A beginner's guide to the p-value

A p-value is a number that determines whether a result in a study is meaningful or due by chance. In many journal articles, you'll often see something like:

Table 3. Differences in reasons for going to university based on personal circumstance.

Reasons for going to university item	Circumstance	M	M_{rank}	Mdn	U	z	p
Personal development	Carers	4.74	153.70	5.00	3045.00	−2.75	.006
	Non-carers	4.49	123.03	5.00			
To make friends	Carers	3.42	102.96	4.00	4811.50	2.21	.027
	Non-carers	3.87	129.98	4.00			
	Under-21s	3.90	134.56	4.00	4405.50	−3.49	<.001
	Mature	3.48	100.25	4.00			
	EFL	3.87	128.26	4.00	3684.00	−2.10	.036
	ESL	3.55	104.87	4.00			
To change direction in my life	Under-21s	3.99	116.37	4.00	6992.50	2.63	.009
	Mature	4.35	141.76	5.00			
For the enjoyment of learning	Carers	4.53	149.76	5.00	3191.00	−2.13	.033
	Non-carers	4.08	123.71	4.00			
To improve my potential future earnings	Carers	4.42	149.39	5.00	3167.50	−2.31	.021
	Non-carers	4.39	123.16	5.00			
	EFL	4.45	130.47	5.00	3474.00	−2.92	.004
	ESL	4.21	100.20	4.00			
	Home	4.43	128.62	5.00	4346.50	1.96	.05
	International	4.21	105.66	4.00			

1. How does it work?

When conducting a study, researchers set up a null hypothesis (H_0) (see next section).

The p-value tells us whether or not the results from a study can be obtained if the null hypothesis were true.

A **small** p-value (usually ≤ 0.05) suggests the findings are meaningful (i.e. strong evidence **against** H_0).

A **large** p-value (usually > 0.05) suggests the findings could be due to random chance (i.e. weak evidence against the H_0).

2. What is the null hypothesis?

The null hypothesis (H_0) is the assumption that there is no difference or real effect. Normally, it serves as a starting point when doing research.

For example, a researcher tests if a new method of therapy reduces anxiety. The null hypothesis (H_0) of this research would be that the therapy has **no effect** (i.e. anxiety levels will remain unchanged). If the p-value of the research is 0.03 (a **small** value < 0.05), this suggests strong evidence **against** H_0 which indicates that the therapy does work.

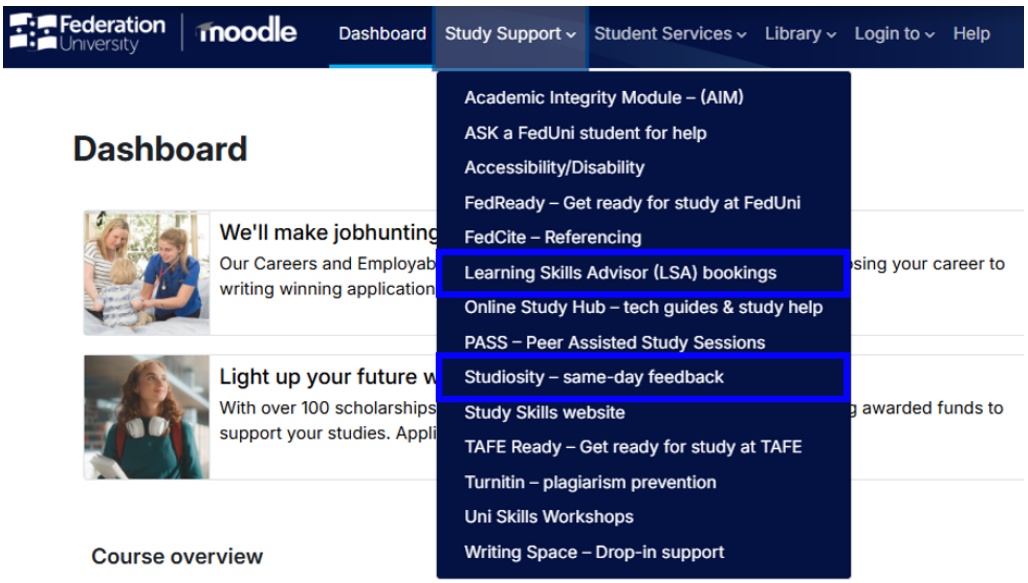
Another researcher is investigating whether a new wound care treatment can speed up recovery. The H_0 in this case would be that the new treatment has no effect compared to standard care. If the p-value of the research is 0.10, there is weak evidence, suggesting that they may need more data.

3. Common misconceptions

A p-value is **NOT** the probability that the hypothesis is true. Think of the p-value more as an indicator of whether the results are meaningful or not.

A p-value of 0.05 does **NOT** mean there is a 95% chance the result is real. Instead, it means that there is a 5% chance (so, very low possibility) that the result the research observed could happen under the null hypothesis.

Further support



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