California Institute of Behavioral
Neurosciences & Psychology

Learn To Write Research Papers

An ebook guide on
research paper writing

ebook is written by Dr Hassaan Tohid
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About The Author

Dr. Hassaan Tohid MBBS, CCATP, CSOTP is a TEDx Speaker, Entrepreneur, Neuroscientist, Motivational speaker, Trainer, Coach, and a Published author. He has a career with three domains. An entrepreneur, an academic (neuroscientist, and a teacher), and a clinician (Addiction treatment). As an entrepreneur, he is the founder of California Institute of Behavioral Neurosciences and Psychology. Where he leads the organization as the CEO. He is a trainer, a coach, and a teacher. His training includes Public Speaking, Research Writing and Research Data Analysis, Business training and coaching, life coaching, and Sales. As an academic he is a Neuroscientist and delivered a TED talk on his specialty Mirror Neurons at TEDx UCDavissf. He has published over 40 scientific articles and written 3 books. As a clinician with substance use disorder treatment specialty. Dr. Tohid graduated as a medical doctor and chose mental health and substance use disorder as a domain of his clinical career.

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CHAPTER-01

BASICS OF RESEARCH PAPER WRITING

Most International Medical Graduates coming to the United States to apply for the residency match have no idea how research papers are written. There is no formal training of research in many foreign countries due to several reasons that range from - the lack of budget for research, to the lack of awareness of the importance of research in the healthcare industry.

It is also a fact that a foreign medical graduate needs to have some papers published in order to be competitive for the NRMP match. For those medical graduates, who can't write research papers due to the lack of skills and knowledge, this e-book will help them successfully write their research papers. So what needs to be done to write a research paper?

The basic step is that you need to know what the end is - or what are you trying to accomplish. You need to have a clear picture of your to-bepublished paper in your mind. How will your paper look like? How many words will it be comprised of? How many headings, how many subheadings and how many citations approximately you will use. After publication, which journals will you target as your first three priorities? These things need to be written on a separate piece of paper a notebook etc. because things not written are merely dreams.

STRUCTURE

Once you have a clear picture in your mind, you jump to the paper structure. The typical research article has the following structure.

1. Abstract
2. Introduction
3. Methods and Material
4. Results
5. Discussion
6. Conclusion
7. References

Once it's done. You should start your paper writing. But wait.....
Where is the title? What are you writing about? If you are thinking about this question and you are still reading at this point, then you are serious about learning the research paper writing skills.

SELECTING THE TOPIC

Selecting the research topic is an essential part of writing the paper. But how do you decide your topic? The way to decide how to write research paper is to stick to your passion. You should only write about the topic which you love to read and listen about. This is perhaps the key to writing the best research paper. You will start with selecting the topic. Let's say Robert is a medical student who loves cardiology. Will he write his paper on cardiology? But again wait... cardiology is an ocean. So what does he need to do? He has to be specific. He has to narrow down this topic. Now narrowing down the topic Robert comes to a conclusion that among all the medical problems and topic related to cardiology, he like Cardiomyopathy So, he will choose cardiomyopathy. But again, cardiomyopathy is a huge topic, so what will he do? He will narrow it down more, to... let's say, hypertrophic cardiomyopathy. Obviously he HCOM is a huge topic as well. Therefore, what he needs to do is to narrow it down more, for example, hypertrophic cardiomyopathy in men under 30 living in Melbourne, Australia.

I hope you understand the approach. The Same approach is valid for any research project whether it's a lab project like an observational study or a clinical trial or it's a meta-analysis or a review. The key here is to select the topic of your own choice and keep narrowing it down until you feel that "yes its narrowed down enough and now I will be able to collect the required data".

DATA COLLECTION

Once you have decided your topic, its time for data collection. If you are working in a lab or hospital environment, then you all probably already know that patient interviewing or randomly finding people in a general population is the way the data is collected. Once that data is collected, you still need literature search to write the Introduction and the discussion part of your paper. A Literature search is also needed for the review articles, in fact, in the review articles, the literature search is the only way, you can collect the data. Thus, in order to collect the data, search the data bases like PubMed, EMBASE, Google Scholar etc. The point to remember here is that, PubMed is not the only database. There are so many articles that can be useful but are not found in PubMed. Thus, always broaden your search.

START WRITING

Once you have collected the data, you start writing. The writing begins with the introduction.

CHAPTER-02

HOW TO WRITE THE INTRODUCTION SECTION?

INTRODUCTION

The typical and the most common way of writing an introduction of a research article is by choosing three paragraphs. Your introduction would be three paragraphs and each paragraph will have something unique and different.

FIRST PARAGRAPH

The first paragraph will discuss “what is already known”. What do you already know? That actually means - what is the common knowledge about the topic and what most people already know. Which can include the definition, the signs, and symptoms of the disease you are writing about. Then you write statistical facts and numbers like prevalence and the most common geographical area of the illness.

THE SECOND PARAGRAPH

The second paragraph will discuss, “what is not known”. Now the question is, how do you know what is not known. Right?

What is not known means.....your research question. What are you trying to explore? If we take the above example of the HCOM in consideration, then our second paragraph will look like somewhat like this.

“Not much is known about the HCOM patients under 30 living in Melbourne, Australia. There we are writing this article to explore this .....
.....
.....
which will not only broaden our understanding about the illness but will also help many clinicians, scientists and the patients in gain more knowledge about the details of this terrible illness.“

LAST PARAGRAPH

The last paragraph is a transitioning paragraph, which is extremely important. Your last paragraph should be written in such a way that the reader would automatically want to read the next section of your paper. The sign of a successful paper is that the reader wants to read every section rather than skimming through the tables and diagrams only. In the third paragraph, mention the clinical significance or insight or your comments and views. Then highlight what to expect in this paper.

FOR EXAMPLE,

"Studying the topic HCOM in Australian male under 30 is an important subject because a high percentage of patients being affected under 30 in the Australian population. Clinically it is relevant because understanding the pathophysiology .....
.....for more possible treatments in the near future. In this article you can expect, the patho-physiology of the illness".

NOTE:
A typical research paper follows the structure of an Hourglass. Broader in the beginning then narrowed down then narrowed in the beginning of discussion section then broader later in the discussion section

TAKE ANOTHER EXAMPLE FROM ONE OF MY RECENTLY PUBLISHED ARTICLES,

People suffering from DID may have two or more distinct personalities with possibly different ages, gender, and culture [1]. Each personality has its own features and characteristics. DID is one of the most interesting yet one of the least understood pathologies. Modern science is expanding the knowledge to help future scientists explore more about the possible causes and mechanism of this disorder. Regarding the involvement of brain, few studies have hinted and given us some idea about the disorder. Some similarities with schizophrenia and some with bipolar have been discussed in the previous literature [1,2].

This article is an attempt to explore the recent literature up to the year 2017, to understand what parts of the human brain are involved in the pathogenesis and what other kinds of alterations are found associated with DID. Studying this disorder in depth and understanding the exact mechanism or causes will not only help the doctors and scientists to enhance our knowledge base, but it will also help patients.

This review article will explain some of the structural, functional and chemical changes in the brain of the DID patients. The article will also address the important question about why many DID patients switch personalities and forget about the previous personality while under the influence of one personality. In this article, we will also address the blood flow changes in these patient's brain in certain regions of the brain. In the end, we will recommend more studies to increase and fill the knowledge gap that is currently unknown.

CHAPTER-03

HOW TO WRITE THE METHOD SECTION?

The Method varies upon what kind of paper you are writing. If you are writing a study or an experiment then you will write every information from the participants to data analysis.

However, if you are writing a review article, you will write everything regarding where you collected the data from, what data bases you used. What keywords you used. Was there any inclusion/exclusion criteria or not.
See the example from couple of my published papers

METHOD FOR A REVIEW ARTICLE

"To study in depth regarding the association of mirror neurons with autism, a comprehensive review of published literature was conducted in PubMed. Articles included were those relevant to the theme of mirror neurons, ASD, and autism. We searched the database PubMed using the keywords fMRI mirror which came out with 919 articles, autistic mirror that gave 143 total articles, autism brain imaging that provided 2186 papers, cognition mirror neurons showed 310 papers, mu rhythms gave 234 papers and mu rhythms autism provided only 5 papers. Autism mirror neurons gave 110 papers, ASD mirror provided 83, autism mirror gave 229, imitation autism provided 333, theory of mind autism provided 686, MNS autism gave 42, autism spectrum mirror gave 121, MNS ASD gave 29, MNS autism provided 117, ASD MNS gave 41, mirror neurons and autistic patients provided 8, MNS autism spectrum gave 73, mirror autistic 143, ventricles mirror neurons 3, empathy ASD 96, empathy mirror ASD 10, while empathy autism provided 357 papers. As of October 2015, this search revealed 6278 published, peer-reviewed scientific articles. Out of these, there was some repetition of the articles. Yet, the total was over 5500 articles.
The inclusion/exclusion criteria for our analyses were as follows: 1. Studies that explicitly mentioned the mirror system in the title, keywords or abstract were included, whereas those that did not be excluded; 2. Because most articles on the subject of mirror neurons are published after the year 1991, we maintained a strict selection criterion to include all the articles published after the year 1985 including autism, ASD and mirror neurons; 3. Articles published in low impact factor journals were excluded to maintain the high standard of the review. Moreover, articles with confusing and vague findings and no clear pathophysiological association of mirror neurons with autism or with no clear outcome were also excluded; 4. Most articles in the English language were selected. Articles in languages other than English were selected only if the English translation was available; 5. The criteria of data selection strictly included articles focusing on autism, ASD, and the MNS; 6. Articles only with animal or/and human data were included, and the selection was mainly focused on the studies with neuroimaging findings. Review articles or meta-analysis with the same focus

were also selected; 7.
Neuroimaging studies with fMRI and EEG with other non-invasive techniques, such as positron emission tomography (PET), single-photon emission tomography (SPECT), magnetoencephalography (MEG) and TMS were included. While any study with invasive techniques was excluded; and 8. Studies in which the authors did not attribute their fMRI results directly to the mirror system were excluded. One hundred and thirty-two of the 6278 scientific papers met this criterion."

Saffin JM1, Tohid H. Walk like me, talk like me. The connection between mirror neurons and autism spectrum disorder. Neurosciences (Riyadh). 2016 Apr;21(2):108-19. doi: 10.17712/nsj.2016.2.20150472.

METHOD FOR A STUDY

A comprehensive review of published literature was conducted in PubMed, Embase, MEDLINE, Science Citation Index, JAMA Neurology Journal of Clinical Neuroscience, Journal of Neurology, Neurosurgery, and Psychiatry ,Neuropsychiatric Disease and Treatment, Neuropsychology Review , Adaptive Behavior, American Behavioral Scientist, American Journal of Psychology, Annual Review of Psychology, Athletic Insight: The Online Journal of Sport Psychology, Basic and Applied Social Psychology, Behavioral and Brain Sciences, British Journal of Sports Medicine, British Journal of Psychology, Canadian Journal of Behavioral Science, Canadian Psychology, Health Psychology, The International Journal of Psychoanalysis, Psychological Reports, Bulletin of the Menninger Clinic and various journals of psychiatry and sports medicine. Some psychiatry journals included British Journal of Psychiatry, Canadian Journal of Psychiatry, Archives of general psychiatry, American Journal of Psychiatry, Journal of Psychiatric research, Psych Info, the Cochrane Library Controlled Trial Registry Databases, some websites, and various newspapers. No date restrictions were used. Article relevant to behavior and feelings in stressful situations were searched.

Terms for search included but not limited to stressful condition, stressful behavior, fear and performance, anxiety and performance, confidence and performance, confidence and stress, stress in sports, social phobia, pressure and sports performance, Javed Miandad, Miandad last ball six. I reviewed reference section for additional relevant articles. Article titles and abstracts were reviewed to ascertain if they were applicable to the theme of the stressful condition. Data on stressful and pressured condition appears in a wide range of studies, case series, project descriptions and program evaluations to more formal research trials. Selected articles were reviewed to identify additional articles that may have been missed by the keyword search. In total, over 500 articles were initially reviewed, with 473 excluded because of little information data on the subject of individual performance in a stressful condition. The study was conducted in the San Francisco Bay Area, California from September 2014 to September 2015 and does not include the involvement of any institution as it was conducted solely by me independently. Furthermore, I created a questionnaire and collected the answer from 126 people of age group 18 to 59. I made sure all the people I interview are familiar with the sports cricket so that they will be in a better position to understand what Javed Miandad was going through. The survey question was as follows, Title: “How people react to pressure and stressful situation?" The question is If you were batting instead of Javed Miandad on the last ball and 4 runs were needed and it was the same match the final India vs Pakistan. You were 110 not out and a batsman of that caliber. What would you be feeling?

A) Fear

B) Anger towards the bowler Sharma

C) Belief and confidence that yes I can hit a sixer

D) Anger towards your team mates that I wish at least some batsman was playing with me E) Nervousness

F) Happy

G) Emotionless

H) Sad - and wish I was not the last man left

I) Hatred towards your team and the Indian team of putting you in this trouble

J) Confusion The results were collected and the data were analyzed and incorporated into the results section of this article.

CHAPTER-04

HOW TO WRITE THE RESULTS AND THE DISCUSSION SECTIONS?

HOW TO WRITE THE RESULTS SECTION?

This is the section where you will write the main points of your study. Moreover, the tables and figures are usually also the part of the result section. Your key points can be written in a paragraph format or in points. To see what kinds of tables and diagrams are usually used in a research paper, kindly see any research article with tables and figures.

HOW TO WRITE THE DISCUSSION SECTION?

The discussion section is actually the main part where you will write the evidence. This section can have 6 to 7 paragraphs. The length of the whole discussion depends upon the total number of words of the whole article. The minimum length of a paragraph is 5 lines while the maximum should be half a page. Each paragraph can have its own heading or it's up to the author whether to use the heading. Each paragraph will contain your data (the information you collected before the writing). Once that is done, you need to analyze and interpret your data. You need to explain after every study the reason, logic and why the study is relevant and what is the clinical significance of this study or how the above-mentioned studies are different or similar to each other. You can incorporate as much data and citations in the discussion as you want, however, you need to make sure that the studies you decide to mention, are relevant to your topic. However, it is best to decide initially how many citations in total are you going to use in the whole paper. The number of citations also depends on the journals (different journals have different limits on the number of citations you can use). Kindly go through the journal's author's guidelines first to decide the total number of citations. The discussion section can have several subheadings depending on your topic. Your discussion section can have different structures. One is the chronological order. The other can be a comparative structure, where you compare one or two things. Obviously, you can use two main headings for the things you are comparing. You may also add an extra heading of "limitations" in your discussion section as well. Some authors prefer the conclusion section for this purpose. In the end, you may mention theoretical or practical implications of your study.

SEE EXAMPLE OF MY PAPER PUBLISHED IN THE "NEUROSCIENCES"

"In humans, the MNS is linked to behavior, social, and communication skills,14language and speech,32 and emotional interpretation.15 The neurons play a role "action execution" and "action observation".17,37,38It is also studied that representational granularity of the motor system is not different from the mechanism of mirroring during action execution.39,40 In primates, mirror neuron activity was identified in the ventral premotor cortex and inferior parietal lobule,11,13,28 and hippocampus.41

While in non-human primates cortical regions outside the parietofrontal circuit, like mesial frontal cortex contain mirror neurons.42According to many mirror neuron research experts, these neurons in humans extend through the dorsal premotor cortex, somatosensory system, posterior temporal cortex, ventral premotor cortex, inferior frontal gyrus, inferior parietal lobe,7,16-18 bilateral cerebellum, left medial frontal gyrus, right temporal lobe, and thalamus,19 Mu suppression has been extensively studied in relation to MNS in the past few years. This suppression has been found to be associated with action observation.43 Evidence exists that mirror neurons fire in response to observing and executing motor action behaviors.32 Mirror neurons are thought to exist in a global population.25 Furthermore, predictive neurons that fire preemptively in expectation of an action have also been studied.44-46 Maranesi et al46 studied mirror neurons in relation to action observation and described 2 kinds of mirror neurons. They called them action mirror neurons and inaction mirror neurons. Action mirror neurons fire during action observation, while inaction mirror neurons demonstrated predictive discharge. The same study concluded that MNS fire, on average, 340 milliseconds before the behavior occurs.46 It is also studied that any damage to the parietal cortex affects the imitation or understanding an observed action. This does not only include one's own actions but also of the others.44 Various studies support the concept that mirror neurons communicate through a series of network pathways involving connections between the amygdalahippocampal circuit, caudate nuclei, the cerebellum, and frontal-temporal regions, and surprisingly these networks are found to be damaged in autism and ASD, which point to a possible connection in the pathophysiology of mirror neurons with autism.47 We believe that these kinds of studies would revolutionize the concept of the association of mirror neurons with ASD and autism. Studies demonstrated that frontal-posterior circuits, posterior superior temporal sulcus, superior temporal gyrus, right inferior frontal gyrus,48 and anterior and posterior regions of the insular cortex have also been found to be associated with autism.49 Thus, further investigation is warranted in these above mentioned regions of the brain to find any presence of the MNS. More of less the same idea of studying MNS in neural networks has also been described in some recent studies published after they year 2010.50-53 The above evidence molds the discussion toward a possibility that pathophysiology of autism in relation to neural networks will help us further explore deep insight into a collective pathophysiology of autism and mirror neurons. Because it is observed that dysfunctions in these neural connections can cause impairments in social reciprocity, language communication, empathy, information processing, and cognitive demands,48,49,54 The EEG and fMRI neuroimaging studies of individuals with autism have observed lack of activity in the MNS55 and instances of disrupted connectivity, that is under-connectivity, and/or over-connectivity in cortical networks when compared with neurotypical persons,49,56-61 resulting in the brain functioning as a less cohesive unit. 48 Other studies involving EEG monitoring and fMRI imaging have failed to find significant differences in brain activity between those with autism and neurotypical individuals.62-64 This disparity leads some researchers to suggest further studies are needed in order to account for the complexity of social cognition in the human brain.

10,22,62 The current body of evidence of mirror neuron dysfunction is sufficient for others to warrant investment in neurofeedback treatment procedures.7,65 Studies have found that autistic patients have benefited from neurofeedback training14,66 and that environmental exposure can stimulate neural connection development, reducing disparity in symptomatic behavior observed between neurotypical individuals and those with autism,67-69 as well as patients with damage to related brain structures."

CHAPTER-05

05- HOW TO WRITE CONCLUSION

The conclusion section is the last part of any research paper. This section can be written as a subpart of the discussion section or it can totally be a separate part. In the conclusion part, you start with the research question or the topic. Then you mention the key points of your paper. You may also write, how this study and your findings could be useful in the future. In the end, you will conclude with the recommendation of future studies. See the example of one of my papers as an example, "Although extensive research has not been conducted on the subject, there is substantial evidence that a relationship between depression and psoriasis exists and that this relationship is bidirectional. Depression and psoriasis are more than coincidental comorbidities of each other, and in many cases, psoriasis severity is strongly associated with an increase in depressive symptoms and vice versa. Major depression itself is a disorder that is often poorly characterized and not well defined in a majority of psoriasis and depression studies, and therefore there is an incredible amount of missing data as to what proportion of psoriasis patients may actually be suffering from a major depressive disorder, potentially leading to smaller observed numbers. Depression and psoriasis have been hypothesized to be linked through inflammatory mechanisms, and this paper supports that hypothesis. Depression has been found to increase the concentration of pro-inflammatory cytokines systemically in patients afflicted with the disease, and these same pro-inflammatory cytokines migrate towards the epidermis and cause psoriatic lesions in susceptible patients, either increasing psoriasis severity or potentially leading to its outbreak. On the other hand, mutations in genes related to psoriasis cause an increase in the same pro-inflammatory cytokines. These cytokines can cause HPA axis hyperactivity observed in major depressive disorder and disturb the negative feedback inhibition of circulating corticosteroids on the said axis and lead to lower serotonergic (5-HT) neurotransmitter levels, thus leading to depressive disorder. In addition, circulating melatonin levels are known to be increasingly low in both psoriasis and depression patients, more so in patients with both conditions, and regulating melatonin levels have shown an effect on reducing the clinical severity of both conditions simultaneously. Thus, we believe that in the near future this melatonin level could also be used globally as a marker for depression-induced psoriasis until the mystery of psoriasis caused by the depression neurochemicals is totally resolved. As of now, we believe that depression leads to psoriasis by a pathophysiological phenomenon which needs more understanding in the near future, especially due to the fact that certain biomarkers present after inflammation in depression are not present in psoriasis and vice versa. As such, antidepressant therapy may be effective in reducing psoriasis severity, psoriasis treatment may also have an effect on a patient's depressive symptoms, and phototherapy may be a potent treatment for both. However, we believe that the above evidence is still inconclusive about why not all depressed patients acquire psoriasis and why not all psoriasis patients acquire depression. We believe future studies dealing with the neuroimmunology of major depression will be able to unearth this association in detail and help future scientists in exploring the detailed mechanism of how major depression induces psoriasis through a neurochemical phenomenon."

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