



Using basic statistics on the individual patient's own numeric data

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Abstract

Introduction: This theoretical report gives an example for how coefficient of variation (CV) and quartile analysis (QA) to assess outliers might be able to be used to analyze numeric data in practice for an individual patient.

Methods: A patient was examined for 8 visits using infrared instrumentation for measurement of mastoid fossa temperature differential (MFTD) readings. The CV and QA were applied to the readings. The participant also completed the Short Form–12 health perception survey on each visit, and these findings were correlated with CV to determine if CV had outcomes support (clinical significance).

Results: An outlier MFTD reading was observed on the eighth visit according to QA that coincided with the largest CV value for the MFTDs. Correlations between the Short Form–12 and CV were low to negligible, positive, and statistically nonsignificant.

Conclusion: This case provides an example of how basic statistical analyses could possibly be applied to numerical data in chiropractic practice for an individual patient. This might add objectivity to analyzing an individual patient's data in practice, particularly if clinical significance of a clinical numerical finding is unknown.

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Introduction

Pattern analysis has been used in chiropractic since the 1940s.¹ Essentially, this approach is used to assess

the patient's neurological health and is based on the theory that dynamic physiologic measures, such as skin temperature, which is under the control of the autonomic part of the central nervous system,² should be dynamic.³ As with other methods of interpretation, pattern analysis suffers from the problem of subjectivity and the paucity of outcomes research. In such cases, where clinical significance may be unknown, statistical significance may be useful, with the patient being his own control.

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The present report uses coefficient of variation (CV) and quartile analysis (QA) to assess variability and outliers, respectively, of an individual patient's data. Previous reports have used standard deviation (SD) to assess for outliers.^{4,5} However, SD alone for variability assessment has a limitation of not accounting for the mean.⁶ In addition, SD is not resistant to outliers, whereas QA does have such a resistance. In addition, this report shows how CV (for variability) can be used in outcomes research by comparing the CV findings to the outcome (in this case, health perception). The use of mastoid fossa temperature differential (MFTD) is only one example of how numerical data generated in chiropractic practice can be subjected to statistical analysis for the individual patient. Most statistical inferences are based on other people and groups, whereas the application of the individual patient's data to him- or herself is a more relevant application and inference. This in turn represents the purpose of the case study, which is to show how basic statistical analysis can improve the objectivity in analyzing numerical data in chiropractic practice for the individual patient, which in turn can reduce clinical uncertainty.⁷⁻⁹

Although there is plenty of literature on statistical analyses used in clinical studies, no literature was found for statistical analyses for an individual patient under the care of an individual practitioner. To investigate this possibly, the purposes of this report are to (1) to investigate if basic statistical analyses could be performed on an individual patient's own

numeric data and (2) to provide a framework for larger outcomes research to determine if the statistical significance has a corresponding clinical significance.

Methods

A relatively healthy 23-year-old white male chiropractic student consented to have the author take MFTD readings on a weekly basis over a 7-week period. Written consent for publication of this case report was provided by the patient. The 8 MFTD readings were taken 1 week apart using the Tytron C-3000 infrared instrument (Titronics R & D, Oxford, IA) beginning on 4-14-04 and ending on 6-2-04 (Table 1). The issues of reliability and validity of this instrument are discussed elsewhere.⁴ The MFTD readings warmer on the left were given a negative sign, whereas those warmer on the right side remained as positive. The participant did not receive any spinal adjustment during the study period (from 4-14-04 to 6-2-04), and his previous adjustment was approximately 3 months prior, on 1-20-04.

The participant completed the Short Form-12 (SF-12) version 2 health perception survey (1-week recall) on each the 8 visits (1 week apart). The survey provides a physical composite summary (PCS) and a mental composite summary (MCS). A higher score indicates better self-rated health perception than a lower score. The expectation is that these 2 types of health

Table 1 Descriptive statistics

Date	MFTD (neg=L)	Mean of 3	SD of 3	CV of 3	Absolute CV	Absolute CV as percentage	PCS	MCS
4/14/2004	-0.5						64.42	35.59
4/21/2004	-0.23						60.88	46.00
4/28/2004	-0.2	-0.31	0.17	-0.533	0.533	53.30	59.59	46.00
5/5/2004	-0.3	-0.24	0.05	-0.211	0.211	21.09	58.76	50.79
5/12/2004	-0.33	-0.28	0.07	-0.246	0.246	24.60	57.14	51.45
5/19/2004	-0.42	-0.35	0.06	-0.178	0.178	17.84	56.95	48.94
5/25/2004	-0.69	-0.48	0.19	-0.390	0.390	39.03	58.76	50.79
6/2/2004	0.17	-0.31	0.44	-1.404	1.404	140.37	56.08	56.70
Q1	-0.44					21.97	57.09	46.00
Q3	-0.22					49.73	59.91	50.96
IQR	0.22					27.76	2.82	4.96
LF	-0.77					-19.68	52.86	38.56
UF	0.10					91.38	64.14	58.39
Skew	0.63					2.04	1.17	-1.15

Mean of 3 and SD of 3 = mean and SD of 3 consecutive MFTD readings. For example, mean and SD of 3 for 4-28-04 is based on that visit (4-28-04), as well as 4-21-04 and 4-14-04. CV of 3 = CV achieved by dividing the SD of 3 by the mean of 3. Absolute CV = CV of 3 without the negative sign. Absolute CV as percentage = absolute CV * 100 for a percentage of variability of a sliding consecutive 3 MFTD readings. Outliers are in boldface.

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