Genre Analysis of Moves in Medical Research Articles

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Produced in David Dadurka's Fall 2013 ENC 1102

1. Introduction

Genre is a concept in the field of linguistics and rhetoric that categorizes writing by similarities in form, style and subject matter. In discourse communities, genres can serve as means of communication that exclude individuals that are not part of the discourse community. Researchers and scholars conduct genre analysis in order to bridge discourse communities by allowing a glimpse of specific communication forms used by particular groups. An important genre that deserves more attention is the medical research article.

1.1 Literature review

The genre of medical research articles has been one of the most prominent forms of communication between scientists in the medical community. It is used to share and discuss new-found knowledge. However, a problem lies in the fact that very few studies have been done on medical research articles as a genre. John Skelton in "Analysis of the Structure of Original Research Papers: An Aid to Writing Original Papers for Publication" describes the difficulty of defining structured writing in the field of medicine because of the lack of research that has been conducted on the genre (455). The lack of research could prove problematic for scholars who wish to share experimental findings but lack the skills to coherently communicate these ideas in the form of writing. Skelton, in order to better understand the genre of medical research articles, devised one of the first sets of moves commonly seen in medical research articles. Through the use of move structural analysis, Skelton, in 1994, was able to discern 15 moves and the stability of each move. In the following years, several notable genre analyses were done on medical research articles. Daniel Lee Fryer's genre analysis is the most recent study of medical research articles as a whole and should therefore be considered the most up-to-date resource. Fryer in "Analysis of the generic discourse features of the English-language medical research article" discerns ten moves used in the rhetorical structure of the genre of medical research articles: three in the Introduction, three in the Methods, one in the Results, and three in the Discussion (8). These moves are what differentiate the genre of medical research articles from other genres. In order to further understand what makes a successful medical research articles, multiple writers such as Fryer and Nwogu have worked to analyze the moves used in medical research articles along with the lexical meaning, propositional meanings and illocutionary forces used in each section. The lexical analysis provides an insight to the vocabulary used by scholars in the medical field. Studying the propositional meanings is intended to further understand the contents of medical research articles. And through the analysis of illocutionary forces—or the intentions of utterance—scholars are able to identify the intentions of the different moves used in medical research articles.

Using the definition of moves given by Nwogu ("a text segment made up of a bundle of linguistic features" [122]), Fryer was able to discern multiple moves commonly seen in medical

research articles and statistically analyze the frequency of each move used in his corpus of medical research articles. A statistical analysis of move frequency is necessary for pedagogical purposes. How often a move occurs, and where it occurs, are both subjects that most genre analyses of medical research articles have touched upon. These two subjects are core subjects of move structural analysis. The pedagogical benefits that come with the move structural analysis of medical research article include, but are not limited to: a better understanding of coherent communication in the genre of medical research articles, knowledge of structured writing in medical research articles, and development in the lexico-grammatical skills of scholars in the field of medicine (Skelton 455).

1.2 Lack of medical research articles analysis

In terms of genre analysis of medical research articles as a whole, there is very limited writing and research on this genre. Most genre analyses in the field of medicine focus specifically on certain sections of medical research articles. In "A Genre Analysis of Medical Abstracts by Chinese and English Native Speakers" (Zhao and Wu 60) and "Abstracting Science: A Corpus-based Approach to Research Article Abstracts" (75), Zhao and Wu and Cava focus solely on the abstract section of medical research articles. Safnil Arsyad, in "A Genre-Based Analysis on Discussion Section of Research Articles in Indonesian Written by Indonesian Speakers," writes about the discussion section (50). The abundance of research that has been done on individual sections has been extraordinary when compared to research done on medical research articles as a whole. The lack of research done on medical research articles as a whole augments the problem of an undefined structure for medical scholars trying to publish medical research articles. In these genre analyses, authors use move structure analysis to analyze the structure of each section. Their research studies are very similar to the genre analysis of medical research articles as a whole with the exception of only analyzing certain sections.

Of the few genre analyses that focus on medical research articles as a whole, most have failed to provide a clear understanding of optional moves as opposed to obligatory moves.

1.3 Analysis of moves

Of the few genre analyses that focus on medical research articles as a whole, most have failed to provide a clear understanding of optional moves as opposed to obligatory moves. Most authors identify the different moves used in medical research articles but fail to describe the mandate of each move. Conflicting definitions of moves is also a problem to note between the genre analyses of medical research articles. Skelton views moves as what "may always be done rather than what must be or is always done" (456). This is a vague definition that implies all moves are optional. Contrary to Skelton, Fryer and Nwogu have gone as far as labeling moves as optional or obligatory hinting at the idea that Fryer and Nwogu believe some moves are necessities in medical research articles. Because Fryer bases his genre analysis off of Nwogu's (7), it is not strange to see that both genre analyses written by them have similar views of obligatory and optional moves. A problem, however, that both genre analyses seemed to have was a lack of explanation as to why a move might be optional aside from a lower frequency of appearance.

By analyzing lexical meanings, propositional meanings, and illocutionary forces, authors Nwogu, Skelton, and Fryer were able to provide meaningful information about why a move might be mandated as obligatory. There is a lack of information, however, on optional moves. Scholars

might benefit from understanding why a move might work in one medical research article and not be a necessity to another medical research article. This is important to clarify because, with the understanding of why a move should be classified as optional, a researcher in the medical field would be able to better structure their research articles in order to communicate new data and research more efficiently and coherently.

1.4 Attempted solutions

Fryer's "Analysis of the Generic Discourse Features of the English-Language Medical Research Article" provides some information on optional moves; however, it seems that the information given is very general and not a suitable explanation as to why a move might not work (9-27). If researchers could understand why a move is optional, they would be able to deduce what types of moves work for their specific medical research article. This would be very useful and would help alleviate some pressure for those involved in medicine who wish to publish research.

One argument that could be made in response to the lack of research on optional moves is that certain genre analyses of individual sections of articles provide an in-depth analysis that should help discern the reason of optional moves. The false assumption in this argument would be that the genre analyses of certain sections contain information on the optional moves. However, in order to provide a precise reason as to why certain moves are ineffectual in medical research articles, a study must be done to clearly discern optional and obligatory moves. .

1.5 Overview

As Skelton has stated, there is a limited amount of research about medical research articles that leads to a limited understanding in describing this structured writing (455). The studies done so far have attempted to discern and successfully established a fair general structure that serves as a very basic outline for medical research articles. However, the problem of vague to absent explanations of why certain moves work limits the understanding of scholars in the medical field trying to publish research. In order to fill in the missing pieces of information, I collected a corpus of medical research articles and analyzed these articles with the help of Nwogu, Skelton, and Fryer's studies. The move structural analysis of medical research articles along with the discrepancies of obligatory and optional moves will allow for a clearer insight on a structure for medical research articles.

2. Methodology

2.1 Study material

The medical research articles in this study were selected from the electronic archives of the *Lancet*. In order to limit the size of the corpus, articles were restricted to only those dealing with neurological pathology. In addition, only articles published between 2005 and 2013 were considered for the corpus. This assured that the medical research articles analyzed were all current and also eliminates lurking variables (such as linguistic evolution) from our analysis. A total of five medical research articles were selected to be included in the corpus. The medical research articles in the corpus were on average about nine pages long.

2.2 Methods

A move structural analysis, based on Skelton's and Nwogu's studies, was used to identify and analyze potential moves. Skelton based his study on two criteria. First, in order for a move to be identified, "there must have been a pattern of association between function and exponent. Secondly, the feature must have occurred in one section (introduction, method, results or discussion) in 65%

of the material studied" (Skelton 456). However, because of limitations on the size of our corpus, we will proceed with the criteria that the feature must have occurred in one section in 40% of the material studied. After identifying several moves, an analysis of the lexical meaning, propositional meanings, and illocutionary forces of each feature was conducted. In doing so, I was able to discern the necessity of each move.

3. Main findings

Before discerning the different moves used in medical research articles, I analyzed each section individually in order to get a general idea of what was contributed from the sections. The rhetorical structure of the medical research articles could be summarized by the following sections: introduction, methods, results, and discussion. In the introduction section, past studies and the relation that the current study would have with past studies were presented. The methods section describes study materials, procedures, and techniques used in the experiment. The results section reports data found through the methodology of the experiment. And the discussion interprets the data and relates it to past studies. This is also where the researchers propose areas that need further research.

Twelve moves were discerned in medical research articles: four in the introduction, four in the methods, one in the results and three in the discussion. Figure 1 provides a section-by-section (IMRD) analysis of the 12 identified moves in their respective sections. The moves are indicated by the numbers in order of which they appear in the medical research articles. Each move will be analyzed by its frequency in each medical research article and be considered optional (frequency <80%) or obligatory (frequency >80%). Because of a limitation in the number of medical research articles analyzed, an obligatory criteria of frequency >80% seemed more appropriate than frequency 100%.

Introduction

1. Present background knowledge
2. Present past research and point out missing information
3. Provide brief insight of experimental methods
4. Identify research purpose

Methods

5. Describe study materials
6. Provide inclusion criteria
7. Describe procedures
8. Present the analysis of the experiment

Results

9. Report data/findings

Discussion

10. Discuss data
11. State the limitations
12. Provide conclusion

Figure 1: Moves (indicated by number) identified in each section

4. Analysis of introduction

The introduction of any research article usually serves the rhetorical function of connecting the relation that the current research will have with past research conducted in the same field. In order to accomplish the rhetorical purpose of the introduction, three moves were generally used in

the selected medical research articles: presenting background knowledge of the subject (move 1), presenting past research done in the field and missing information (move 2), providing a brief insight of experimental methods (move 3), and presenting the purpose of the research and how it will relate to past research (move 4).

4.1 Move 1: Present background knowledge

Move 1 (frequency 100%) is an obligatory move that contained one step. Step 1 (1a) provides general knowledge of the subject at hand before going into specifics of the actual research project. The general knowledge explained in this step can be seen in (1). The information provided is very general knowledge on strokes and does not provide any information on the study done in the paper.

(1) Stroke is the fourth leading cause of death in North America, the second leading cause of death globally, and a major cause of disability. . . . In developing countries, stroke incidence has increased in the past few decades, and rates of disability and mortality in medically underserved regions are at least ten times greater than those in developed countries. (LAN-4)

This move is important in that it adds credibility to the writers. This move also restates knowledge that scholars in the field would understand and with which they would concur. This move is obligatory because it allows the reader to gain the trust in the abilities and knowledge of the writer. Occasionally, it also appeared that move 1 uses emotional appeals in order to gain the reader's favor. Emotional appeals are presented in the form of mortality rates and damage that the ailment in the study can cause.

4.2 Move 2: Present past research and point out missing information

Move 2 (frequency 60%) was comprised of two steps. The first step (2a) is noting past research. And the second step is pointing out gaps and reasons why they need to be filled.

Step 1 (2a) of this move identifies paucity or contradictory results in the literature. This step was generally introduced using concessive dependent clause (see (2)); something that is also noted by Fryer in his genre analysis (13).

(2) Although progress has been made in understanding the complex pathophysiology of amyotrophic lateral sclerosis, no unifying model of disease pathogenesis exists. (LAN-2)

Step 2 (2b) provided reasons for the necessity in filling these gaps. This step was only specifically stated in three out of the five research articles (60%); however it is heavily implied through all medical research articles from the consequences of the diseases studied.

This move was seen only in 60% of the medical research articles in the corpus. Because of this, move 2 is identified as an optional move. The medical research articles in our corpus mainly comprised of treatment experiments where the necessity of move 2 can be omitted. Nods to past experiments are non-existent in two articles in our corpus. A likely explanation for this could be because an experiment for that certain subject has not been conducted before. Because of the lack of research in that certain subject, it is very difficult to source past experiments. If, however, there is recent research that can be documented, it would be beneficial to include that work in a medical research article on the same subject.

4.3 Move 3: Provide brief insight of experimental methods

Move 3 (frequency 100%) is comprised of three steps. Step 1 (3a) introduced study materials such as subjects and treatments. Step 2 (3b) briefly explains the process of the experiment. Step 3 (3c) concludes the move by offering some results. It should be noted that step 3 was not seen in all research articles in our corpus. This move provides a short summary of what is further explained in the methods section. I find this move to be questionable in terms of its

necessity to be included in a research article. The frequency of this move points to it being obligatory. Move 3 seems to serve as a preview for readers of what's to come in the following section.

4.4 Move 4: Identify research purpose

Move 4 (frequency 100%) is comprised of one step (4a). This move provides an explanation of what the researchers are trying to find. It appears that in this move an extensive amount of personal pronouns are used (see (3)). It is a common misconception that the use of personal pronouns in formal writing is prohibited; however, the addition of such personal pronouns can serve beneficial in adding in emotional aspects to factual evidence. In the scenario of move 4, it serves in helping to shift from recounting past research to the intentions of the current research:

(3) First, we undertook secondary analyses using different endpoints to confirm or refute the efficacy and safety outcomes in the primary analysis in ECASS III. Second, we sought evidence of confounding factors or subgroups that might differentially affect treatment outcome. (LAN-1)

5. Analysis of methods

The rhetorical function of the methods section is to describe materials used and the procedure of the experiment conducted for the medical research article. This part of the medical research articles completely disregards ethical and emotional appeals. The methods section uses logos in order to describe the methodology of the experiment.

5.1 Move 5: Describe study materials

Move 5 (frequency 100%) comprised of three potential steps: size of study sample (5a), length of study period (5b), type of data that was collected (5c). These steps were not always in sequential order and, sometimes, a step (5c) was included in another move (move 6). Step 5a helped provide a visual for the size of the study and was identified in all five of the research articles (see (4)).

(4) We recruited patients from 32 centres in five European countries (France, Germany Netherlands, Hungary, and Switzerland). (LAN-3)

Step 5b was found in 100% of the research articles. This step is necessary in most experiments involving treatments. The length of time of the study must be consistent in order to not contradict data due to lurking variables. Step 5c was identified in 100% of the research articles. Step 5c provides what data researchers are looking for in the experiment (see (5))

(5) The primary (mRS 0-1), secondary (the global outcome statistic), some tertiary functional, and safety endpoints of ECASS III have already been reported. We report the additional outcomes investigated in ECASS III at 90 days and 30 days in the intention-to-treat (ITT) and per protocol (PP) populations. . . . (LAN-1)

5.2 Move 6: Provide inclusion criteria

Move 6 (frequency 80%) comprised of two potential steps. The first step (6a) included the criteria patients/subjects were required to meet in order to participate in the study. Step 2 (6b) would explain the data that was being collected. It should be noted that step 6b was sometimes included as part of a separate move (move 5). Step 6a was very specific when describing the criteria and would sometimes include exclusion criteria (see (6)):

(6) Inclusion criteria were having Parkinson's disease (diagnosed by a neurologist according to UK brain bank criteria), being aged 20-80 years, living independently in the community, being able to complete questionnaires. . . and having a planned routine

follow-up consultation with the treating neurologist. Exclusion criteria were having atypical parkinsonian syndromes. . . . (LAN-5)

Step 6b was a move that would explain what data was going to be collected from the experiment. This step was occasionally incorporated into move 6 while the writer explains the necessities of certain criteria (see (7)):

(7) In our double-blind, randomized, phase 3 study (EMPOWER), we enrolled adults aged 18-80 years with a diagnosis of possible, laboratory-supported probable, probable, or definite amyotrophic lateral sclerosis (familial or sporadic) in accordance with the revised EL Escorial criteria. (LAN-2)

Based on the frequency of move 6, we can see that the inclusion of move 6 is obligatory. In randomized samples, it seems that inclusion criteria are beneficial to include because of the justification that it provides for the experimental procedures and results.

5.3 Move 7: Describe procedures

Move 7 (frequency 100%) is comprised of three potential steps: randomization (7a), measurements taken (7b), and outcomes (7c). Randomization was touched upon in all five of the medical research articles. Step 7a provided information that allows the reader to identify the type of experiment being run and the methodology of selection. Example (8) shows how step 7a describes the assignments of treatments to patients:

(8) Patients were randomly assigned in a 1:1 ratio via a centralized web-based randomization process to either 25% albumin solution (2g/kg estimated body weight) or saline, with a biased coin minimization approach that accounted for the status of treatment group balance within and across sites. (LAN-4)

Step 7b was identified in 100% of the medical research articles and describes the measurements of materials used for the experiment by the patients/subjects. In some articles, the frequency with which the measurements were taken was also recorded.

The final step used in move 7 was the outcome. Identified in 2/5 (40%) of the research articles, step 7c was used in order to convey the results in a summarized fashion. Results were shown in greater details in the next section (Results). Step 7c usually noted the survival and mortality rates. The lack of frequency of this step points to the nonessential nature of step 7c. It provides little detail when compared to the move used in the results section and is by no means an obligatory step. Upon further analysis, however, it does seem that step 7c is useful in acting as a transition between move 7 and move 8.

5.4 Move 8: Present the analysis of the experiment

Move 8 (frequency 100%) is comprised of two steps: statistical test techniques (8a) and software used (8b). Step 8a describes the statistical test techniques by providing calculations and serves to describe the reason for their uses (see (9)). Step 8a was noted in all five of the medical research articles:

(9) A sample size of 402 participants per group was needed to provide 90% power to detect a mean difference between groups of 2·13 on ALSFRS-R total score at 12 months, assuming a 20% dropout rate. (LAN-2)

Step 8b provided information on the software used to help make the statistical calculations. This step was found in 2/5 (40%) of the medical research articles and were usually short. Most were limited to one sentence.

6. Analysis of results

In this section, data found from the experiment is recorded. It is usually the shortest of the four sections of the IMRD format of research articles. Data is usually recorded in the forms of graphs and tables.

6.1 Move 9: Report data/findings

Move 9 (frequency 100%) is comprised of four steps: reference to graphs or tables (9a), main findings (9b), associations/correlations (9c), and adjustments to analysis (9d). Step 9a occurred in 5/5 (100%) of the medical research articles. This step was used to refer to data posted in the graphs and tables of the article. Step 9a usually followed the formula of "refer to table x" followed by an explanation of the data provided by table x (see (10)):

(10) Table 1 shows the baseline demographic and clinical characteristics of the two groups. These were well balanced, although there were numerical differences in stroke severity and the presence or absence of previous stroke. (LAN-1)

Step 9b describes the main findings/data that were collected during and after the experiment. This step is found in all five of the medical research articles. These main findings are directly related to step 7c. Personal pronouns were rarely noted in this step (see (11)). The lack of personal pronouns could be due to the nature of step 9b; the emotional aspects that personal pronouns add would be considered distracting. Logical appeals are more favorable when describing findings and data.

(11) Treatment with alteplase remained significant for a favorable outcome in the ITT analysis of the primary endpoint adjusted according to the full and final model (table 2). (LAN-1)

Step 9c was found in 100% of the medical research articles and described association and correlations between the data. This step was used to identify risk factors and trends across the study material (see (12)). This step is a direct result based on move 7 and 8.

(12) Increase in age has been associated with an increased rate of symptomatic intracranial hemorrhage, but the association is not clear. (LAN-1)

Step 9d was found in 3/5 research articles (60%) and was used to check for miscalculations due to variables. This step is valuable in identifying lurking variables or the effects of a new variable added to the experiment.

7. Analysis of discussion

The final section of the IMRD format used in medical research articles is where the data found in the previous section is analyzed and discussed. The interpretation of data provided in the results section is touched upon in this section by discussing the data (move 10), stating limitations (move 11), and providing a conclusion (move 12).

7.1 Move 10: Discuss data

Move 10 (frequency 100%) consisted of two steps: main findings (10a) and analyzing the main findings (10b). Step 10a states the main findings and relates it back to the claims made in move 3. This step seems to revert to the use of personal pronouns in order to avoid the confusion of their results getting mixed up with results of past experiments (see (13)).

(13) We enrolled 943 participants between March 28, 2011, and Sept. 30, 2011 (figure 1). Table 1 shows baseline characteristics. Enrollment rates varied between participating study sites (0.25-6.45 participants per centre per month). (LAN-2)

Step 10b was present in all five of the medical research articles. This step provides an analysis of the findings and data from the results section. This is an essential step of every research article. In order to use the findings and data in the results section, this step must be included.

7.2 Move 11: State the limitations

Move 11 (frequency 80%) is comprised of one step. Step 11a helps in stating the strengths and weaknesses of the study. It provides data for where the study might be able to improve and serves to address possible questions that the reader might have. The language used in this move also seems to be very passive in order to preserve the validity of the research article (see (14)).

(14) A history of stroke seemed to affect functional outcome advantageously in ECASS III. However this finding, which is in contrast to evidence from previous stroke trials, is probably linked to the small sample size. (LAN-1)

7.3 Move 12: Provide conclusion

Move 12 (frequency 100%) is comprised of three steps: reiterating main findings (step 12a), discussion implications (step 12b), and explaining how readers could further improve on the project if they ever chose to recreate it (step 12c). Step 12a was only seen in 3/5 (60%) of the medical research articles which leads to the conclusion that it is not a necessary step. However, the benefits that stem from this step could prove to be quite rewarding when trying to get the results of one's experiment across.

Step 12b was identified in 100% of the medical research articles and proves to be one of the most important steps. Providing limitations allows readers to better understand the endeavors that the researchers had to overcome (see (15)). It also helps set up the next step (12c) which provides details on what could be improved upon by future researchers wishing to recreate the same experiment.

(15) Our study had some limitations. Its short duration did not allow prediction of whether tolerance can develop on continuation; also, the flexible dosage and multiple visits could have affected the efficacy. (LAN-3)

Step 12c provides recommendations for future experiments in the same nature and was identified in 4/5 (80%) of the medical research articles. It provided information on what the future may hold if further research is done on their experiment (see (16)).

(16) If these findings are supported by further studies, it could offer a promising treatment for narcolepsy. (LAN-3)

8. Discussion

8.1 Lexicogrammar

After analyzing the medical research articles used in my corpus, I have found the genre to be exclusive to individuals outside of the discourse communities that use medical research articles. Understanding the language used in these research articles requires a basic knowledge of medical terminology and statistical analysis. The writers of the medical research articles rarely included definitions for their statistical methods and wrote on the assumption that the reader would understand what a "logistic regression analysis" and "stratified responder analysis" entailed.

The use of personal pronouns was also something that was limited to only certain moves. Personal pronouns had the effect of adding emotional appeal and were generally found in similar sections within the medical research articles of the corpus. The use of logical appeal was generally favored over emotional appeal in analytical sections where findings and data were recorded.

8.2 Concluding remarks

From this analysis, twelve moves were identified as common to the structure of medical research articles. Most were obligatory with the exception of a few moves. The contributions that each move provides were separated into several steps that allowed further analysis on the

necessity of a move. Out of the twelve moves identified, eleven were obligatory with only one (move 2) being optional. However, it should be noted that several steps within each move were not always mandatory in accomplishing the rhetorical purpose that each move presented. This is clearly seen in step 8b where the frequency is limited to 20% whereas the move itself was found in all five of the medical research articles.

Relatively little research has been done on moves used in medical research articles and even less research has been done on the steps that entail each move. This is a problem that is noted by other scholars such as Fryer (6) and Skelton (455). The discourse communities that use medical research articles are growing and would benefit greatly from more studies of medical research articles. The pedagogical values that medical research articles have in the community is essential to the development of scientists in the medical field. This development further aids healthcare workers in the preservation of patient health and provides insight on new treatments for diseases.

In this genre analysis, a basic outline of medical research articles is provided in figure 1. It is important to note that the outline is a form of possibilities that could be used in medical research articles. Some limitations I observed during my research were a lack of available medical research articles and restricted time. If one were to continue this study with a bigger corpus, then perhaps a more accurate structure for medical research articles could be obtained and the effects that structured writing has on the communication between scholars of the medical field could be expanded upon.

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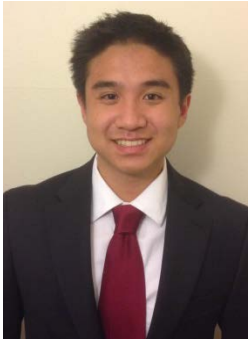

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Daniel Huang is currently a freshman at the University of Central Florida majoring in biomedical sciences. Upon graduation, he hopes to attend medical school and receive his M.D. Daniel was awarded a spot on the Dean's List and is a member of the American Medical Student Association and the National Society of Collegiate Scholars. He is very dedicated to his schoolwork and is excited to continue his studies at UCF.

Appendix: Corpus Research Articles

Code	References
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LAN-3	Dauvilliers, Yves, et al. "Pitolisant versus Placebo or Modafinil in Patients with Narcolepsy: A Double-Blind, Randomised Trial." *Lancet Neurology* 12.11 (2013): 1068-75. *Academic OneFile*. Web. 21 Oct. 2013.
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