Academy of Historical Arts

and the

Historical European Martial Arts Coalition (HEMAC)

Flute for Fencing:
An Experiment in Breath Control

Author:
Keith Farrell

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Chapters

1 Introduction

This chapter will introduce the experiment and why I was interested in the idea in the first place.

1.1 Hypothesis

My hypothesis was that by playing the flute for half an hour a day, every day, for four weeks, my lung capacity and breath control should improve significantly; and as a result my performance in martial arts activities (historical fencing in particular) should become better.

1.2 Background

I have been involved with martial arts for around fifteen years now. I began with karate in 1998, and have been studying historical fencing since 2008. In secondary school I learned to play the flute and spent about five years between 2001 and 2006 playing and practicing several times a week. Unfortunately after I finished school and went to university (and even after finishing university and moving into self-employment) I have not given much time at all to my musical practice.

It has always been my experience that while playing the flute, my breath control during martial arts practice improved. Even an irregular flute session during my time at university usually resulted in better breath control for karate or historical fencing activities for a short while afterwards.

Although I spent more than a decade believing that this is the case, I have never measured anything or performed tests in a methodical fashion to establish whether or not this is in fact true. This experiment is intended to develop the necessary experimental data to prove or disprove my theory.

1.3 Proposed Method

The plan was that for 28 days, I would practice for half an hour every day. The first 10 minutes of each half hour would be spent practising basic exercises such as scales and sustained notes. The next 20 minutes would be spent playing pieces from my collection of classical sheet music.

Playing pieces for fun might not be as effective a way to spend my time as half an hour of structured and planned exercises, but is significantly more enjoyable. I wanted to enjoy the experiment as much I could, and doing 30 minutes a day of basic exercises would probably not have been very interesting or much fun.

On days 1, 8, 15, 22 and 29 (the day after the four weeks of practice), I would perform three tests: a sustained breathing test, a stepwise breathing test, and a cutting exercise with a longsword. The first test (on day 1) should be performed before I do any flute practice. The final test (on day 29) should be performed after the last flute playing session of the experiment.

1.4 The Tests

Sustained Breathing Test

For the sustained breathing test, I should play an A (first two fingers only, not going into the higher registers) and, with the aid of a stopwatch (*http://www.online-stopwatch.com/*), I should time how long the note could be sustained. There should be three attempts at this test per testing session, and a note taken of the average time.

Stepwise Breathing Test

For the stepwise breathing test, I should play a scale in a pyramid fashion:

C D
C D E D
C D E F E D
C D E F G F E D
C D E F G A G F E D
C D E F G A B A G F E D
C D E F G A B C B A G F E D
C D E F G A B A G F E D
C D E F G A G F E D
C D E F G F E D
C D E F E D
C D E D
C D
C

Or at least, I should attempt to play as much of this sequence as possible, at a rate of 168 bpm (using the online metronome service at *http://www.metronomeonline.com/* as my guide), and note how far I manage to play into the sequence before my breath fails me. Again, this test should be performed three times per testing session and a note taken of the average of my score (where each note counts as 1 point, to allow quantification of the result).

This stepwise scale is an exercise that I developed a few years ago to improve my dexterity of fingering the different notes on a flute, and it serves very well as a test for this experiment.

Cutting Exercise Test

For the cutting exercise test with the sword, I should use my Albion Meyer for consistency. I should begin in Vom Tag on the right shoulder and cut an Oberhaw into a left lower hanger, which I should then drive forward and up into a left Ochs (effectively a Zornhaw Ort). I should then retreat back into a left Vom Tag position, cut into a right lower hanger, then drive forward and up into a right Ochs (so a mirror of the technique). Then back into a right Vom Tag, and repeat.

I should do this as often as I can until I feel out of breath. "Out of breath" should be defined as the point in time where I could no longer continue to breathe through just my nose, and when I would need to open my mouth to assist with my breathing during the exercise. This would of course be a much more subjective test than the previous two, but I have done my best to perform the test fairly and within the rules for the experiment.

The number of repetitions performed (counting each cut and wind as 1 point) should be recorded. This test should only be performed once per testing session.

1.5 Control and Fairness

Since the first test of the experiment (on day 1) was performed before any flute playing was practised, it was an effective "before" snapshot of my abilities and breath control before attempting any practice. The following tests at weekly intervals should therefore be able to show any improvement and benefits gained from the regular flute practice.

In an effort to maintain fairness in the tests, the daily flute playing was the only addition to my regular routine. There were no additional fencing sessions or personal training sessions to augment my regular routine; indeed, circumstances conspired against me, and I attended fewer regular fencing classes than I normally do in a four-week period. Although I continued to do some personal solo drilling with my longsword during the four weeks, I avoided practising my Zornhaw Ort and instead worked on other techniques that trained different muscles, or at least trained muscles in a different way.

In every way I attempted to keep the experiment as fair and as unbiased as possible.

1.6 What the Experiment is NOT

After I posted my first announcement of the experiment on various online forums and on Facebook, several people seemed to misunderstand what I was trying to accomplish, and offered some fairly unhelpful suggestions.

This experiment was NOT:

- a replacement for any martial arts or strength training;
- an attempt to learn to co-ordinate my breathing and moving;
- a "get fit quick" scheme;
- a method to enlarge my lungs or to improve my lung capacity;
- a formal scientific study with the backing of a laboratory, expensive equipment and trained technicians.

The experiment was simply a set of tests to see if martial arts activity can benefit from musical practice that one is already undertaking, in an attempt to prove or disprove a theory that I have held for over a decade.

Obviously the best way to get better at martial arts is to practise martial arts, and the best way to improve one's strength is to perform strength-building exercises. This experiment was not intended to be a "magical bullet" to replace these necessary elements of anyone's martial arts or sports training.

2 Experimental Data

This chapter will show the numbers and data that I developed by performing the various tests.

2.1 Sustained Breathing

The first table (table 2.1.1) shows the test results and averages from each testing session. The emboldened column headings indicate the testing days, and the rows provide the test data for each column.

	Day 1	**Day 8**	**Day 15**	**Day 22**	**Day 29**
Attempt 1	17	19.5	22.3	29.9	42.3
Attempt 2	17	22.1	32.5	43.0	43.2
Attempt 3	18	26.05	28.3	38.1	42.3
Average	17.3	22.38	27.7	37.0	42.6

Table 2.1.1: test results and averages. The unit of time measurement is seconds.

The second table (table 2.1.2) shows the comparison between daily averages and the percentage of improvement. The emboldened row headings indicate which day is being compared against previous daily averages (in turn indicated by the column headings).

	Day 1	Day 8	Day 15	Day 22
Day 1	-	-	-	-
Day 8	29.36%	-	-	-
Day 15	60.12%	23.77%	-	-
Day 22	113.87%	65.33%	33.57%	-
Day 29	146.24%	90.35%	53.79%	15.14%

Table 2.1.2: comparison of daily averages. The unit of time measurement is percentage of improvement, in terms of how many seconds the note was sustained.

These findings meet expectations: the more often I did my regular daily flute practice, the better I became at sustaining a note on the flute. This has no direct bearing on martial arts training; it simply serves to show that as I practised the flute, my breath control for flute playing improved.

This test by itself does not prove or disprove the hypothesis.

2.2 Stepwise Breathing

The first table (table 2.2.1) shows the test results and averages from each testing session. The emboldened column headings indicate the testing days, and the rows provide the test data for each column.

	Day 1	**Day 8**	**Day 15**	**Day 22**	**Day 29**
Attempt 1	28	49	63	57	92
Attempt 2	39	56	69	64	79
Attempt 3	40	55	67	68	84
Average	35.7	53.3	66.3	63.0	85.0

Table 2.2.1: test results and averages. The unit of measurement is steps played on the stepwise pyramid.

The second table (table 2.2.2) shows the comparison between daily averages and the percentage of improvement. The emboldened row headings indicate which day is being compared against previous daily averages (in turn indicated by the column headings).

	Day 1	Day 8	Day 15	Day 22
Day 1	-	-	-	-
Day 8	49.30%	-	-	-
Day 15	85.71%	24.39%	-	-
Day 22	76.47%	18.20%	-4.98%	-
Day 29	138.10%	59.48%	28.21%	34.92%

Table 2.2.2: comparison of daily averages. The unit of measurement is percentage of improvement in terms of steps played on the stepwise pyramid.

Again, these findings meet expectations: the more often I did my regular daily flute practice, the better I became at playing a stepwise pyramid pattern of notes on the flute. This has no direct bearing on martial arts training; it simply serves to show that as I practised the flute, my breath control for flute playing improved.

Worth noting is that on day 22, my average score was lower than on day 15. This seems to have been just a temporary blip in my overall improvement, and follows the concepts of General Adaption Syndrome and Sports Periodisation (please see this article *http://en.wikipedia.org/wiki/Sports_periodization* for more information about this concept; thanks to Gordon Hamilton for his input on this issue).

This test by itself does not prove or disprove the hypothesis.

2.3 Cutting Exercises

The first table (table 2.3.1) shows the test results from each testing session. The emboldened column headings indicate the testing days, and the rows provide the test data for each column.

	Day 1	**Day 8**	**Day 15**	**Day 22**	**Day 29**
Cutting Repetitions	156	257	395	530	723

Table 2.3.1: test results. The unit of measurement is repetitions of the Zornhaw Ort before I could no longer continue with nose breathing as normal.

The second table (table 2.3.2) shows the comparison between daily repetitions and the percentage of improvement. The emboldened row headings indicate which day is being compared against previous daily averages (in turn indicated by the column headings).

	Day 1	Day 8	Day 15	Day 22
Day 1	-	-	-	-
Day 8	64.74%	-	-	-
Day 15	153.21%	53.70%	-	-
Day 22	239.74%	106.23%	34.18%	-
Day 29	363.46%	181.32%	83.04%	36.42%

Table 2.3.2: comparison of daily results. The unit of measurement is percentage of improvement in terms of repetitions of the Zornhaw Ort before I could no longer continue with nose breathing as normal.

These findings are interesting. Across the four weeks, I became significantly better at controlling my breathing while performing the cutting exercises, allowing me significantly more repetitions before having to switch from purely nose breathing during the exercise.

2.4 Improvements

The first table (table 2.4.1) shows how long it took me to perform the cutting exercise test at each testing session. The emboldened row headings indicate which day is being compared against previous daily averages (in turn indicated by the column headings).

	Day 1	**Day 8**	**Day 15**	**Day 22**	**Day 29**
Repetitions	156	257	395	530	723
Seconds	~393.9	~648.925	~997.375	~1338.25	~1825.575
Minutes	~6.565	~10.815	~16.623	~22.304	~30.42

Table 2.4.1: test results expressed in repetitions, approximate seconds and approximate minutes.

The day 22 test took around 22 minutes to complete, and the day 29 test took around 31 minutes to complete. This works out to around 2.49 seconds per repetition on day 22 and 2.56 seconds per repetition on day 29; an average of 2.525 seconds per repetition. It is from this average of 2.525 that the entries in table 2.4.1 have been constructed.

It must be admitted that this could have been measured much more accurately, and could have been measured on days 1, 8 and 15 as well as just days 22 and 29. My initial plan had been just to measure and compare the number of repetitions, but it was suggested to me by Ivan Čurić that I time the test as well. This has the benefit that the data can now be visualised in terms of time rather than just repetitions; however, it must be borne in mind that the number of repetitions is the only data that has been measured explicitly and with complete accuracy in table 2.4.1, and the time data is only as best an estimation as can be managed.

What this test shows is NOT that I became better at fencing; what it shows is that my breath control improved over the course of the four weeks. As a result of this improvement in breath control, my ability to regulate my breathing allowed me to manage only six and a half minutes of fencing activity on day 1, but around 31 minutes of fencing activity on day 29. The improvement between every set of test results shows that my ability to manage my breath control developed and improved steadily.

This does not make me any better at doing my Zornhaw Ort, nor does it make me any stronger at cutting. It simply shows that my breath control has improved and that I can manage a longer period of activity before feeling out of breath.

3 Conclusions

This chapter will explain the conclusions drawn from the experiment and its tests.

3.1 Hypothesis

My hypothesis (as stated in section 1.1) was that by playing the flute for half an hour a day, every day, for four weeks, my lung capacity and breath control should improve significantly; and as a result my performance in martial arts activities (historical fencing in particular) should become better.

I believe that the results of the testing sessions show that this is almost correct; as I wrote in section 2.4, there has been a strong improvement in my breath control that has allowed me to manage longer periods of activity before feeling out of breath. This is of course a valuable characteristic for historical fencing and indeed for any martial art, but it is not an improvement in my historical fencing skills.

The hypothesis was not quite specific enough. A much more correct statement would be: by playing the flute for half an hour a day, every day, for four weeks, my lung capacity and breath control should improve significantly; *and as a result my ability to regulate and control my breathing while participating in martial arts activities (historical fencing in particular) should become better*.

This corrected statement is supported by the data gathered from the tests, and I believe that even if some of the tests were not as accurate or as effective as they could have been, the data does show a general improvement in breath control across the course of the experiment.

3.2 Problems

I would be remiss if I did not mention the problems and issues that have been present in this experiment.

The first problem that I noticed in my first set of tests on day 1 was that the number of repetitions of the Zornhaw Ort that I managed to achieve was significantly higher than I had expected. My guess had been that I would manage ~80 repetitions on the first day, maybe ~100 after a week, and reach perhaps ~150 by the end of the month. However, I managed to achieve significantly higher

numbers of repetitions, meaning that I was pushing my body to its limits of muscular endurance as well as breath control. It was a painful process to force myself to keep going during the tests on days 22 and 29; on the final day, once I reached 600 repetitions, my body was in quite a lot of pain and I really wanted to stop, but I was still within my limits in terms of breath control. The learning point is that repetitions of a technique was not the correct unit of measurement for this test, and perhaps some other form of measurement could have been tested instead.

The second problem was of course that I should have timed the Zornhaw Ort repetition test during each of the five testing sessions, and should have used an accurate timer such as a stopwatch. This would have allowed me to note precise time details rather than estimates and best guesses.

The third problem was that I missed my daily practice a few times throughout the experiment. Furthermore, my left thumb and forefinger began to hurt and stiffen up quite badly after a couple of weeks, as that is where the bulk of the support for the instrument is given, and requires a significantly stiffer and more tense grip than elsewhere on the flute, and so I had to take a day or two off from playing to allow my fingers to loosen off again. A better plan would have been to specify five half hour practice slots a week, to fit them around my schedule and physical limitations, and then I would not have "missed" any practice times across the experiment.

The fourth problem was that this study had only a single subject (myself), and so it may not be representative of the effects of regular practice across a wider group of people. The study has certainly proven that ***I*** will develop better breath control if I undertake regular flute practice; it does not necessarily prove that everyone else will develop better breath control if they undertake regular flute practice. I suspect that most people will see an improvement, but it has not been proven by this experiment.

The fifth problem was a limited amount of control data. I only did a single testing session before beginning my flute practice; doing two or three or four weeks of control testing (without the daily flute practice) would have provided a much better set of control data for comparison at the end of the experiment. There is control data for this experiment; just not very much of it, and this could have been improved.

4 Further Study

Taking into account the results, but also the problems and issues, there is scope for further study.

I would like to run an experiment with three pools of several subjects each: one pool only doing the flute playing (no fencing at all), one pool only doing the fencing (no flute playing or flute tests at all), and one pool doing both flute playing and fencing practice and tests. This would generate a reasonable amount of data for comparison, especially with a decent population of subject in each pool.

A slight extension of the hypothesis might allow that regular practice of *any* wind instrument would bring the same kind of benefits as the regular flute practice has brought me. Accordingly, similar experiments could test other wind instruments to see if the same kind of improvements can be seen, or if it is something particular just to the flute. I believe that any wind instrument will bring the benefits, but that modification of my original hypothesis will need to be tested!

Finally, another study might compare the sorts of benefits and improvements gained by flute practice (or practice of any wind instrument, if that study is conducted first) against the sorts of benefits and improvements gained by other physical activities such as swimming, running or yoga. Perhaps some physical activities will bring more benefits than wind instrument practice; perhaps practice of a wind instrument will be more effective than other physical activities. It would be an interesting set of results to see at the end of such a study.

It would make me very happy to see other people undertake further study of this concept, with or without my own involvement.