

Mind-to-paper is an effective method for scientific writing

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ABSTRACT

INTRODUCTION: The problem of initiating the writing process is a well-known phenomenon, especially for young and inexperienced scientists. The purpose of this paper is to present an effective method to overcome this problem and increase writing efficiency among inexperienced scientists.

MATERIAL AND METHODS: Twelve young scientists within the medical/surgical fields were introduced to the mind-to-paper concept. The first and last article drafts produced by each of the scientists were scored for language complexity (LIX number, Flesch Reading Ease Scale and Gunning Fog), flow, structure, length and use of references; and the results were compared.

RESULTS: All participants produced one full article drafts during each of the three dictation days. When comparing the first and last article draft regarding time used, no significant difference was detected. In general, the manuscripts were of high quality on all evaluated parameters, but language complexity had increased in the final manuscript.

CONCLUSION: Mind-to-paper dictation for scientific writing is an effective method for production of scientific papers of good initial quality, even when used for the first time by inexperienced scientists. We conclude that practicing this concept produces papers of an adequate language complexity, and that dictation as a writing tool allows for fast transfer of ideas and thoughts to written text.

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Academic writing and publishing is an integral part of scientific work [1]. However, both professors and young researchers can experience difficulties when initiating the writing process, i.e. writer's block. Furthermore, the usual methods for academic writing in the form of writing on paper or on a computer may be time-consuming, and the work process is often fragmented as opposed to spontaneous speech, defined as the direct transition from thought to words [2]. There are different methods to overcome writer's block, e.g. use of a dictation device, modular writing, or elimination of distractions in the common environment. The use of dictation allows easy transfer of ideas to paper without interruptions from interfering thoughts and practical tasks. Evidence that dictation as a means of writing holds benefits for both average and expert writers is building [3]. The

speed of talking resembles the speed of thinking more closely than the speed of typing text on a computer or writing by hand. Furthermore, the quality of the text is not only associated with fluency of the speech, as it is imperative that the author has relatively much knowledge about the topic [4].

The aim of the present study was to explore and describe the mind-to-paper (MTP) concept for academic writing with the use of a structured manuscript outline, dictation of the first manuscript draft and a structured learning environment. We also wanted to evaluate if a learning effect was associated with the use of the MTP technique and therefore examined the first and the third paper produced by the participants.

MATERIAL AND METHODS

During a ten-month period, three separate courses were conducted. Each of the courses consisted of a four-week preparation period, a one day retreat where a full scientific manuscript was dictated, and a subsequent period of eight weeks for critical revision of the manuscript concluding with submission of the paper to a scientific journal. We have evaluated and compared manuscript outcomes from the first and last course.

For the first course process, the preparation phase was initiated with a two-hour kick-off seminar giving participants detailed instructions on article composition, the concept of dictation for scientific writing as well as instructions for producing a structured manuscript outline. During the subsequent four weeks, participants attended group meetings (3-5 participants in each group) with an academic supervisor, who was experienced in use of the dictation technique for academic writing. The overall objective of the preparation phase was to produce a structured outline for the manuscript. All figures, tables and statistical analyses for the manuscript had to be prepared in advance and finished before the dictation retreats.

The dictation retreat consisted of one full day dedicated to dictation of a full text article draft. Each of the participants brought their detailed manuscript outline, all needed references were printed and ordered according to the manuscript outline. The retreat was held in a remote location and each participant had a separate room for dictation. There were three academic super-

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TABLE 1

Guidelines for dictation.

Limit use of stops and rewinds
 Do not revise during the dictation process
 Use "mental sticky notes" every time you get an idea or want to change something (e.g. move a sentence or paragraph)
 Use simple words and short sentences – aim for a language level between spoken language and advanced academic language
 Dictate in a quiet environment without interruptions
 Turn off cell your phone and computer (e-mail, etc.)
 Only start the dictation process if you have time enough to finish the whole paper

visors who were available for ad hoc supervision during the dictation phase. We aimed at one continuous process for dictation of a full article draft with a minimum of interruptions. The detailed instructions for dictation are presented in **Table 1**.

The participants were instructed to interrupt the flow of speech while recording. Thus, every effort was made to keep the dictaphone continuously activated without pausing or rewinding to correct mistakes. If something incorrect was dictated, the participants should continue dictating and merely include a note for themselves (a "mental sticky note") for the subsequent revision phase. The aim of applying the mental sticky note was to enable the author to put aside disturbing thoughts occurring in parallel with the dictation process. It proved important to include references while dictating in order to save time in the revision phase. Participants were instructed to use basic academic language and to

avoid complicated sentence structures, i.e. we aimed for a language complexity level somewhere between normal spoken everyday language and advanced academic language. The dictations were transcribed and participants then had eight weeks for critical revision together with their co-authors. Articles could only have co-authors if these had participated in the various phases as outlined in the International Committee on Medical Journal Editors' (ICMJE) authorship criteria [5]. It was therefore not evident that the academic supervisor assigned to the MTP writing course would be a co-author on the paper.

In order to evaluate if a learning effect was associated with using the MTP technique, all article drafts from the first and third retreats were evaluated by two separate assessment groups. The assessors were also members of the research group, but they were blinded as to who was the author, and to whether the article was from retreat one or three. The manuscripts were evaluated as they appeared after the initial transcription, i.e. before any corrections from the first author or from co-authors. After an initial training session, the participants in the rating groups discussed the scoring system and the various scoring criteria in order to better understand and agree on these. After evaluation of the drafts in each group, the results of the respective manuscripts were compared. Any disagreements on the assessment were settled by discussion. Both English and Danish article drafts were scored with regard to flow, structure, language, preparation, length, use of references and use of mental sticky notes. The drafts were



TABLE 2

Results from the first and third writing retreat.

	Retreat 1, median (range)	Retreat 3, median (range)	Wilcoxon signed ranks test, p-value
Flow ^a	4.5 (3-5)	5 (3-5)	0.317
Structure ^a	4 (2-5)	5 (2-5)	0.070
Language ^a	4 (2-5)	4 (3-5)	0.206
Preparation ^a	3.5 (1-5)	5 (2-5)	0.328
Length ^a	4 (2-5)	5 (4-5)	0.161
Use of references ^a	4 (1-5)	5 (3-5)	0.139
Dictation time for first draft, hours	4 (1.5-7.0)	5 (3.5-7.0)	0.057
LIX number	55 (46-65)	59 (51-70)	0.045
Gunning Fog index	17.55 (1.289-19.39)	15.7 (14.3-21.7)	0.763
Flesch Reading Ease Scale Score	47 (26.40-57.50)	38.1 (25.5-52.1)	0.028
Types of articles produced during the writing retreat	4 narrative reviews 1 systematic review 4 original articles 1 Cochrane review 1 editorial 1 case report	2 narrative reviews 3 systematic reviews 7 original articles	
Language of produced articles	5 Danish 7 English	2 Danish 10 English	

a) Scale 1-5.

scored on a verbal rating scale with 1 being the lowest and 5 the highest possible score. The term “flow” indicated that the language floated naturally from one sentence to another, i.e. we used it to reflect the authors’ ability to transfer fluency of thoughts directly onto paper. The structure was evaluated based on the normal structure for the specific type of scientific article. The language was scored for difficulty and readability. This implies that a too simple every-day spoken language would give a low score for language level, and this would also be the case for very difficult and complicated scientific language use. The score for preparation would be low if some paragraphs were not dictated or if references for parts of the manuscript were missing. Whereas all manuscript drafts were scored regarding flow, structure, language, preparation, length, use of references and use of mental sticky notes, only manuscripts in English were evaluated for readability. The length of the article received a low score if the text was too short or too long compared with the normal length of an article of this type. The use of references received a high score if the number of references was considered adequate, and if the references were used throughout the manuscript, especially in the background and discussion sections. The use of mental sticky notes received a high score if they were used consistently throughout the paper and if the notes were relevant with respect to the contents of the manuscript. The lack of mental sticky notes in a manuscript was not given a low score if it seemed relevant to omit them. All scores were assessed by reaching consensus in the author group assessing the article.

The Gunning Fog was applied as it measures how difficult it is to read a written text by calculating the average number of words per sentence and the percentage of words with three or more syllables. A text resembling high school level has a Gunning Fog index of around 12, whereas a Gunning Fog index above 16 resembles very difficult reading comparable to the post-graduate level [6]. The Flesch Reading Ease Scale (range 0-100) evaluates the readability of a written text by calculating the average length of the sentences and the average number of syllables per sentence [7]. The higher the Flesch score, the easier and “more fluent” the text will read. A Flesch score < 30 indicates very difficult reading comparable to a legal contract [6]. The LIX score evaluates the length of sentences and the use of long words (more than six letters), and a higher score indicates increased reading difficulty [8]. The Gunning Fog, LIX and the Flesch Reading Ease Scale were evaluated by computerized algorithms available on the internet. Thus, there was no subjective evaluation for any of these parameters for any of the articles.

The study was approved by The Danish Data Protection Agency (no. 2007-58-0015/HEH.750.89-16).



Dictating scientific articles holds a series of advantages.

The study was not evaluated by the local ethics committee, since only biomedical research require ethical approval according to Danish law.

Trial registration: not relevant.

RESULTS

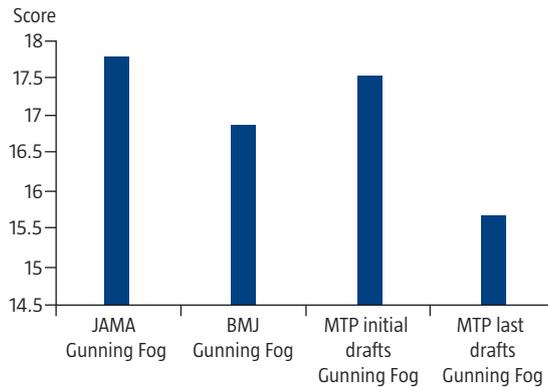
All 12 participants (five males and seven females) completed the dictation process in the course of one day and thus produced a full article draft for submission after a total of 12 weeks in each of the three course processes. The median age of the participants was 30 years (range 25-49 years). The median number of previously submitted articles for the 12 participants was four (range 0-15 articles). Three participants had previously dictated articles (1-4 papers) according to the MTP concept. Eight of the participants were PhD students, two were medical student scholars and two were clinical research nurses. The results from the first and third retreats are presented in **Table 2**.

The duration of the dictation process was generally short and the quality of the papers was very high with median values for the various categories of 4-5. The readability, measured by the Gunning Fog, LIX and the Flesch Reading Ease Scale, of the language in the article drafts was very close to our aim, which was a language fairly easy to read, while nevertheless reporting scientific data in a format suitable for scientific publication.

As seen in **Figure 1** and **Figure 2**, our manuscripts for the initial drafts showed better readability than manuscripts from the BMJ and JAMA measured by the Flesch Reading Ease scale and the Gunning Fog index. The last draft increased in language difficulty (Gunning Fog index) compared with both the initial draft, the BMJ

FIGURE 1

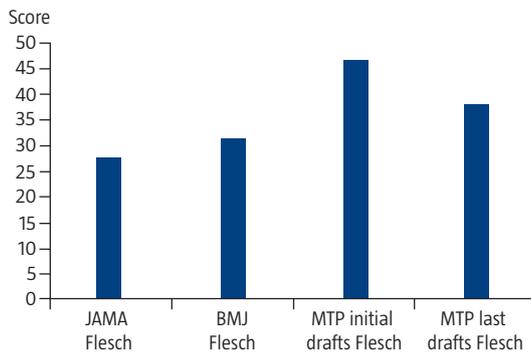
Readability scores from BMJ and JAMA compared with our dictated manuscripts according to the Gunning Fog index [6]. This figure shows equal complexity of our articles compared with BMJ and JAMA for the initial drafts and increased complexity for the last drafts.



MTP = Mind-to-paper manuscripts.

FIGURE 2

Readability scores from BMJ and JAMA compared with our dictated manuscripts according to Flesch Reading Ease Scale [6]. This figure shows that our manuscripts were easier to read than articles compared with articles from BMJ and JAMA.



MTP = Mind-to-paper manuscripts.

and JAMA; however, it still maintained good readability (Flesch Reading Ease scale). As seen in Table 2, only minor changes in quality were seen when comparing the first and last course process. The significantly higher LIX values and lower values of the Flesch Reading Ease scale indicated increased reading difficulty for the last course process (Table 2). This difficulty was not a result of a different distribution of major article types, such as systematic reviews, original articles and narrative review articles.

DISCUSSION

The basic finding of our study was that writers with limited experience were able to produce a high quality full

article ready for submission over the course of a structured 12-week period. The concept of MTP seemed to result in fluent transmission of thoughts to the paper without disturbance. A well-prepared manuscript outline along with the dictation process produced articles that were easy to read. Thus, the text was adequately structured with a level of language complexity close to that of an article ready for submission. With this method it was possible to dictate the first draft for a full article in only a few hours. Furthermore, we found that the method was appropriate for all participants regardless of prior experience with dictation and publication, and apparently without a substantial learning curve.

There are many reasons for writer's block, including lack of self-confidence, fear of rejection or competition, and lack of a structured framework [1, 9, 10]. One method for overcoming writer's block is to give up on the idea of producing a perfect first draft and just aim to get all thoughts down on paper even though the draft may look unfinished [11]. Planning a detailed manuscript outline may also be an important measure against writer's block [12]. The preparation phase consisted of teams with 4-5 researchers. Each team had a writing supervisor, and we used a remote writing retreat to enhance focus on the dictation process by eliminating distractions. MTP may be a very effective instrument against writer's block as the technique seemed to allow for a free flow of thoughts and to facilitate fast preparation of the first article draft. Together with the results indicating high quality of the initial drafts, we found that the method was easy to learn and with no apparent learning curve.

An essential part of the MTP concept is the preparation period. It is important to have a detailed manuscript outline with references sorted for every single paragraph in advance. Furthermore, all data analyses should be completed before dictation commences. When dictation is based on a detailed manuscript outline, uncontrolled free association was limited which made the final product more structured and precise. Thus, the concept of MTP is different from a brainstorming process, which would be applicable as a mental preparation before writing the manuscript outline. It is possible that the structured environment with a planned preparation phase, development of a detailed outline, and a short period for producing the first draft without external distractions may have contributed substantially to the results of producing 12 full articles of high quality in every retreat – rather than the concept of dictation per se. The present study design cannot evaluate the effect of dictation versus writing on a computer or on paper, but feedback from the participants showed that the method of dictation was a positive experience and that novices had experienced flow-like states of mind during the dictation process.

It might be feared that the use of dictation for scientific writing may impair scientific language quality. In comparison with earlier publications from BMJ and JAMA [6], our manuscripts had comparable Gunning Fog (Figure 1) and Flesch scores (Figure 2). In general, the results show that our dictated manuscripts had a sufficient complexity combined with a high readability. On the other hand, the texts produced were easy to read with an adequate flow of words and sentences. When using the MTP concept, the participants obviously made an effort not to use too simple every-day language, and at the same time the MTP method prevented the use of very difficult scientific language [12]. Our scores for flow of the language were very high for both the first and last draft. This means that the dictation method produced a natural language metaphorically resembling the flow of thoughts transferred directly to paper. By restricting any pausing and rewinding during the dictation phase, it is possible to keep a strong flow from MTP and to limit the number of interruptions. This may be one of the main arguments in support of dictation.

CONCLUSION

In conclusion, the concept of MTP dictation for academic writing seems time-efficient, while the method yields high-quality papers. MTP does not require substantial academic experience and is a quick way to produce concise articles with a language level comparable to that of other writing methods and apparently without a substantial learning curve. Thus, the concept of MTP for academics is advisable even in the young and inexperienced academic writer and may be a way to increase efficiency in academic writing.

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