Chiropodist	Expected numbers		O-E		$(O-E)^2/E$	
	Correct I/Ds	Incorrect I/Ds	Correct I/Ds	Incorrect I/Ds	Correct I/Ds	Incorrect I/Ds
6	44.4	15.6	-2.4	2.4	.1297	.369
7	44.4	15.6	-8.4	8.4	1.589	4.523
8	44.4	15.6	15.6	-15.6	5.48	15.6
9	44.4	15.6	-2.4	2.4	.1297	.369
10	44.4	15.6	-2.4	2.4	.1297	.369
Total	222	78	0	0	7.458	21.23

(Where O = Observed No. and E = Expected No.)

$\chi^2 = 7.458 + 21.23 = 28.688$

Degrees of freedom = (Number of columns minus 1) x (Number of rows minus 1) = (2-1) x (5-1) = 4 degrees of freedom.

Entering the χ^2 table at 4 degrees of freedom, $P>0.001$

This is a very highly significant result and indicates that the probability of the difference in the degree of success of chiropodists undertaking identification tests in Brighton arising by chance is less than 0.1%, therefore an apparent difference in success is shown for the Test 1 Situation.

Appendix 24

χ^2 test for the differences in proportions correctly identified/eliminated by respective chiropodists in the Brighton District (for the combined result of Situations 1 and 2 in Test 1), not including the results of chiropodist 8.

Brighton District results less the results of chiropodist 8

Chiropodist	Correct Identifications	Incorrect Identifications	Total
6	42	18	60
7	36	24	60
9	42	18	60
10	42	18	60
Total	162	78	240

Null Hypothesis - that there is no difference between the success rates of the above chiropodists in undertaking identification from chiropody records in the Brighton District for the Situation represented by Test 1.

Assume the proportion identified is the same for each chiropodist as it is for all combined. This total is derived from the total identified, and for the above chiropodists = $\frac{162.}{240}$

Calculation of χ^2 on the above figures

To find the expected number identified by each chiropodist, multiply the actual number in the total column by the proportion $\frac{162}{240}$.

Chiropodist	Expected numbers		O-E		$(O-E)^2/E$	
	Correct I/Ds	Incorrect I/Ds	Correct I/Ds	Incorrect I/Ds	Correct I/Ds	Incorrect I/Ds
6	40.5	19.5	1.5	-1.5	.055	.115
7	40.5	19.5	-4.5	4.5	1.742	1.038
9	40.5	19.5	1.5	-1.5	.055	.115
10	40.5	19.5	1.5	-1.5	.055	.115
Total	162	78	0	0	1.978	1.383

(Where O = Observed No. and E = Expected No.)

$\chi^2 = 1.978 + 1.383 = 3.361$

Degrees of freedom - (Number of columns minus 1) x (Number of rows minus 1) = (2-1) x (4-1) = 3 degrees of freedom

Entering the χ^2 table at 3 degrees of freedom, $0.50>P>0.10$

This is a non-significant result, indicating that the success of chiropodists other than chiropodist 8 in Brighton appears to be equal, there being 10-50% probability that the differences observed arose by chance alone.

Appendix 25

χ^2 test for the differences in proportions correctly identified/eliminated by respective chiropodists in the Sheffield District (for the combined results of Situations 1 and 2 in Test 2).

Sheffield District Results

Chiropodist	Correct Identification	Incorrect Identification	Total
1	31	0	31
2	32	2	34
3	30	0	30
4	33	1	34
5	32	0	32
Total	158	3	161

Null Hypothesis - that there is no difference between the success rates of chiropodists in undertaking identification from chiropody records in the Sheffield District for the Situation represented by Test 2.

Assume the proportion identified is the same for each chiropodist as it is for all combined. This total is derived from the total identified and for correct identifications in Sheffield:

Chiropodist 1 = $\frac{31}{161}$ x 158 = 30.42

Chiropodist 2 = $\frac{34}{161}$ x 158 = 33.37

Chiropodist 3 = $\frac{30}{161}$ x 158 = 29.44

Chiropodist 4 = $\frac{34}{161}$ x 158 = 33.37

Chiropodist 5 = $\frac{32}{161}$ x 158 = 31.40

For incorrect identifications in Sheffield:

Chiropodist 1 = $\frac{31}{161}$ x 3 = .58

Chiropodist 2 = $\frac{34}{161}$ x 3 = .63

Chiropodist 3 = $\frac{30}{161}$ x 3 = .56

Chiropodist 4 = $\frac{34}{161}$ x 3 = .63

Chiropodist 5 = $\frac{32}{161}$ x 3 = .6

Chiropodist	Expected numbers		O-E		$(O-E)^2/E$	
	Correct I/Ds	Incorrect I/Ds	Correct I/Ds	Incorrect I/Ds	Correct I/Ds	Incorrect I/Ds
1	30.42	.58	.58	-0.58	.011	.58
2	33.37	.63	-1.37	1.37	.056	2.98
3	29.44	.56	.56	-0.56	.0106	.56
4	33.37	.63	-0.37	.37	.004	.22
5	31.4	.6	.6	-0.6	.011	.6
Total	158	3	0	0	.192	4.94

(Where O = Observed No. and E = Expected No.)

$\chi^2 = .192 + 4.94 = 5.132$

Degrees of freedom = (Number of columns minus 1) x (Number of rows minus 1) = (2-1) x (5-1) = 4.

Entering the χ^2 table at 4 degrees of freedom, $0.50>P>0.10$.

This is a non-significant result and indicates that in the Sheffield District, the success of identification by respective chiropodists for the Situation represented by Test 2 is equal, the differences observed having a 10-50% probability of arising by chance alone. Thus, the null hypothesis stands.

Appendix 26

χ^2 test for differences in proportions correctly identified/eliminated by respective chiropodists in the Brighton District (for the combined results of Situations 1 and 2 in Test 2).

Brighton District Results

Chiropodist	Correct Identification	Incorrect Identification	Total
6	15	2	17
7	20	9	29
8	6	0	6
9	49	11	60
10	19	16	35
Total	109	38	147

Null Hypothesis - that there is no difference between the success rates of chiropodists undertaking identification from chiropody records in the Brighton District for the Situation represented by Test 2.

Assume the proportion identified is the same for each chiropodist as it is for all combined. This total is derived from the total identified and for correct identifications in Brighton:

Chiropodist 6 $= \frac{17}{147} \times 109 = 12.6$

Chiropodist 7 $= \frac{29}{147} \times 109 = 21.5$

Chiropodist 8 $= \frac{6}{147} \times 109 = 4.45$

Chiropodist 9 $= \frac{60}{147} \times 109 = 44.5$

Chiropodist 10 $= \frac{35}{147} \times 109 = 25.95$

For incorrect identifications in Brighton:

Chiropodist 6 $= \frac{17}{147} \times 38 = 4.4$

Chiropodist 7 = $\frac{29}{147}$ x 38 = 7.5

Chiropodist 8 = $\frac{6}{147}$ x 38 = 1.55

Chiropodist 9 = $\frac{60}{147}$ x 38 = 15.5

Chiropodist 10 = $\frac{35}{147}$ x 38 = 9.05

Chiropodist	Expected numbers		0-E		$(0-E)^2/E$	
	Correct I/Ds	Incorrect I/Ds	Correct I/Ds	Incorrect I/Ds	Correct I/Ds	Incorrect I/Ds
6	12.6	4.4	2.4	-2.4	.457	1.31
7	21.5	7.5	-1.5	1.5	.104	0.3
8	4.45	1.55	1.55	-1.55	.54	1.55
9	44.5	15.5	4.5	-4.5	.455	1.3
10	25.95	9.05	-6.95	6.95	1.86	5.34
Total	109	38	0	0	3.416	9.81

(Where O = Observed No. and E = Expected No.)

$\chi^2 = 3.146 + 9.81 = 13.226$

Degrees of freedom = (Number of columns minus 1) x (Number of rows minus 1) = (2-1) x (5-1) = 4.

Entering the χ^2 table at 4 degrees of freedom, $0.02>P>0.01$, hence the result is statistically significant and the null hypothesis can be rejected.

This significant result indicates that the probability of the difference in the degree of success of chiropodists undertaking identification tests in Brighton arising by chance is less than 2%, therefore an apparent difference in success is shown for the Test 2 Situation, with chiropodist 10 demonstrating a significantly lower success rate than the other chiropodists.

Appendix 27

χ^2 test for the differences in proportions correctly identified/eliminated by respective chiropodists in the Brighton District (for the combined results of Situations 1 and 2 in Test 2), not including the results of chiropodist 10.

Brighton District results less the results of chiropodist 10

Chiropodist	Correct Identification	Incorrect Identification	Total
6	15	2	17
7	20	9	29
8	6	0	6
9	49	11	60
Total	90	22	112

Null Hypothesis - that there is no difference between the success rates of chiropodists undertaking identification from chiropody records in the Brighton District for the Situation represented by Test 2.

Assume the proportion identified is the same for each chiropodist as it is for all combined. This total is derived from the total identified and for correct identifications by the above chiropodists in Brighton = $\frac{90}{112}$

Chiropodist 6 = $\frac{90}{112}$ x 17 = 13.66

Chiropodist 7 = $\frac{90}{112}$ x 29 = 23.31

Chiropodist 8 = $\frac{90}{112}$ x 6 = 4.82

Chiropodist 9 = $\frac{90}{112}$ x 60 = 48.21

For incorrect identification the proportion = $\frac{22}{112}$

Chiropodist 6 = $\frac{22}{112}$ x 17 = 3.54

Chiropodist 7 = $\frac{22}{112}$ x 29 = 5.69

Chiropodist 8 = $\frac{22}{112}$ x 6 = 1.18

Chiropodist 9 = $\frac{22}{112}$ x 60 = 11.79

Chiropodist	Expected numbers		O-E		$(O-E)^2/E$	
	Correct I/Ds	Incorrect I/Ds	Correct I/Ds	Incorrect I/Ds	Correct I/Ds	Incorrect I/Ds
6	13.66	3.34	1.34	-1.34	.131	.538
7	23.31	5.70	-3.31	3.31	.47	1.92
8	4.82	1.18	1.18	-1.18	.29	1.18
9	48.20	11.8	0.79	-0.79	.0129	.053
Total	89.99	22.02	0	0	.9039	3.691

(Where O = Observed No. and E = Expected No.)

$\chi^2 = .9030 + 3.691 = 4.5949$

Degrees of freedom = (Number of columns minus 1) x (Number of rows minus 1) = (2-1) x (4-1) = 3 degrees of freedom
2

Entering the table at 3 degrees of freedom, $0.50>P>0.10$.

This is a non-significant result.

Therefore, the success of the above chiropodists in Brighton District in undertaking identification from chiropody records appears to be equal, there being 10-50% probability of the differences observed arising by chance alone.

Appendix 28

χ^2 test to compare the success of identification/elimination in the Test 1 Situation, with the success of identification/elimination in the Test 2 Situation (for Situations 1 and 2 combined).

Obtained frequencies

	Correct	Incorrect	Total
Test 1	515	85	600
Test 2	267	41	308

Null Hypothesis - that there is no difference between the success of identification in the Test 1 Situation, and success in the Test 2 Situation.

Using:

	Correct	Incorrect	Total
Test 1	a	b	a + b
Test 2	c	d	c + d
Total	a + c	b + d	a+b+c+d

$$\chi^2 = \frac{(ad - bc)^2 (a+b+c+d)}{(a+b)(c+d)(b+d)(a+c)}$$

$$\chi^2 = \frac{(515 \times 41 - 85 \times 267)^2 (908)}{(600)(308)(126)(782)}$$

$\chi^2 = 0.1245$

When comparing one sample with another, the rule for degrees of freedom is that they equal (Number of columns minus 1) x (Number of rows minus 1). Thus, with the above 4 fold table, there is one degree of freedom.

Entering the χ^2 table at 1 degree of freedom, $0.455>P$, therefore $0.50>P$. This is a non-significant result indicating that the probability of the difference observed occurring by chance alone is much greater than 50%, therefore the null hypothesis that there is no significant difference between results obtained from Test 1 and results obtained from Test 2 stands. i.e. there is equal degrees of success in identification in each of the Situations represented by these tests.

Appendix 29

χ^2 test to compare differences between results obtained from Situation 2 (using a nominated chiropodist's notes), and Situation 3 (using notes obtained from chiropodists taken at random in Test 1 to show whether in practice, the success of identification/elimination would be significantly different in the Test 1 Situation.

Obtained frequencies

	Correct	Incorrect	Total
Nominated chiropodists notes	247	53	300
Random chiropodists notes	255	45	300
Total	502	98	600

Null Hypothesis - that there is no significant difference between results obtained from a nominated chiropodists notes, and results obtained from random chiropodists notes, and therefore no difference expected in practice, for the Situation represented by Test 1.

Using:

	Correct	Incorrect	Total
Nominated chiropodists notes	a	b	a + b
Random chiropodists notes	c	d	c + d
Total	a + c	b + d	a+b+c+d

$$\chi^2 = \frac{(ad - bc)^2 (a+b+c+d)}{(a+b)(c+d)(b+d)(a+c)}$$

$$\chi^2 = \frac{(247 \times 45 - 53 \times 255)^2 (600)}{(300)(300)(98)(502)}$$

$$\chi^2 = 0.78$$

When comparing one sample with another, the rule for degrees of freedom is that they equal (Number of columns minus 1) x (Number of rows minus 1). Thus, with the above 4 fold table, there is one degree of freedom. Entering the χ^2 table at 1 degree of freedom, $0.455>P>2.706$, therefore $0.50>P>0.10$.

This is a non-significant result indicating that the probability of the difference observed occurring by chance is greater than 10%, therefore the null hypothesis that there is no significant difference between results obtained from a nominated chiropodists notes, and notes made by chiropodists taken at random and therefore no difference expected in practice for the Situation represented by Test 1 stands.

Appendix 30

χ^2 test to compare differences between results obtained from Situation 2 (using a nominated chiropodists notes) and Situation 3 (using notes obtained from chiropodists taken at random) for Test 2, to show whether in practice, the success of identification/elimination would be significantly different in the Test 2 Situation.

Obtained frequencies

	Correct	Incorrect	Total
Nominated chiropodists notes	140	23	163
Random chiropodists notes	151	28	179
Total	291	51	342

Null Hypothesis - that there is no significant difference between results obtained from a nominated chiropodists notes, and results obtained from random chiropodists notes, and therefore no difference expected in practice, for the Situation represented by Test 2.

Using:

	Correct	Incorrect	Total
Nominated chiropodists notes	a	b	a + b
Random chiropodists notes	c	d	c + d
Total	a + c	b + d	a+b+c+d

$$\chi^2 = \frac{(ad - bc)^2 (a+b+c+d)}{(a+b)(c+d)(b+d)(a+c)}$$

$$\chi^2 = \frac{(140 \times 28 - 23 \times 151)^2 (342)}{(163)(179)(51)(291)}$$

$$\chi^2 = 0.1578$$

When comparing one sample with another, the rule for degrees of freedom is that they equal (Number of columns minus 1) x (Number of rows minus 1). Thus, with the above 4 fold table, there is one degree of freedom.
Entering the χ^2 table at 1 degree of freedom, $P>0.50$.
This is a non-significant result, indicating that the

probability of the difference observed occurring by chance is greater than 50%, therefore the null hypothesis that there is no significant difference between results obtained from a nominated chiropodists notes, and notes made by chiropodists taken at random, and therefore no difference expected in practice for the Situation represented by Test 2 stands.