# Using Text Analytics Of AJOT Article Titles To Reveal Trends In Occupational Therapy Research

[1]Joydeep Dutta Chaudhuri, [2]Nirmala Palayanthan, [3]B. Venugopal Rao

*[1]Associate Professor, College of Health, Husson University*
*[2]Designation:MAHSA University*
*Saujana Putra, 42610, Selangor, Malaysia*
*[3]Associate Professor, MAHSA University*
*Saujana Putra, 42610, Selangor, Malaysia*
*Corresponding Author: joydeep Dutta Chaudhuri*

**Abstract:** *Objective: To identify trends inoccupational therapy research over ten yearsusing text analytic tools.*
*Methods: Articles published in the American Journal of Occupational Therapy (AJOT) from 2007-2016 were retrieved from Pubmed and compiled in a database. The most frequently occurring words in the titles of these articles wereanalyzed using text analytics.*
*Results: Based on the analysis of journal article titles, the most striking trendsthat were observed were a substantial increase in the number of articles related to intervention and assessment in children and adults, and a growing emphasis on the publication of systematic reviews.*
*Conclusion: While this study provides a valuable insight into the trends in occupational therapy research, it does not elucidate the specific contents of these articles. Hence, more detailed investigations are necessary to identify the specific direction of occupational therapy research.*

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## I.    Introduction

The recent changes in the delivery of health care has broadened the scope of influence of occupational therapy (OT) in addressingthe profession's distinct value and contributions to patient outcomes. This approach has been driven by an increased complexity of delivery of healthcare, along with a greaterrecognition of clients as being the ultimate consumers. Another facet of this issue is the recent mandate of the American Occupational Therapy Association (AOTA) to transition towards a doctoral-level single point of entry for occupational therapists by 2027 (1). This need driven approach is a monumental step for the growth and development of the OT profession.

One of the cornerstones of a successful doctoral program in a professional course is the acquisition of an advanced level of knowledge and skills that can be applied to clinical settings(2). This can be achieved through training that focusses on the ability to conduct and translate research and provide leadership for transforming education and health care systems. The broad recommendations of the AOTA for the doctoral program include a research agenda that incorporates interprofessional education, and provides mechanisms for signature pedagogy and the development of education among OT faculty(1). These elegant recommendations can be best realized by an initial identification of the current research trends in OT since scholarship and teaching are mutually sustaining endeavours. An identification of the current focus of research will mirror the educational goals of the OT profession, and help in planning future steps in the enhancement of the learning experience of studentswith the overarching goal of providing accessible and affordable care to diverse populations in multiple settings.

Journal articles are important repositories of specialized knowledge that define a profession (2).The American Journal of Occupational Therapy(AJOT) is the official scholarly publication of the AmericanOccupational Therapy Association (AOTA), and is the most highly ranked OT journal.  Since itsinception in 1937, it has published material relatedto OT that reflects thechanging trends in the field and serves as an archive ofits advances(3).

A title is an important component of a journal article that intends to describe the content of the article. It summarizes the main idea or ideas of a study in the fewest possible words needed to highlight the content and/or purpose of a research study.  Articles that provide the most meaningful information include reports of original research, reviews, metasynthesis and surveys of previously published literature. Conference abstracts, letters to the editor, book reviews and news items are relatively unimportant in this context as they do not have sufficient study details and may not have been peer reviews (4).

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Considering the exponential growth in the quantity of unstructured research data it is necessary to make this data accessible, useful and relevant. Moreover, natural language text is often inconsistent, and contains ambiguities caused by inconsistent syntax and semantics. Hence, it is very challenging to minimize human bias during the analysis of such data (5).Text mining, also referred to as text analytics, refers to the analysis of data contained in natural language text to identify trends in text-based content. Text analytics software helps by transposing words and phrases in unstructured data into numerical values. With an iterative approach, itcan be used to gain insight into content-specific information that will assist in guiding the future direction of OT education (6).

The broad objective of this study is to investigate the trends in OT research and determine whether they conform to the broad vision of enhancing education and research quality, quantity and capacity in the OT profession. It is aimed to accomplish this by analyzing the titles of published scholarly articles in AJOT from 2007-2016. This approach would assist educators in evaluating the development of the OT profession and planning appropriate professional and educational changes for the future.

## II. Methods

Titles of all AJOT articles published from 2007-2016 were retrieved from Pubmed on January 6th, 2017, using the search query "Am J OccupTher.", and parsedinto comma separated values (csv) file format. PubMed (https://www.ncbi.nlm.nih.gov/pubmed) is a free search engine accessing primarily the MEDLINE database of references and abstracts on life sciences and biomedical topics that is maintained as part of the Entrez system of information retrieval.

Articles that were considered for this study included reports of original research, reviews, metasynthesis and surveys of previously published literature. A summary of these articles was downloaded using Apache Flink, an open source platform for data processing (https://ci.apache.org/projects/flink/flink-docs-release-1.4/). The summary included information about the title, publication date, and authors of all articles.

An open access online platform (https://wordcounttools.com)was used to determine the most frequently occurring words in the titles of these articles published. For the purpose of this study a word was defined as sets of letters that are separated by spaces, hyphens, and punctuation marks. Prepositions, conjunctions, articles, etc., were excluded from analysis because though they act as bridges and provide clues in a structured sentence they do not provide meaningful information if listed as a single word.

All statistical analysis was carried out using Statistical Package of the Social Sciences (SPSS), Version 25 (https://www-01.ibm.com).

## III. Results

A total of 873 AJOT articles published from 2007-2016 were retrieved, plotted against the year of publication (data not shown), and the summaries of their titles were analyzed.

Table 1 lists the top 20 words that appeared most frequently in the titles of journals published in AJOT between 2007 and 2016. The most frequently occurring word was "children" followed by "intervention and "sensory".The next group of wordsin order of decreasing frequency were "adult", "effective" and "disorder". The remaining less frequent words are listed in Table 1.

The percent change in the frequency of each word in 2016 was calculated using the frequency of the same word in 2007 as a baseline and the detailed results are presented in Tables 3 and 4. Thewords whose frequency increased most significantly were "intervention" (1800.00 %), "brain" (1200.00%) and"systematic" (1100.00 %). The most striking decrease in frequency over the same time period was the word "disorder" (90.00%). A detailed list is presented in Tables 3 and 4.

Based on the above information the most striking trends that can be identified in OT research from 2007-2016 area substantial increase in the number of articles related to intervention and assessment in children and adults, and a growing emphasis on the publication of systematic reviews.

## IV. Discussion

A study of the trends in OT researchwas carried out through an analysis of the frequency of the words mentioned in the titles of articles published in AJOT from 2007-2016. Based on the results, there are strong indications that research activity in OT was centered onintervention and assessment studies in children and adults, and systematic reviews related to OT during this time period. These findings are consistent with the current emphasis of OT profession on Evidence Based Medicine (EBP) that seeks to integrate clinical expertise and the preferences, beliefs and values of the client, the details of which will be discussed in the subsequent sections (3).

The time period of 2007-2016 was chosen for this study due to significant changes in the OT profession, partly influenced by the World Health Organization's International Classification of Functioning and Health (2001) that seeks to provide a conceptual basis for the definition and measurement

of health and disability(6,7). In addition, the enactment of The Patient Protection and Affordable Care Act (also known as the ACA or Obamacare) in 2010, that included OT provided rehabilitation and habilitation in the essential health benefits package, has also been transformational for the OT profession(9).Moreover, this time period is also significant following the greater recognition of the role of the OT profession considering the increasing numbers of aging baby boomers, returning military personnel, and children(9). The time period of ten years that was chosen is also appropriate from a research standpoint, sincejournal articles have been suggested to have their greatest impact within the first ten years of publication due to the maximum number of citations by other articles (10).

Based on the results of this study the greatest focus on intervention and assessment studies in children and adults, is perhaps a reflection of the effectiveness of the numerous legislative processes that have been instituted in the United States to provide early intervention, special education and related services to children with disabilities (11). A similar increase in adults can be attributed to the increase in the population of elderly individuals(12), since they have higher risks of developing chronic diseases and characterized by multi-morbidity (13). In addition, the recognition of the role of OT in helping veterans to improve their basic motor functions and reasoning abilities, and also compensate for permanent loss of function, which can account for the increase in the number of studies involving adults (14). The overall increase in publications related to interventions and assessment and can also be attributed to a greater focus on the psychometric properties of interventions and assessments describing the experience of disability and the evolving nature of the OT occupation (15).

The increase in the number of publications addressing interventions and assessmentsis particularly encouraging considering that it is an indicator of the importance attached by OT practitioners to the necessity of being currentwith information related to effective and efficient means to hasten the progression of clients to independence in purposeful occupations. However, since this study relies solely on analyses of titles of journal articles, it is not possible to comment on the specific areas of focus and also on the available literature involving preparatory methods and tasks, advocacy, education and training(4). But considering the current emphasis of the AOTA on children and youth, mental health, and productive aging it can be speculated that most publications would address one or more of these issues.Nonetheless, caution needs to be exercised since analyses of journal articles does not reveal the standard of these articles regarding their levels of evidence. This is particularly significant considering that majority of the OT publications were at lower levels of evidence where the risk of bias is relatively high (3).

Systematic reviews are instrumental for the implementation of evidence-based practice and also for the shaping of future research. They assist in the creation of data-based rationales for newly proposed development activities and are often a measure of the quality of development efforts. Thus, the increase in the number of systematic reviewsis a direct reflection of the goal of the AOTA to chronicle Evidence Based Literature that integrates clinical experience and reasoning, preferences of clients and their families (16). However, reliance on journal titles precludes the identification of the specific topics of these systematic reviews. While the broad outline of some of these systematic reviewsare more easilydiscernible, such as stroke(17), and dementia (18), others such as mental health (4,19), productive aging (Leland &Elliott, 2012) and Early Childhood Services (Arbesman, et al., 2013)are too inclusive in their coverage. Again, despite the increasing trend of OT based systematic reviews, as with primary research studies, these reviews vary greatly in quality and hence the trustworthiness of the yielded outcomes and recommendations should be assessed critically (2, 5, 20).

A seminal article by Richards, 2015 provides a snapshot view of the state of OT research over a period of one year (2014-2015), and highlights the increasing focus on the publication of articles related to instrument development and systematic reviews on critical topics in OT(3,11,21). It is highly encouraging that this observation is corroborated over the ten year trend observed in this study, which attests to the robustness of the study and provides justification for more detailed investigations.

## V. Limitations of the study

Though the results of this study provide meaningful results, further elucidation of the data is required primarily because of certain assumptions that were made. The first assumption was that the most prominent ideas or themes were included in the journal title. The second assumption was that the higher thefrequency of the word, the greater was its importance. It is possible that the title might not have been chosen appropriately because authors at times refrain from highlighting OT specific terms and rather focus on the relevance of an article to occupational engagement (3), and hence the title of the article may not always accurately reflect its content hencean analysis of article titles is not the only approach to identify emerging trends in research and education(4). Therefore, other scholarly articles related to OT education that are published in other peer-reviewed journals should be analyzed, since some OT researchers publish on topics that are not viewed as specifically OT related and hence are not published in OT journals (9). Additionally, emerging trends in OT research and education can be gauged by analyzing posters presented during national and international

conferences. However, the importance of this study should not be underestimated as it provides previously lacking dataabout the direction of OT education and research. This study also demonstrates the feasibility of the use of such an approach on a larger scale to investigate possible effects and associations.

In addition to the above issues, the exponential increase in the amount of research data presents a challenge in identifying links between scholarly articles and long-term or emerging trends in a profession(12).Text analytic tools assist in this analysis by identifying meaningful relationships within the large volume of data, though there are limitations to this program. Its major drawback is that it treats words as datasets, and isolates words to group and counts them. Therefore, the program cannot distinguish the meaning of words in the research context, and hence a human mind is needed to analyze the dataand determine meaningful contextual relationships, and thereby introducing the possibility of bias.

**Future directions**

Hence, this study constitutes a vanguard exercise on the feasibility of text analytics to investigate the possible effects and associationsin research trends in OT. The methods utilized in these studies offer an appropriate balance between an objective framework, a rigorously scientific approach to data analysis and the necessary contribution of the researcher's subjectivity.

Most significantly the results indicate that the research in OT appears to be broadly aligned with the goals of the profession. However, as previously stated, the biggest lacuna is that the specific nature of theinterventions or assessments, or the topics of the systematic reviewshave not been elucidated. Hence, with this limited information it is not possible to accurately comment on thedirection in which the OT profession is headed in its aim of delivering better health care with measurable outcomes.However, as the specific nature of these interventions, assessments and systematic reviews are not known, detailed studiesare necessary to resolve this issue. The conclusions drawn from such data driven information will highlight the future research and educational needs of the OT profession.

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[22]. Table 1-Frequently Appearing Top 20 Words in Title of AJOT Articles Published Between 2007-2016. Prepositions, conjunctions, and articles have been ignored. The percentage of individual words was calculated against the total number of articles published from 2007-2016.

| Serial Number | Word | Percentage | Frequency |
|---|---|---|---|
| 1 | Children | 19.01 | 166 |
| 2 | Intervention | 12.26 | 107 |
| 3 | Sensory | 11.45 | 100 |
| 4 | Adult | 9.39 | 82 |
| 5 | Effective | 7.10 | 62 |
| 6 | Disorder | 6.87 | 60 |
| 7 | Performance | 6.76 | 59 |
| 8 | Practice | 6.53 | 57 |
| 9 | Study | 6.30 | 55 |
| 10 | Systematic | 6.19 | 54 |
| 11 | Assess | 5.38 | 47 |
| 12 | Effective | 5.27 | 46 |
| 13 | Injury | 4.81 | 42 |
| 14 | Effect | 4.81 | 42 |
| 15 | Student | 3.78 | 33 |
| 16 | Brain | 3.09 | 27 |
| 17 | Process | 2.06 | 18 |
| 18 | Commission | 2.06 | 18 |
| 19 | Occupation | 1.60 | 14 |
| 20 | Measure | 1.37 | 12 |

The percentage of individual words in the titles was calculated against the total number of articles published in each year. The correlation coefficient was calculated for each word, over the period 2007-2016, with a positive value indicating an uptrend and a negative value a downtrend. As indicated by correlation coefficient values, use of words "children" "intervention," "sensory" and "adult" and "systematic increased from 2007-2016, while the use of the words "performance", "practice" "study" and "assess" decreased significantly. All details are presented in Table 2.

**Table 2**- The percentage of individual words in the titles calculated against the total number of articles published in AJOT between 2007-2016. CR denotes correlation coefficient.

| Word | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | CR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Children | 20.00 | 13.85 | 19.51 | 20.00 | 22.09 | 22.22 | 24.14 | 18.48 | 21.43 | 18.18 | 0.28 |
| Intervention | 1.54 | 24.62 | 6.10 | 2.11 | 2.33 | 0.00 | 26.44 | 0.00 | 18.75 | 18.18 | 0.24 |
| Sensory | 27.69 | 7.69 | 10.98 | 12.63 | 13.95 | 10.00 | 0.00 | 15.22 | 14.29 | 11.11 | 0.33 |
| Adult | 4.62 | 7.69 | 0.00 | 8.42 | 9.30 | 16.67 | 11.49 | 15.22 | 8.04 | 14.14 | 0.66 |
| Effective | 7.69 | 0.00 | 0.00 | 6.32 | 6.98 | 0.00 | 11.49 | 0.00 | 14.29 | 10.10 | 0.45 |
| Disorder | 15.38 | 0.00 | 0.00 | 0.00 | 0.00 | 8.89 | 6.90 | 11.96 | 14.29 | 9.09 | 0.39 |
| Performance | 9.23 | 9.23 | 7.32 | 13.68 | 15.12 | 10.00 | 10.34 | 0.00 | 8.93 | 0.00 | - 0.50 |
| Practice | 18.46 | 16.92 | 12.20 | 8.42 | 9.30 | 0.00 | 0.00 | 0.00 | 8.04 | 0.00 | - 0.83 |
| Study | 15.38 | 16.92 | 12.20 | 8.42 | 9.30 | 0.00 | 0.00 | 0.00 | 8.04 | 0.00 | - 0.81 |
| Systematic | 1.54 | 0.00 | 0.00 | 10.53 | 11.63 | 0.00 | 14.94 | 13.04 | 6.25 | 11.11 | 0.60 |
| Assess | 7.69 | 10.77 | 0.00 | 13.68 | 15.12 | 0.00 | 6.90 | 6.52 | 0.00 | 10.10 | - 0.55 |
| Effective | 7.69 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 11.49 | 0.00 | 14.29 | 0.00 | 0.22 |
| Injury | 3.08 | 0.00 | 21.95 | 5.26 | 5.81 | 0.00 | 0.00 | 0.00 | 0.00 | 13.13 | 0.10 |
| Effect | 7.69 | 7.69 | 0.00 | 0.00 | 0.00 | 16.67 | 0.00 | 11.96 | 0.00 | 0.00 | - 0.14 |
| Student | 9.23 | 6.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 7.61 | 8.04 | 7.07 | 0.14 |
| Brain | 1.54 | 0.00 | 17.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 12.12 | 0.00 |
| Process | 13.85 | 0.00 | 0.00 | 9.47 | 10.47 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | - 0.55 |
| Commission | 7.69 | 9.23 | 8.54 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | - 0.79 |
| Occupation | 10.77 | 0.00 | 6.10 | 1.05 | 1.16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | - 0.66 |
| Measure | 7.69 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 7.61 | 0.00 | 0.00 | - 0.17 |

**Table 3-** Percentage changes in words in titles of AJOT articles that have increased from 2007-2016

| Serial Number | Word | Percentage change |
|---|---|---|
| 1 | Intervention | 1800.00 |
| 2 | Brain | 1200.00 |
| 3 | Systematic | 1100.00 |
| 4 | Injury | 650.00 |
| 5 | Adult | 466.67 |
| 6 | Assess | 200.00 |
| 7 | Children | 138.46 |
| 8 | Student | 116.07 |

**Table 4-** Percentage changes in words in titles of AJOT articles that have decreased from 2007-2016

| Serial Number | Word | %age change |
|---|---|---|
| 1 | Disorder | 90.00 |
| 2 | Sensory | 61.11 |
| 3 | Study | 30.00 |
| 4 | Intervention | 33 |
| 5 | Measure | 20.00 |
| 6 | Effective | 20.00 |
| 7 | Commission | 20.00 |
| 8 | Effect | 20.00 |
| 9 | Performance | 16.67 |
| 10 | Practice | 16.67 |
| 11 | Occupation | 14.29 |
| 12 | Process | 11.11 |