

SPEAKING DYSPNEA: EFFECT OF BREATHING DISCOMFORT ON SPEAKING IN PEOPLE

WITH COPD

By

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## Abstract

Dyspnea (breathing discomfort) in people with COPD is an issue that impacts quality of life. Breathing discomfort can have negative emotional, physical, and mental effects due to chest/lung tightness, anxiety, and fear. By analyzing data of breathing perceptions and breathing patterns of participants, this study aims to determine the effects of breathing discomfort on speaking in people with COPD. The study also looks at which speaking tasks cause the most amount of breathing discomfort and why that may be.

## **Introduction**

Chronic obstructive pulmonary disease (COPD) is characterized by constant limited airflow and enhanced inflammation of the airways (Pocket Guide to COPD Diagnosis, Management, and Prevention, 2014). Breathing difficulty can lead to shortness of breath and tiredness, causing the feeling of discomfort while breathing (Standards for the Diagnosis and Management of Patients with COPD, 2004, p. 8). People with COPD suffer from dyspnea (breathing discomfort) in their everyday lives, which is a cardinal symptom of COPD. This discomfort is worsened by speaking, affecting socialization, careers, and overall quality of life. Breathing discomfort can have negative emotional, physical, and mental effects due to chest/lung tightness, anxiety, and fear (Hoit, J., Lansing, R., Dean, K., Yarkosky, M., & Lederle, A., 2011). This research aims to identify which types of speaking tasks cause the most and least amount of breathing discomfort and why this is so.

## **Methods**

This research involved analyzing the breathing perceptions and breathing patterns of three subjects who were diagnosed with COPD. Each participant performed the same speaking tasks for the same amount of time. Extemporaneous speaking (speaking without constraints about any topic of choice) was performed by each participant for 1 minute. There were also the 1 minute reading and 3 minute reading tasks in which the participant read a paragraph aloud for 1 and 3 minutes and would read it over again if need be until the allotted time was up. The soft counting and loud counting tasks each involved counting from 1 through 10 repeatedly for 1 minute in quiet voice and loud voice, respectively, with an inspiration after each count to 10.

For the short counting task, the participant counted from 1 to 5 repeatedly for 1 minute with an inspiration after each count to 5. The long counting task required the participant to count from 1 to 15 repeatedly for 1 minute with an inspiration after each count to 15.

The sessions occurred in either the home of the participant or in the University of Arizona Speech Research Laboratory. The research was approved by the University of Arizona Institutional Review Board and each participant filled out a consent form. Two of the three participants took part in a second session in order to collect more data.

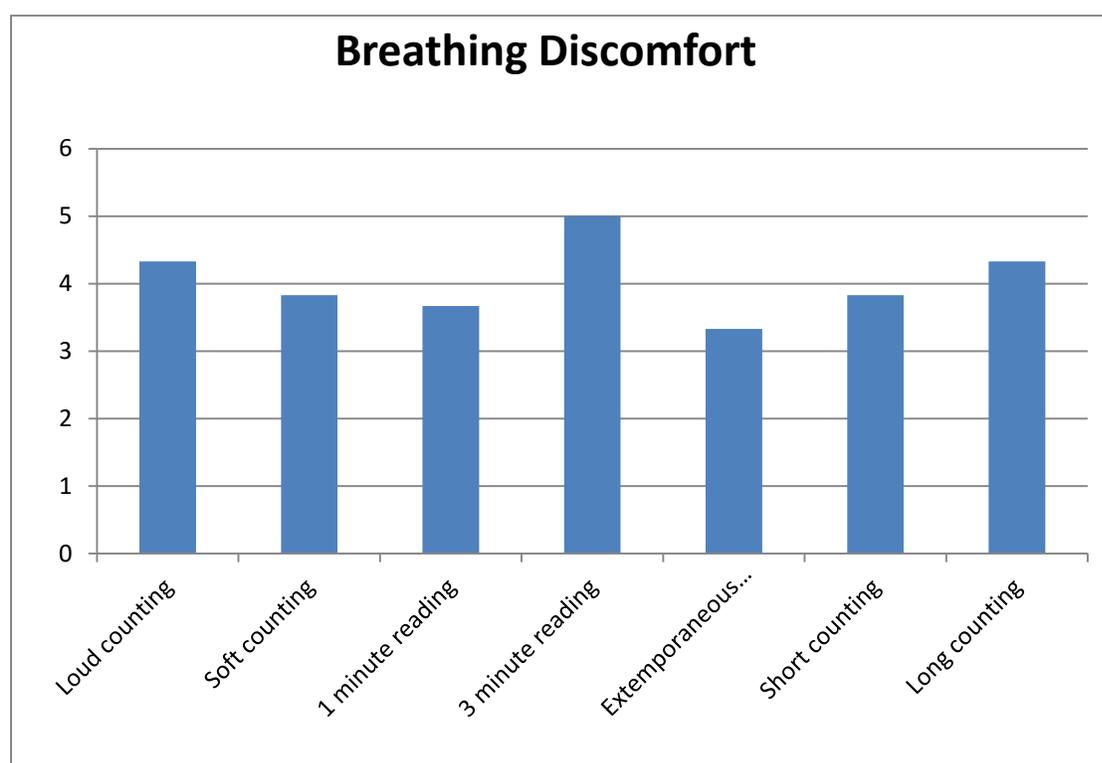
After each task, the participant was asked to rate his or her breathing discomfort on a scale of 0-10, with 0 being no discomfort and 10 being the maximum amount of discomfort felt. In order to collect qualitative data, the entire session was recorded and important comments made by the participants were transcribed and added to the data.

Before analyzing the data, calculations were made in order to determine the average syllables per breath, average speaking rate (syllables per second), and average breaths per minute for each of the tasks across all sessions and subjects. By listening to the recordings, it was possible to determine how many breaths were taken and how many syllables were uttered. The data were then analyzed through the use of Excel graphs in order to compare and contrast the results of each subject.

## **Results**

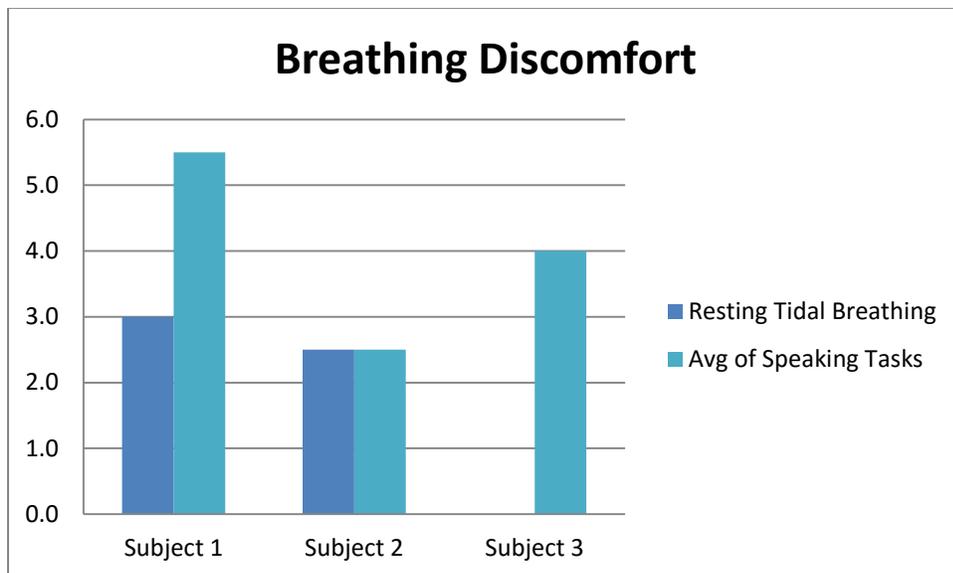
Overall, patients had the most breathing discomfort during the longer speaking tasks. Both the average syllables per breath as well as the average rate were highest for the reading tasks versus extemporaneous speaking, indicating that people with COPD may purposefully slow

down their speaking rate when they have the ability to speak freely and are not constrained. The overall average breaths per minute increased during the reading tasks as well, indicating that when speaking longer with an increased amount of syllables per sentence, they become more out of breath. The long counting also caused significant discomfort, for the same reasons as said above, due to constrained amounts of breath and more syllables spoken. The loud counting caused a lot of breathing discomfort as well, due to the fact that exerting more force and energy causes fatigue and breathlessness.

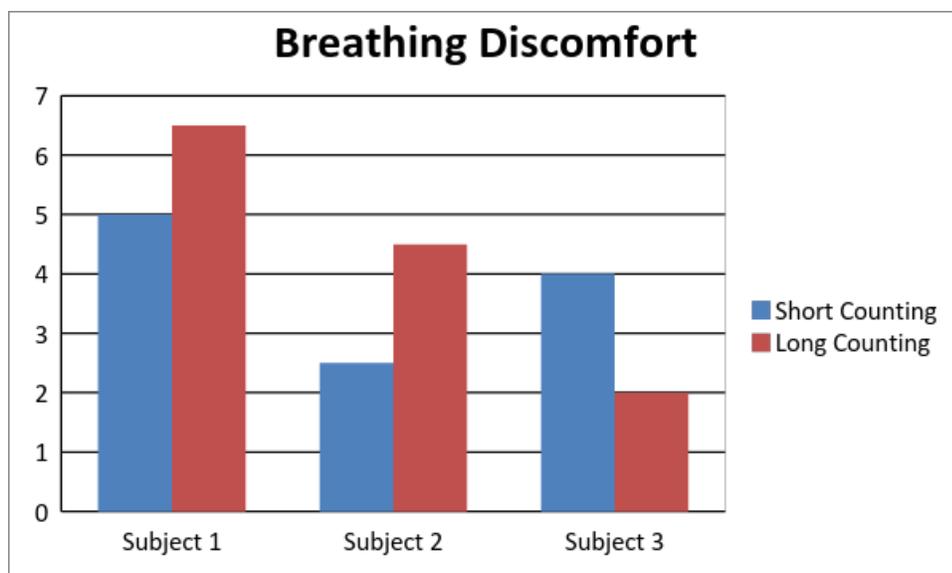


This graph shows the average breathing discomfort between of three subjects and sessions. When averaging the discomfort between all three participants for each task, the ratings found are as followed: Loud counting: 4.33; Soft counting: 3.83; 1 minute reading: 3.67; 3 minute reading: 5; Extemporaneous speaking: 3.33; Short counting: 3.83; Long counting: 4.33. This

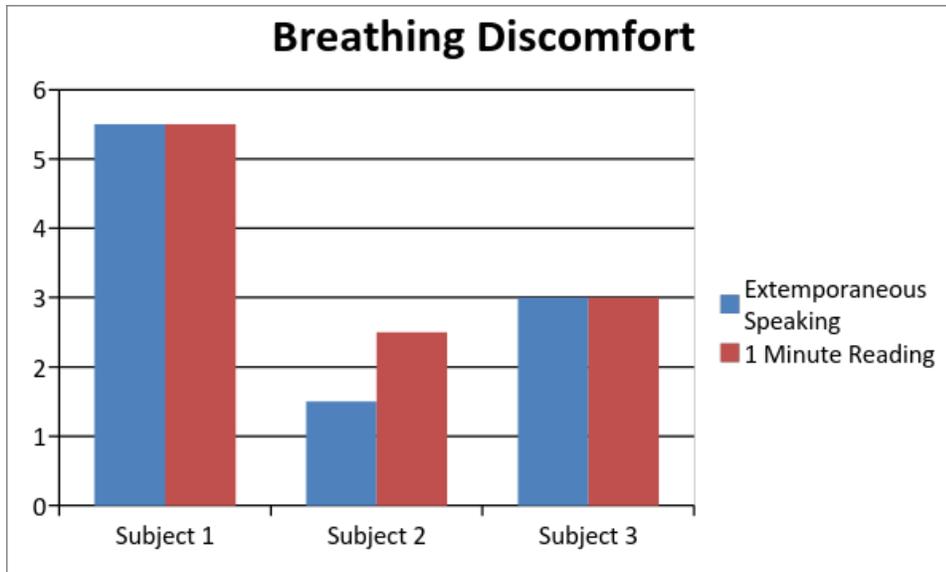
shows that the 3 minute reading (the task that requires the patient to speak for the longest amount of time with constrained syllables) caused the most amount of discomfort.



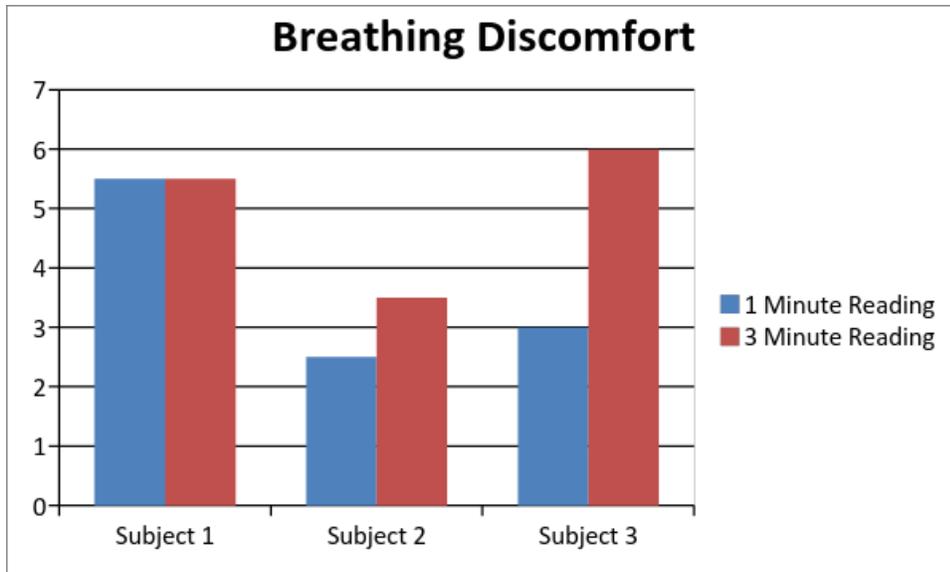
This graph compares the average breathing discomfort of all of the speaking tasks vs the breathing discomfort for resting tidal breathing. Subject 3 rated tidal breathing as zero on the discomfort scale which is why it does not appear on the graph. Breathing discomfort was higher during speaking for two subjects and lower during speaking for one subject.



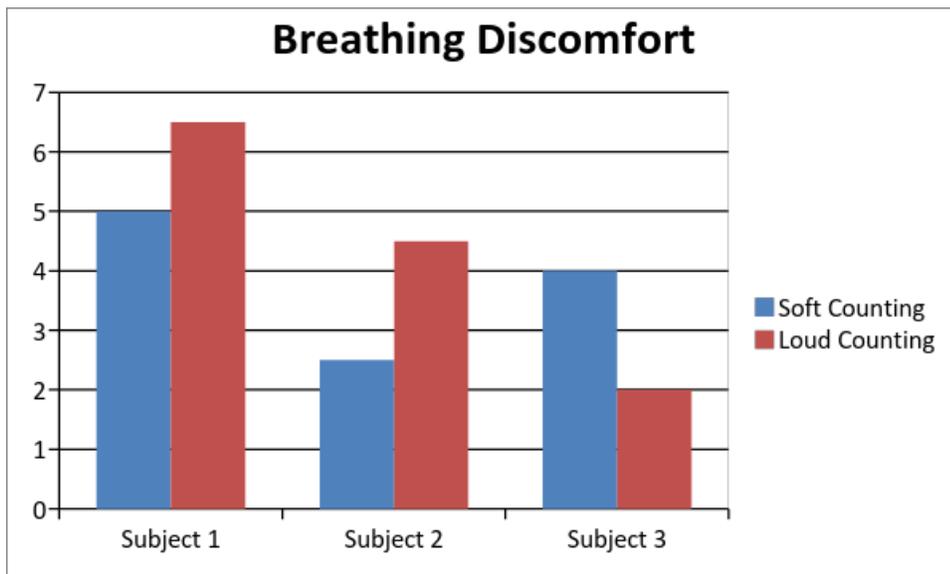
Even though ventilation was assumed to be the same for short counting and long counting, breathing discomfort ratings were different for each task. When Subject 3 was asked why short counting seemed to cause more discomfort than long, she replied, “I just seemed to be getting out of breath. And it started about midway.” She seemed to be taking very deep and long breaths in between each count of 15. At the end of each long count, Subject 2’s voice turned into a whisper and he seemed to be out of breath. Subject 1 described long counting as “more effort.” Subject 1 also noted that “none of this may be consistent with the last test either.. because it is erratic; because you just really don’t know from one week to the next especially at this age... and sometimes in the humidity I struggle a lot more than on a clear day when the air is dry.”



Even though both of these tasks are one minute each, one of the subjects, Subject 2, rated the 1 minute reading task as more uncomfortable than extemporaneous speaking. This could be due to the fact that the 1 minute reading has greater linguistic constraints. Subject 2 also had a very rapid rate of speaking during the reading tasks which may have caused him to feel more breathless. Subject 2 also expressed that he felt more distracted during extemporaneous speaking since he wasn't focusing on his speaking like he did in the reading tasks. He states that "Interesting while speaking, I wasn't concentrated on.. you know, so my discomfort was 1.... Cause I'm not conscious."

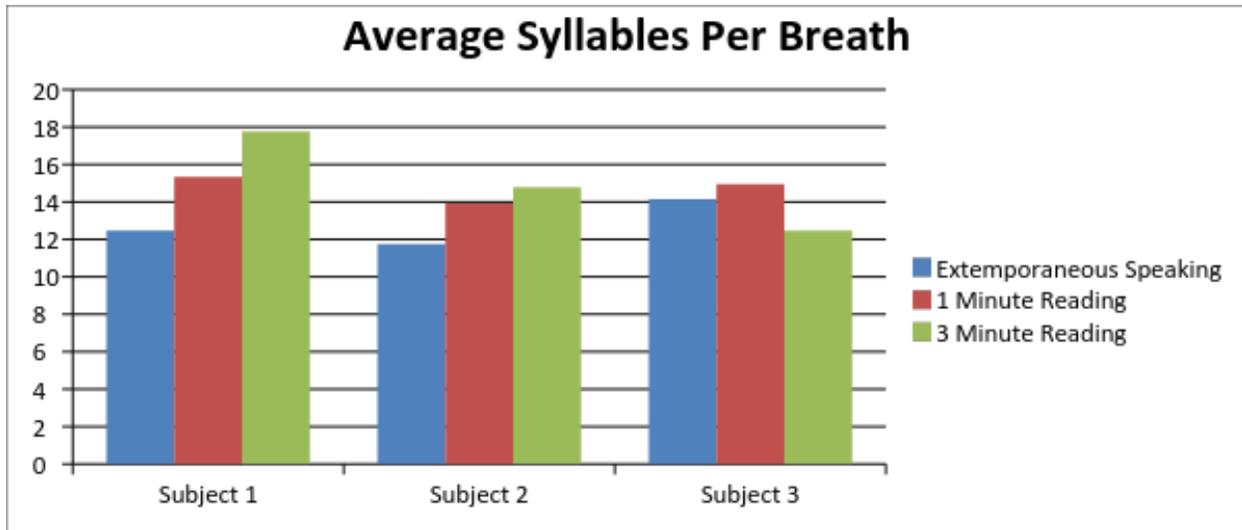


The 3 minute reading seemed to cause more discomfort than the 1 minute in two out of the three subjects. This shows that speaking for longer periods of time may take more of a toll on people with COPD.

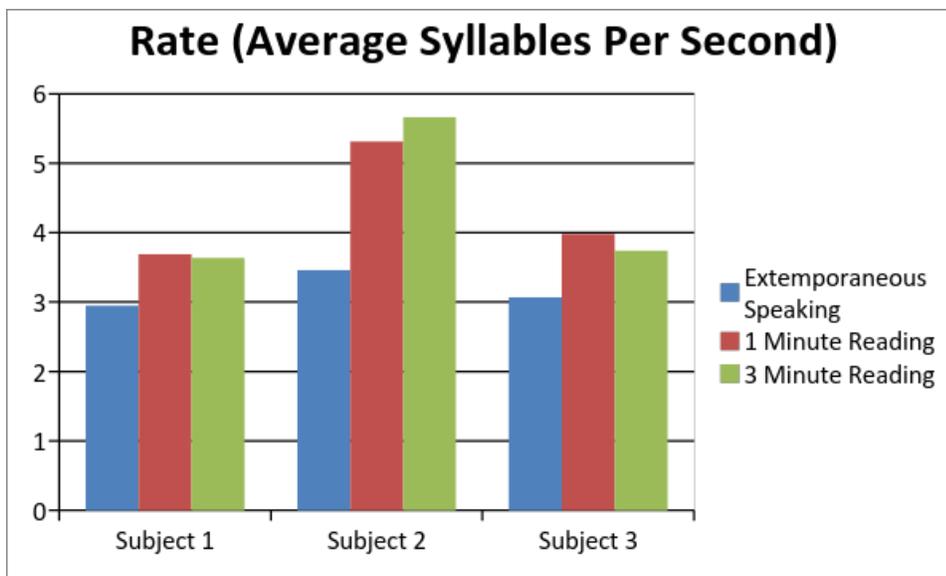
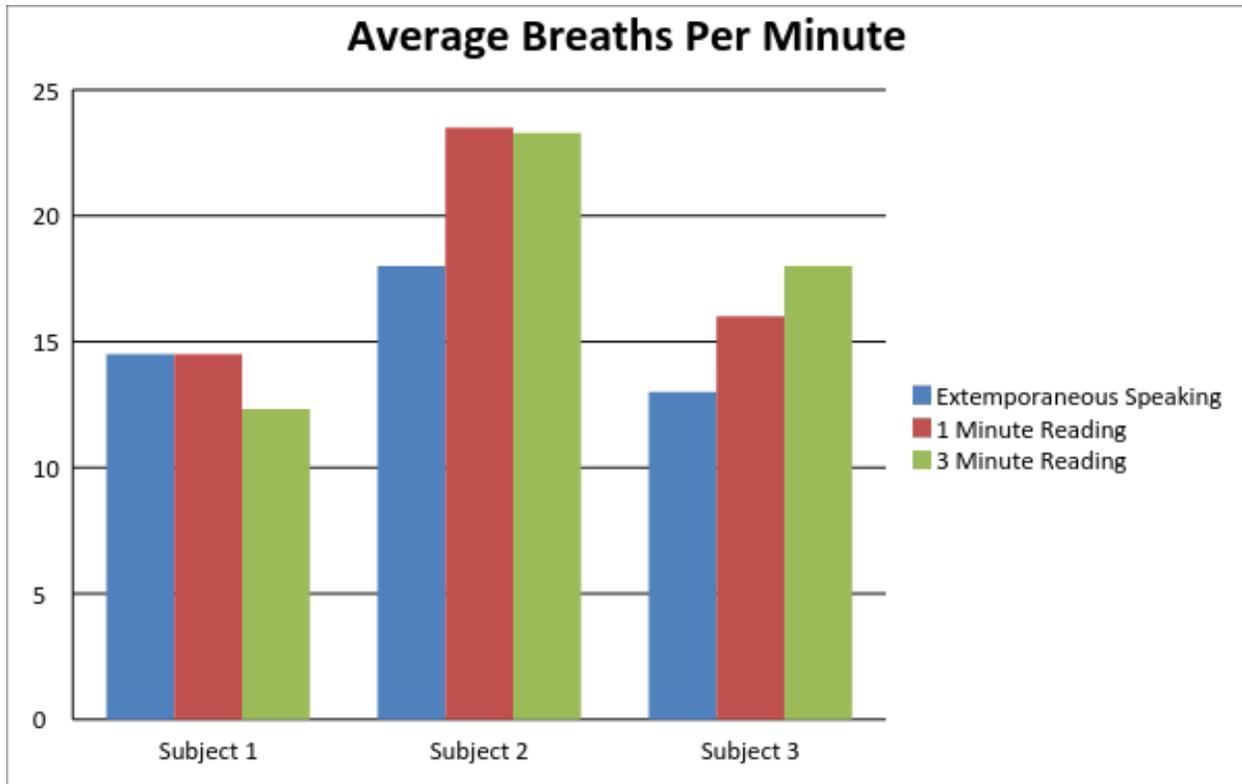


Two of the three subjects had greater breathing discomfort after loud counting, whereas one

showed the opposite effect. After soft counting, Subject 2 asked about that task, saying, “why is that much more difficult?” (than he thought it would be). The lower loudness seems to add more work (which was unexpected). After loud counting, Subject 3 commented that “towards the end I was getting a little lightheaded.” Subject 1 explained how loud counting made her “feel a little heavy,” even after resting for a minute after. She took long breaths after each count period of the loud counting. She explained that the loud counting was the worst. “That felt like I was getting heavy, yeah. When I raise my voice that way. Then I feel it in my vocal cords too. Where it causes a little bit of that hoarseness. You know, my range of tone.” “It was starting to give me a little bit of a headache, actually, on the right side of my head. Where I’m straining to speak that way and um it’s an effort to speak that loud. I think in general, as I get older, I can’t quite, you know, speak that loud, and even yelling or screaming...To me that’s an effort, because I normally have difficulty breathing. However, you know the inhaler I take in the morning and at night helps me kind of cruise through the day. But if I have to do anything out of the ordinary, if I were to walk out the door now, go to my mailbox, which is sort of a community mailbox for this road, I, I’m out of breath instantly. You know the walking. It’s the same way with shouting. If I have to use my voice to the point where I’m actually yelling, then it’s hard to breathe.” In the second session Subject 1 noted that “what happens when I shout is I get a little bit dizzy, which shows the air isn’t quite there the way it should be.”



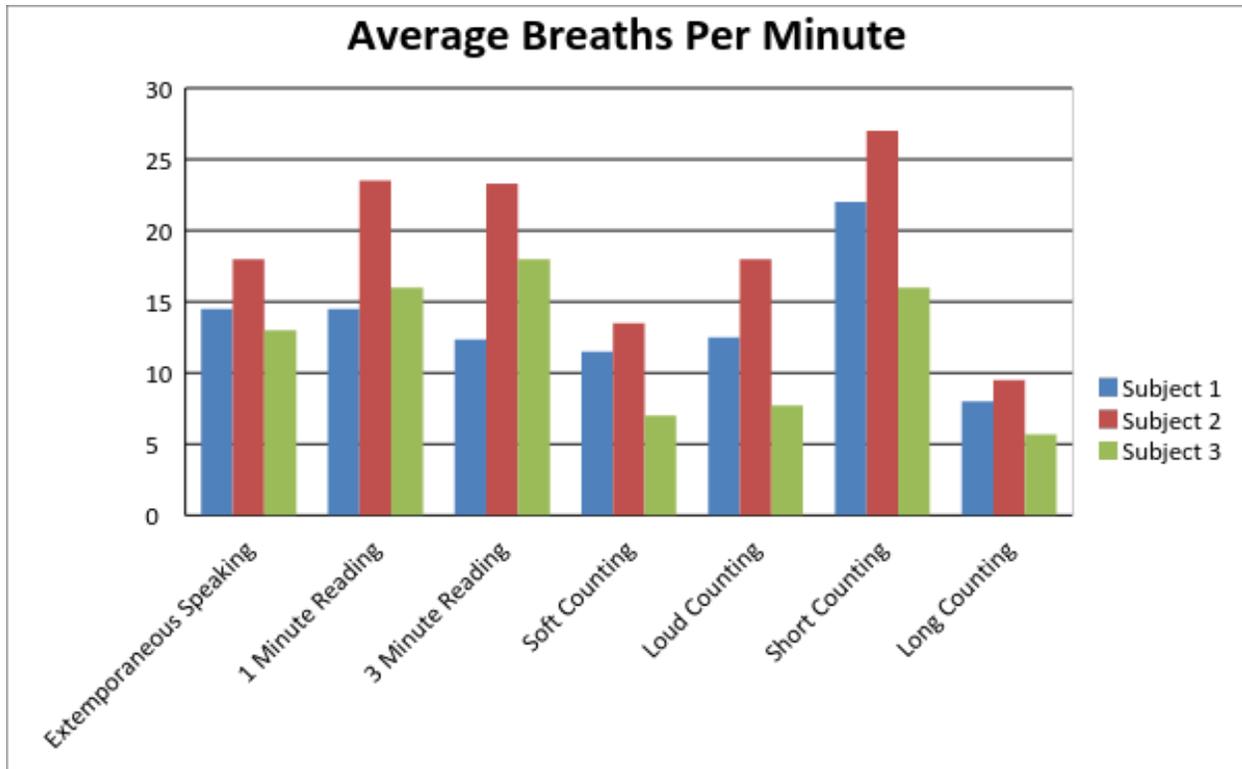
For the most part, syllables per breath increased when the participants read aloud compared to extemporaneous speaking. This pattern of more syllables per breath for reading aloud than speaking is consistent with data from healthy speakers (Hoit & Hixon, 1987; Hoit, Hixon, Altman, & Morgan, 1989) However, this was not the case for Subject 3. She may have been experiencing breathing discomfort and therefore increased her breathing frequency, as seen in the next graph.



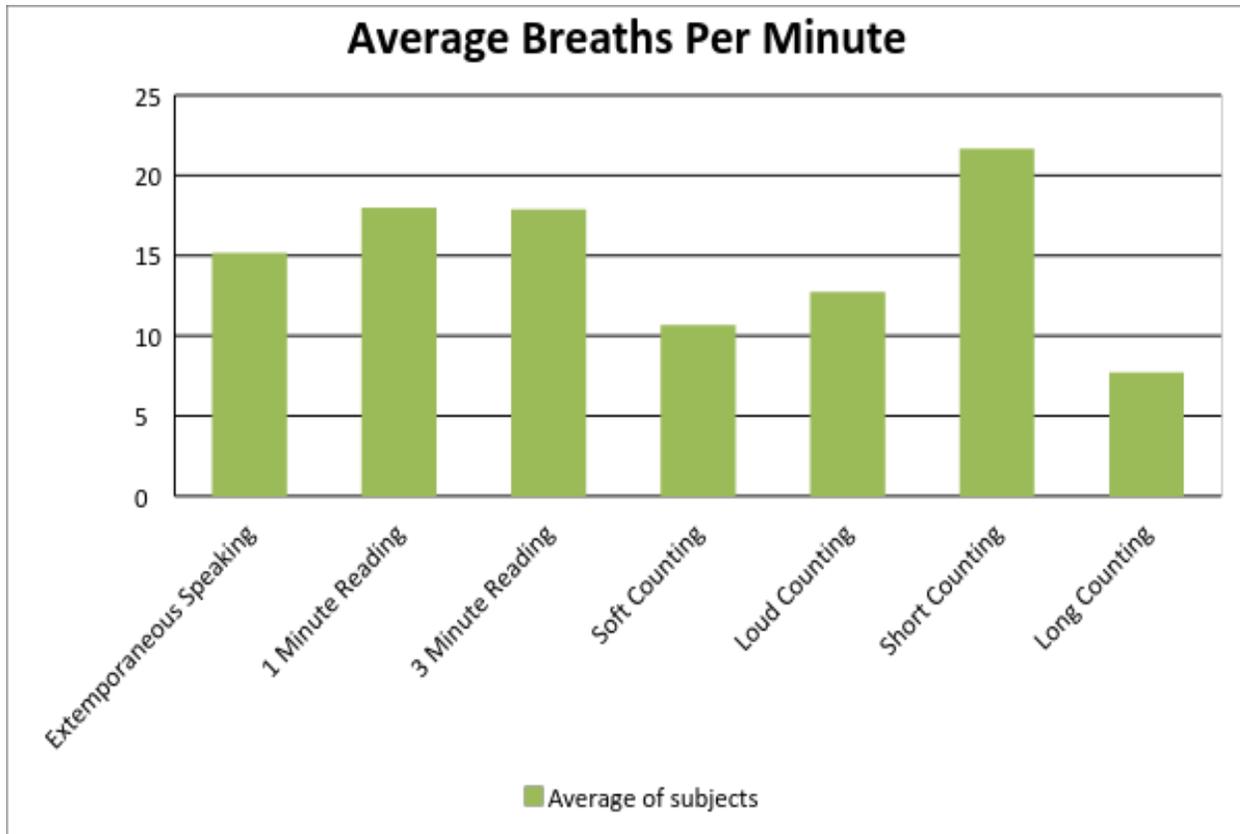
The average speech rate for the 1 minute reading and 3 minute reading tasks were almost exactly the same, averaged across all subjects. For all speakers, reading rate was faster than extemporaneous. This could be due to the fact that during extemporaneous speaking, they are

thinking, and therefore speaking more slowly. Also, while reading from a passage, they may feel the need to get through the entire passage within the time constraint of 1 or 3 minutes, and therefore increased their speaking rate.

The average speech rate for Subject 2 was higher than both of the other two subjects across all tasks. However, his average breathing discomfort for the speaking tasks was lower than the other subjects. He also took the most breaths per minute, indicating that quicker and higher frequency of breaths may help ease his discomfort. However, in the case of Subject 3, more frequent breaths (during the short counting) seemed to cause more discomfort than the long counting, even though the amount of ventilation was the same for both tasks. This data can be seen in a graph below.



Subject 2 seems to be taking the most frequent amount of breaths for all tasks.



The short counting task caused the most amounts of breaths to be taken because this task required participants to take a breath after count, resulting in a higher amount of breaths per minute. Between the three non-constrained speaking tasks, both reading tasks had the most amounts of breaths taken. This may indicate that the participants became more out of breath due to the long syllable sentences within the reading passage.

### **Discussion**

The average breathing discomfort across all three subjects for resting tidal breathing is 1.83. This breathing discomfort is lower than any of the average breathing discomfort ratings for all other tasks. When averaging the discomfort ratings across all three participants for each speaking task, the ratings ranged from 3.33 to 5.00. These ratings confirm that speaking causes

people with COPD to feel more breathing discomfort than resting tidal breathing. These data also reveal that the 3-minute reading task caused the most discomfort. The long counting caused significant discomfort also, indicating that speaking with longer breath groups causes greater discomfort, even though the ventilation was assumed to be the same for both short and long counting. The average rate of all 3 subjects is 4.33 for the 1 minute reading and 4.35 for the 3 minute reading. The rate is almost exactly the same for both tasks, which further suggests that the overall duration of time speaking influences discomfort more than the rate of speaking. Extemporaneous speaking caused the least amount of discomfort. As explained by one of the subjects, they didn't pay attention to the discomfort as much because they were focusing on their thoughts rather than their speaking and breathing patterns. This type of speaking is also free from constraints, which explains the low discomfort ratings since they can speak at whichever speed they like, take as many breaths as they choose, and choose their sentence lengths.

The subjects described their feelings towards the loud counting (one of the highest rated breathing discomfort tasks) as "light-headed," "dizzy," and "heavy," supporting that speaking at high amplitudes creates physical discomfort.

A limitation of the study is the limited amount of participants analyzed. There would be a need for future follow-up studies with larger sample sizes. Also, Subject 1 and Subject 2 each had two separate sessions, but Subject 3 did not. This is a limitation because all subjects should have a consistent amount of sessions.

### **Summary and Conclusion**

Breathing discomfort causes COPD patients to change the way in which they speak to help alleviate the discomfort, or even avoid speaking completely. This study would help research in the future by creating ways in which to test if patients have dyspnea, and what methods can be used to cope with it. Given the weaknesses with the sample size and inconsistent amount of sessions for each participant, future studies should be done to address these issues. For example, studies with larger sample sizes and a standardized protocol that includes a specific number of sessions for each participant, as well as more research on the emotional and psychological impact of dyspnea. Given the negative emotional, physical, and mental aspect that breathing discomfort has on COPD patients, further research is needed to help combat this issue and to determine ways in which breathing discomfort can be evaluated during speaking.

## References

- Global Initiative for Chronic Obstructive Lung Disease*. Pocket Guide to COPD Diagnosis, Management, and Prevention. A Guide for Healthcare Professionals. (Updated 2014).
- Hoit, J., & Hixon, T. (1987). Age and speech breathing. *Journal of Speech and Hearing Research*, 30, 361-366.
- Hoit, J., & Hixon, T., Altman, M., & Morgan, W. (1989). Speech Breathing in Women. *Journal of Speech and Hearing Research*, 32, 353-365.
- Hoit, J., Lansing, R., Dean, K., Yarkosky, M., & Lederle, A. (2011). Nature and evaluation of dyspnea in speaking and swallowing. *Seminars in Speech and Language*, 32(1), 5-14.
- Standards for the Diagnosis and Management of Patients with COPD*. (2004). American Thoracic Society and European Respiratory Society, New York.