

# 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	<i>M</i>	<i>M<sub>rank</sub></i>	Mdn	<i>U</i>	<i>z</i>	<i>p</i>
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  $\leq 0.05$ ) 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.



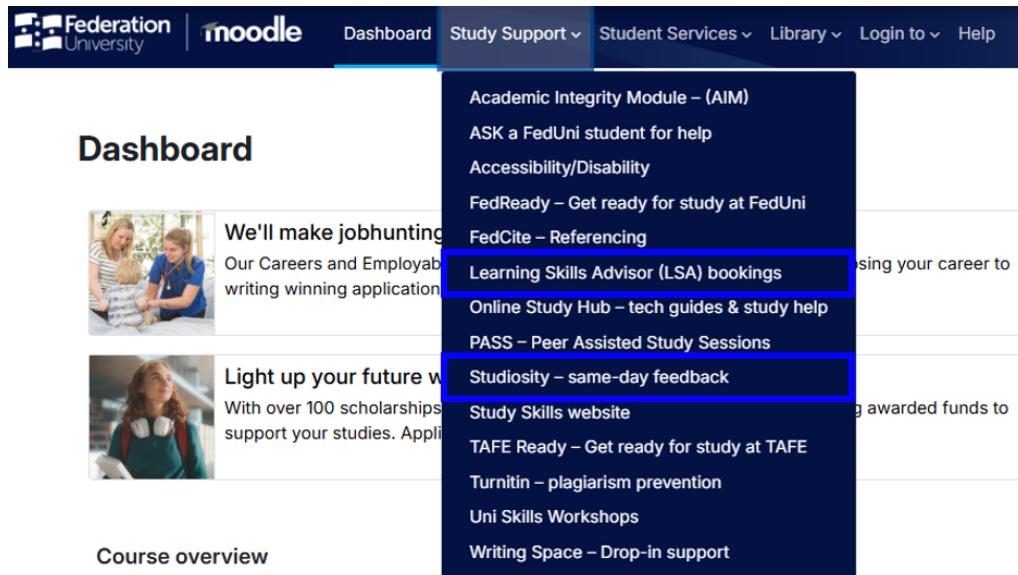
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### 3. Common misconceptions

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



The screenshot shows the Moodle dashboard of Federation University. The top navigation bar includes the Federation University logo, moodle, Dashboard, Study Support (with a dropdown menu), Student Services, Library, Login to, and Help. The 'Study Support' dropdown menu is open, listing various services: Academic Integrity Module – (AIM), ASK a FedUni student for help, Accessibility/Disability, FedReady – Get ready for study at FedUni, FedCite – Referencing, Learning Skills Advisor (LSA) bookings, Online Study Hub – tech guides & study help, PASS – Peer Assisted Study Sessions, Studiosity – same-day feedback, Study Skills website, TAFE Ready – Get ready for study at TAFE, Turnitin – plagiarism prevention, Uni Skills Workshops, and Writing Space – Drop-in support. The 'Learning Skills Advisor (LSA) bookings' and 'Studiosity – same-day feedback' options are highlighted with blue boxes.

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