Paired t-Tests

These questions are for you to complete in your own time. Please use them for extra revision of the concepts discussed in lectures and practised in tutorials. For help with these questions, you can ask any of your tutorial leaders or visit Maths-Aid. Maths-Aid can be found in Room 1.16 on Level 1 of the Marjorie Robinson Library and can be contacted at mathsaid@ncl.ac.uk.

One Tailed

1) A lecturer believes that students in his class are not getting enough sleep to perform to the best of their ability on tests. To test this theory, he asks 10 students in his class to keep sleep diaries over a four week period. He tells the students to ensure they sleep for 8 hours per night. At the beginning and end of the four weeks, all the students take a standard IQ test. Scores on the test at the beginning and end of the four week period are below. Is there any evidence to support the researcher's theory that longer periods of sleep improve performance?

Participant	First Test Score	Second Test Score
1	92	102
2	97	100
3	76	74
4	87	85
5	80	83
6	79	89
7	99	100
8	111	112
9	103	99
10	93	97

2) A pharmaceutical company is testing a new drug for the treatment of cognitive impairments in dementia. They expect patient performance on a test of executive function to improve following a course of treatment that last 3 months – that is to say, they will score more highly on the test. The cognitive test is a visual Go/NoGo task where the patients must press a buzzer if they see a circle appear on a screen but not if they see a square. The patients take the task at the start and end of the three month period.

To analyse the data, the company calculates d' values for each patients in each test.

Thirteen patients were tested in total. Their d' values before and after treatment are below. Is there evidence to suggest the drug works?

Participant	Before treatment	After treatment
1	1.23	2.45
2	2.08	2.90
3	3.67	3.87
4	2.45	4.76
5	2.87	3.99
6	2.34	2.88
7	2.84	3.07
8	3.04	3.86
9	1.56	2.97
10	1.94	1.02
11	1.46	1.45
12	1.85	2.83
13	2.74	1.93

Two Tailed

3) A health psychology student is testing a new intervention to be used with individuals who are overweight. The intervention takes an aggressive approach with patients who admit to constantly snacking. To this end, it is unclear whether the intervention will lead to the desired effect of reduced weight or whether the patient's weight will increase due to the stress of the intervention. The patients were weighed prior to the intervention and 6 weeks post intervention. Is there evidence of any effect of intervention?

Participant	Weight before (kg)	Weight after (kg)
1	104	90
2	120	104
3	111	115
4	108	110
5	123	113
6	109	100
7	103	135
8	119	123
9	103	98
10	130	97
11	122	102
12	125	128

Solutions

One Tailed

1) $t = 1.6, v = 9, p = 0.144 > 0.05$, the result is not significant.

2) $t = 2.47, v = 12, p = 0.029 < 0.05$, the result is significant.

Two Tailed

3) $t = 1.103, v = 11, p = 0.294 > 0.025$ (we use 0.025 instead of 0.05 because the test is 2-tailed), the result is not significant.