Erik Parner
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Standard analysis 3-1

The purpose of this note is to present a standard analysis of paired continuous data based on the normal model. The data on heart period for active and passive was used in Exercise 2-4 and Exercise 3-4.

Statistical methods

The heart period during day and night for the active persons were compared using the paired t-test. The assumptions were checked by plotting the individual difference in heart period during day and night against the average heart period (Bland-Altman plot) and by a Q-Q plot of the difference. Estimates are presented with 95% confidence intervals.

Results and conclusion

The heart period for the active persons was 216 (95% CI: 185-247) ms higher during the night than during the day, which is a statistical difference ($p<0.0001$). The individual difference ranged between 43 ms and 389 for 95% of the active persons.

Do file

```
*********************************************************************
* Standard3-1.do
* Task: A standard analysis of paired data using the
*       normal model. The data were used in Exercise 3-4, but here
*       we consider only the active.
* Erik Parner: 15-1-2016.
*********************************************************************

graph drop _all

cd "D:\Teaching\BasicBiostat\Exercises"

capture log close
log using Standard3-1.log , text replace

use hp.dta,clear

*********************************************************************
* Keep the active.
*********************************************************************
keep if group==2

*********************************************************************
* Scatter plot and Bland-Altman for absolute and relative differences.
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* Figure 1: scatter and Bland-Altman plot for absolute difference.
gene dif=night-day
gene ave=(day+night)/2
label var dif "night-day"
label var ave "(day+night)/2"
twoway  ///
  (scatter night day ,mco(red) msi(large) msy(x) ) ///
  (function y=x, range(500 1500)) ///
  ,aspect(1) legend( ring(0) pos(10) col(1) lab(1 "active") lab(2 "y=x") )  ///
  ytit("night") xtit("day") title("A") name(fig1,replace)
twoway  ///
  (scatter dif ave ,mco(red) msi(large) msy(x) ) ///
  ,aspect(1) legend( ring(0) pos(10) col(1) lab(1 "active")  )  ///
  ytit("Difference") xtit("Average") title("B") name(fig2,replace)
graph combine fig1 fig2
graph export Figure1.png,replace
* The absolutely difference between night and day can be assumed approximately
* the same for alle active person.


* Figure 2: scatter and Bland-Altman plot for relative difference.
gene lognight=log(night)
gene logday=log(day)
gene logdif=log(night/day)
gene logave=log(day*night)/2
label var logdif "log(night/day)"
label var logave "log(day*night)/2"
twoway  ///
  (scatter lognight logday ,mco(red) msi(large) msy(x) ) ///
  (function y=x, range(6 7.5)) ///
  ,aspect(1) legend( ring(0) pos(10) col(1) lab(1 "active") lab(3 "y=x") )  ///
  ytit("night") xtit("day") title("A") name(fig1,replace)
twoway  ///
  (scatter logdif logave ,mco(red) msi(large) msy(x) ) ///
  ,aspect(1) legend( ring(0) pos(10) col(1) lab(1 "active") )  ///
  ytit("Difference") xtit("Average") title("B") name(fig2,replace)
graph combine fig1 fig2
graph export Figure2.png,replace
* The absolutely difference between night and day can be assumed approximately
* the same for alle active person.

*************************************************************************
* Conclusion: From Figure 1 and 2 it follows that both an absoute and a
* relative difference is approximately the same for all active person. Thus
* we choose here to analyse the absolute difference.
*************************************************************************

* Figure 3: QQ-plots.
qnorm dif , aspect(1) title("Active") name(fig2,replace)
graph export Figure3.png,replace
```

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* The paired t-test.
ttest day=night
centile dif , centile(2.5 97.5) meansd

* Wilcoxon signed-rank test confirms the significance.
signrank day=night

log close
```