# Can data extraction from figures perform a meta-analysis?

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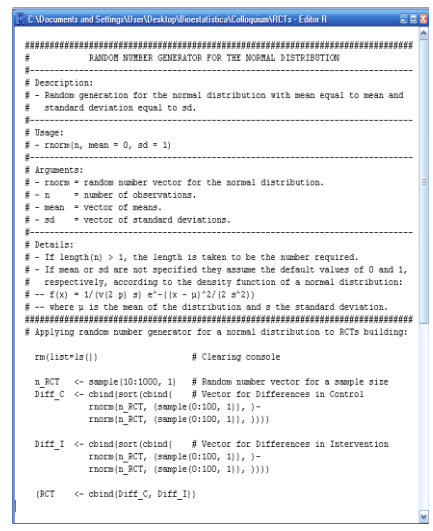
**Background:** Systematic reviews (SR) with the statistical methods of meta-analysis represent the highest level on the evidence to make decision. Extracting data can be a problem when randomized clinical trials (RCT) publish figures as the only source of outcome data. Thus, none included RCTs in the SRs can be lost to perform meta-analysis. In this way, alternative methods to data extraction need to be developed.

**Objectives:** To analyze the precision of alternative methods (rule and software) to data extraction from figures to perform meta-analysis.

**Methods:** All data were produced in a statistical package and were generated 14 RCTs (**Figure 1**). Figures were generated from same RCTs; mean and 95% confidence interval (CI) were used as statistical parameters from figures to elevated the complexity of data extraction; standard deviations was obtained applying the equation: "Sqrt(N) x (upper limit of CI - lower limit of CI) / 3.92". Differences between researchers (VS and AJG) to data extraction were previously compared. After it, one blind researcher (AJG) performed data extraction from figures with a simple rule (**Figure 2a**) and another blind researcher (VS) performed the data extraction with the Digitizelt software (**Figure 2b**). Meta-analyses were performed and compared with data extracted from a rule, software and original data.

**Results:** There are no differences (Chi² = 0.01, df. = 1, P = 0.93; I² = 0%) between researchers (VS and AJG) to data extraction. The results are presented through the **Figures 3 and 4**.



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################################################################################
#           RANDOM NUMBER GENERATOR FOR THE NORMAL DISTRIBUTION
#-------------------------------------------------------------------------------
# Description:
# - Random generation for the normal distribution with mean equal to mean and
#   standard deviation equal to sd.
#-------------------------------------------------------------------------------
# Usage:
# - rnorm(n, mean = 0, sd = 1)
#-------------------------------------------------------------------------------
# Arguments:
# - rnorm = random number vector for the normal distribution.
# - n     = number of observations.
# - mean  = vector of means.
# - sd    = vector of standard deviations.
#-------------------------------------------------------------------------------
# Details:
# - If length(n) > 1, the length is taken to be the number required.
# - If mean or sd are not specified they assume the default values of 0 and 1,
#   respectively, according to the density function of a normal distribution:
# -- f(x) = 1/(v(2 p) s) e^-((x - µ)^2/(2 s^2))
# -- where µ is the mean of the distribution and s the standard deviation.
################################################################################
# Applying random number generator for a normal distribution to RCTs building:

  rm(list=ls())                    # Clearing console

  n_RCT   <- sample(10:1000, 1)    # Random number vector for a sample size
  Diff_C  <- cbind(sort(cbind(     # Vector for Differences in Control
             rnorm(n_RCT, (sample(0:100, 1)), )-
             rnorm(n_RCT, (sample(0:100, 1)), ))

  Diff_I  <- cbind(sort(cbind(     # Vector for Differences in Intervention
             rnorm(n_RCT, (sample(0:100, 1)), )-
             rnorm(n_RCT, (sample(0:100, 1)), ))

  (RCT    <- cbind(Diff_C, Diff_I))
```

**Figure 1**. Script to generate hypothetical RCTs.

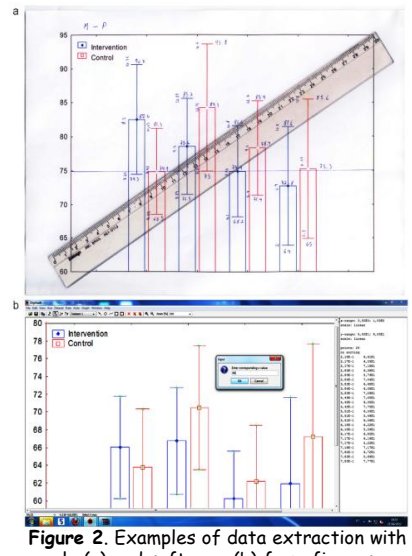


**Figure 2**. Examples of data extraction with a rule (a) and software (b) from figures.

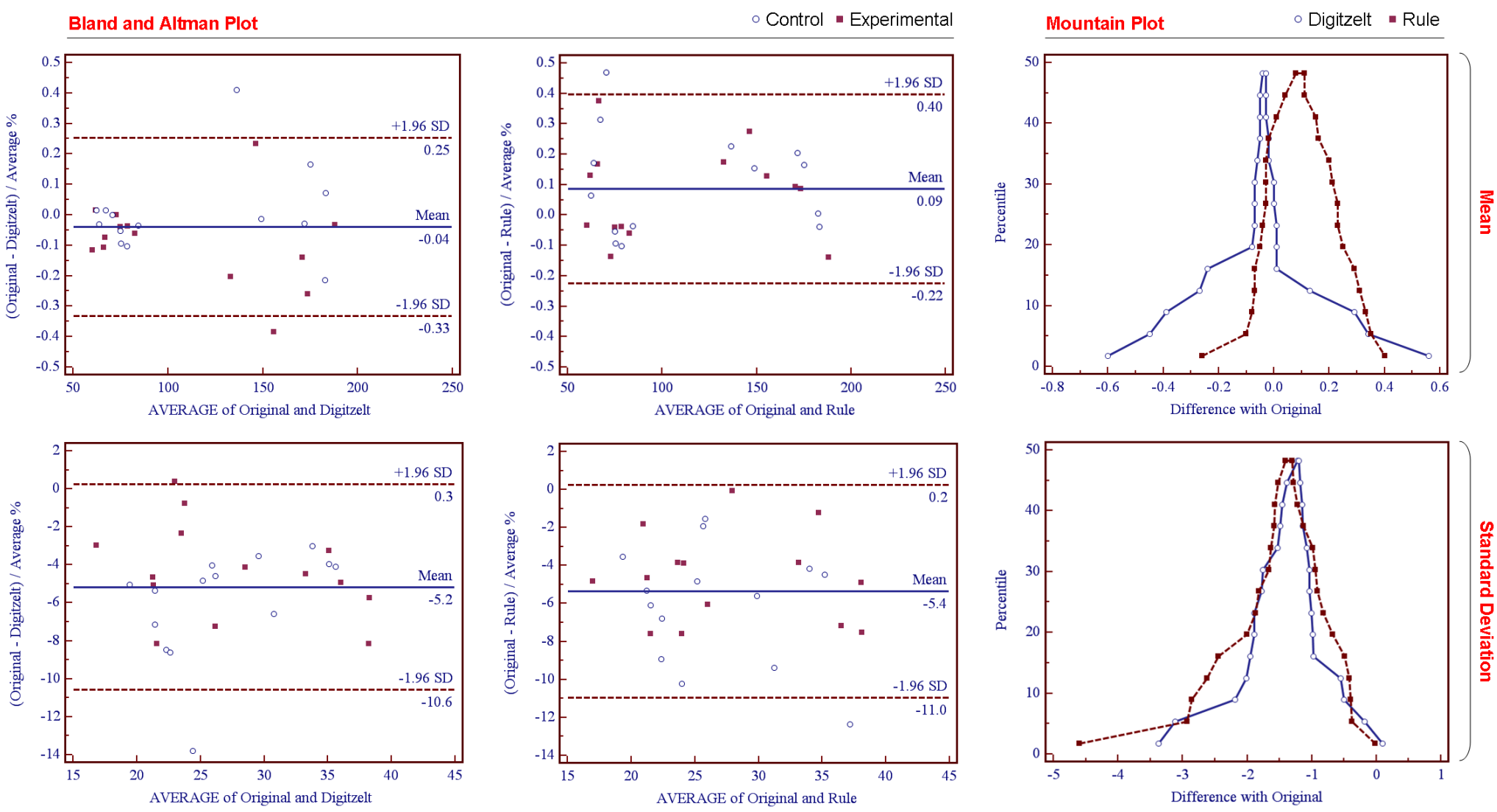


**Figure 3**. Comparisons of techniques to data extraction from figures as from original data.

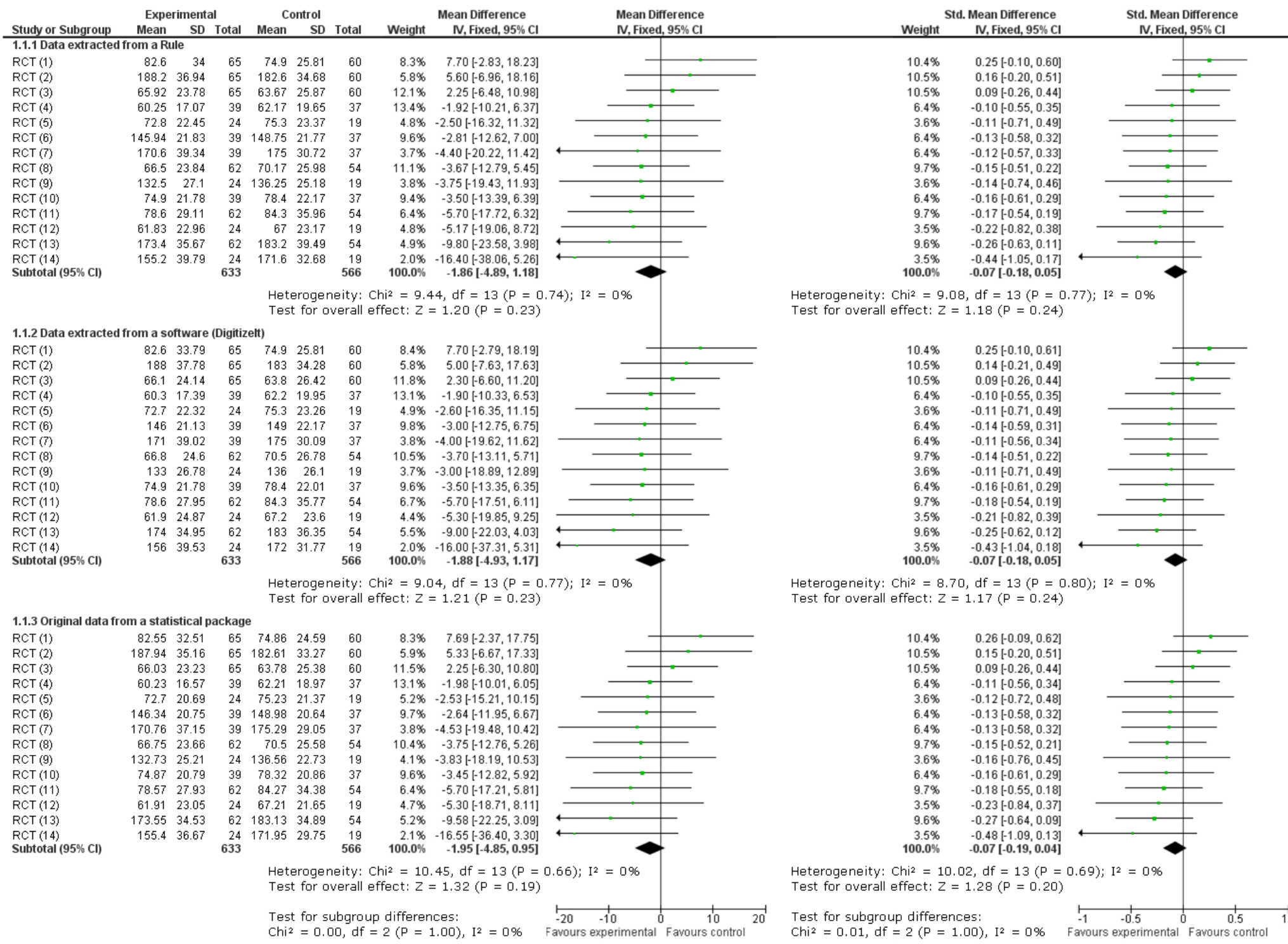


**Figure 4**. Meta-analysis performed through alternative methods (rule and software) to data extraction from figures

**Conclusions:** The alternative methods, such as rule and software, evaluated in this study to procedure data extraction from figures showed high precision and seem to be useful as a option to perform meta-analysis when RCTs publishe figures as the only source of outcome data.