	1	0.002261	0.01302	0.909240
Scorelevel					
Racegroup*Scorelevel	0.32153	5	0.064306	0.37022	0.868849
Error	49.67702	286	0.173696		

Univariate Tests of Significance for item11 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.03504	1	0.03504	0.1537	0.695318
Scorelevel					
Racegroup*Scorelevel	0.89143	5	0.17829	0.7819	0.563405
Error	65.21119	286	0.22801		

Univariate Tests of Significance for item12 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	6.62498	1	6.624979	34.29718	0.000000
Racegroup	0.07330	1	0.073305	0.37949	0.538364
Scorelevel	4.75601	5	0.951202	4.92432	0.000243
Racegroup*Scorelevel	0.25767	5	0.051535	0.26679	0.930992
Error	55.24489	286	0.193164		

Univariate Tests of Significance for item13 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.02419	1	0.02419	0.11504	0.734730
Scorelevel					
Racegroup*Scorelevel	1.13753	5	0.22751	1.08171	0.370601
Error	60.15172	286	0.21032		

Univariate Tests of Significance for item14 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.15447	1	0.154472	0.86809	0.352271
Scorelevel	0.68368	5	0.136736	0.76842	0.573193
Racegroup*Scorelevel	0.48549	5	0.097099	0.54567	0.741588
Error	50.89238	286	0.177945		

Univariate Tests of Significance for item15 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.40187	1	0.40187	1.87858	0.171570
Scorelevel	2.13535	5	0.42707	1.99640	0.079213
Racegroup*Scorelevel	1.48555	5	0.29711	1.38889	0.228391
Error	61.18120	286	0.21392		

Univariate Tests of Significance for item16 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	38.25211	1	38.25211	168.5156	0.000000
Racegroup	0.11017	1	0.11017	0.4854	0.486574
Scorelevel	4.55071	5	0.91014	4.0095	0.001566
Racegroup*Scorelevel	1.56086	5	0.31217	1.3752	0.233567
Error	64.92042	286	0.22699		

Univariate Tests of Significance for item17 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.00235	1	0.00235	0.0123	0.911864
Scorelevel					
Racegroup*Scorelevel	0.82381	5	0.16476	0.8606	0.507986
Error	54.75270	286	0.19144		

Univariate Tests of Significance for item18 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.27988	1	0.279878	1.85585	0.174176
Scorelevel					
Racegroup*Scorelevel	0.40448	5	0.080895	0.53641	0.748637
Error	43.13119	286	0.150808		

Univariate Tests of Significance for item19 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.17259	1	0.17259	0.82272	0.365150
Scorelevel					
Racegroup*Scorelevel	0.74260	5	0.14852	0.70798	0.617862
Error	59.99692	286	0.20978		

Univariate Tests of Significance for item20 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	4.44303	1	4.443029	26.16916	0.000001
Racegroup	0.13354	1	0.133544	0.78657	0.375886
Scorelevel	3.81940	5	0.763880	4.49921	0.000580
Racegroup*Scorelevel	0.37316	5	0.074632	0.43958	0.820698
Error	48.55740	286	0.169781		

Univariate Tests of Significance for item21 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.05133	1	0.051333	0.29590	0.586886
Scorelevel					
Racegroup*Scorelevel	0.64593	5	0.129186	0.74468	0.590579
Error	49.61466	286	0.173478		

Univariate Tests of Significance for item22 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.02690	1	0.026903	0.26510	0.607034
Scorelevel					
Racegroup*Scorelevel	0.32650	5	0.065300	0.64346	0.666711
Error	29.02368	286	0.101481		

Univariate Tests of Significance for item23 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.00290	1	0.002899	0.02201	0.882160
Scorelevel	0.80208	5	0.160415	1.21803	0.300643
Racegroup*Scorelevel	0.42960	5	0.085921	0.65240	0.659897
Error	37.66624	286	0.131700		

Univariate Tests of Significance for item24					
Sigma-restricted parameterization					
Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	0.88975	1	0.889752	8.730357	0.003390
Racegroup	0.04347	1	0.043468	0.426518	0.514227
Scorelevel	0.91068	5	0.182136	1.787139	0.115414
Racegroup*Scorelevel	0.12683	5	0.025366	0.248894	0.940164
Error	29.14762	286	0.101915		

Univariate Tests of Significance for item25					
Sigma-restricted parameterization					
Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.02149	1	0.021486	0.211663	0.645816
Scorelevel					
Racegroup*Scorelevel	0.25475	5	0.050951	0.501932	0.774720
Error	29.03171	286	0.101509		

GRT1 differential item functioning: Applicants and incumbents at a bank.

Sample composition

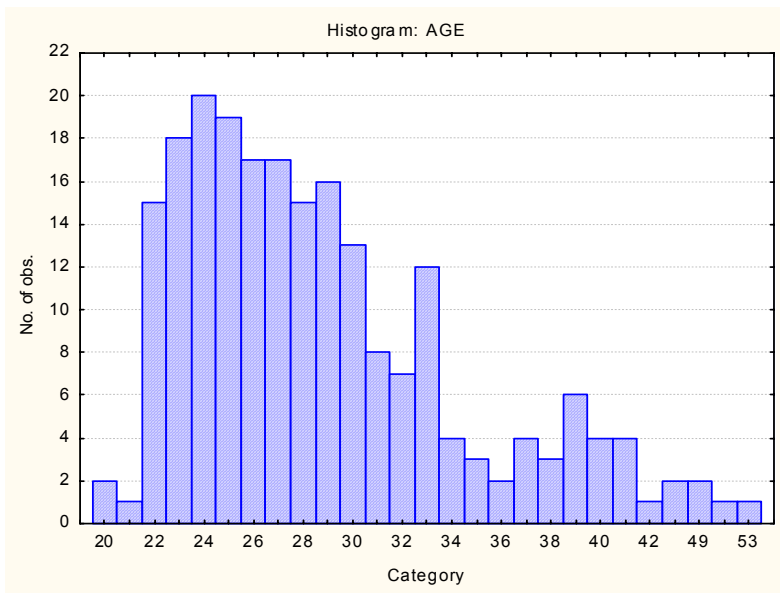
Applicants and incumbents in a major SA Bank (Positions that require graduate qualifications).
Data were collected between 1997 and 2000

Category	Frequency table: RACE			
	Count	Cumulative Count	Percent	Cumulative Percent
Whites/coloureds	123	123	53.71179	53.7118
Asians	26	149	11.35371	65.0655
Blacks	78	227	34.06114	99.1266
Missing	2	229	0.87336	100.0000

Category	Frequency table: Racegroup			
	Count	Cumulative Count	Percent	Cumulative Percent
Non-Black	149	149	65.06550	65.0655
Black	78	227	34.06114	99.1266
Missing	2	229	0.87336	100.0000

Category	Frequency table: GENDER			
	Count	Cumulative Count	Percent	Cumulative Percent
Female	98	98	42.79476	42.7948
Male	131	229	57.20524	100.0000
Missing	0	229	0.00000	100.0000

Variable	Descriptive Statistics					
	Mean	Std.Dev	Minimum	Maximum	N	No.cases Missing
AGE	28.88018	6.027285	20.00000	53.00000	217	12



Method

Applicants were classified into Black and non-Black for the purpose of the analysis, since the size of the sample did not allow for finer distinctions.

Applicants were classified into score levels for the test being evaluated. The cut-offs for the levels were determined by examining the frequency distributions for both race groups, trying to ensure a sufficient number of cases for both races in each category.

The statistical technique used in this study was factorial analysis of variance. For every item a factorial analysis of variance was done, using the scored item response as dependent variable, and the race group and score level (on the overall test score for the subtest being investigated) as predictor variables. If a significant effect was found for race, that was taken as an indication of uniform item bias, and the least-square difference in the means for that item was plotted graphically to illustrate which race group had a higher probability of getting the item right. If a significant interaction effect was found for race group and score level, that was taken as an indication of non-uniform item bias, and the means at all levels for both race groups were plotted to illustrate the severity of the non-uniform bias that was found.

Detailed results by item for Graduate Verbal Reasoning Test

Item number	Uniform Bias	In favour of group	Non-uniform bias
1	No		Yes
2	Yes	Non-Black	No
3	Yes	Non-Black	No
4	No		No
5	No		No
6	Yes	Non-Black	No
7	No		No
8	No		Yes
9	No		No
10	Yes	Non-Black	No
11	No		No
12	No		No
13	No		No
14	No		No
15	No		No
16	No		No
17	No		No
18	No		No
19	Yes	Black	No
20	No		No
21	No		No
22	No		No
23	No		No
24	No		No
25	Yes	Black	No
26	No		No
27	No		No
28	No		No
29	No		No
30	No		No

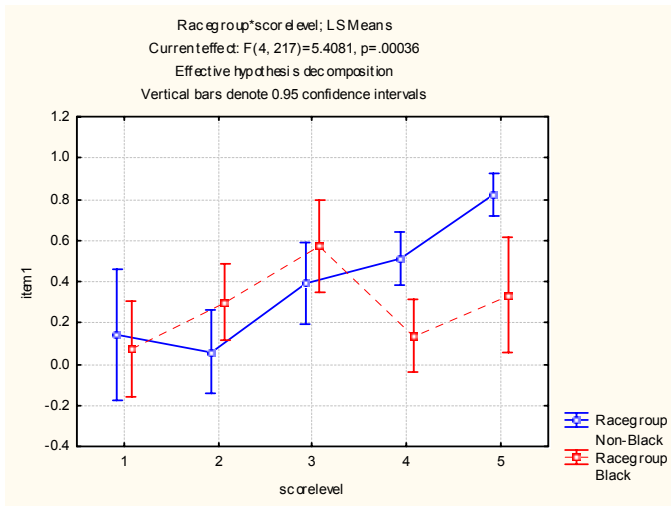
Uniform bias was found in six items out of 30.

Four of these items were biased in favour of the Non-Black group, two were biased in favour of the Black group.

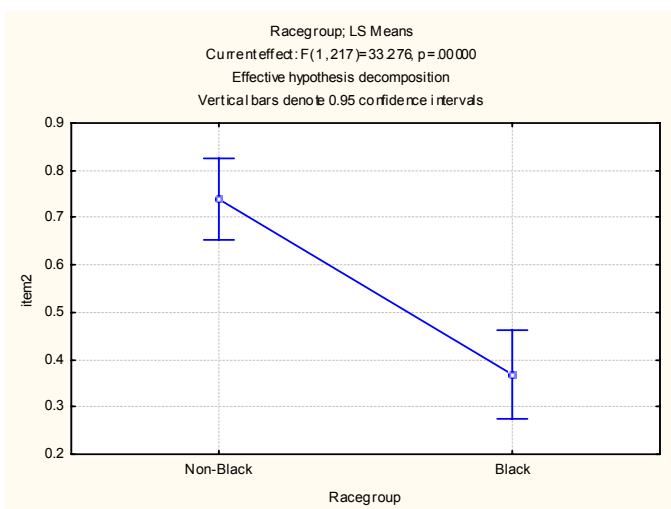
Non-uniform bias was found in two items.

The graphs that follow in the detailed results give more information about the bias that was found

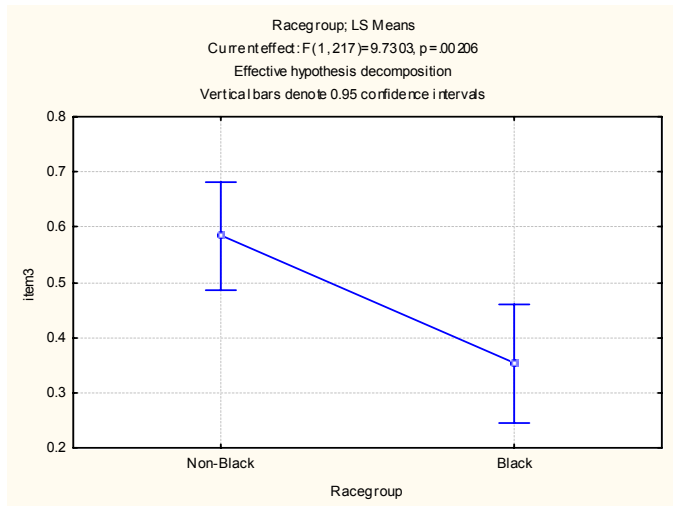
Univariate Tests of Significance for item1 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	17.10752	1	17.10752	94.50767	0.000000
Racegroup	0.38807	1	0.38807	2.14385	0.144589
scorelevel	4.30084	4	1.07521	5.93982	0.000149
Racegroup*scorelevel	3.91581	4	0.97895	5.40806	0.000361
Error	39.28074	217	0.18102		



Univariate Tests of Significance for item2 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup					
scorelevel					
Racegroup*scorelevel	0.25369	4	0.06342	0.4024	0.806787
Error	34.19866	217	0.15760		



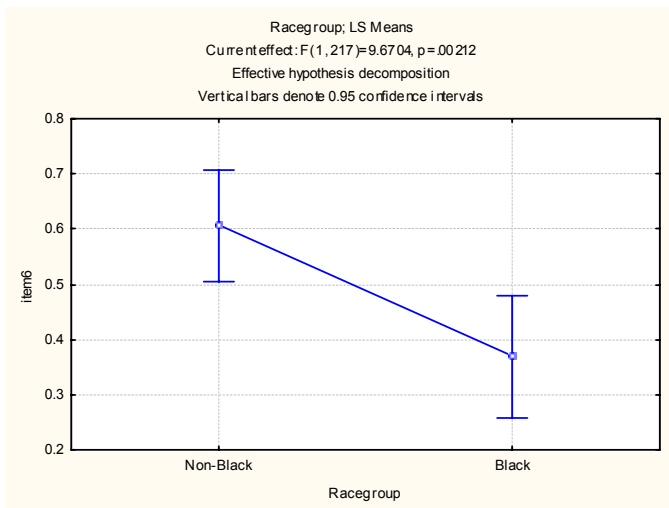
Univariate Tests of Significance for item3 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	33.74674	1	33.74674	160.9029	0.000000
Racegroup	2.04077	1	2.04077	9.7303	0.002058
scorelevel	3.59815	4	0.89954	4.2890	0.002325
Racegroup*scorelevel	0.10433	4	0.02608	0.1244	0.973583
Error	45.51219	217	0.20973		



Univariate Tests of Significance for item4 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.16265	1	0.16265	0.8614	0.354379
scorelevel					
Racegroup*scorelevel	1.40046	4	0.35011	1.8542	0.119610
Error	40.97359	217	0.18882		

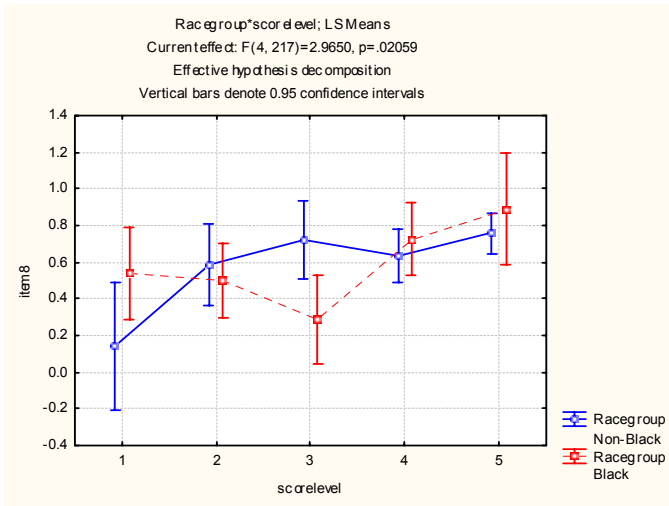
Univariate Tests of Significance for item5 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.03210	1	0.03210	0.1708	0.679770
scorelevel					
Racegroup*scorelevel	0.14133	4	0.03533	0.1880	0.944467
Error	40.77380	217	0.18790		

Univariate Tests of Significance for item6 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	36.46425	1	36.46425	162.8655	0.000000
Racegroup	2.16512	1	2.16512	9.6704	0.002124
scorelevel	2.17665	4	0.54416	2.4305	0.048650
Racegroup*scorelevel	0.76660	4	0.19165	0.8560	0.491253
Error	48.58453	217	0.22389		



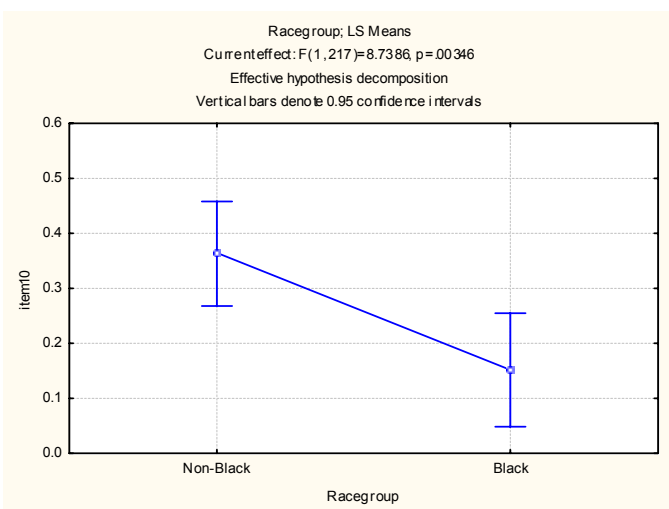
Univariate Tests of Significance for item7 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.56002	1	0.56002	2.5843	0.109382
scorelevel					
Racegroup*scorelevel	1.17066	4	0.29266	1.3506	0.252262
Error	47.02371	217	0.21670		

Univariate Tests of Significance for item8 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.01394	1	0.01394	0.0650	0.799074
scorelevel					
Racegroup*scorelevel					
Error	46.55975	217	0.21456		



Univariate Tests of Significance for item9 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	8.59602	1	8.596022	47.14253	0.000000
Racegroup	0.30632	1	0.306316	1.67991	0.196313
scorelevel	4.85770	4	1.214425	6.66018	0.000045
Racegroup*scorelevel	0.18401	4	0.046002	0.25228	0.908059
Error	39.56802	217	0.182341		

Univariate Tests of Significance for item10 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup					
scorelevel					
Racegroup*scorelevel	0.37217	4	0.09304	0.47045	0.757395
Error	42.91651	217	0.19777		



Univariate Tests of Significance for item11 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	15.21738	1	15.21738	67.65709	0.000000
Racegroup	0.21327	1	0.21327	0.94823	0.331255
scorelevel	2.46628	4	0.61657	2.74129	0.029571
Racegroup*scorelevel	0.78665	4	0.19666	0.87437	0.480085
Error	48.80748	217	0.22492		

Univariate Tests of Significance for item12 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.54157	1	0.54157	2.4883	0.116151
scorelevel					
Racegroup*scorelevel	1.49296	4	0.37324	1.7149	0.147729
Error	47.22885	217	0.21764		

Univariate Tests of Significance for item13 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.10459	1	0.10459	0.4594	0.498608
scorelevel					
Racegroup*scorelevel	0.39007	4	0.09752	0.4284	0.788067
Error	49.39990	217	0.22765		

Univariate Tests of Significance for item14 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.53775	1	0.537754	3.37806	0.067437
scorelevel					
Racegroup*scorelevel	0.97837	4	0.244594	1.53648	0.192649
Error	34.54431	217	0.159190		

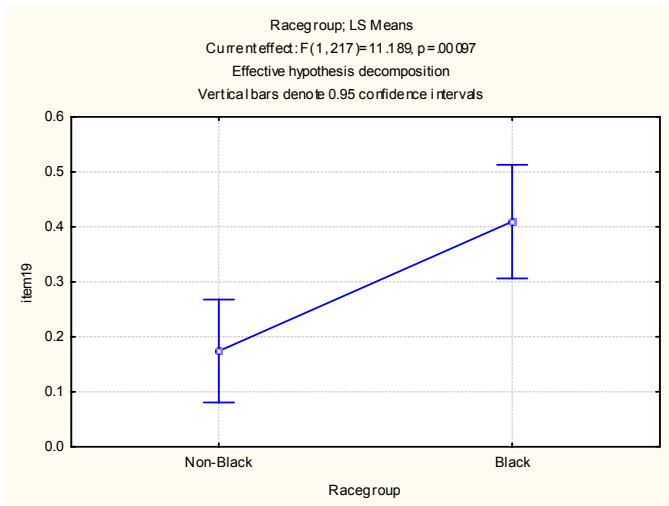
Univariate Tests of Significance for item15 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	4.37166	1	4.371658	25.38664	0.000001
Racegroup	0.64074	1	0.640735	3.72081	0.055043
scorelevel	1.13938	4	0.284845	1.65412	0.161822
Racegroup*scorelevel	0.97374	4	0.243435	1.41365	0.230417
Error	37.36808	217	0.172203		

Univariate Tests of Significance for item16 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.06851	1	0.06851	0.2926	0.589138
scorelevel					
Racegroup*scorelevel	1.38836	4	0.34709	1.4822	0.208595
Error	50.81534	217	0.23417		

Univariate Tests of Significance for item17 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.45809	1	0.45809	2.4747	0.117146
scorelevel					
Racegroup*scorelevel	0.60399	4	0.15100	0.8157	0.516342
Error	40.16863	217	0.18511		

Univariate Tests of Significance for item18 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.23834	1	0.23834	1.0180	0.314117
scorelevel					
Racegroup*scorelevel	1.61972	4	0.40493	1.7296	0.144502
Error	50.80421	217	0.23412		

Univariate Tests of Significance for item19 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	13.13300	1	13.13300	69.46870	0.000000
Racegroup	2.11521	1	2.11521	11.18866	0.000970
scorelevel	4.51949	4	1.12987	5.97660	0.000140
Racegroup*scorelevel	0.99531	4	0.24883	1.31620	0.264903
Error	41.02369	217	0.18905		



Univariate Tests of Significance for item20 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.22800	1	0.22800	1.13211	0.288507
scorelevel					
Racegroup*scorelevel	0.99330	4	0.24832	1.23302	0.297793
Error	43.70277	217	0.20140		

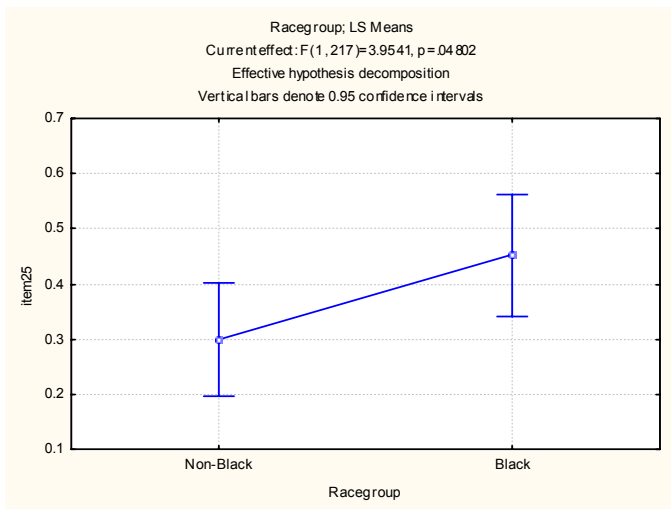
Univariate Tests of Significance for item21 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.12945	1	0.129449	0.88735	0.347244
scorelevel					
Racegroup*scorelevel	1.27506	4	0.318764	2.18508	0.071676
Error	31.65644	217	0.145882		

Univariate Tests of Significance for item22 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	6.52849	1	6.528485	35.67252	0.000000
Racegroup	0.04541	1	0.045407	0.24811	0.618915
scorelevel	2.96661	4	0.741651	4.05248	0.003442
Racegroup*scorelevel	0.64411	4	0.161027	0.87987	0.476773
Error	39.71352	217	0.183012		

Univariate Tests of Significance for item23 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.21970	1	0.219703	1.92450	0.166785
scorelevel					
Racegroup*scorelevel	1.02245	4	0.255612	2.23905	0.065853
Error	24.77294	217	0.114161		

Univariate Tests of Significance for item24 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.33982	1	0.339823	2.11755	0.147065
scorelevel					
Racegroup*scorelevel	0.33782	4	0.084454	0.52626	0.716543
Error	34.82406	217	0.160480		

Univariate Tests of Significance for item25 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup					
scorelevel					
Racegroup*scorelevel	0.17003	4	0.04251	0.18870	0.944124
Error	48.88202	217	0.22526		



Univariate Tests of Significance for item26 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	19.74200	1	19.74200	94.51169	0.000000
Racegroup	0.22503	1	0.22503	1.07731	0.300455
scorelevel	6.35488	4	1.58872	7.60574	0.000009
Racegroup*scorelevel	0.52072	4	0.13018	0.62321	0.646423
Error	45.32787	217	0.20888		

Univariate Tests of Significance for item27 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	0.23709	1	0.23709	3.714851	0.055236
Racegroup	0.00981	1	0.00981	0.153666	0.695441
scorelevel	0.60831	4	0.152077	2.382838	0.052473
Racegroup*scorelevel	0.08150	4	0.020374	0.319232	0.864922
Error	13.84935	217	0.063822		

Univariate Tests of Significance for item28 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.20270	1	0.20270	1.894934	0.170065
scorelevel					
Racegroup*scorelevel	0.53100	4	0.132751	1.241004	0.294491
Error	23.21255	217	0.106970		

Univariate Tests of Significance for item29 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	2.80861	1	2.808610	21.07765	0.000007
Racegroup	0.05051	1	0.050513	0.37908	0.538740
scorelevel	4.59312	4	1.148280	8.61745	0.000002
Racegroup*scorelevel	0.13029	4	0.032574	0.24445	0.912797
Error	28.91539	217	0.133251		

Univariate Tests of Significance for item30 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.04793	1	0.047925	0.444381	0.505724
scorelevel					
Racegroup*scorelevel	0.60793	4	0.151983	1.409247	0.231884
Error	23.40276	217	0.107847		

Detailed results by item for Graduate Numerical Reasoning Test

Item number	Uniform bias	In favour of group	Non-uniform bias
1	No		No
2	No		No
3	No		No
4	No		No
5	No		No
6	No		No
7	No		No
8	Yes	Black	No
9	No		No
10	No		No
11	No		Yes
12	No		No
13	No		No
14	No		No
15	Yes	Non-Black	No
16	No		No
17	No		No
18	Yes	Non-Black	No
19	Yes	Non-Black	No
20	No		No
21	Yes	Non-Black	No
22	No		No
23	No		No
24	No		No
25	No		No

Uniform bias was found in five items. Four items were biased in favour of the Non-Black group, and one item in favour of the Black group. Non-uniform bias was found in one item.

The graphs in the detailed results that follow give more information about the bias that was found.

Univariate Tests of Significance for item1 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	62.64567	1	62.64567	362.2864	0.000000
Racegroup	0.00526	1	0.00526	0.0304	0.861770
scorelevel	12.16581	4	3.04145	17.5890	0.000000
Racegroup*scorelevel	0.61404	4	0.15351	0.8878	0.472053
Error	37.52310	217	0.17292		

Univariate Tests of Significance for item2 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.01688	1	0.01688	0.0854	0.770430
scorelevel					
Racegroup*scorelevel	0.37206	4	0.09302	0.4704	0.757457
Error	42.91203	217	0.19775		

Univariate Tests of Significance for item3 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.38221	1	0.38221	1.8135	0.179495
scorelevel					
Racegroup*scorelevel	1.27711	4	0.31928	1.5149	0.198857
Error	45.73511	217	0.21076		

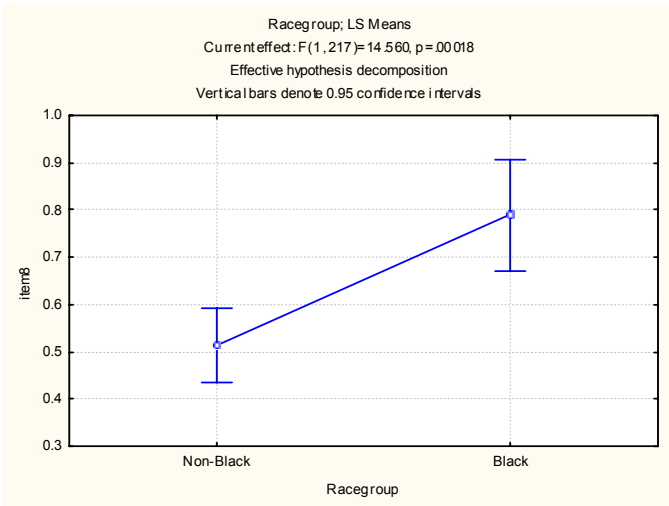
Univariate Tests of Significance for item4 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.35525	1	0.35525	1.8991	0.169594
scorelevel					
Racegroup*scorelevel	1.58549	4	0.39637	2.1190	0.079483
Error	40.59215	217	0.18706		

Univariate Tests of Significance for item5 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	84.95501	1	84.95501	506.5372	0.000000
Racegroup	0.02119	1	0.02119	0.1263	0.722595
scorelevel	6.35021	4	1.58755	9.4657	0.000000
Racegroup*scorelevel	0.50132	4	0.12533	0.7473	0.560793
Error	36.39463	217	0.16772		

Univariate Tests of Significance for item6 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.04136	1	0.04136	0.2194	0.639972
scorelevel					
Racegroup*scorelevel	0.12544	4	0.03136	0.1663	0.955289
Error	40.91084	217	0.18853		

Univariate Tests of Significance for item7 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.02341	1	0.02341	0.1259	0.723069
scorelevel					
Racegroup*scorelevel	0.55787	4	0.13947	0.7501	0.558918
Error	40.34826	217	0.18594		

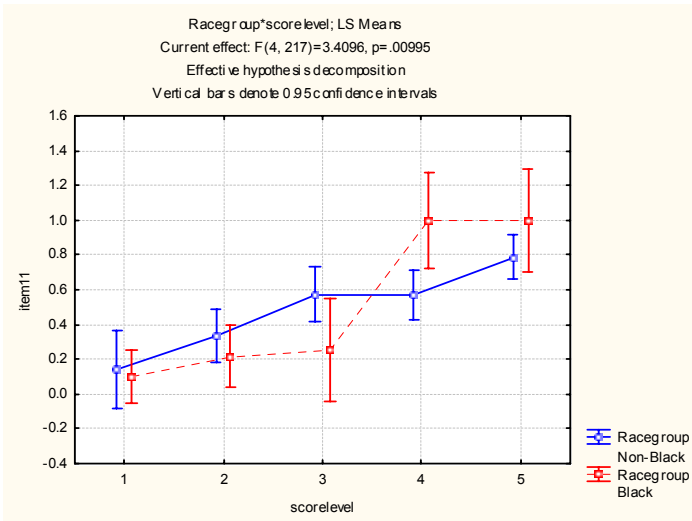
Univariate Tests of Significance for item8 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup					
scorelevel					
Racegroup*scorelevel	0.88673	4	0.22168	1.0620	0.376242
Error	45.29598	217	0.20874		



Univariate Tests of Significance for item9 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	38.99141	1	38.99141	188.5426	0.000000
Racegroup	0.02928	1	0.02928	0.1416	0.707075
scorelevel	6.66881	4	1.66720	8.0617	0.000004
Racegroup*scorelevel	0.60614	4	0.15154	0.7328	0.570495
Error	44.87652	217	0.20680		

Univariate Tests of Significance for item10 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.30865	1	0.30865	1.4092	0.236492
scorelevel					
Racegroup*scorelevel	0.22321	4	0.05580	0.2548	0.906535
Error	47.52905	217	0.21903		

Univariate Tests of Significance for item11 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.04193	1	0.04193	0.2333	0.629548
scorelevel					
Racegroup*scorelevel					
Error	38.99400	217	0.17970		

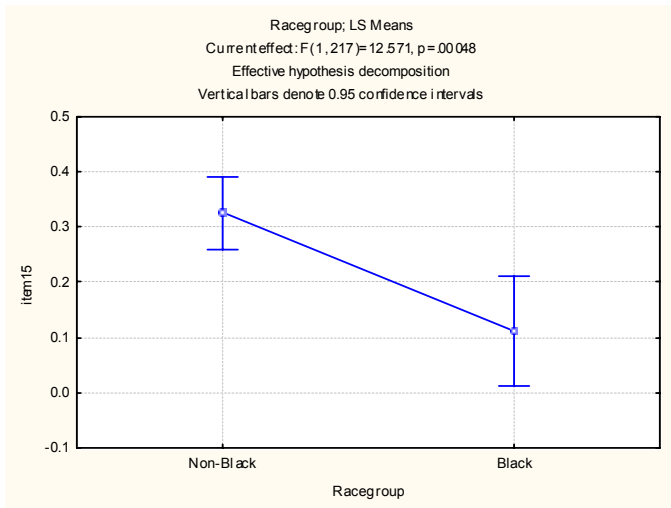


Univariate Tests of Significance for item12 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	27.31077	1	27.31077	146.7896	0.000000
Racegroup	0.00572	1	0.00572	0.0308	0.860957
scorelevel	10.05733	4	2.51433	13.5140	0.000000
Racegroup*scorelevel	1.02247	4	0.25562	1.3739	0.243978
Error	40.37367	217	0.18605		

Univariate Tests of Significance for item13 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.11223	1	0.11223	0.5290	0.467813
scorelevel					
Racegroup*scorelevel	0.29987	4	0.07497	0.3534	0.841516
Error	46.03604	217	0.21215		

Univariate Tests of Significance for item14 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.01410	1	0.01410	0.0770	0.781667
scorelevel					
Racegroup*scorelevel	0.26513	4	0.06628	0.3619	0.835596
Error	39.74878	217	0.18317		

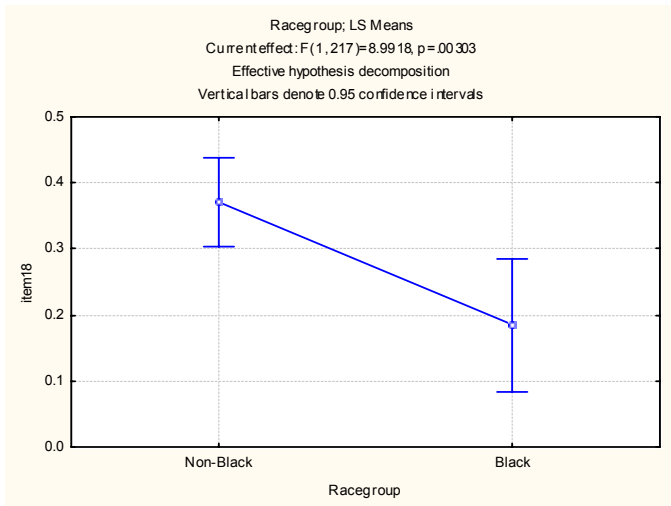
Univariate Tests of Significance for item15 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	7.58783	1	7.587831	52.61257	0.000000
Racegroup	1.81300	1	1.812995	12.57096	0.000480
scorelevel	3.94003	4	0.985009	6.82986	0.000034
Racegroup*scorelevel	0.89015	4	0.222536	1.54303	0.190804
Error	31.29593	217	0.144221		



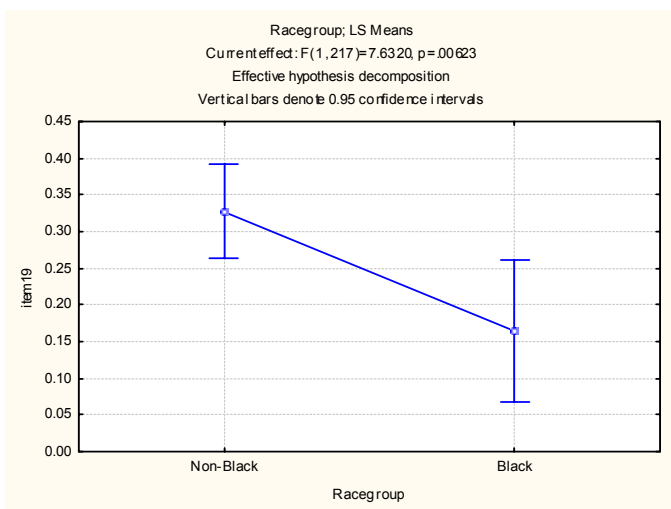
Univariate Tests of Significance for item16 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.01436	1	0.01436	0.0909	0.763279
scorelevel					
Racegroup*scorelevel	1.38205	4	0.34551	2.1882	0.071327
Error	34.26384	217	0.15790		

Univariate Tests of Significance for item17 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.27157	1	0.271575	1.89799	0.169723
scorelevel					
Racegroup*scorelevel	0.97704	4	0.244261	1.70709	0.149475
Error	31.04960	217	0.143086		

Univariate Tests of Significance for item18					
Sigma-restricted parameterization					
Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	12.19960	1	12.19960	80.70158	0.000000
Racegroup	1.35929	1	1.35929	8.99184	0.003028
scorelevel	6.88432	4	1.72108	11.38511	0.000000
Racegroup*scorelevel	0.39812	4	0.09953	0.65840	0.621559
Error	32.80374	217	0.15117		

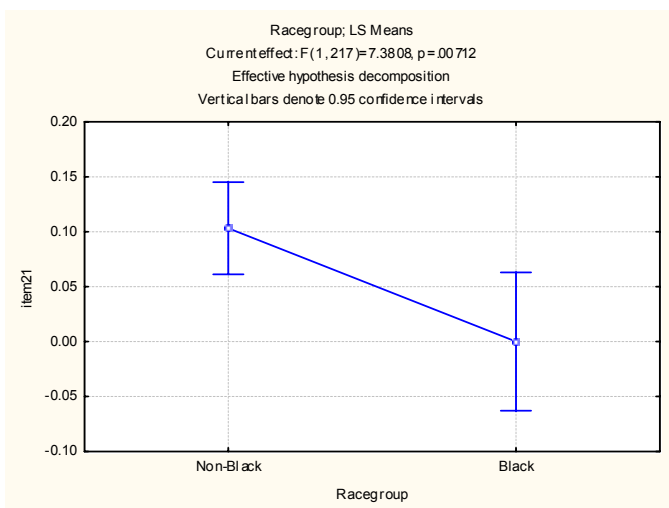


Univariate Tests of Significance for item19					
Sigma-restricted parameterization					
Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup					
scorelevel					
Racegroup*scorelevel	0.18008	4	0.045021	0.32628	0.860156
Error	29.94236	217	0.137983		



Univariate Tests of Significance for item20 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	2.55795	1	2.557952	21.97801	0.000005
Racegroup	0.23732	1	0.237318	2.03904	0.154744
scorelevel	1.82899	4	0.457248	3.92869	0.004226
Racegroup*scorelevel	0.54347	4	0.135867	1.16738	0.326133
Error	25.25595	217	0.116387		

Univariate Tests of Significance for item21 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup					
scorelevel	0.46077	4	0.115193	1.990655	0.097003
Racegroup*scorelevel	0.46077	4	0.115193	1.990655	0.097003
Error	12.55714	217	0.057867		



Univariate Tests of Significance for item22 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.00040	1	0.000397	0.00459	0.946031
scorelevel	0.71822	4	0.179554	2.07809	0.084708
Racegroup*scorelevel	0.65653	4	0.164133	1.89962	0.111590
Error	18.74950	217	0.086403		

Univariate Tests of Significance for item23 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	0.232957	1	0.232957	8.122296	0.004794
Racegroup	0.021578	1	0.021578	0.752349	0.386692
scorelevel	0.531037	4	0.132759	4.628795	0.001321
Racegroup*scorelevel	0.227206	4	0.056801	1.980446	0.098545
Error	6.223810	217	0.028681		

Univariate Tests of Significance for item24 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.00705	1	0.007046	0.134092	0.714583
scorelevel					
Racegroup*scorelevel	0.05743	4	0.014357	0.273238	0.895030
Error	11.40238	217	0.052546		

Univariate Tests of Significance for item25 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	0.013156	1	0.013156	0.997774	0.318962
Racegroup	0.000027	1	0.000027	0.002062	0.963827
scorelevel	0.021448	4	0.005362	0.406656	0.803750
Racegroup*scorelevel	0.038430	4	0.009607	0.728626	0.573269
Error	2.861284	217	0.013186		

Detailed results by item for Graduate Abstract Reasoning Test

Item number	Uniform bias	In favour of group	Non-uniform bias
1	No		No
2	No		No
3	No		Yes
4	No		No
5	No		No
6	Yes	Non-Black	No
7	No		No
8	No		No
9	No		No
10	No		No
11	No		No
12	No		No
13	No		No
14	No		No
15	No		No
16	No		No
17	No		No
18	No		No
19	No		Yes
20	No		No
21	No		No
22	No		No
23	No		No
24	No		No
25	No		No

Uniform bias was found in one item, in favour of the non-Black group.

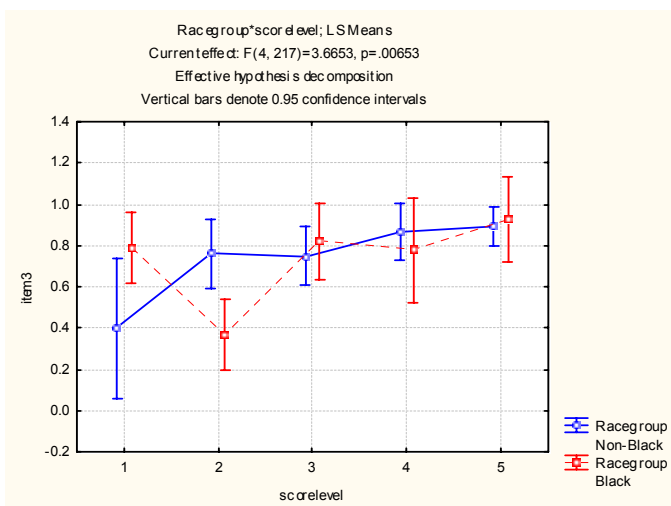
Non-uniform bias was found in two items.

The graphs in the detailed results that follow give more information about the bias that was found.

Univariate Tests of Significance for item1 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	50.71980	1	50.71980	212.2600	0.000000
Racegroup	0.01367	1	0.01367	0.0572	0.811209
scorelevel	0.68139	4	0.17035	0.7129	0.583912
Racegroup*scorelevel	0.64921	4	0.16230	0.6792	0.607039
Error	51.85243	217	0.23895		

Univariate Tests of Significance for item2 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.11998	1	0.11998	1.260	0.262841
scorelevel					
Racegroup*scorelevel	0.80142	4	0.20035	2.105	0.081291
Error	20.65865	217	0.09520		

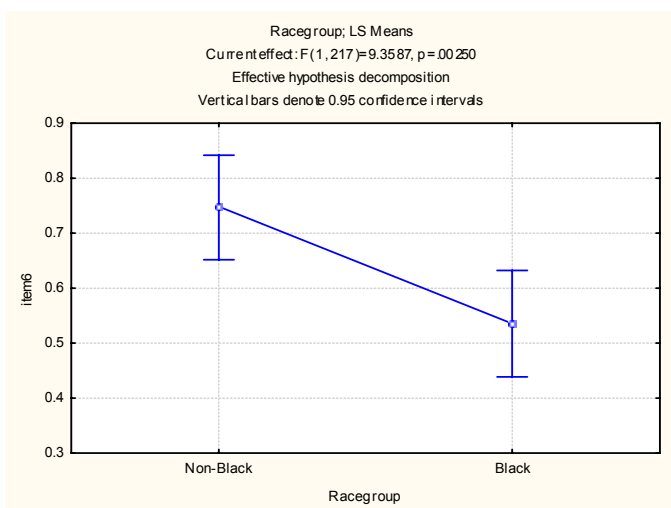
Univariate Tests of Significance for item3 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.00042	1	0.00042	0.0028	0.957792
scorelevel					
Racegroup*scorelevel					
Error	32.50601	217	0.14980		



Univariate Tests of Significance for item4 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	23.01625	1	23.01625	105.3116	0.000000
Racegroup	0.00157	1	0.00157	0.0072	0.932437
scorelevel	6.07459	4	1.51865	6.9486	0.000028
Racegroup*scorelevel	0.38666	4	0.09666	0.4423	0.777952
Error	47.42617	217	0.21855		

Univariate Tests of Significance for item5 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.30713	1	0.30713	1.5999	0.207275
scorelevel					
Racegroup*scorelevel	0.77190	4	0.19298	1.0052	0.405674
Error	41.65736	217	0.19197		

Univariate Tests of Significance for item6 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup					
scorelevel					
Racegroup*scorelevel	0.42667	4	0.10667	0.6104	0.655544
Error	37.91848	217	0.17474		



Univariate Tests of Significance for item7 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	43.02486	1	43.02486	206.3175	0.000000
Racegroup	0.23398	1	0.23398	1.1220	0.290663
scorelevel	4.36865	4	1.09216	5.2373	0.000479
Racegroup*scorelevel	0.72669	4	0.18167	0.8712	0.482015
Error	45.25255	217	0.20854		

Univariate Tests of Significance for item8 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.01075	1	0.01075	0.0537	0.816999
scorelevel					
Racegroup*scorelevel	0.33267	4	0.08317	0.4152	0.797591
Error	43.46596	217	0.20030		

Univariate Tests of Significance for item9 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.28636	1	0.28636	1.2795	0.259246
scorelevel					
Racegroup*scorelevel	1.00711	4	0.25178	1.1249	0.345615
Error	48.56712	217	0.22381		

Univariate Tests of Significance for item10 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.14964	1	0.14964	0.69160	0.406534
scorelevel					
Racegroup*scorelevel	0.58921	4	0.14730	0.68080	0.605948
Error	46.95174	217	0.21637		

Univariate Tests of Significance for item11 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	28.07566	1	28.07566	123.3872	0.000000
Racegroup	0.53058	1	0.53058	2.3318	0.128213
scorelevel	2.71424	4	0.67856	2.9821	0.020021
Racegroup*scorelevel	0.30087	4	0.07522	0.3306	0.857238
Error	49.37643	217	0.22754		

Univariate Tests of Significance for item12 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.44938	1	0.44938	2.16256	0.142857
scorelevel					
Racegroup*scorelevel	0.69861	4	0.17465	0.84049	0.500816
Error	45.09230	217	0.20780		

Univariate Tests of Significance for item13 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.13009	1	0.13009	0.71345	0.399230
scorelevel					
Racegroup*scorelevel	0.18237	4	0.04559	0.25004	0.909423
Error	39.56787	217	0.18234		

Univariate Tests of Significance for item14 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.01266	1	0.012664	0.09853	0.753897
scorelevel					
Racegroup*scorelevel	0.25771	4	0.064428	0.50128	0.734823
Error	27.89036	217	0.128527		

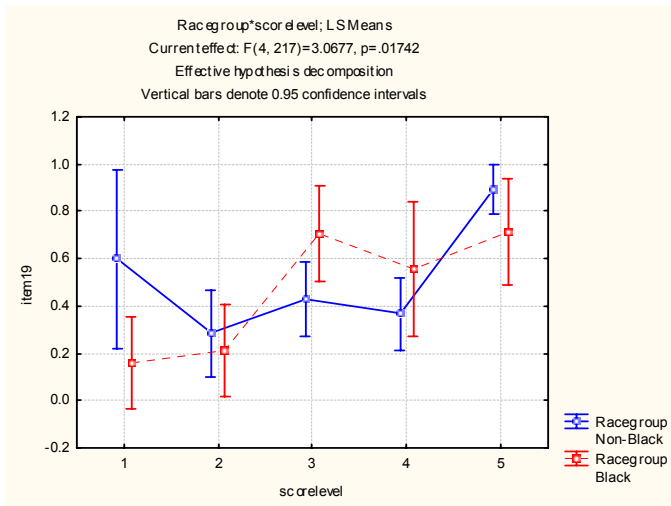
Univariate Tests of Significance for item15 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	21.09468	1	21.09468	103.4191	0.000000
Racegroup	0.16896	1	0.16896	0.8284	0.363759
scorelevel	6.89460	4	1.72365	8.4504	0.000002
Racegroup*scorelevel	0.61963	4	0.15491	0.7595	0.552719
Error	44.26210	217	0.20397		

Univariate Tests of Significance for item16 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.42480	1	0.42480	1.7821	0.183288
scorelevel	2.28972	4	0.57243	2.4015	0.050945
Racegroup*scorelevel	0.59957	4	0.14989	0.6288	0.642427
Error	51.72579	217	0.23837		

Univariate Tests of Significance for item17 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.00185	1	0.00185	0.0088	0.925155
scorelevel					
Racegroup*scorelevel	0.20773	4	0.05193	0.2489	0.910139
Error	45.28263	217	0.20868		

Univariate Tests of Significance for item18 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.00072	1	0.00072	0.00357	0.952397
scorelevel					
Racegroup*scorelevel	0.64997	4	0.16249	0.80413	0.523705
Error	43.84960	217	0.20207		

Univariate Tests of Significance for item19					
Sigma-restricted parameterization					
Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	35.62939	1	35.62939	194.0235	0.000000
Racegroup	0.07735	1	0.07735	0.4212	0.517024
scorelevel	7.15202	4	1.78801	9.7368	0.000000
Racegroup*scorelevel	2.25336	4	0.56334	3.0677	0.017418
Error	39.84867	217	0.18363		



Univariate Tests of Significance for item20					
Sigma-restricted parameterization					
Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup					
scorelevel					
Racegroup*scorelevel	0.53813	4	0.13453	0.81853	0.514563
Error	35.66570	217	0.16436		

Univariate Tests of Significance for item21					
Sigma-restricted parameterization					
Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.01446	1	0.014457	0.09254	0.761264
scorelevel					
Racegroup*scorelevel	1.19614	4	0.299036	1.91420	0.109123
Error	33.89971	217	0.156220		

Univariate Tests of Significance for item22 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	2.17358	1	2.173582	18.39067	0.000027
Racegroup	0.19819	1	0.198195	1.67692	0.196710
scorelevel	1.29408	4	0.323521	2.73731	0.029761
Racegroup*scorelevel	0.70863	4	0.177157	1.49893	0.203560
Error	25.64710	217	0.118189		

Univariate Tests of Significance for item23 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.17109	1	0.171090	1.44064	0.231345
scorelevel	0.97963	4	0.244907	2.06221	0.086825
Racegroup*scorelevel	0.94842	4	0.237104	1.99650	0.096131
Error	25.77085	217	0.118760		

Univariate Tests of Significance for item24 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.09710	1	0.097100	1.221500	0.270290
scorelevel	0.35356	4	0.088389	1.111911	0.351789
Racegroup*scorelevel	0.33323	4	0.083308	1.047993	0.383351
Error	17.24992	217	0.079493		

Univariate Tests of Significance for item25 Sigma-restricted parameterization Effective hypothesis decomposition					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept					
Racegroup	0.03094	1	0.030941	0.453054	0.501604
scorelevel	0.51506	4	0.128766	1.885451	0.114038
Racegroup*scorelevel	0.03822	4	0.009555	0.139910	0.967246
Error	14.81992	217	0.068295		