HOW TO INTERPRET THE RESULTS OF A SCIENTIFIC ARTICLE?

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HOW TO INTERPRET THE RESULTS OF A SCIENTIFIC ARTICLE?

- Identify the main question and the primary outcome of the study

❖This is important because the sample is often calculated for the analysis of the primary outcome of the study, so inferences about outcomes of secondary outcomes and subgroup analyzes are just observations generating hypotheses, since the chance of false positive (alpha error, most frequently used 5%) and the power of the study (1 - beta, being beta the chance of false negative study, most frequently used 80% power) were considered for the primary outcome.

- Choose the most suitable statistical tests for the study

❖ This is extremely important since the statistical analysis validates the data of the study and allows the extrapolation of the results obtained for the studied population.

❖ The methodological assumptions determine the statistical models to be used.

❖ What we really want to know: how big is the effect and what does it mean and for whom?

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⚠ Attention to interpret the *p* value

- The *p* value can reflect the effect size, the sample size, and the test type (Lang et al. 1988). So, in some cases a statistically significant result merely tells us that a big sample was used.

💡 So, how to know if the effect is big enough to mean something?

- To assess the substantive significance of a result we need to interpret our estimates of the effect size.
- But what means the Effect Size?
  - Is simply a way of quantifying the size of the difference between two groups.
- What means the Spearman Correlation Coefficient (*rho*)?
  - It evaluates the correlation between two outcomes, which can vary from +1 to -1. A correlation of +1 means that there is a perfect positive linear relationship between the variables, while a correlation of -1 indicates the existence of a perfect negative linear relationship. A correlation is considered strong when *r* is greater than +0.7 or lower than -0.7.

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TABLE 1: Thresholds for interpreting effect size

Test	Relevant effect size	Effect size threshold			
		Small	Medium	Large	Very large
Standardized mean difference	d, Δ, Hedges' g	.20	.50	.80	1.30
Correlation	r	.10	.30	.50	.70

Notes: The rationale for these benchmarks can be found in Cohen (1988) at the following pages: d (p.40) and r (pp.79-80). Supplementing Cohen's (1988) original small, medium and large effect sizes, Rosenthal (1996) added a classification of very large, defined as being equivalent to, or greater than d = 1.30 or r = .70.

Ellis, P.D. (2009), "Thresholds for interpreting effect sizes,"

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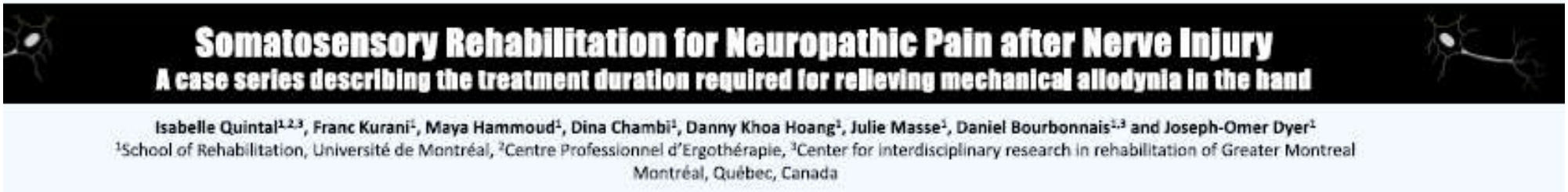
✏ Let's practice? Using this poster presentation of Isabela Quintal and collegues, 2017, how we can interpret the results and make a conclusion?



Somatosensory Rehabilitation for Neuropathic Pain after Nerve Injury

A case series describing the treatment duration required for relieving mechanical allodynia in the hand

Isabelle Quintal[1,2,3], Franc Kurani[1], Maya Hammoud[1], Dina Chambi[1], Danny Khoa Hoang[1], Julie Masse[1], Daniel Bourbonnais[1,3] and Joseph-Omer Dyer[1]
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Montréal, Québec, Canada

OBJECTIVES

This study aims to evaluate:

Main Outcome Measure

1. The duration of treatment using SRPM that is required to relieve SMA at a specific anatomical region, that is the **hand** of patients with PNI
2. Whether the duration of treatment based on SRPM is correlated with the duration of NP symptoms, pain intensity and SMA severity at treatment initiation
3. The effect size of the treatment on pain intensity measurement

Interpretation:

✓ The NP symptoms had a mean duration of 24 months, ranging from 4 to 135 months. The mean duration of SRPM was about 6 months, ranging from 4 to 18 months.

RESULTS

Table 2: Duration of symptoms (Pre-SRPM) and duration of SRPM required to relieve MA

	Duration of NP symptoms (months)	Duration of SRPM (months)
Mean (SD)	24.1 (31.9)	5.5 (7.8)
Median (min; max)	15.5 (4.0; 135.0)	3.7 (1.3; 18.4)

The mean is the average of duration of NP symptoms (middle column) or SRPM (last column) of all the 16 patients included in this study (i.e. the sum of the duration of each patient divided by 16). The mean is followed by the standard deviation that measure how spread out numbers are.

The "median" is the "middle" value in the list of numbers. To find the median, the values have to be listed in numerical order from smallest to largest. As in this case we have 16 patients (even number of information), to find the median, we must find the two central values of the list, add them and divide the result by 2. The median is accompanied by the minimum and maximum value found in the sample.

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Table 3: Correlation (Spearman) of SRPM treatment duration with symptoms duration, MPQ score and SMA severity at treatment initiation

Clinical measures at SRPM initiation	Correlation coefficient	p value
Symptoms duration	0.13	0.63
MPQ	0.55	0.03
SMA severity	0.43	0.10

The Correlation coefficient varied from 0.13 (weak correlation) to 0.55 (moderate correlation). A *rho* of 0.43 means that about 18% of the SRPM duration can be explained by the SMA severity at the beginning of treatment. In the same way, a *rho* of 0.55 means that about 30% of the SRPM duration can be explained by the initial MPQ score. Finally, the symptoms duration can explain only 0,02 % of SRPM treatment duration.

The p value in this case was only significant ($p<0.05$) in the correlation of SRPM treatment duration and MPQ initial score. The *p* value should be analyzed concomitantly with the rho correlation coefficient.

Interpretation:

- ✓ There is no correlation between symptoms duration and SRPM treatment duration.
- ✓ A significant positive correlation was found between MPQ inital score and SRPM treatment duration indicating that the higher the MPQ initial score, the longer the duration of treatment.
- ✓ A moderate non significant positive correlation was also found between VAS score with a 15g pressure and the SRPM treatment, indicating that there is a tendency that the higher the VAS score, the longer the duration of treatment.

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Table 4: Comparison and effect size of pain intensity (/100), for the initial and final assessments

	Initial mean (SD)	Final mean (SD)	P value (paired T-test)	Effect size (Cohen's d)
Pain intensity score (MPQ)	42.81 (17.83)	17.06 (10.64)	< .001	1.75

Interpretation:

- ✓ The SRPM is effective in reducing mechanical allodynia at the hand in individuals with unilateral peripheral neuropathic injury.
  - ✓ This is independent of the duration of injury symptoms.
  - ✓ The severity of symptoms can predict the duration of SRPM treatment.

✓ **The mean value of MPQ before treatment was 43/100 and at the end of treatment was 17/100. It is important to remember that the treatment ends when mechanical allodynia is resorbed (no pain evoked with 15g pressure), so, the MPQ score have probably a correlation with the SMA severity. Probably because in this poster we do not have this information analysis.**

✓ **The paired T-test revealed a strong significant ($p<0.001$) difference between MPQ score before and at the end of treatment.**

✓ **The effect size was very large (d >1,30), indicating that the difference found is big enought to confirm the efficacy of SRPM treatment.**