

**MS-95**

**Management Programme**

**ASSIGNMENT  
FIRST SEMESTER  
2013**

**MS - 95: Research Methodology for Management Decisions**



**School of Management Studies  
INDIRA GANDHI NATIONAL OPEN UNIVERSITY  
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## ASSIGNMENT

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<b>Course Code</b>	:	<b>MS-95</b>
<b>Course Title</b>	:	<b>Research Methodology for Management Decisions</b>
<b>Assignment No.</b>	:	<b>MS-95/TMA /SEM-I/2013</b>
<b>Coverage</b>	:	<b>All Blocks</b>

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**Note** : Attempt all the questions and submit this assignment on or before 30<sup>th</sup> April, 2013 to the coordinator of your study center.

1. What is a research design? Is it a specific plan like a building plan? How would you classify research designs?
  
2. Listed below are some objects of varying degree of abstractness. Suggest the properties of each of these objects that can be measured by each of the four basic types of scales (levels of measurement)
  - a. Customers in a retail store
  - b. Voter attitudes
  - c. Preference for a particular equity share
  - d. Profitability of various divisions in a company
  
3. What are the format requirements of a research article to be published in a professional journal? Use the web to find out information on APA reference style.
  
4. Make a list of formulae that are used in non-parametric tests. Your list should contain name of the test, its purpose and the test statistic used.

**Q1)What is a research design? Is it a specific plan like a building plan? How would you classify research designs?**

Ans:Designing of the research is done mainly to solve the problem of getting the various stages of the research under control. This control factor is very important for the researcher during any of the research operation. Preparation of the design for the research forms a very critical stage in the process of carrying out some research work or a research project.

Research Design in general terms can be referred to as the scheme of work to be done or performed by a researcher during the various stages of a research project.

With the help of the research design, one can very easily handle and operate research work as research design acts as a working plan, which is made by a researcher even before he starts working on his research project. By this, researcher gets a great help and guidance in achieving his aims and goals.

According to Russell Ackoff, research design is the process of making decisions before a situation arises in which the decision has to be carried out. It is actually a process of deliberate anticipation directed towards bringing an unexpected situation under control.

Russell Ackoff has in a great way explained about the research design in his book 'Designs of Social Research'.

**Meaning of research design**

Like an architect prepares a blue print before he approves a construction – in the same way researcher makes or prepares a plan or a schedule of his own study before he starts his research work. This helps the researcher to save time and also save some of his crucial resources. This plan or blue print of study is referred to as the research design.

Research design is also called as the research strategy and the various steps or stages that a research design may include can be summarized as follows –

1. Research problem selection
2. Problem presentation
3. Hypothesis formulation
4. Conceptual clarity
5. Methodology
6. Literature survey
7. Bibliography
8. Collection of the data
9. Hypothesis testing
10. Interpretation of the result
11. Report writing

This specific presentation of the various steps in the process of research was given by Cook Jahoda.

**Factors affecting research design**

1. Availability of scientific information
2. Availability of sufficient data
3. Time availability
4. Proper exposure to the data source
5. Availability of the money

6. Manpower availability
7. Magnitude of the management problem
8. Degree of Top management' s support
9. Ability, knowledge, skill, technical understanding and technical background of the researcher
10. Controllable variables
11. Un – controllable variables
12. Internal variables
13. External variables

#### Advantages of research design

1. Consumes less time.
2. Ensures project time schedule.
3. Helps researcher to prepare himself to carry out research in a proper and a systematic way.
4. Better documentation of the various activities while the project work is going on.
5. Helps in proper planning of the resources and their procurement in right time.
6. Provides satisfaction and confidence, accompanied with a sense of success from the beginning of the work of the research project.

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Is research design a specific plan like a building plan?

AT THE INITIAL STAGE, WHILE THE ARCHITECTS ARE WORKING OUT THE DESIGN OF THE BUILDING, IT IS LIKE A RESEARCH DESIGN.

LATER ON, Building plans are a graphical representation of what a building will look like after construction. They are used by builders and contractors to construct buildings of all kinds. Building plans are also useful when it comes to estimating how much a project will cost, and preparing project budgets. The creation of a set of building plans starts when an owner or developer approaches an architect with an idea for a new building. The architect issues a proposal for his services based on the type of project and the owner's description. The cost for building plans typically ranges from 3-5% of the total cost of the project. Once the owner signs a contract with the architect, the design phase begins.

On larger projects, the design process goes through several distinct phases. It starts with a schematic phase, where the architect captures the basic information about the project and creates simple floor plans to reflect this information. After the owner reviews these drawings, the architect proceeds with a more detailed set, called the "Design Development" phase. This process continues through a 50% drawing phase, a 90% drawing phase, and a final construction set. After each set of building plans is created, the owner is given a review period, and his comments are incorporated into the next phase. Once the building plans have been finalized, they are put out for bid. During the bidding process, contractors and subcontractors review the plans and submit their price to complete the work. Most of the time, the job is awarded to the lowest bidder, but this is not always the case. Owners may also take experience, schedule, and relationships into account when awarding a project.

Building plans may consist of a single drawing, or hundreds of pages. Construction Specifications sets of building plans start with a title page, which shows a list of all included drawings and well as a symbols legend. This page is followed by civil, or site, plans; architectural drawings; mechanical and electrical plans; then any specialty information, like sprinkler systems, special equipment, or furnishings. Other

countries may have their own standardized systems for building plans.

Most sets of building plans are accompanied by a specifications book, or spec book. This manual is organized in accordance with CSI codes, and contains information on materials and methods to be utilized when completing the project. It is critical that the spec book is used in conjunction with the project drawings, and there may be information in one that is not shown in the other.

various types of research design?

Various types of research design are as follow:

1. Research design for exploratory or formulative studies

- In this type of design, a vague problem is selected and understood and is then followed by an exploratory research to find a new hypothesis and then carrying out conclusion research decisions to finally get new ideas.
- Aims at finding a new hypothesis.
- Individual surveys, referring to secondary sources of data etc. play an important role in such research designs.
- Reviewing related literature, following or surveying people having practical experience in the problem related field act as very important and most commonly used methods by an exploratory researcher.

2. Research design for conclusive studies

Also referred to as the research design for the descriptive studies and is further divided as follows –

a. Case Study method –

- Finds extensive use in commerce and industry.
- Very respectable method of teaching and research in management.
- Helps greatly in knowing the causes and the results of the incident of the phenomenon.

b. Statistical method –

- Also trying to find its place in commerce and industry.
- Act as method of correlation and regressions, analysis, chi square etc.
- Has been made very rigorous and sophisticated by coming up of the computers.

3. Research design for experimental studies –

- Explains the structure of an experiment.
- Involve plans for the testing of the causal hypothesis.
- Decides the number of observations to be taken and also the order in which experiments are to be carried out.
- Which randomization method to be used.
- Which mathematical model to be used for explaining the experiment.

This research design can be further categorized into the following –

1. Informal experimental design –

- After only design.
- After only with control design.
- Before and after without control design.
- Before and after with control design.

## 2. Formal experimental design –

- Completely randomized design.
- Randomized block design.
- Latin square design.
- Factorial design.

**Q2 )Listed below are some objects of varying degree of abstractness. Suggest the properties of each of these objects that can be measured by each of the four basic types of scales (levels of measurement)**

**A]Customers in a retail store**

**B]Voter attitudes**

**C]Preference for a particular equity share**

**D]Profitability of various divisions in a company**

**Ans:Types of scales & levels of measurement**

### **Discrete and continuous variables**

Daniel's text distinguishes between discrete and continuous variables. These are technical distinctions that will not be all that important to us in this class. According to the text, discrete variables are variables in which there are no intermediate values possible. For instance, the number of phone calls you receive per day. You cannot receive 6.3 phone calls. Continuous variables are everything else; any variable that can theoretically have values in between points (e.g., between 153 and 154 lbs. for instance). It turns out that this is not all that useful of a distinction for our purposes. What is really more important for statistical considerations is the level of measurement used. When I say it is more important, I've really understated this. Understanding the level of measurement of a variable (or scale or measure) is the first and most important distinction one must make about a variable when doing statistics!

### Levels of measurement

Statisticians often refer to the "levels of measurement" of a variable, a measure, or a scale to distinguish between measured variables that have different properties. There are four basic levels: nominal, ordinal, interval, and ratio.

#### Nominal

A variable measured on a "nominal" scale is a variable that does not really have any evaluative distinction. One value is really not any greater than another. A good example of a nominal variable is sex (or gender). Information in a data set on sex is usually coded as 0 or 1, 1 indicating male and 0 indicating female (or the other way around--0 for male, 1 for female). 1 in this case is an arbitrary value and it is not any greater or better than 0. There is only a nominal difference between 0 and 1. With nominal variables, there is a qualitative difference between values, not a quantitative one.

#### Ordinal

Something measured on an "ordinal" scale does have an evaluative connotation. One value is greater or larger or better than the other. Product A is preferred over product B, and therefore A receives a value of 1 and B receives a value of 2. Another example might be rating your job satisfaction on a scale from 1 to 10, with 10 representing complete satisfaction. With ordinal scales, we only know that 2 is better than 1 or 10 is better than 9; we do not know by how much. It may vary. The distance between 1 and 2 maybe shorter than between 9 and 10.

#### Interval

A variable measured on an interval scale gives information about more or betterness as ordinal scales do, but interval variables have an equal distance between each value. The distance between 1 and 2 is equal to the distance between 9 and 10. Temperature using Celsius or Fahrenheit is a good example, there is the exact same difference between 100 degrees and 90 as there is between 42 and 32.

#### Ratio

Something measured on a ratio scale has the same properties that an interval scale has except, with a ratio scaling, there is an absolute zero point. Temperature measured in Kelvin is an example. There is no value possible below 0 degrees Kelvin, it is absolute zero. Weight is another example, 0 lbs. is a meaningful absence of weight. Your bank account balance is another. Although you can have a negative or positive account balance, there is a definite and nonarbitrary meaning of an account balance of 0. One can think of nominal, ordinal, interval, and ratio as being ranked in their relation to one another. Ratio is more sophisticated than interval, interval is more sophisticated than ordinal, and ordinal is more sophisticated than nominal. I don't know if the ranks are equidistant or not, probably not. So what kind of measurement level is this ranking of measurement levels?? I'd say ordinal. In statistics, it's best to be a little conservative when in doubt.

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four basic types of scales (levels of measurement)

1. An example of a nominal scale [ A. CUSTOMER IN A RETAIL STORE

Which of the following food items do you tend to buy at least once per month? (

Sauce /cooking oil/ spices

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1. An example of a nominal scale [ VOTER ATTITUDE ]

Which of the following PARTIES YOU PREFER (

LABOR OR LIBERAL

\*\*\*\*\*

1. An example of a nominal scale [ PREFERENCE FOR EQUITY SHARE

Which of the following EQUITY SHARE YOU PREFER (

MAJOR CORPORATION'S EQUITY SHARE OR SMALL / MEDIUM COs

\*\*\*\*\*

1. An example of a nominal scale [ PROFITABILITY ]

Which of the following DIVISION PROFITABILITY(

TOILETERIES DIV 55/100 SOAP DIV 55/10

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2. An example of an ordinal scale what weekly / monthly shopping

[ customers in a retail store.

Order of preference period

1 weekly

2 Monthly

3 fortnightly

4 No preference

\*\*\*\*\*

2. An example of an ordinal scale used to determine voting time

[ voter attitude ]

Order of preference Time

- 1 Morning
- 2 Noon
- 3 eveningt
- 4 No time

\*\*\*\*\*

2 .An example of an ordinal scale used to determine equity preferences

[ equity share ]

Order of preference Equity

- 1 Small/medium
- 2 Large corp

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2. An example of an ordinal scale used to determine profitability choice

[ profitability choice]

Order of preference Profit

- 1 High
- 2 medium.
- 3 Low

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3. Examples of interval scales [ customers in a retail store ]

Please indicate your views on Balkan Olives by scoring them on a scale of 5 down to 1 (i.e. 5 = Excellent;

1= Poor) on each of the criteria listed

Succulence 5 4 3 2 1

Fresh tasting 5 4 3 2 1

Free of skin blemish 5 4 3 2 1

Good value 5 4 3 2 1

Attractively packaged 5 4 3 2 1

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3. Examples of interval scales [ VOTERS ATTITUDE ]

Please indicate your views ON VOTING BOOTH CONDITIONS by scoring them on a scale of 5 down to 1

(i.e. 5 = Excellent; = Poor) on each of the criteria listed



ORGANIZATION 5 4 3 2 1  
ATMOSPHERE 5 4 3 2 1  
STAFF SUPPORT 5 4 3 2 1  
CONDITIONS INTERNAL 5 4 3 2 1  
5 4 3 2 1

\*\*\*\*\*

3. Examples of interval scales [ EQUITY SHARE]

Please indicate your LIKING FOR EQUITY by scoring them on a scale of 5 down to 1 (i.e. 5 = Excellent; = Poor) on each of the criteria listed

LARGE CORPORATION EQUITY 5 4 3 2 1  
MEDIUM CO EQUITY 5 4 3 2 1  
SMALL CO EQUITY 5 4 3 2 1  
5 4 3 2 1  
5 4 3 2 1

\*\*\*\*\*

3. Examples of interval scales [ PROFITABILITY ]

Please indicate your RATING OF DIV PROFITABILITY by scoring them on a scale of 5 down to 1 (i.e. 5 = Excellent; = Poor) on each of the criteria listed

DIVISION A 5 4 3 2 1  
DIVISION B 5 4 3 2 1  
DIVISION C 5 4 3 2 1  
DIVISION D 5 4 3 2 1  
DIVISION E 5 4 3 2 1

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4..Ratio scales

A]Customers in a retail store

MALE/ FEMAIL RATIO= 55%/45 %

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4.Ratio scales

B]Voter attitudes

IN FAVOUR OF ELECTION : AGAINST= 80/20

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4.Ratio scales

C]Preference for a particular equity share

LARGE CORP: SME EQUITY = 60/40%

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#### 4. Ratio scales

D] Profitability of various divisions in a company

MOST PREFER 18% RETURN ON SALES.

### **Q3 ] What are the format requirements of a research article to be published in a professional journal? Use the web to find out information on APA reference style.**

**Ans:** To encourage full and transparent reporting of research we do not set fixed limits for the length of research articles. Nonetheless, please try to make your article concise and make every word count. Think hard about what really needs to be in the paper to get your message across accurately and what can be left out. We suggest ..... words as a guideline for fully reporting a study's methods, results, introduction, and discussion in an average article, although we recognise that some studies may need more space, others less. You will be prompted to provide the word count for the main text (excluding the abstract, references, tables, boxes, or figures) when you submit your manuscript.

2. Important: The manuscript should include the structured abstract and all tables, figures, boxes, and appendices that are essential to reporting the study design and findings. We may suggest later that you separate out some material into web extras to make the main manuscript clearer for general readers, but for peer review (including editorial and statistical review), the manuscript should be a complete document that fully reports the study.

#### 3. Abridged research articles

The full text of all accepted research articles is published online in full, with open access and no word limit, on bmj.com as soon as it is ready. In the print each research article is abridged, with the aim of making research more inviting and useful to readers.

There is no need for authors to prepare a pico to submit along with their full research article. Authors produce their own pico, using a template from us, as part of the final revisions before acceptance for publication.

Because publication of research is definitive, rather than interim "epublication ahead of print", authors who do not wish to abridge their articles using pico will be able to opt for online only publication.

#### 4. Title page

This should give the title of the article, including the study design. Please give for each author his or her name and initials, full address including postal code and one main work position (job title) at the time of writing the paper. We do not need authors' qualifications. For the corresponding author please provide an email address and the best contact address: this may differ from his or her work address.

#### 5. Overall style

Original research articles should follow style (introduction, methods, results and discussion) and should include a structured abstract (see below), a structured discussion, and a succinct introduction that focuses - in no more than three paragraphs - on the background to the research question.

We also ask you to ensure that the manuscript includes all the information recommended in the relevant reporting statement. We do not use reporting guidelines as critical appraisal tools to evaluate study quality or filter out articles. We're simply aiming to make research articles so clear that peer reviewers, editors, clinicians, educators, ethicists, policy makers, systematic reviewers, guideline writers, journalists,

patients, and the general public can tell what really happened during a study.

## 6. Structured abstract

## 7. Structured discussion

Please ensure that the discussion section of your article comprises no more than five paragraphs and follows this overall structure, although you do not need to signpost these elements with subheadings:

- Statement of principal findings
- Strengths and weaknesses of the study
- Strengths and weaknesses in relation to other studies, discussing important differences in results
- Meaning of the study: possible explanations and implications for clinicians and policymakers
- Unanswered questions and future research

For original research articles in particular, please note that we need, as appropriate:

In the manuscript

- for an intervention study the manuscript should include enough information about the intervention(s) and comparator(s) (even if this was usual care) for reviewers and readers to understand fully what happened in the study. To enable readers to replicate your work or implement the interventions in their own practice please also provide (uploaded as one or more supplemental files, including video and audio files where appropriate) any relevant detailed descriptions and materials. Alternatively, please provide in the manuscript urls to openly accessible websites where these materials can be found.
- a statement that the study obtained ethics approval (or a statement that it was not required), including the name of the ethics committee(s) or institutional review board(s), the number/ID of the approval(s), and a statement that participants gave informed consent before taking part.
- a statement giving the details of all sources of funding for the study
- description of the role of the study sponsor(s) or funder(s), if any, in study design; in the collection, analysis, and interpretation of data; in the writing of the report; and in the decision to submit the article for publication
- a statement of the independence of researchers from funders
- a statement that all authors, external and internal, had full access to all of the data (including statistical reports and tables) in the study and can take responsibility for the integrity of the data and the accuracy of the data analysis
- a data sharing statement such as "Data sharing: patient level data [and/or] full dataset [and/or] technical appendix [and/or] statistical code [and/or] available at [/doi] [with open access/with these restrictions] [from the corresponding author at ]. Participants gave informed consent for data sharing [or ...consent was not obtained but the presented data are anonymised and risk of identification is low... or consent was not obtained but the potential benefits of sharing these data outweigh the potential harms because...]". If there are no such further data available, please use this wording: "Data sharing: no additional data available".
- trial registration number and name of register for a clinical trial—in the last line of the structured abstract
- registration number and name of register for any study type, if registered—in the last line of the structured abstract. We are keen to promote registration for observational studies and systematic reviews
- for articles that include explicit statements of the quality of evidence and strength of

recommendations, we prefer reporting using the GRADE system (we encourage but do not insist on this)

- one or more references for the statistical package(s) used to analyse the data eg RevMan for a systematic review. There is no need to provide a formal reference for a very widely used package that will be very familiar to general readers eg STATA, but please say in the text which version you used.

As supplemental files

- the original protocol for a clinical trial or, if the protocol has been published in an open access online journal, its reference and url. We appreciate that studies sometimes deviate from protocols, but please explain any important deviations in the manuscript, particularly those about choice of outcomes and analyses or change in sample size
- the original protocol for an observational study or systematic review, if available
- for a randomised controlled trial, the appropriate completed checklist showing on which page of your manuscript each checklist item appears, the structured abstract, and the flowchart .
- PRISMA checklist and flowchart for a systematic review or meta-analysis of randomised trials and other evaluation studies
- MOOSE checklist for a meta-analysis of observational studies
- STARD checklist and flowchart for a study of diagnostic accuracy
- STROBE checklist for an observational study
- GRIPS for genetic risk prediction studies
- for an economic evaluation (noting that we do not usually consider economic evaluations of clinical or health services research studies unless we have already published or are currently considering those primary studies)
- 
- original raw data if you think they will help our reviewers (and maybe readers), or if we specifically request them. Please note our policy on data sharing, explained above
- video and audio files that will add educational value to your article, for example by explaining the intervention in a trial
- copies of any non-standard questionnaires and assessment schedules used in the research
- copies of patient information sheets used to obtain informed consent for the study or to comprise or deliver the intervention in a clinical trial
- copies of closely related articles you have published (this is particularly important when details of the study methods are published elsewhere)
- copies of any previous reviewers' reports on this article. We appreciate that authors may have tried other journals before sending their work , and find it helpful if you let us know how you have responded to previous reviewers' comments
- 
- In the cover letter
- details of previous publications from the same study - including in scientific abstracts or partial reports by the media at scientific meetings and in foreign language journals
- details of any previous publication of the same study in electronic form.
- names and contact details (including email addresses) of suitable peer reviewers; we often find authors' suggestions helpful, though this is optional
- assurance that a study funded or sponsored by industry follows the guidelines on good publication

practice. These GPP2 guidelines aim to ensure that such studies are published in a responsible and ethical manner. The guidelines cover companies' responsibility to endeavour to publish results of all studies, companies' relations with investigators, measures to prevent redundant or premature publication, the roles of authors and contributors, and the role of professional medical writers

- assurance that any article written by a professional medical writer follows the guidelines by the Medical Writers' Association on the role of professional medical writers. The guidelines emphasise the importance of respecting widely recognised authorship criteria, and in particular of ensuring that all people listed as named authors have full control of the content of articles. The role of professional medical writers must be transparent. Please name any professional medical writer among the list of contributors to any article for the BMJ (not only original research articles), and specify in the formal funding statement for the article who paid the writer. Writers and authors must have access to relevant data while writing articles. Medical writers have professional responsibilities to ensure that the articles they write are scientifically valid and are written in accordance with generally accepted ethical standards.

#### Structured abstract

Please ensure that the structured abstract is as complete, accurate, and clear as possible—but not unnecessarily long—and has been approved by all authors. We may screen original research articles by reading only the abstract.

Please note the general rules for abstracts :

- should be 250- 300 words long: you may need up to 400 words, however, for a PRISMA style abstract.

Medline can now handle up to 600 words

- use active voice but avoid “we did” or “we found”
- numbers over 10 do not need spelling out at the start of sentences
- sentences starting with a number do not require a capital letter
- p values should always be accompanied by supporting data and denominators should be given for percentages
- abstracts do not need references

The first few items (objective, design, setting) may be note-like and need not form full sentences. The results and conclusions sections should be written properly. Do not mix notes and full sentences in one section.

If the standard headings do not suit the type of study, substitute something sensible such as "population" as a heading instead of "participants" in an economics article. Please do not simply delete the heading. For standard original research articles please provide the following headings and information (for RCTs please add the trial registration details):

- objectives - a clear statement of the main aim of the study and the major hypothesis tested or research question posed
- design - including factors such as prospective, randomisation, blinding, placebo control, case control, crossover, criterion standards for diagnostic tests etc
- setting - include the level of care eg primary, secondary; number of participating centres. Be general rather than give the name of the specific centre, but give the geographical location if this is important
- participants (instead of patients or subjects) - numbers entering and completing the study, sex, and ethnic group if appropriate. Give clear definitions of how selected, entry and exclusion criteria
- interventions - what, how, when and for how long. This heading can be deleted if there were no

interventions but should normally be included for randomised controlled trials, cross over trials, and before and after studies.

- main outcome measures - those planned in protocol, those finally measured (if different, explain why)
- results - main results with (for quantitative studies) 95% confidence intervals and, where appropriate, the exact level of statistical significance and the number need to treat/harm. Whenever possible, state absolute rather than relative risks
- conclusions - primary conclusions and their implications, suggesting areas for further research if appropriate. Do not go beyond the data in the article. Conclusions are important because this is often the only part that readers look at.
- trial registration - registry and number (for clinical trials and, if available, for observational studies and systematic reviews)

Please note that confidence intervals should be written in the format (15 to 27) within parentheses, using the word "to" rather than a hyphen.

Abstracts for meta-analyses and systematic reviews should have these headings but should also include all the items required ):

- objective - what the review set out to determine
- design - type of meta-analysis, systematic review and study appraisal and synthesis methods
- data sources - where included studies were retrieved from
- eligibility criteria for selecting studies - inclusion and exclusion criteria (specifying participants and interventions, as appropriate)
- results - main findings with 95% confidence intervals
- conclusions - primary conclusions and their implications
- systematic review registration - registry and number (if registered)

Abstracts for qualitative research articles should follow the standard style but may need fewer headings:

- objective
- design
- participants
- setting
- results
- conclusions

Quality improvement reports - also have their own style of structured abstract:

- problem
- design
- setting
- key measures for improvement
- strategies for change
- effects of change
- lessons learnt

“What this paper adds” box

Please produce a box offering a thumbnail sketch of what your article adds to the literature, for readers who would like an overview without reading the whole article It should be divided into two short sections, each with 1-3 short sentences.

### Section 1: What is already known on this subject

In two or three single sentence bullet points please summarise the state of scientific knowledge on this subject before you did your study and why this study needed to be done. Be clear and specific, not vague. For example you might say: "Numerous observational studies have suggested that tea drinking may be effective in treating depression, but until now evidence from randomised controlled trials has been lacking/the only randomised controlled trial to date was underpowered/was carried out in an unusual population/did not use internationally accepted outcome measures/used too low a dose of tea." or: "Evidence from trials of tea therapy in depression have given conflicting results. Although Sjogren and Smith conducted a systematic review in 1995, a further 15 trials have been carried out since then..."

### Section 2: What this study adds

In one or two single sentence bullet points give a simple answer to the question "What do we now know as a result of this study that we did not know before?" Be brief, succinct, specific, and accurate. For example: "Our study suggests that tea drinking has no overall benefit in depression".

You might use the last sentence to summarise any implications for practice, research, policy, or public health. For example, your study might have: asked and answered a new question (one whose relevance has only recently become clear) contradicted a belief, dogma, or previous evidence provided a new perspective on something that is already known in general provided evidence of higher methodological quality for a message which is already known.

### Summary statistics to clarify your message

We do want your piece to be easy to read but also want it to be as scientifically accurate as possible. Whenever possible, state absolute rather than relative risks. Please include in the results section of your structured abstract (and in the article's results section) the following terms, as appropriate:

For a clinical trial:

- Absolute event rates among experimental and control groups
- RRR (relative risk reduction)
- NNT or NNH (number needed to treat or harm) and its 95% confidence interval (or, if the trial is of a public health intervention, number helped per 1000 or 100,000)

For a cohort study:

- Absolute event rates over time (eg 10 years) among exposed and non-exposed groups
- RRR (relative risk reduction)

For a case control study:

- OR (odds ratio) for strength of association between exposure and outcome

For a study of a diagnostic test:

- Sensitivity and specificity
- PPV and NPV (positive and negative predictive values)

The box stating what is known and what this paper adds (see below) should also reflect accurately the above information. Under what this paper adds please give the one most useful summary statistic eg NNT.

Please do not use the term "negative" to describe studies that have not found statistically significant differences, perhaps because they were too small. There will always be some uncertainty, and we hope you will be as explicit as possible in reporting what you have found in your study. Using wording such as "our results are compatible with a decrease of this much or an increase of this much" or "this study found

no effect” is more accurate and helpful to readers than “there was no effect/no difference”. Please use such wording throughout the article, including the structured abstract, and the box stating what the paper adds.

If you are sending us a revised article

Please provide all of the above, as appropriate (if not done earlier), as well as a detailed covering letter explaining how you have responded to editorial and peer review comments and other guidance .

Commentaries on research

If we ask you to write a commentary, please provide in the manuscript a title for your piece; a title page giving your name, position, and contact details including email address; and statements of competing interests and - if appropriate – co ntributorship and funding.

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**Q4 )Make a list of formulae that are used in non-parametric tests. Your list should contain name of the test, its purpose and the test statistic used.**

- Non-parametric tests
- These are sometimes referred to as “distribution free” tests, because they do not make assumptions about the normality or variance of the data
- The Mann Whitney U test is appropriate for a 2 condition independent samples design
- The Wilcoxon Signed Rank test is appropriate for a 2 condition related samples design
- If you have decided to use a non-parametric test then the most appropriate measure of central tendency will probably be the median
- Mann-Whitney U test
- To avoid making the assumptions about the data that are made by parametric tests, the Mann-Whitney U test first converts the data to ranks.
- If the data were originally measured on an interval or ratio scale then after converting to ranks the data will have an ordinal level of measurement

Mann-Whitney U test: ranking the data

Sample 1    Sample 2

Score   Rank 1   Score   Rank 2

7   3   6   2

13   8   12   7

8   4   4   1

9   5.5   9   5.5

Mann-Whitney U test: ranking the data

Sample 1    Sample 2

Score   Rank 1   Score   Rank 2

7   3   6   2

13   8   12   7

8   4   4   1

9   5.5   9   5.5

Scores are ranked irrespective of which experimental group they come from

Mann-Whitney U test: ranking the data



Sample 1	Sample 2
Score	Rank
7	3
13	8
8	4
9	5.5

Tied scores take the mean of the ranks they occupy. In this example, ranks 5 and 6 are shared in this way between 2 scores. (Then the next highest score is ranked 7)

- Rationale of Mann-Whitney U
- Imagine two samples of scores drawn at random from the same population
- The two samples are combined into one larger group and then ranked from lowest to highest
- In this case there should be a similar number of high and low ranked scores in each original group
  - if you sum the ranks in each group the totals should be about the same
  - this is the null hypothesis
- If however, the two samples are from different populations with different medians then most of the scores from one sample will be lower in the ranked list than most of the scores from the other sample
  - the sum of ranks in each group will differ

Mann-Whitney U test: sum of ranks

Sample 1	Sample 2
Score	Rank
7	3
13	8
8	4
9	5.5
Sum of ranks	20.5

The next step in computing the Mann-Whitney U is to sum the ranks in the two groups

Mann Whitney U – SPSS

- Mann Whitney U - reporting
- “As the data was skewed, and the two sample sizes were unequal, the most appropriate statistical test was Mann-Whitney. Descriptive statistics showed that group 1 (median = \_\_\_\_ ) scored higher on the DV than group 2 (median = \_\_\_\_). However, the Mann-Whitney U was found to be 51 ( $Z = -1.21$ ),  $p > 0.05$ , and so the null hypothesis that the difference between the medians arose through sampling effects cannot be rejected.”
- For a significant result: “..... Mann-Whitney U was found to be 276.5 ( $Z = -2.56$ ),  $p = 0.01$  (one-tailed), and so the null hypothesis that the difference between the medians arose through sampling effects can be rejected in favour of the alternative hypothesis that the IV had an influence on the DV.”
- Wilcoxon signed ranks test
- This is appropriate for within participants designs
- The t test lecture used a within participants example based upon testing reaction time in the morning and in the afternoon, using the same group of participants in both conditions
- The Wilcoxon test is conceptually similar to the related samples t test

– between subjects variation is minimised by calculation of difference scores

Wilcoxon test: ranking the data

Score cond 1   Score cond 2   Difference   Ranked dif ignoring +/-

3   7   -4   3.5

5   6   -1   1

5   3   2   2

4   8   -4   3.5

First rank the difference scores, ignoring the sign of the difference. Differences of 0 receive no rank

- Rationale of Wilcoxon test
  - Some difference scores will be large, others will be small
  - Some difference scores will be positive, others negative
  - If there is no difference between the two experimental conditions then there will be similar numbers of positive and negative difference scores
  - If there is no difference between the two experimental conditions then the numbers and sizes of positive and negative differences will be equal
- this is the null hypothesis
- If there is a differences between the two experimental conditions then there will either be more positive ranks than negative ones, or the other way around
- Also, the larger ranks will tend to lie in one direction

Wilcoxon test: ranking the data

Score cond 1   Score cond 2   Difference   Ranked dif ignoring +/-   Ranked dif +/- reattached

3   7   -4   3.5   -3.5

5   6   -1   1   -1

5   3   2   2   2

4   8   -4   3.5   -3.5

Add the sign of the difference back into the ranks

Wilcoxon test: ranking the data

Score cond 1   Score cond 2   Difference   Ranked dif ignoring +/-   Ranked dif +/- reattached

3   7   -4   3.5   -3.5

5   6   -1   1   -1

5   3   2   2   2

4   8   -4   3.5   -4

Separately, sum the positive ranks and the negative ranks. In this example the positive sum is 2 and the negative sum is -8.5. The Wilcoxon T is whichever is smaller (2 in this case)

Wilcoxon T – SPSS

The value of T is equal to whichever of the mean ranks is lower

T is converted to a Z score by SPSS, taking into account sample size, and the p value is derived from the standard normal distribution

- Wilcoxon T - reporting
- “As the difference scores were not normally distributed, the most appropriate statistical test was the Wilcoxon signed-rank test. Descriptive statistics showed that measurement in condition 1 (median = \_\_\_\_\_) produced higher scores than in condition 2 (median = \_\_\_\_\_). The Wilcoxon test (T = 2.17) was converted

into a Z score of -2.73,  $p = 0.006$  (two tailed). It can therefore be concluded that the experimental and control treatments produced different scores.”

- Limitations of non-parametric methods
- Converting ratio level data to ordinal ranked data entails a loss of information
- This reduces the sensitivity of the non-parametric test compared to the parametric alternative in most circumstances
  - sensitivity is the power to reject the null hypothesis, given that it is false in the population
  - lower sensitivity gives a higher type 2 error rate
- Many parametric tests have no non-parametric equivalent
  - e.g. Two way ANOVA, where two IV's and their interaction are considered simultaneously

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**Note:**The information in this assignment is taken from text of Mr.Leo Lingham.

**The sole purpose of putting this information here is that ,maximum students can have the benefit of this text for their assignments.**

***Best Wishes***

***Maanas***