



Uni-Edit 写作技巧 011

怎样准确有效的使用‘significant’这个词

难度：中階

你肯定不止一次見過在帶有统计结果或讨论某事重要性的科技论文中使用见到‘significant’这个词的使用，可是，你是否知道‘significant’这个词根据是否用在表达统计或非统计的意义中，它的意思是不同的。

举例，请看下面论文中的这句话是否有问题：

Significant levels of bisphenol-A were detected in 47 of the 50 sites sampled (85.0%).

(在 50 个采样点中， 47 个采样点中的双酚-A 检测达显著水平 (85.0%)。)

清楚的是，‘significant’在这里表达的是普通含义，表示程度或范围，但不清楚的是作者指的是程度的重要性、相关性还是统计意义上的数量解释。

为了让我们的写作技巧清楚易懂，让大家能区分常见的例子，我们将‘significant’的用法分为两大类：统计性与非统计性。

统计性

在统计性意义上，‘significant’通常用在结果部分，根据 P 值，表明变量与零假设或基准数的差异，通常設定 $P < 0.05$ 。

There was a statistically significant difference between the experiment and control groups ($P < 0.05$), leading us to reject our null hypothesis.

(在实验组与对照组之间有显著的不同 ($P < 0.05$)，因而否定了零假设。)

这意味着，两组之间的数量差异已大到足以满足对二者差异分析的统计标准。

顺便说一下，将形容词搭配副词‘significantly’使用的表达通常会更有效、更自然，读者凭直觉就可以明白这种比较。

普通表达：**There was a statistically significant difference between the time taken by our nutrient extraction method to extract 1 kg of oleic acid and that taken by the leading conventional method (Robinson et al., 2015) (6.3 ± 1.2 h vs. 8.0 ± 0.5 h; $p = 0.032$).**

(提取一公斤的油酸, 在花费的时间上, 使用营养提取方法提取和传统方法提取有显著不同。
(Robinson et al., 2015) (6.3±1.2 h vs. 8.0±0.5 h; p=0.032).)

更好的表达: **Our nutrient extraction method extracted 1 kg of oleic acid significantly faster than the leading conventional method (Robinson et al., 2015) (6.3±1.2 h vs. 8.0±0.5 h; p=0.032).**

(使用营养提取方法提取一公斤的油酸比传统方法快很多。(Robinson et al., 2015) (6.3±1.2 h vs. 8.0±0.5 h; p=0.032).)

非统计性

通常来讲, 在非统计性意义上, 'significant'通常表达某事的重要性及相关性。

Iron ore is a significant export contributing to Australia's economy.

(铁矿石是促进澳大利亚经济发展的重要出口品。)

可以换种方式表达: **Iron is an important export contributing to Australia's economy.**

(铁矿石是促进澳大利亚经济发展的重要出口品。)

Our finding that rice paddy runoff reduces salinity of adjacent lagoons bears significance on India's aquacultural policy.

(我们的调查结果发现稻田的径流量会减少相邻池塘的盐度, 这对印度的水产养殖政策具有重要的影响。)

这句话可以换种方式表达: **Our finding that rice paddy runoff reduces the salinity of adjacent lagoons has relevance to India's aquacultural policy.**

(我们的调查结果发现稻田的径流量会减少相邻池塘的盐度, 这与印度的水产养殖政策有相关性。)

这里的'significant'都是一般意义。例如, 第一句话并不是分析所有澳大利亚的出口品, 其统计结果只表明铁矿石的出口数量远的影响大于其他商品, 及澳大利亚出口大量的铁矿石(澳大利亚也出口羊毛和小麦, 但是与此研究不相关。)

消除歧义-例 1

Significant levels of bisphenol-A were detected in 47 of the 50 sites sampled (85.0%).

在这里作者的意思是含量比一般水平高呢? 还是说检测结果很重要(令人担忧的结果)? 即便作者要把这两层含义都表达出来, 这句话也需要重新改写。

1) 就语法的表达, 读者有理由假设双酚-A 是有益的, 含量低将是令人担忧的问题。

2) 没有比较的对象: 是和什么对比含量高?

表示重要性: **The high levels of bisphenol-A detected in 47 of the 50 sites samples (85.0%) are cause for concern.**

(在 50 个采样点中, 47 个采样点中检测到双酚-A 的含量高, 这令人担忧。)

表示统计意义上显著的: **Levels of bisphenol-A significantly higher (p<0.001) than the amount EPA guidelines consider safe were detected in 47 of the 50 sites sampled (85.0%).**

(在 50 个采样点中,47 个采样点中检测到双酚-A 的含量明显高于环保局规定的安全标准。(p<0.001))

消除歧义-例 2

Our results agree with the significant findings of Kang et al. (2006), who found that β -carotene production was more efficient in 5% kerosene-supplemented media than in non-supplemented media.

(我们的结果与 Kang 等人的重要调查结果一致：他们发现比起没有添加的介质， β -胡萝卜素的生产在添加了 5%煤油的介质中更为高效。)

作者是说 kang 等人的调查结果在统计意义上非常显著？这一点在明确的比较“添加了 5%煤油的介质”和“无添加的介质”中得到暗示，或者作者的意思是说 Kang 等人的调查结果十分重要具有开创性？作者很有可能要表达这两层意思，如果 Kang 等人的调查结果既显著又具有开创性。这种用法是可接受的，然而如有必要，我们可以把意思表达仅限于一种，这样会更明确。（例：如果 Kang 等人的调查结果不是特别的新颖。）

表示重要性：Our results agree with the major findings of Kang et al. (2006), who found that β -carotene production was more efficient in 5% kerosene-supplemented media than in non-supplemented media.

(我们的结果与 Kang 等人(2006)的主要调查结果一致：他们发现 β -胡萝卜素的产量在添加了 5%煤油介质中比在无添加介质中产量更高。)

表示统计意义上显著的：Our results agree with the findings of Kang et al. (2006), who found that β -carotene production was significantly more efficient in 5% kerosene-supplemented media than in non-supplemented media ($F_{4,15} = 25.6, P < 0.001$).

(我们的结果与 Kang 等人的调查结果一致：他们发现比起没有添加的介质， β -胡萝卜素的生产在补充了 5%煤油的介质中明显的更为高效。(F_{4,15} = 25.6, P < 0.001).)

总结

根据以上的例子，我们归纳如下：

- 1) 用来衡量数量、重要性及相关性
- 2) 按其使用可以分为两大类：统计性、非统计性

完

Uni-edit English Writing Tip 011

How to significantly improve your usage of the term 'significant'

Difficulty: Intermediate

How many times have you seen the word 'significant' used in a scientific paper either with statistical results or to discuss the importance of something? Did you know its meaning is different depending on if it is used in a statistical or non-statistical sense?

For example, what's wrong with this sentence from a paper's Discussion section?

Significant levels of bisphenol-A were detected in 47 of the 50 sites sampled (85.0%).

What is clear is that 'significant' is used in a general sense, to indicate degree or extent. What is unclear is whether the author is referring to the levels' importance or relevance, or instead to a statistical, quantitative interpretation.

To make this writing tip easy to follow and distinguish common examples, we divide 'significant' into two categories: 'statistical' and 'non-statistical'.

Statistical Usage

In its statistical sense, 'significant' is commonly used in the Results section to indicate how much a variable differs from a null hypothesis or baseline measurement based on the P-value, usually $P < 0.05$.

There was a statistically significant difference between the experiment and control groups ($P < 0.05$), leading us to reject our null hypothesis.

This means the quantitative difference between the two groups was large enough to satisfy the statistical criteria of the analysis comparing the two groups.

By the way, it is often more effective and natural to combine the adverb form 'significantly' with an adjective, so that readers intuitively understand the axis of measurement.

Okay: There was a statistically significant difference between the time taken by our nutrient extraction method to extract 1 kg of oleic acid and that taken by the leading conventional method (Robinson et al., 2015) (6.3 ± 1.2 h vs. 8.0 ± 0.5 h; $p = 0.032$).

Better: Our nutrient extraction method extracted 1 kg of oleic acid significantly faster than the leading conventional method (Robinson et al., 2015) (6.3 ± 1.2 h vs. 8.0 ± 0.5 h; $p = 0.032$).

Non-statistical Usage

In its non-statistical sense, 'significant' is commonly used to express the importance or relevance of something, generally speaking.

Iron ore is a significant export contributing to Australia's economy.

This could be rephrased to: Iron is an important export contributing to Australia's economy.

Our finding that rice paddy runoff reduces salinity of adjacent lagoons bears significance on India's aquacultural policy.

This could be rephrased to: Our finding that rice paddy runoff reduces the salinity of adjacent lagoons has relevance to India's aquacultural policy.

The meanings here are general. For example, the first sentence does not mean that all of Australia's exports were analyzed, and our statistical results give us confidence that the quantity of iron was greater than another export. It just means Australia exports a lot of iron (it also exports a lot of wheat and wool, but that's not relevant here).

Resolving ambiguity - Example 1

Significant levels of bisphenol-A were detected in 47 of the 50 sites sampled (85.0%).

Does the author mean that the levels were significantly higher with respect to a standard or baseline measurement? Or that these results were important (and thus cause for concern)? This sentence requires major revision, even if both usages were intended:

- 1.) Based on the grammar alone, a reader is justified in assuming bisphenol-A is good, and that low levels are cause for concern.
- 2.) There is no object of comparison: what are the levels higher (or lower) than?

Important: The high levels of bisphenol-A detected in 47 of the 50 sites samples (85.0%) are cause for concern.

Statistically significant: Levels of bisphenol-A significantly higher ($p < 0.001$) than the amount EPA guidelines consider safe were detected in 47 of the 50 sites sampled (85.0%).

Resolving ambiguity - Example 2

Our results agree with the significant findings of Kang et al. (2006), who found that β -carotene production was more efficient in 5% kerosene-supplemented media than in non-supplemented media.

Does the author mean that the Kang et al.'s findings were statistically significant? This is certainly suggested by the explicit comparison of '5% kerosene-supplemented media' and 'non-supplemented media'. Or does the author mean Kang et al.'s findings were important and ground-breaking? The grammar suggests this interpretation.

The author likely means both! If Kang et al.'s findings were both statistically significant and ground-breaking, this usage is acceptable. However, we can limit the word to one of these usages if warranted (e.g., if Kang et al.'s findings were not particularly novel).

Important: Our results agree with the major findings of Kang et al. (2006), who found that β -carotene production was more efficient in 5% kerosene-supplemented media than in non-supplemented media.

Statistically significant: Our results agree with the findings of Kang et al. (2006), who found that β -carotene production was significantly more efficient in 5% kerosene-supplemented media than in non-supplemented media ($F_{4,15} = 25.6$, $P < 0.001$).

Conclusion

The take-home messages from the above examples are:

- 1.) Significance is used to measure quantity, importance, and relevance; and
- 2.) Its usages can be conveniently categorized as 'statistical' and 'non-statistical'.

END OF TIP