Lab Report

Research Question: To determine the speed of a pulse in a thin metallic spring.

Variables:

- **Dependent:** Length of spring
- **Independent:** Period of pulse
- **Control:** How big the pulse is

Equipment:

- Thin metallic spring
- Chairs(x2)
- Stopwatch

Methodology Setup:

Methodology:

1. Two chairs were aligned as bases, one opposite of the other with a distance of 6,49 m and a spring was attached at the end of each chair.
2. One person operated the stop watch, while the other created the pulses. A third person wrote down the results shown in the stopwatch.

3. The stopwatch was simultaneously operated so it would start counting when the pulse was created and stop counting when the pulse returned to the base that it started.
4. When the stopwatch stopped counting, the results were observed and written down.
5. The total results where 45.

Results Table:

No 1	**1.19 ± 0.01s**	**No 34**	**1.17 ± 0.01s**	**No 67**	**0.97 ± 0.01s**
No 2	**1.13 ± 0.01s**	**No 35**	**1.30 ± 0.01s**	**No 68**	**1.00 ± 0.01s**
No 3	**1.21 ± 0.01s**	**No 36**	**0.95 ± 0.01s**	**No 69**	**0.93 ± 0.01s**
No 4	**1.04 ± 0.01s**	**No 37**	**1.15 ± 0.01s**	**No 70**	**1.30 ± 0.01s**
No 5	**1.08 ± 0.01s**	**No 38**	**1.13 ± 0.01s**	**No 71**	**1.22 ± 0.01s**
No 6	**1.11 ± 0.01s**	**No 39**	**1.01 ± 0.01s**	**No 72**	**1.16 ± 0.01s**
No 7	**1.09 ± 0.01s**	**No 40**	**1.14 ± 0.01s**	**No 73**	**0.97 ± 0.01s**
No 8	**1.05 ± 0.01s**	**No 41**	**1.24 ± 0.01s**	**No 74**	**1.42 ± 0.01s**
No 9	**1.21 ± 0.01s**	**No 42**	**1.16 ± 0.01s**	**No 75**	**1.04 ± 0.01s**
No 10	**1.21 ± 0.01s**	**No 43**	**1.04 ± 0.01s**	**No 76**	**1.12 ± 0.01s**
No 11	**1.22 ± 0.01s**	**No 44**	**1.11 ± 0.01s**	**No 77**	**1.12 ± 0.01s**
No 12	**1.13 ± 0.01s**	**No 45**	**1.08 ± 0.01s**	**No 78**	**0.97 ± 0.01s**
No 13	**1.19 ± 0.01s**	**No 46**	**1.03 ± 0.01s**	**No 79**	**1.10 ± 0.01s**
No 14	**1.03 ± 0.01s**	**No 47**	**1.10 ± 0.01s**	**No 80**	**1.16 ± 0.01s**
No 15	**1.18 ± 0.01s**	**No 48**	**1.10 ± 0.01s**	**No 81**	**0.97 ± 0.01s**

No 16	1.15 ± 0.01s	No 49	1.04 ± 0.01s	No 82	1.24 ± 0.01s
No 17	1.17 ± 0.01s	No 50	1.32 ± 0.01s	No 83	1.03 ± 0.01s
No 18	1.09 ± 0.01s	No 51	1.40 ± 0.01s	No 84	1.07 ± 0.01s
No 19	1.09 ± 0.01s	No 52	1.20 ± 0.01s	No 85	1.10 ± 0.01s
No 20	1.13 ± 0.01s	No 53	0.98 ± 0.01s	No 86	1.13 ± 0.01s
No 21	1.12 ± 0.01s	No 54	1.22 ± 0.01s	No 87	1.11 ± 0.01s
No 22	1.18 ± 0.01s	No 55	1.06 ± 0.01s	No 88	1.32 ± 0.01s
No 23	1.01 ± 0.01s	No 56	1.04 ± 0.01s	No 89	1.17 ± 0.01s
No 24	1.14 ± 0.01s	No 57	1.05 ± 0.01s	No 90	1.22 ± 0.01s
No 25	1.05 ± 0.01s	No 58	0.96 ± 0.01s	No 91	1.13 ± 0.01s
No 26	1.17 ± 0.01s	No 59	1.12 ± 0.01s	No 92	1.04 ± 0.01s
No 27	1.11 ± 0.01s	No 60	1.12 ± 0.01s	No 93	1.25 ± 0.01s
No 28	1.26 ± 0.01s	No 61	1.02 ± 0.01s	No 94	1.28 ± 0.01s
No 29	1.08 ± 0.01s	No 62	1.18 ± 0.01s	No 95	1.10 ± 0.01s
No 30	1.09 ± 0.01s	No 63	1.15 ± 0.01s	No 96	1.07 ± 0.01s
No 31	0.99 ± 0.01s	No 64	1.07 ± 0.01s	No 97	1.05 ± 0.01s
No 32	1.19 ± 0.01s	No 65	1.21 ± 0.01s	No 98	1.09 ± 0.01s
No 33	1.04 ± 0.01s	No 66	0.93 ± 0.01s	No 99	0.99 ± 0.01s

Distance: 6.49 m

Average Time: 1.05 ± 0.01

Speed of pulse: $\frac{6.49}{1.05} = 6.18\ m/sec$

Conclusion/Discussion:

The velocity of the pulse was calculated successfully by measuring the distance and the time taken for the pulse to travel along the thin metallic spring, then applying the formula v = s/t.

The velocity of the pulse was calculated from the data, but as the results clearly show, each attempt produced a different result, mostly because of human errors and inaccuracies. The reaction of the time of the person operating the stopwatch would have had an effect on the measurements, as would the reaction time of the person who must repeat the flicking every time the reflection arrives at his end of the spring. The person may flick the spring slightly before or after the reflection arrives, which would therefore, affect the time recorded.

Also, the fact that the thin metallic spring was placed on the floor would have had an effect due to friction slowing the pulse down. Other factors that might have had an impact on the accuracy of the measurements could be inaccuracy in the measurements of the distance, or imperfections on the spring, such as kinks, since the spring was rather old, rusty and weak.

Improvements:

One improvement in this particular experiment could be the use of a new thin metallic spring rather than the old, rusty and weak spring that we used. Another improvement could be using electronic timing equipment and videotaping the movement, which would give us a much more accurate result, since we could actually see in the frames/sec the start of the pulse and the end of it. One last improvement would be to repeat the experiment some more times and also maybe use different size springs.