Academic Decision Making for Statistical Analyses

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Overview

- An example

- Sample characteristics

- Factors influencing the way researcher use statistics

- The importance of guiding researchers when they are young

An example

The problem: need a method to look at the association between the presence or absence of response at any given point in time with the immediately following, or subsequent responses.

An example

The problem: need a method to look at the association between the presence or absence of response at any given point in time with the immediately following, or subsequent responses.

Ask your supervisor

An example

The problem: need a method to look at the association between the presence or absence of response at any given point in time with the immediately following, or subsequent responses.

Ask your supervisor

Consult your statistics textbook

The problem with decision trees

Why not just use a decision tree?

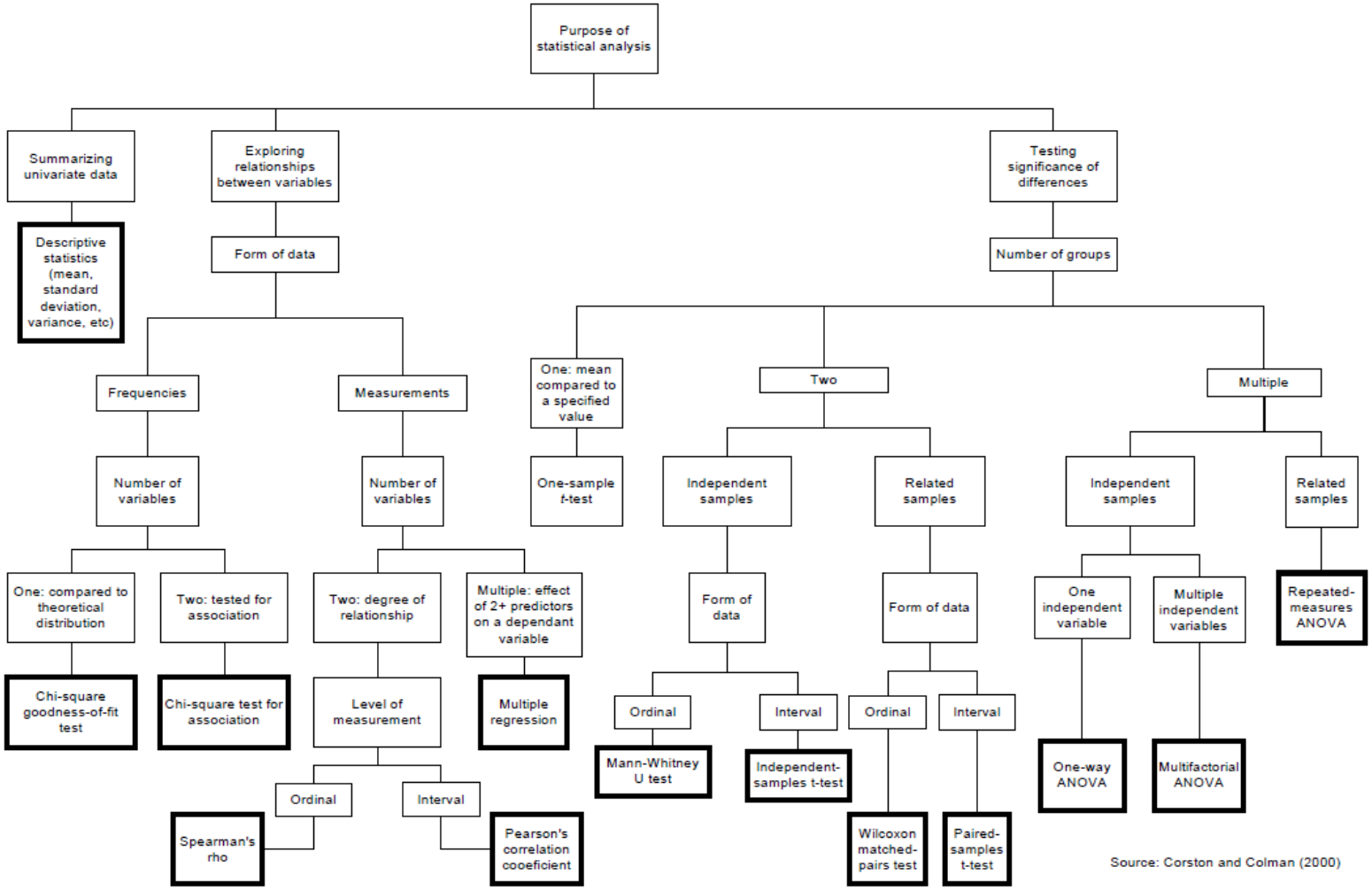

Figure 9. Choosing an appropriate statistical procedure

The problem with decision trees

Why not just use several in concert?

Mock, T. J. (1972). A Decision Tree Approach to the Methodological Decision Process. Analysis, 47(4), 826–829. Retrieved from http://www.jstor.org/stable/245

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Matsumo, D. & Van de Vijver, F. J. R. (2010). Cross-Cultural Research Methods in Psychology. Cambridge University Press. Retrieved from http://books.google.com.au/books/about/Cross_Cultural_Research_Methods_in_Psych.html?id=6VpQNlc9pUAC

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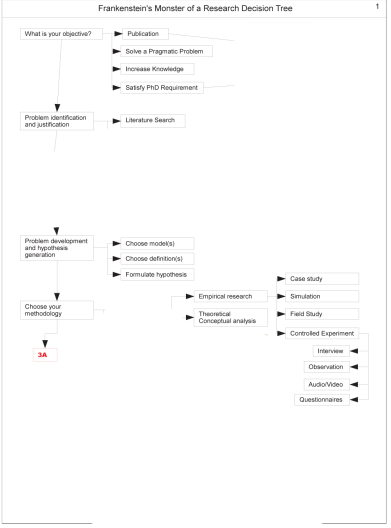
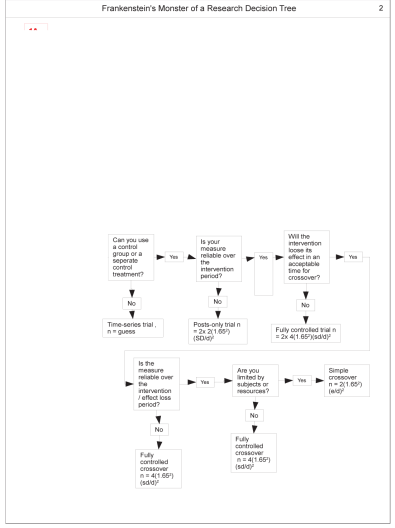
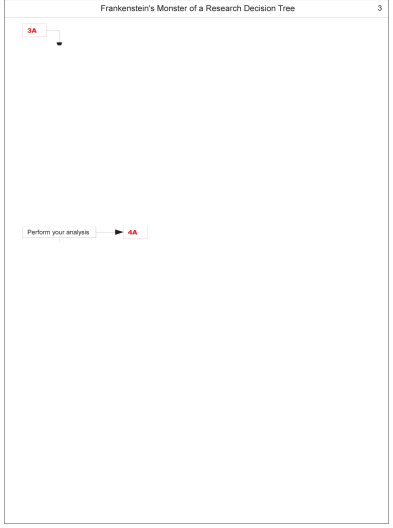
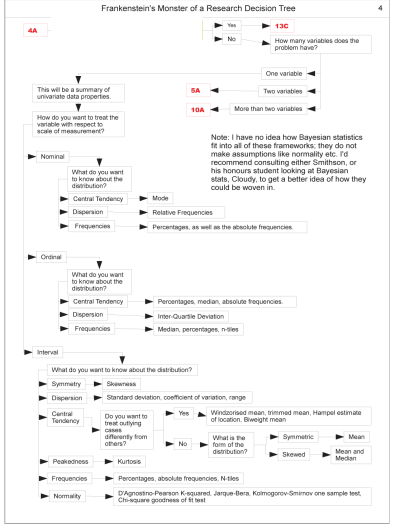
- MicroOsiris Decision Tree For Statistics (http://www.microsiris.com/Statistical%20Decision%20Tree/)

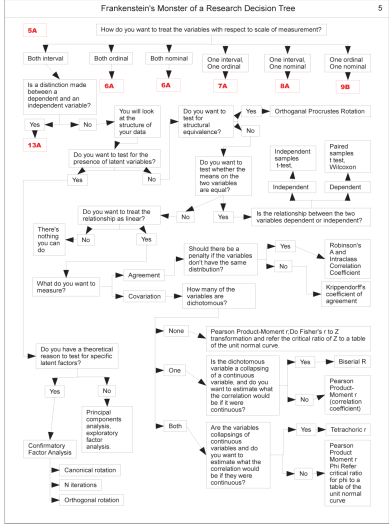
- Selecting Statistics (http://www.socialresearchmethods.net/selstat/ssstart.htm)

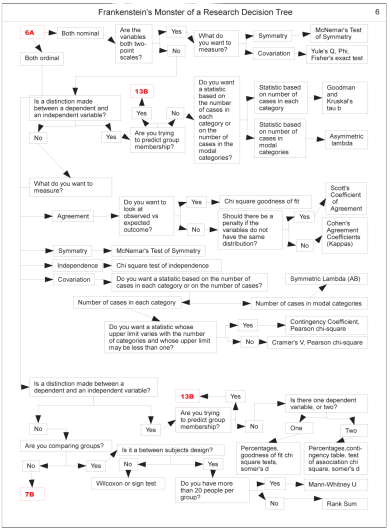

Frankenstein's Monster of a Research Decision Tree
1
What is your objective?
Publication
Solve a Pragmatic Problem
Increase Knowledge
Satisfy PhD Requirement
Problem identification and justification
Literature Search
Problem development and hypothesis generation
Choose model(s)
Choose definition(s)
Formulate hypothesis
Choose your methodology
Empirical research
Theoretical Conceptual analysis
Case study
Simulation
Field Study
Controlled Experiment
Interview
Observation
Audio/Video
Questionnaires
3A

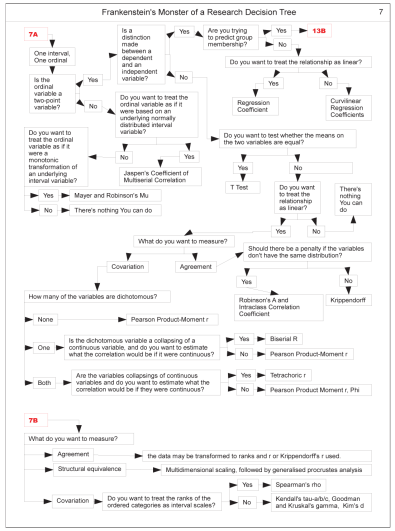

Frankenstein's Monster of a Research Decision Tree
2
Can you use a control group or a seperate control treatment?
Yes
No
Time-series trial , n = guess
Is your measure reliable over the intervention period?
Yes
No
Posts-only trial n = 2x 2(1.65²) (SD/d)²
Will the intervention loses its effect in an acceptable time for crossover?
Yes
No
Fully controlled trial n = 2x 4(1.65²)(sd/d)²
Is the measure reliable over the intervention / effect loss period?
Yes
No
Fully controlled crossover n = 4(1.65²) (sd/d)²
Are you limited by subjects or resources?
Yes
No
Fully controlled crossover n = 4(1.65²) (sd/d)²
Simple crossover n = 2(1.65²) (sd/d)²

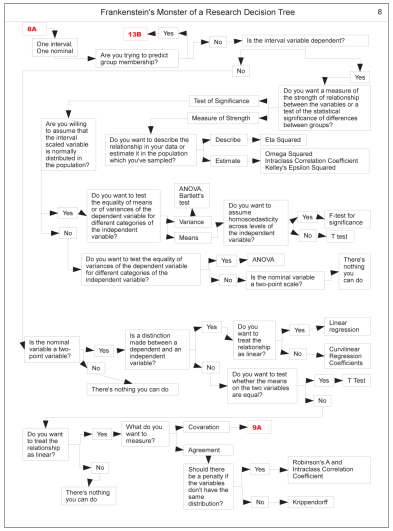

Frankenstein's Monster of a Research Decision Tree
3
3A
Perform your analysis
4A

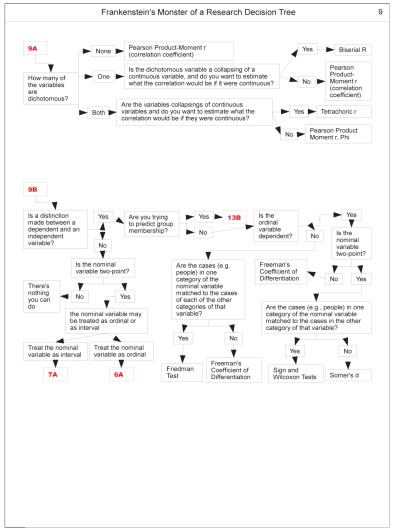

Frankenstein's Monster of a Research Decision Tree
4
4A
Yes
No
13C
How many variables does the problem have?
One variable
Two variables
More than two variables
5A
10A
This will be a summary of univariate data properties.
How do you want to treat the variable with respect to scale of measurement?
Note: I have no idea how Bayesian statistics fit into all of these frameworks; they do not make assumptions like normality etc. I'd recommend consulting either Smithson, or his honours student looking at Bayesian stats. Cloudy, to get a better idea of how they could be woven in.
Nominal
What do you want to know about the distribution?
Central Tendency
Mode
Dispersion
Relative Frequencies
Frequencies
Percentages, as well as the absolute frequencies.
Ordinal
What do you want to know about the distribution?
Central Tendency
Percentages, median, absolute frequencies.
Dispersion
Inter-Quartile Deviation
Frequencies
Median, percentages, n-tiles
Interval
What do you want to know about the distribution?
Symmetry
Skewness
Dispersion
Standard deviation, coefficient of variation, range
Central Tendency
Do you want to treat outlying cases differently from others?
Yes
No
Windzorised mean, trimmed mean, Hampel estimate of location, Biweight mean
What is the form of the distribution?
Symmetric
Mean
Skewed
Mean and Median
Peakedness
Kurtosis
Frequencies
Percentages, absolute frequencies, N-tiles
Normality
D'Agnostino-Pearson K-squared, Jarque-Bera, Kolmogorov-Smirnov one sample test, Chi-square goodness of fit test

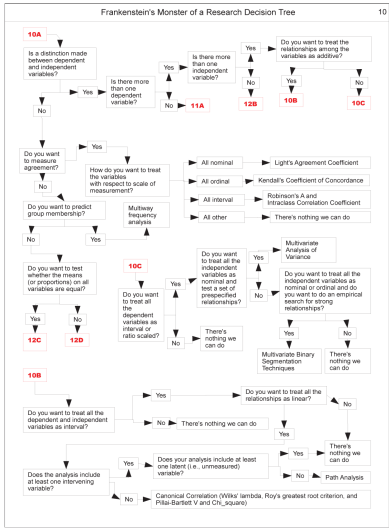

Frankenstein's Monster of a Research Decision Tree
5
5A
How do you want to treat the variables with respect to scale of measurement?
Both interval
Both ordinal
Both nominal
One interval, One ordinal
One interval, One nominal
One ordinal One nominal
Is a distinction made between a dependent and an independent variable?
6A
7A
8A
9B
Yes
No
13A
Do you want to test for structural equivalence?
Orthogonal Procrustes Rotation
You will look at the structure of your data
Do you want to test for the presence of latent variables?
Do you want to test whether the means on the two variables are equal?
Independent samples t-test, Wilcoxon
Paired samples t test, Wilcoxon
Independent
Dependent
Do you want to treat the relationship as linear?
Is the relationship between the two variables dependent or independent?
There's nothing you can do
What do you want to measure?
Agreement
Covariation
How many of the variables are dichotomous?
Should there be a penalty if the variables don't have the same distribution?
Robinson's A and Intraclass Correlation Coefficient
Krippendorff's coefficient of agreement
Do you have a theoretical reason to test for specific latent factors?
Confirmatory Factor Analysis
Principal components analysis, exploratory factor analysis.
Canonical rotation
N iterations
Orthogonal rotation
None
One
Both
Pearson Product-Moment r (correlation coefficient)
Do Fisher's r to Z transformation and refer the critical ratio of Z to a table of the unit normal curve.
Is the dichotomous variable a collapsing of a continuous variable, and do you want to estimate what the correlation would be if it were continuous?
Biserial R
Pearson Product-Moment r (correlation coefficient)
Are the variables collapsings of continuous variables and do you want to estimate what the correlation would be if they were continuous?
Tetrachoric r
Pearson Product Moment r, Phi
Pearson Product Moment r, Phi Refer critical ratio for phi to a table of the unit normal curve

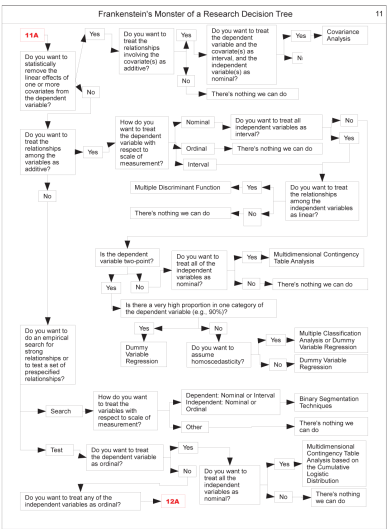

Frankenstein's Monster of a Research Decision Tree
6
6A
Both nominal
Both ordinal
Are the variables both two-point scales?
Yes
No
What do you want to measure?
Symmetry
McNemar's Test of Symmetry
Covariation
Yule's Q, Phi, Fisher's exact test
Is a distinction made between a dependent and an independent variable?
13B
Yes
No
Do you want a statistic based on the number of cases in each category or on the number of cases in the modal categories?
Statistic based on number of cases in each category
Statistic based on number of cases in modal categories
Goodman and Kruskal's tau b
Asymmetric lambda
Are you trying to predict group membership?
What do you want to measure?
Agreement
Do you want to look at observed vs expected outcome?
Yes
No
Chi square goodness of fit
Should there be a penalty if the variables do not have the same distribution?
Yes
No
Scott's Coefficient of Agreement
Cohen's Agreement Coefficients (Kappas)
Symmetry
McNemar's Test of Symmetry
Independence
Chi square test of independence
Covariation
Do you want a statistic based on the number of cases in each category or on the number of cases?
Symmetric Lambda (AB)
Number of cases in each category
Number of cases in modal categories
Do you want a statistic whose upper limit varies with the number of categories and whose upper limit may be less than one?
Yes
No
Contingency Coefficient, Pearson chi-square
Cramer's V, Pearson chi-square
Is a distinction made between a dependent and an independent variable?
13B
Yes
No
Are you trying to predict group membership?
Is there one dependent variable, or two?
One
Two
Are you comparing groups?
No
Yes
Is it a between subjects design?
No
Yes
Percentages, goodness of fit chi square tests, somer's d
Percentages,contingency table, test of association chi square, somer's d
7B
Wilcoxon or sign test
Do you have more than 20 people per group?
Yes
No
Mann-Whitney U
Rank Sum

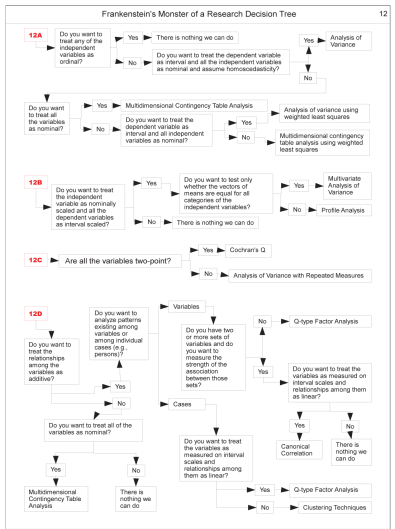

Frankenstein's Monster of a Research Decision Tree
7
7A
Is a distinction made between a dependent and an independent variable?
Yes
No
One interval, One ordinal
Is the ordinal variable a two-point variable?
Yes
No
Do you want to treat the ordinal variable as if it were based on an underlying normally distributed interval variable?
Yes
No
Jaspen's Coefficient of Multiserial Correlation
Do you want to treat the ordinal variable as if it were a monotonic transformation of an underlying interval variable?
Yes
Mayer and Robinson's Mu
No
There's nothing You can do
Are you trying to predict group membership?
Yes
No
13B
Do you want to test the relationship as linear?
Yes
No
Regression Coefficient
Curvilinear Regression Coefficients
Do you want to test whether the means on the two variables are equal?
Yes
No
T Test
Do you want to test the relationship as linear?
Yes
No
There's nothing You can do
What do you want to measure?
Covariation
Should there be a penalty if the variables don't have the same distribution?
Agreement
Yes
No
Robinson's A and Intraclass Correlation Coefficient
Krippendorff
How many of the variables are dichotomous?
None
Pearson Product-Moment r
One
Is the dichotomous variable a collapsing of a continuous variable, and do you want to estimate what the correlation would be if it were continuous?
Yes
Biserial R
No
Pearson Product-Moment r
Both
Are the variables collapsings of continuous variables and do you want to estimate what the correlation would be if they were continuous?
Yes
Tetrachoric r
No
Pearson Product Moment r, Phi
7B
What do you want to measure?
Agreement
the data may be transformed to ranks and r or Krippendorff's r used.
Structural equivalence
Multidimensional scaling, followed by generalised procrustes analysis
Covariation
Do you want to treat the ranks of the ordered categories as interval scales?
Yes
Spearman's rho
No
Kendall's tau-a/b/c, Goodman and Kruskal's gamma, Kim's d

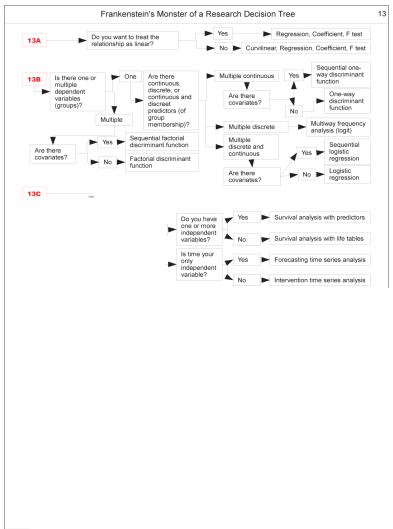

Frankenstein's Monster of a Research Decision Tree
8
8A
One interval, One nominal
Are you trying to predict group membership?
Yes
No
13B
Yes
No
Is the interval variable dependent?
Yes
No
Test of Significance
Measure of Strength
Do you want a measure of the strength of relationship between the variables or a test of the statistical significance of differences between groups?
Are you willing to assume that the interval scaled variable is normally distributed in the population?
Do you want to describe the relationship in your data or estimate it in the population which you've sampled?
Describe
Eta Squared
Estimate
Omega Squared
Intraclass Correlation Coefficient
Kelley's Epsilon Squared
Do you want to test the equality of means or of variances of the dependent variable for different categories of the independent variable?
Yes
No
ANOVA, Bartlett's test
Variance
Means
Do you want to assume homoscedasticity across levels of the independent variable?
Yes
No
F-test for significance
T test
Do you want to test the equality of variances of the dependent variable for different categories of the independent variable?
Yes
No
ANOVA
Is the nominal variable a two-point scale?
Yes
No
There's nothing you can do
Is the nominal variable a two-point variable?
Yes
No
Is a distinction made between a dependent and an independent variable?
Yes
No
Do you want to treat the relationship as linear?
Yes
No
Linear regression
Curvilinear Regression Coefficients
Do you want to treat the relationship as linear?
Yes
No
T Test
There's nothing you can do
Do you want to treat the relationship as linear?
Yes
No
What do you want to measure?
9A
Covariation
Agreement
Should there be a penalty if the variables don't have the same distribution?
Yes
No
Robinson's A and Intraclass Correlation Coefficient
Krippendorff
There's nothing you can do

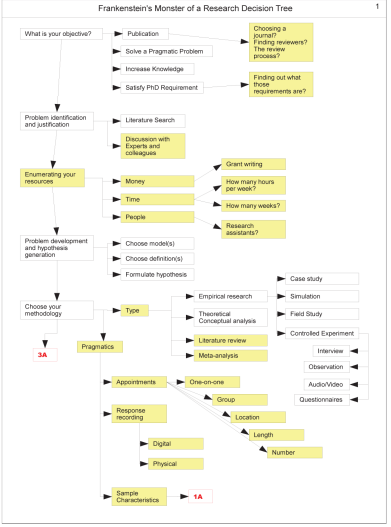

Frankenstein's Monster of a Research Decision Tree
9
9A
How many of the variables are dichotomous?
None
Pearson Product-Moment r (correlation coefficient)
One
Is the dichotomous variable a collapsing of a continuous variable, and do you want to estimate what the correlation would be if it were continuous?
Yes
Biserial R
No
Pearson Product-Moment r (correlation coefficient)
Both
Are the variables collapsings of continuous variables and do you want to estimate what the correlation would be if they were continuous?
Yes
Tetrachoric r
No
Pearson Product Moment r, Phi
9B
Is a distinction made between a dependent and an independent variable?
Yes
No
Are you trying to predict group membership?
Yes
No
13B
Is the ordinal variable dependent?
Yes
No
Is the nominal variable two-point?
Yes
No
There's nothing you can do
Is the nominal variable two-point?
Yes
No
Are the cases (e.g people) in one category of the nominal variable matched to the cases of each of the other categories of that variable?
Yes
No
Freeman's Coefficient of Differentiation
Yes
No
Are the cases (e.g., people) in one category of the nominal variable matched to the cases in the other category of that variable?
Yes
No
Treat the nominal variable as interval
7A
Treat the nominal variable as ordinal
6A
Friedman Test
Freeman's Coefficient of Differentiation
Sign and Wilcoxon Tests
Somer's d

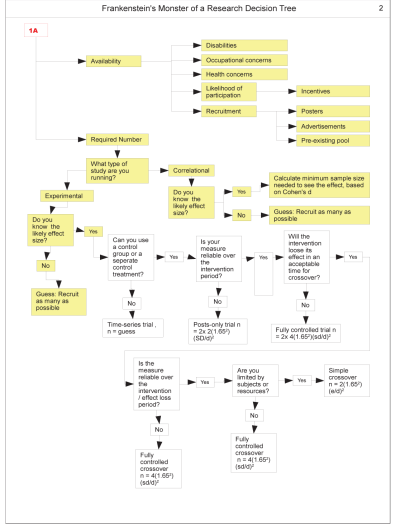

Frankenstein's Monster of a Research Decision Tree
10
10A
Is a distinction made between dependent and independent variables?
Yes
No
Is there more than one dependent variable?
Yes
No
11A
Is there more than one independent variable?
Yes
No
12B
Do you want to treat the relationships among the variables as additive?
Yes
No
10B
10C
Do you want to measure agreement?
Yes
No
How do you want to treat the variables with respect to scale of measurement?
Nominal
Ordinal
Interval
Multiway frequency analysis
All nominal
All ordinal
All interval
All other
Light's Agreement Coefficient
Kendall's Coefficient of Concordance
Robinson's A and Intraclass Correlation Coefficient
There's nothing we can do
Do you want to predict group membership?
No
Yes
Do you want to test whether the means (or proportions) on all variables are equal?
Yes
No
12C
12D
Do you want to treat all the dependent variables as interval or ratio scaled?
10C
Yes
No
Do you want to treat all the independent variables as nominal and test a set of prespecified relationships?
Yes
No
Multivariate Analysis of Variance
Do you want to treat all the independent variables as nominal or ordinal and do you want to run an empirical search for strong relationships?
Yes
No
Multivariate Binary Segmentation Techniques
There's nothing we can do
There's nothing we can do
10B
Do you want to treat all the relationships as linear?
Yes
No
Do you want to treat all the dependent and independent variables as interval?
Yes
No
There's nothing we can do
Yes
No
There's nothing we can do
Does the analysis include at least one latent (i.e., unmeasured) variable?
Yes
No
Does your analysis include at least one latent (i.e., unmeasured) variable?
Yes
No
Path Analysis
Canonical Correlation (Wilks' lambda, Roy's greatest root criterion, and Pillai-Bartlett V and Chi_square)

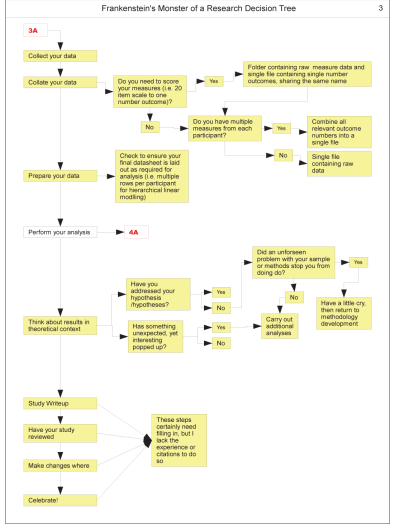

Frankenstein's Monster of a Research Decision Tree
11
11A
Yes
No
Do you want to statistically remove the linear effects of one or more covariates from the dependent variable?
Do you want to treat the relationships involving the covariate(s) as additive?
Yes
No
There's nothing we can do
Do you want to treat the dependent variable and the covariate(s) as interval, and the independent variable(s) as nominal?
Yes
No
Covariance Analysis
Do you want to treat the relationships among the variables as additive?
Yes
No
How do you want to treat the dependent variable with respect to scale of measurement?
Nominal
Ordinal
Interval
Do you want to treat all independent variables as interval?
No
Yes
There's nothing we can do
Multiple Discriminant Function
Yes
No
There's nothing we can do
Do you want to treat the relationships among the independent variables as linear?
Is the dependent variable two-point?
Yes
No
Do you want to treat all of the independent variables as nominal?
Yes
No
Multidimensional Contingency Table Analysis
There's nothing we can do
Is there a very high proportion in one category of the dependent variable (e.g., 90%)?
Yes
No
Do you want to do an empirical search for strong relationships or to test a set of prespecified relationships?
Dummy Variable Regression
Do you want to assume homoscedasticity?
Yes
No
Multiple Classification Analysis or Dummy Variable Regression
Dummy Variable Regression
Search
How do you want to treat the variables with respect to scale of measurement?
Dependent: Nominal or Interval Independent: Nominal or Ordinal
Binary Segmentation Techniques
Other
There's nothing we can do
Test
Do you want to treat the dependent variable as ordinal?
Yes
No
Do you want to treat all the independent variables as nominal?
Yes
No
Multidimensional Contingency Table Analysis based on the Cumulative Logistic Distribution
There's nothing we can do
Do you want to treat any of the independent variables as ordinal?
12A

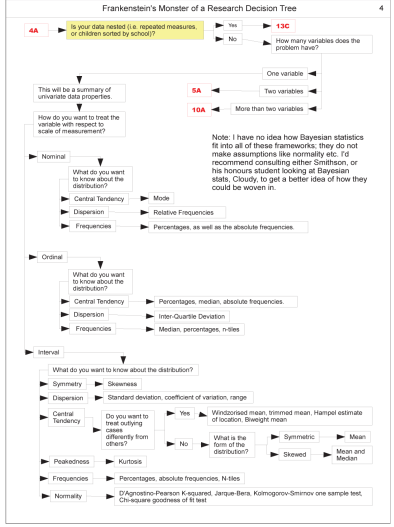

Frankenstein's Monster of a Research Decision Tree
12
12A
Do you want to treat any of the independent variables as ordinal?
Yes
There is nothing we can do
No
Do you want to treat the dependent variable as interval and all the independent variables as nominal and assume homoscedasticity?
Yes
No
Analysis of Variance
Do you want to treat all the variables as nominal?
Yes
No
Multidimensional Contingency Table Analysis
Do you want to treat the dependent variable as interval and all independent variables as nominal?
Yes
No
Analysis of variance using weighted least squares
Multidimensional contingency table analysis using weighted least squares
12B
Do you want to treat the independent variable as nominally scaled and all the dependent variables as interval scaled?
Yes
No
Do you want to test only whether the vectors of means are equal for all categories of the independent variables?
Yes
No
There is nothing we can do
Multivariate Analysis of Variance
Profile Analysis
12C
Are all the variables two-point?
Yes
Cochran's Q
No
Analysis of Variance with Repeated Measures
12D
Do you want to treat the relationships among the variables as additive?
Do you want to analyze patterns existing among variables or among individual cases (e.g., persons)?
Yes
No
Do you want to treat all of the variables as nominal?
Yes
No
Multidimensional Contingency Table Analysis
There is nothing we can do
Variables
Do you have two or more sets of variables and do you want to measure the strength of the association between those sets?
No
Yes
Q-type Factor Analysis
Do you want to treat the variables as measured on interval scales and relationships among them as linear?
Yes
No
Cases
Do you want to treat the variables as measured on interval scales and relationships among them as linear?
Yes
No
Canonical Correlation
There is nothing we can do
Yes
No
Q-type Factor Analysis
Clustering Techniques

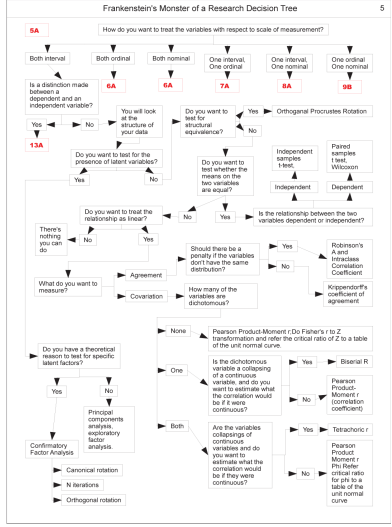

Frankenstein's Monster of a Research Decision Tree
13
13A
Do you want to treat the relationship as linear?
Yes
No
Regression, Coefficient, F test
Curvilinear, Regression, Coefficient, F test
13B
Is there one or multiple dependent variables (groups)?
One
Multiple
Are there continuous, discrete, or continuous and discreet predictors (of group membership)?
Multiple continuous
Are there covariates?
Yes
No
Sequential one-way discriminant function
One-way discriminant function
Multiple discrete
Multiple discrete and continuous
Are there covariates?
Yes
No
Multiway frequency analysis (logit)
Sequential logistic regression
Logistic regression
Are there covariates?
Yes
No
Sequential Factorial discriminant function
Factorial discriminant function
13C
...
Do you have one or more independent variables?
Yes
No
Survival analysis with predictors
Survival analysis with life tables
Is time your only independent variable?
Yes
No
Forecasting time series analysis
Intervention time series analysis

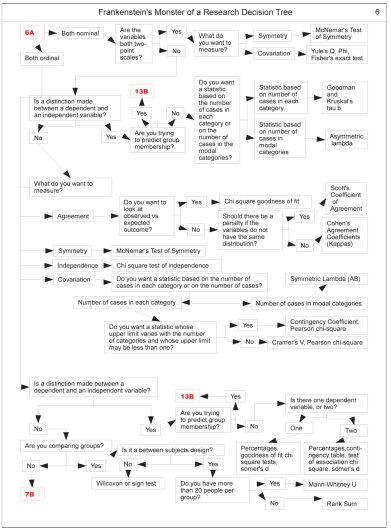


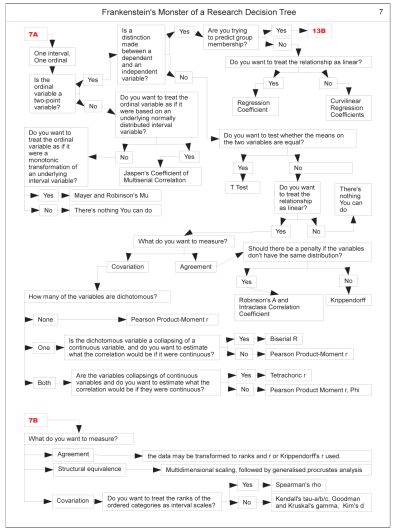


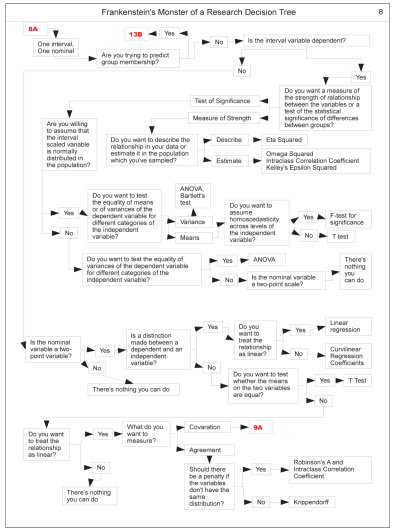


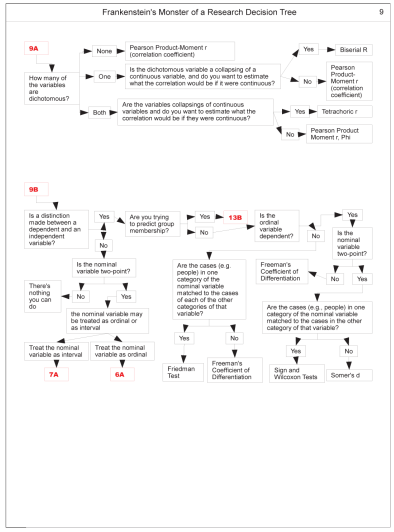


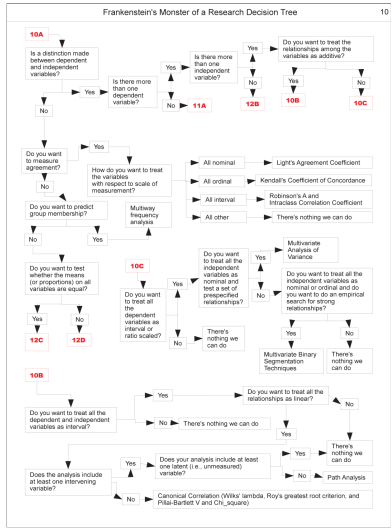


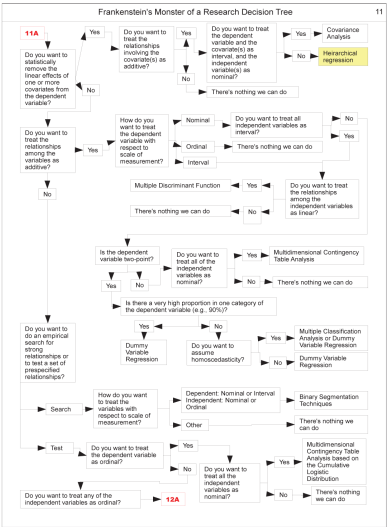


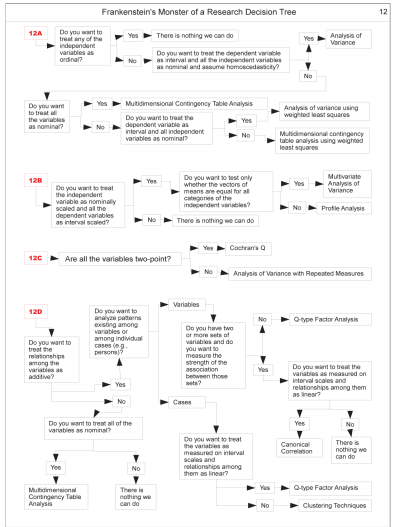


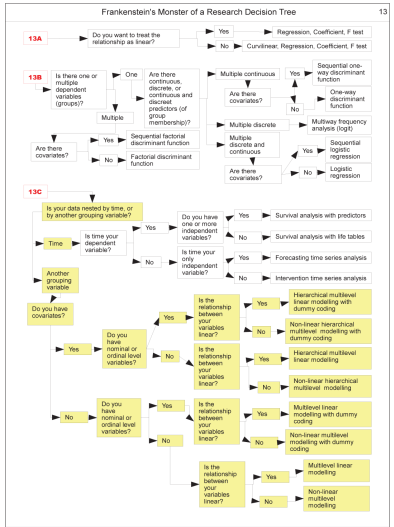












STILL missing techniques (no bayesian approaches at all!)

The quest continues

The problem: need a method to look at the association between the presence or absence of response at any given point in time with the immediately following, or subsequent responses.

Decision trees are too narrow in scope

Check the literature for similar research

The problem with going off the literature

- Underreporting of analyses used (Clark-carter, 1997)

- Lack of theoretical understanding of statistics in those who wrote the papers (Macdonald, 1997)

- Leads to a focus only on the conclusion of the decision making process (Corbett, 1995)

The problem with going off the literature

The problem: need a method to analyse a first-order Markov process, looking at the association between the presence or absence of response at any given point in time with the immediately following, or subsequent responses.

Decision trees are too narrow in scope

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         State 1                        State 2

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Log-linear effects of born

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                         HR          L          U
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Ask Smithson

The benefit of experience

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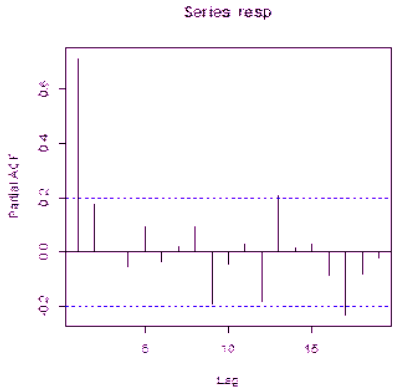
```

mixed logistic autoregression model

```
> pacf(resp)
> mod1 <- glmer(resp ~ lag1 + (1|id), family = binomial)

> summary(mod1)
Generalized linear mixed model fit by
the Laplace approximation
Formula: resp ~ lag1 + (1 | id)
   AIC   BIC logLik deviance
 74.16 81.83 -34.08    68.16
Random effects:
 Groups Name        Variance Std.Dev.
 id     (Intercept) 3.4846   1.8667
Number of obs: 95, groups: id, 4

Fixed effects:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  -0.9891     1.0960  -0.902  0.36681
lag1          2.6427     0.6833   3.868  0.00011 ***
---
Correlation of Fixed Effects:
     (Intr)
lag1 -0.361
```



Elegance

But what if there is no Smithson?

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Forums / crowd sourcing

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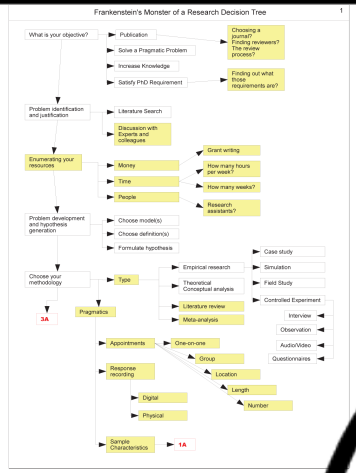
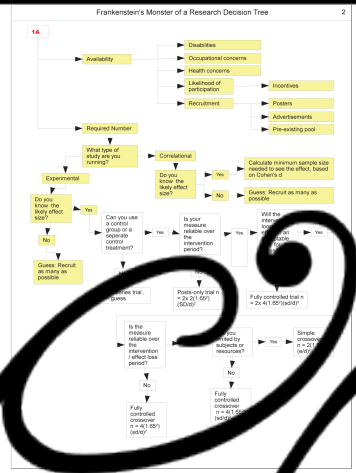
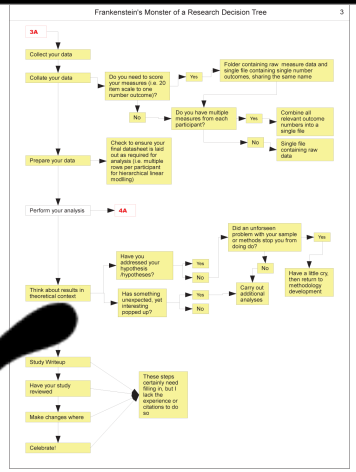
Blindly forge ahead (the road to stats misuse)

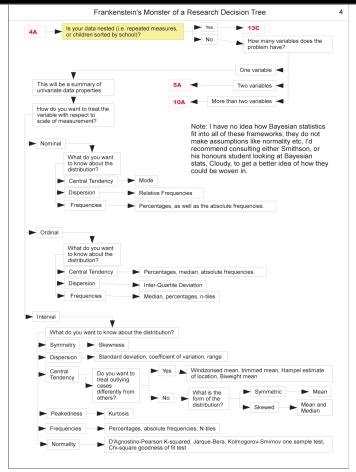
Give up trying to answer the original research question

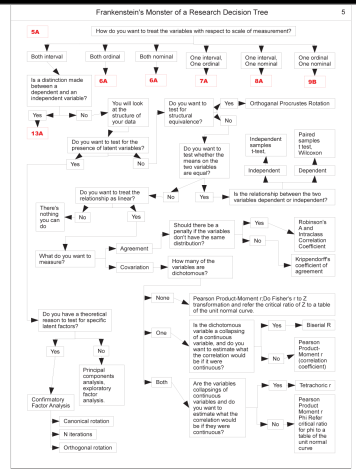
The beautiful combination

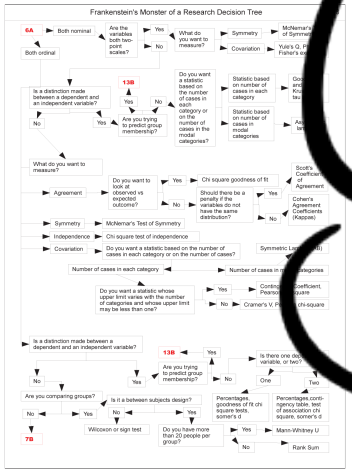


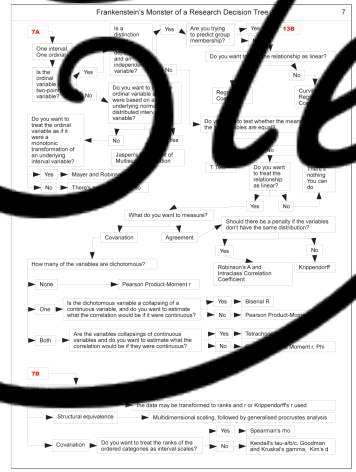


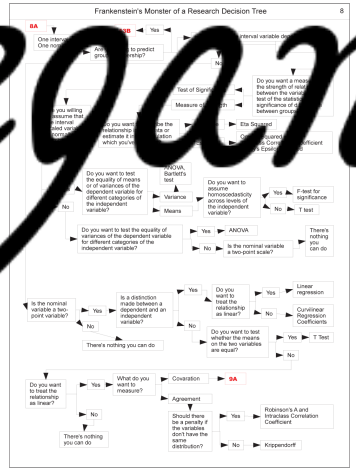


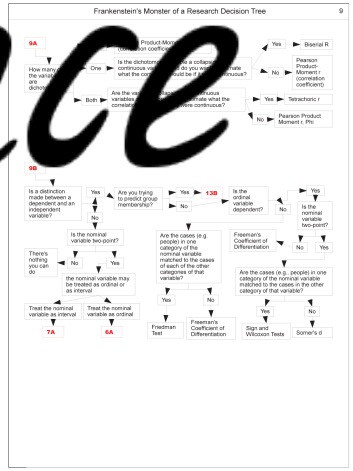


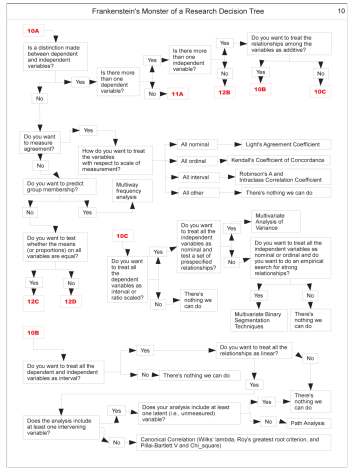


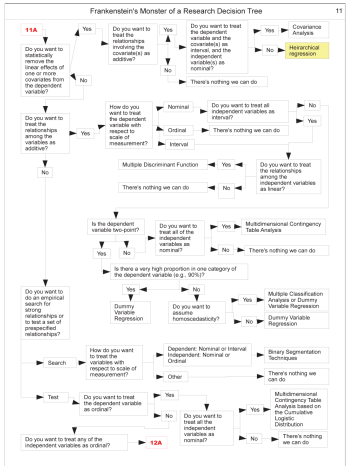


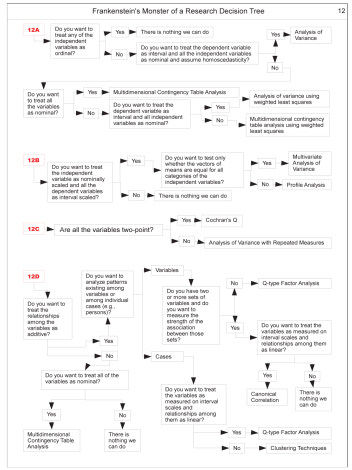


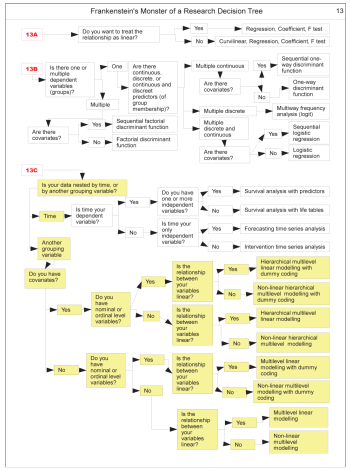


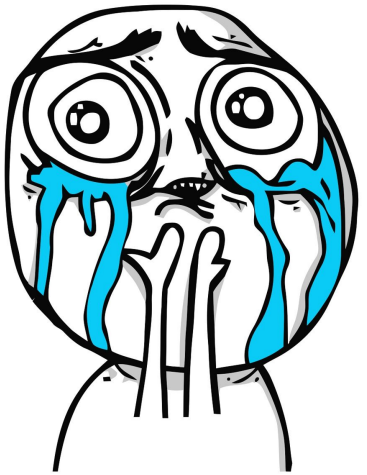












Recruitment Process

1806 tertiary institutions, from 78 countries

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- 480 had psychology departments or schools

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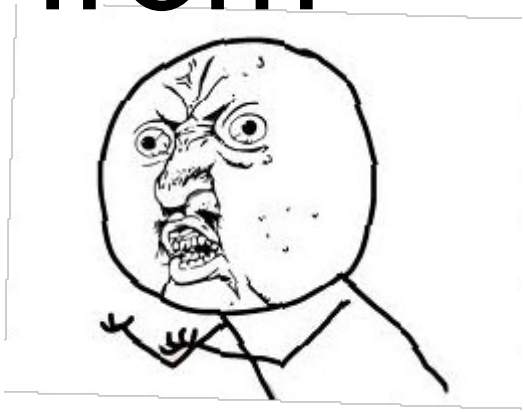
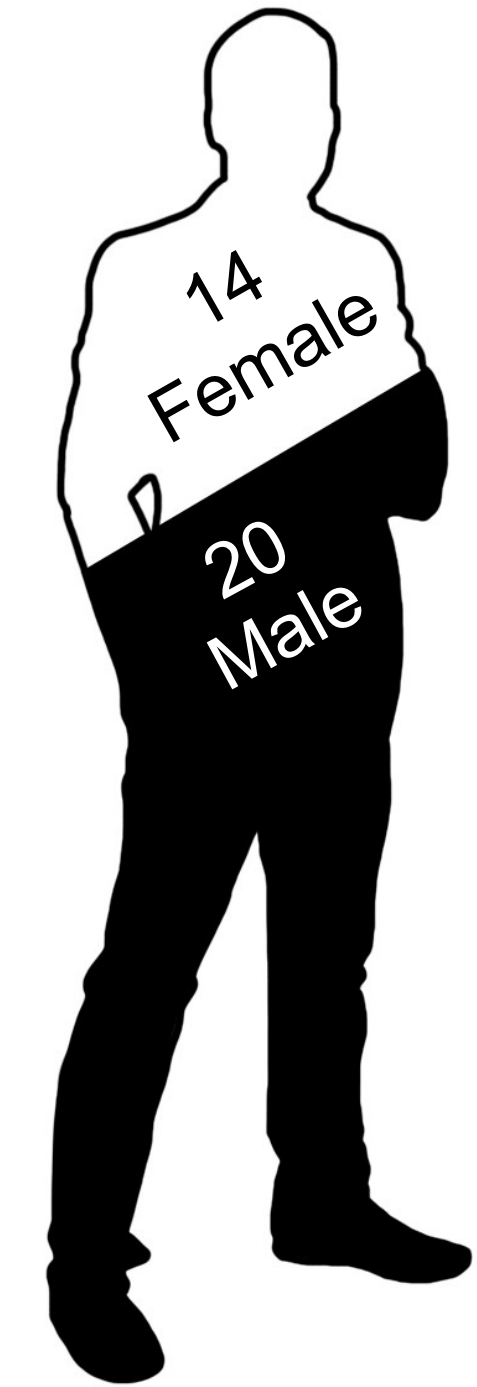


480 had psychology departments or schools

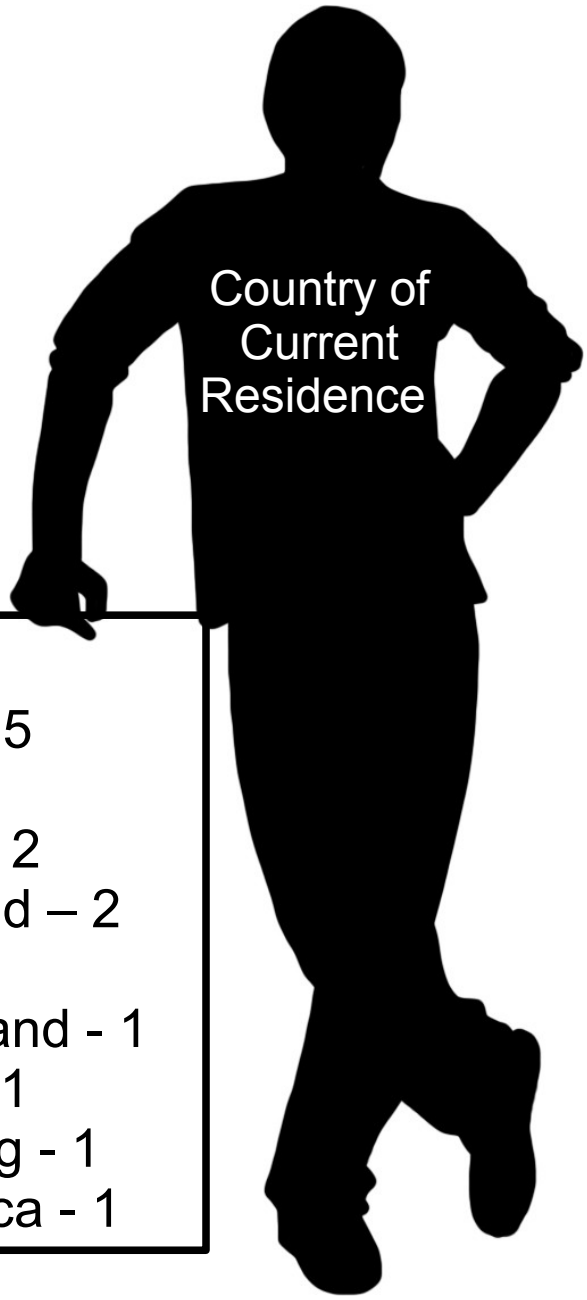
70 academics started the questionnaire

34 finished

Sample demographics



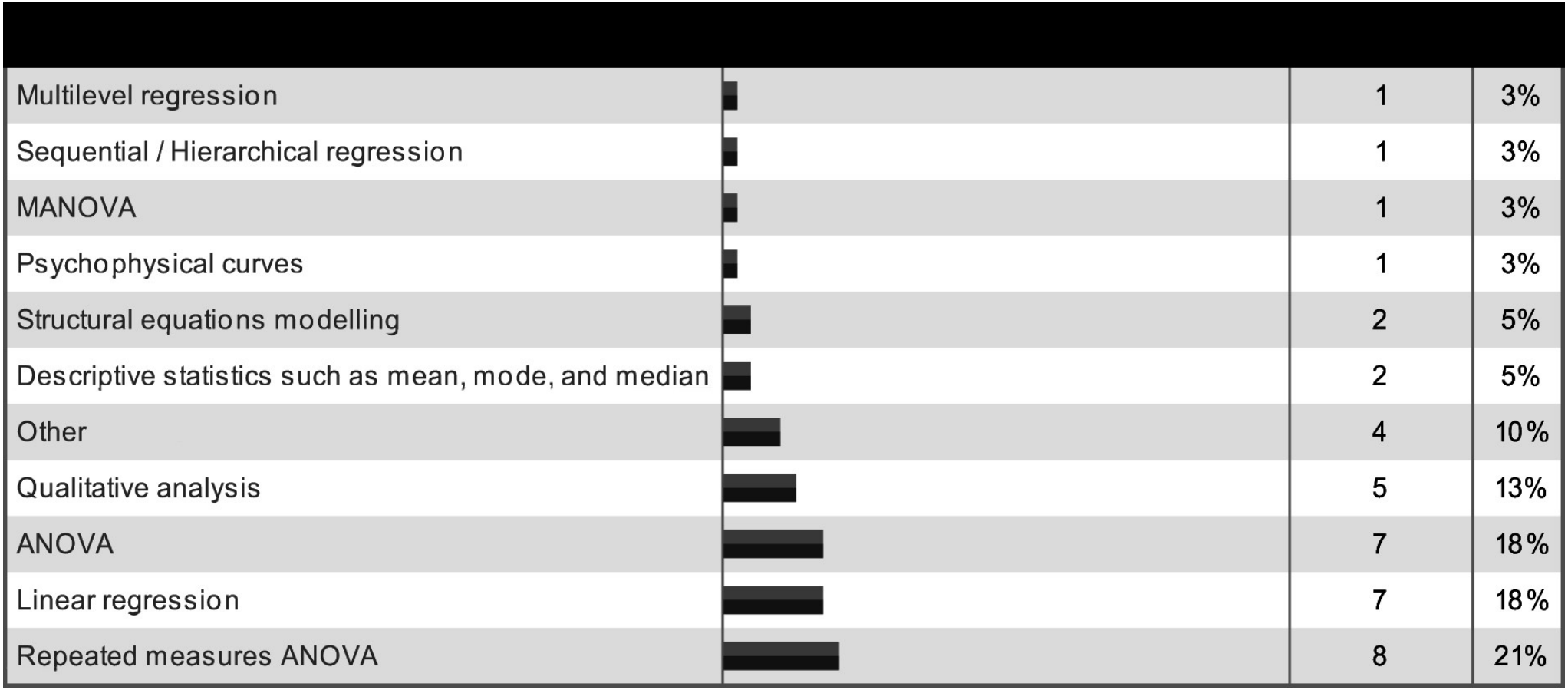
Years spent actively researching:
Mean 19 years
Median 17 years



USA - 18
Canada – 5
UK – 3
Australia - 2
Switzerland – 2
Ireland -2
New Zealand - 1
England - 1
Hong Kong - 1
South Africa - 1

Statistical experience of the current sample

Most used



Multilevel regression	1	3%
Sequential / Hierarchical regression	1	3%
MANOVA	1	3%
Psychophysical curves	1	3%
Structural equations modelling	2	5%
Descriptive statistics such as mean, mode, and median	2	5%
Other	4	10%
Qualitative analysis	5	13%
ANOVA	7	18%
Linear regression	7	18%
Repeated measures ANOVA	8	21%

“Other” includes non-parametic tests, t-tests, dynamic causal modelling, cluster analysis

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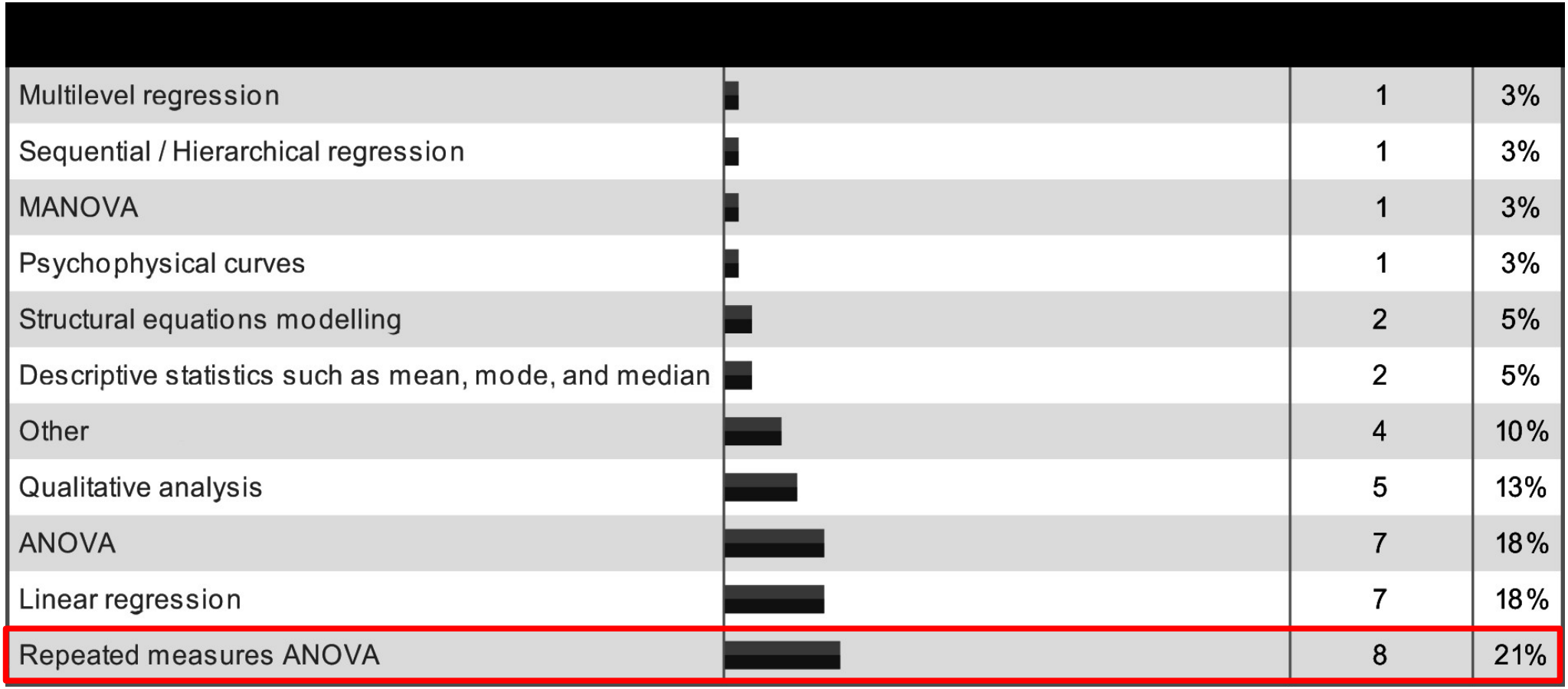

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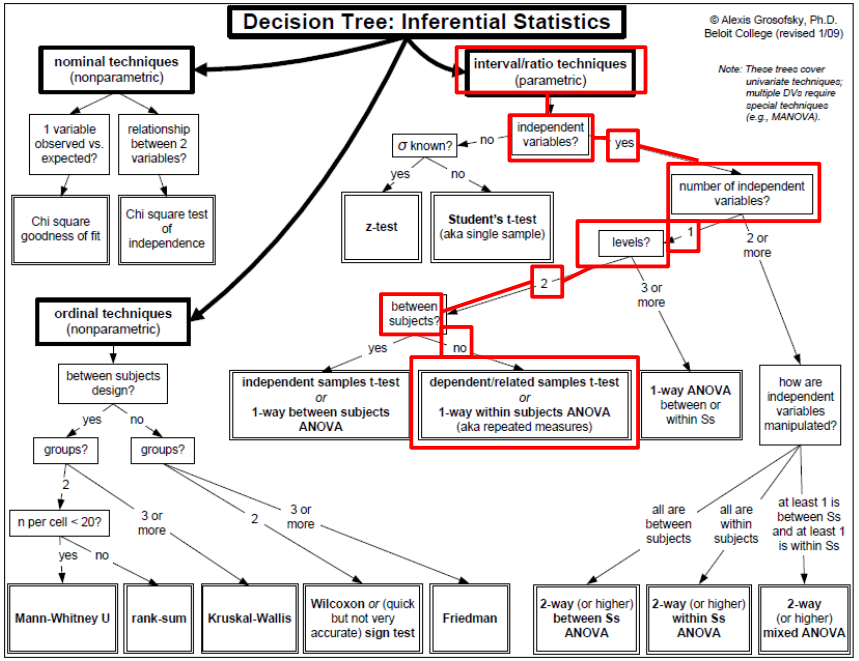
Statistical advice from the current sample

Why choose to use repeated measures ANOVA?

Textbooks tell us...



All points relate to the data itself.

Choose ANOVA when:
- When you have interval or ratio data
- When you have 1 IV
- When your analysis is not between subjects

Statistical advice from the current sample

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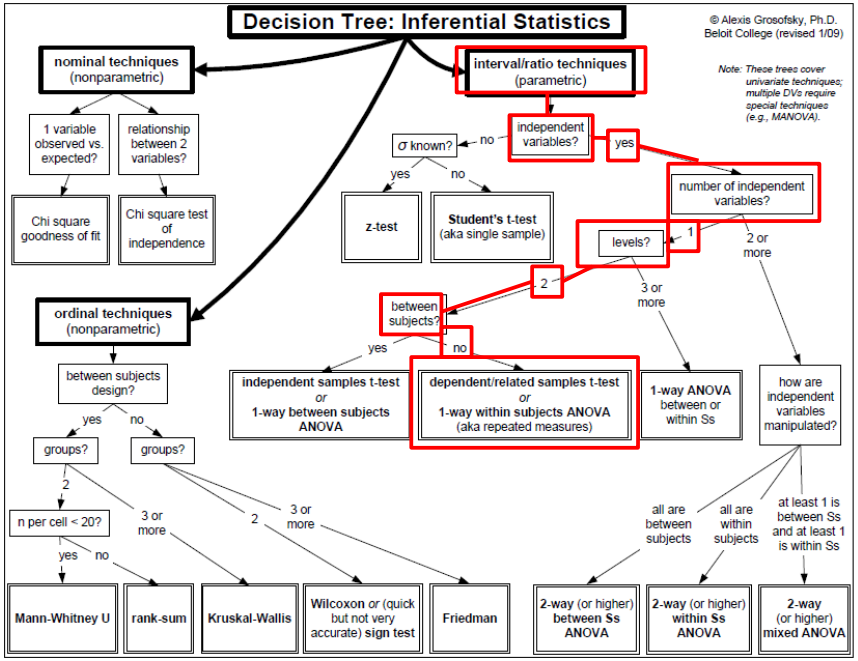

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Active researchers tell us...

More information about the broader utility of the technique.

"Useful to test for group/time interaction"
- BA, Canada, 3 years research experience

*"I use this method because **the field prefers it** and it is **appropriate for event related potential data**."*
- PhD USA, 12 years research experience

*"ANOVA's are **usually appropriate for experiments.** Most of my experiments involve at least one factor that requires repeated measures. These factors are useful because they often reduce variance."*
- PhD USA, 40 years research experience

Statistical advice from the current sample

Above and beyond the decision tree...

Benefits of repeated measures ANOVA, from the researcher's personal experience

"Easy to carry out"
-PhD, Australia, 14 years research experience

"It is generally appropriate to use it and it is accepted by the field. It isn't as good as MANOVA in some ways but MANOVAs are not as accepted by the field."
- PhD, USA, 12 years research experience

Problems with repeated measures ANOVA, from the researcher's personal experience

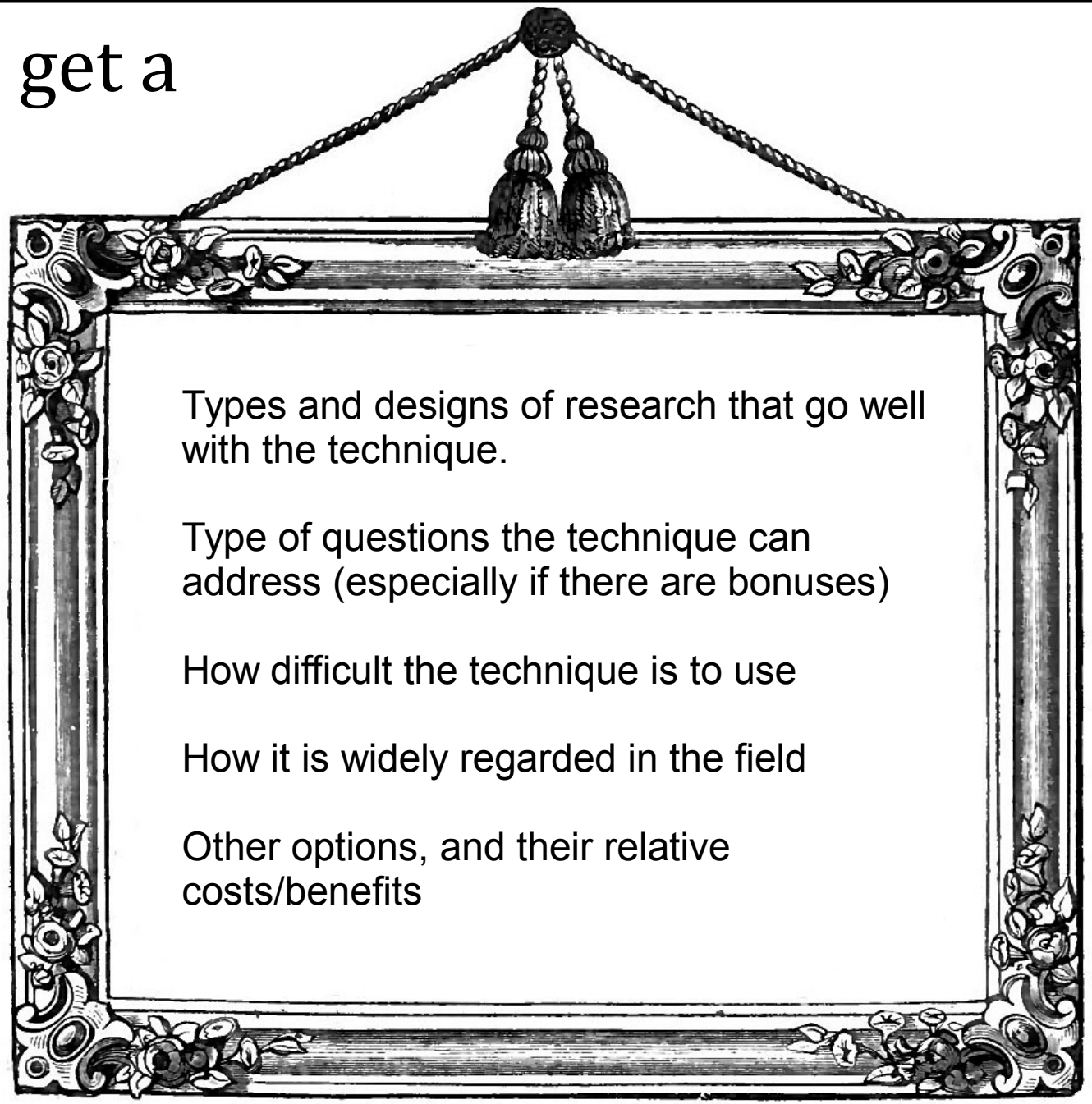
"Difficulty conducting simple main effects analyses. Difficulty calculating appropriate error bars, especially when there is violation of sphericity"
- PhD, UK, 12 years research experience

"Assumptions are sometimes violated but the technique still used."
-PhD, Australia, unspecified years research experience

"Error term calculation and test of means can be finicky."
- PhD, USA, 20 years research experience

Statistical advice from the current sample

Now, we begin to get a full picture of repeated measures ANOVA



Types and designs of research that go well with the technique.

Type of questions the technique can address (especially if there are bonuses)

How difficult the technique is to use

How it is widely regarded in the field

Other options, and their relative costs/benefits

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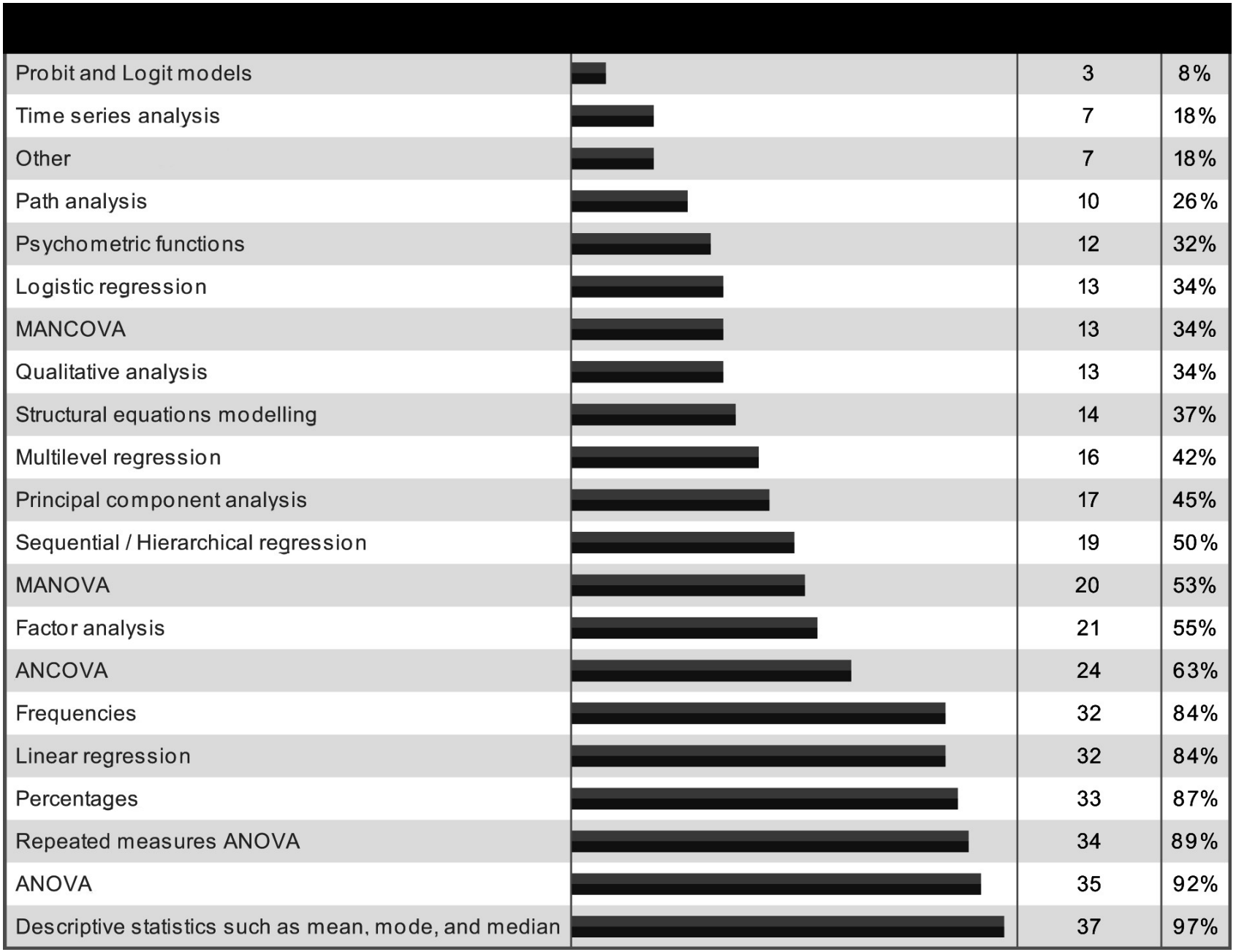
Statistical experience of the current sample

Variety



Probit and Logit models	3	8%
Time series analysis	7	18%
Other	7	18%
Path analysis	10	26%
Psychometric functions	12	32%
Logistic regression	13	34%
MANCOVA	13	34%
Qualitative analysis	13	34%
Structural equations modelling	14	37%
Multilevel regression	16	42%
Principal component analysis	17	45%
Sequential / Hierarchical regression	19	50%
MANOVA	20	53%
Factor analysis	21	55%
ANCOVA	24	63%
Frequencies	32	84%
Linear regression	32	84%
Percentages	33	87%
Repeated measures ANOVA	34	89%
ANOVA	35	92%
Descriptive statistics such as mean, mode, and median	37	97%

"Other" includes non-parametic tests, t-tests, dynamic causal modelling, cluster analysis

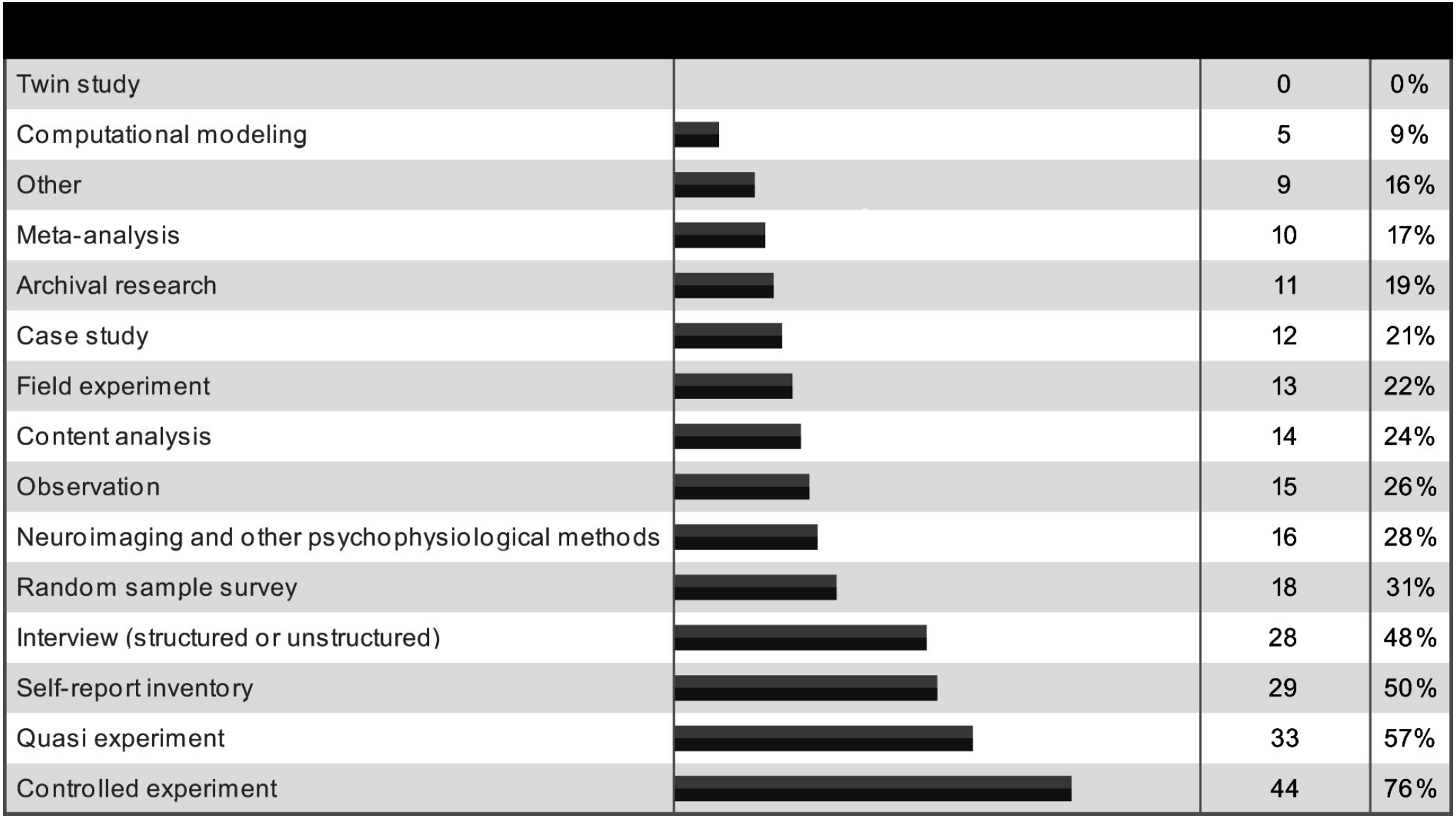
Statistical experience of the current sample

What drives this experience?

- Types of research
- Research designs
- Number of years spent doing psychological research
- Field of research
- Opportunities to expand statistical knowledge

Types of research used by the current sample

Variety

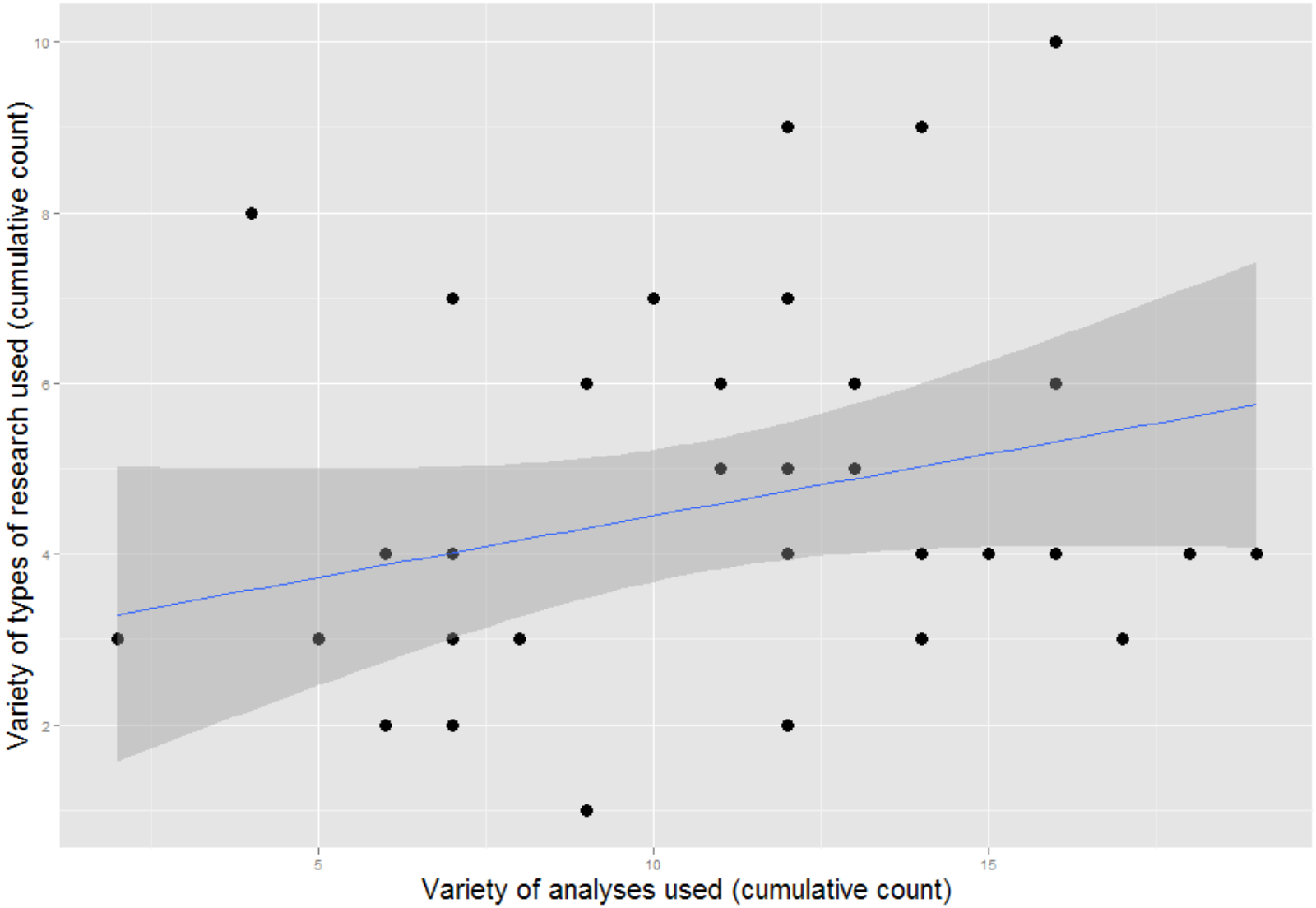


Twin study	0	0%
Computational modeling	5	9%
Other	9	16%
Meta-analysis	10	17%
Archival research	11	19%
Case study	12	21%
Field experiment	13	22%
Content analysis	14	24%
Observation	15	26%
Neuroimaging and other psychophysiological methods	16	28%
Random sample survey	18	31%
Interview (structured or unstructured)	28	48%
Self-report inventory	29	50%
Quasi experiment	33	57%
Controlled experiment	44	76%

"Other" includes neuropsychological tests, knowledge extraction from experts, experience sampling

Types of research used by the current sample

The association between variety of types of research experience, and variety in types of analysis used



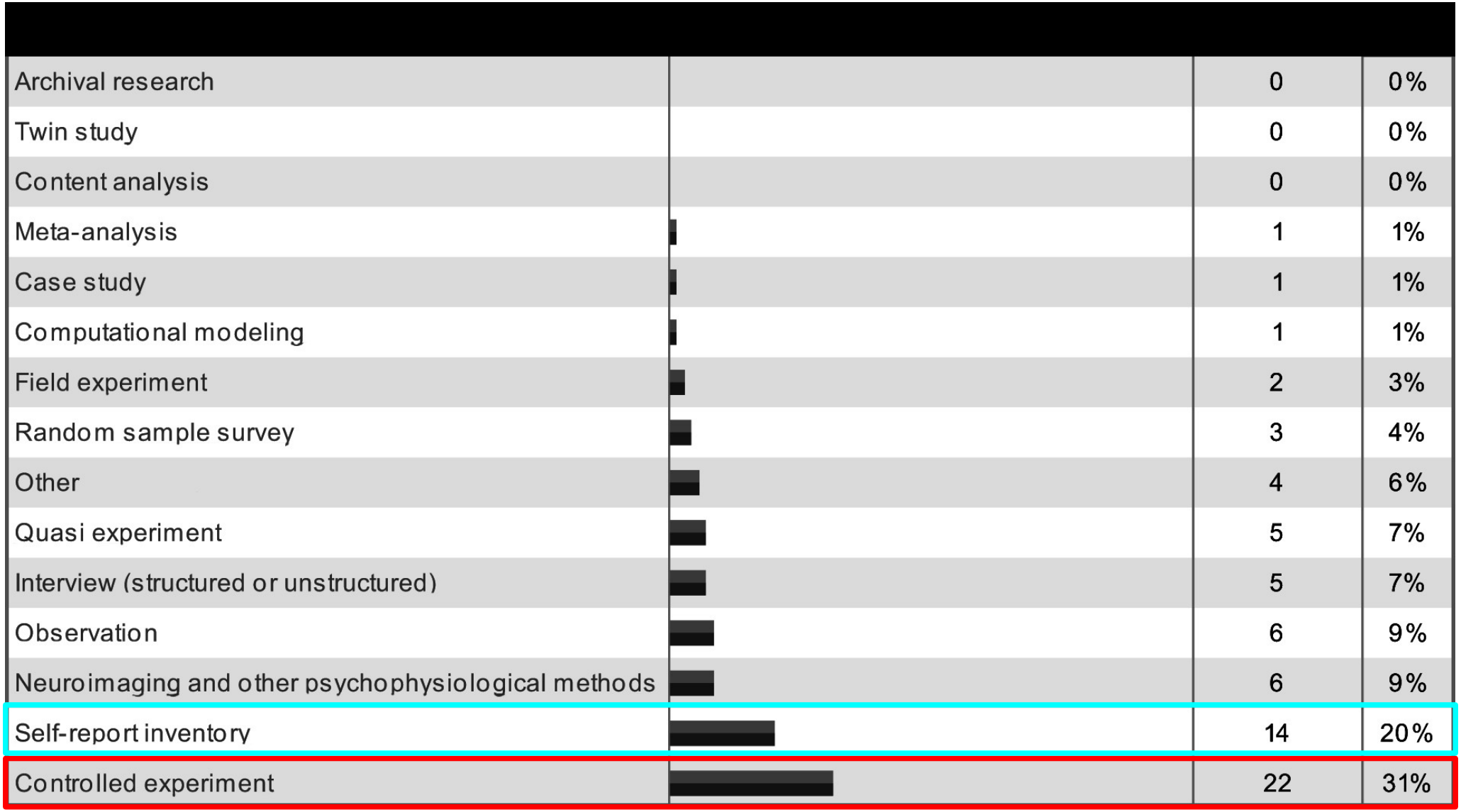
Types of research used by the current sample

Most used

Archival research	0	0%
Twin study	0	0%
Content analysis	0	0%
Meta-analysis	1	1%
Case study	1	1%
Computational modeling	1	1%
Field experiment	2	3%
Random sample survey	3	4%
Other	4	6%
Quasi experiment	5	7%
Interview (structured or unstructured)	5	7%
Observation	6	9%
Neuroimaging and other psychophysiological methods	6	9%
Self-report inventory	14	20%
Controlled experiment	22	31%

Types of research used by the current sample

Most used



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Meta-analysis	1	1%
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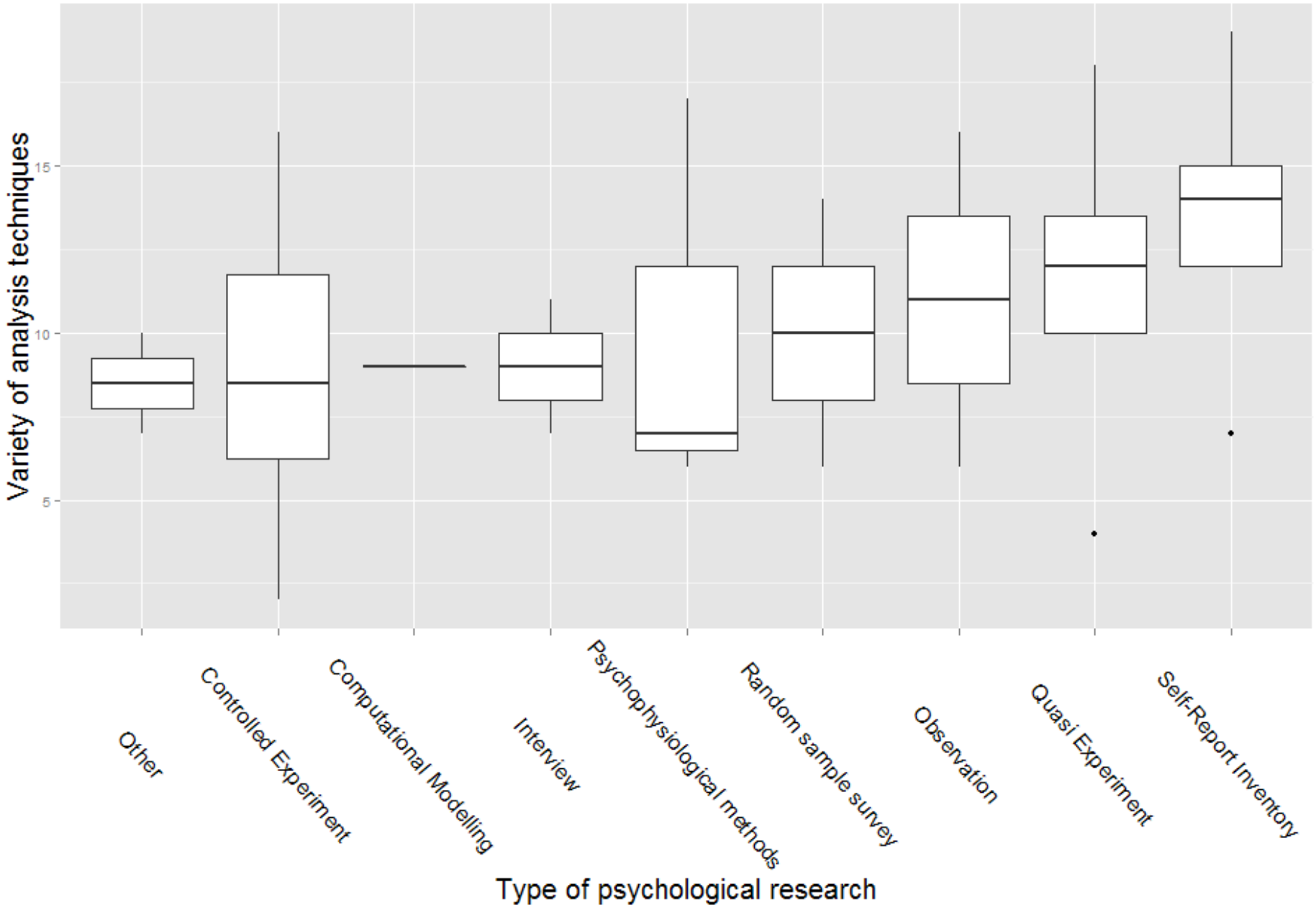
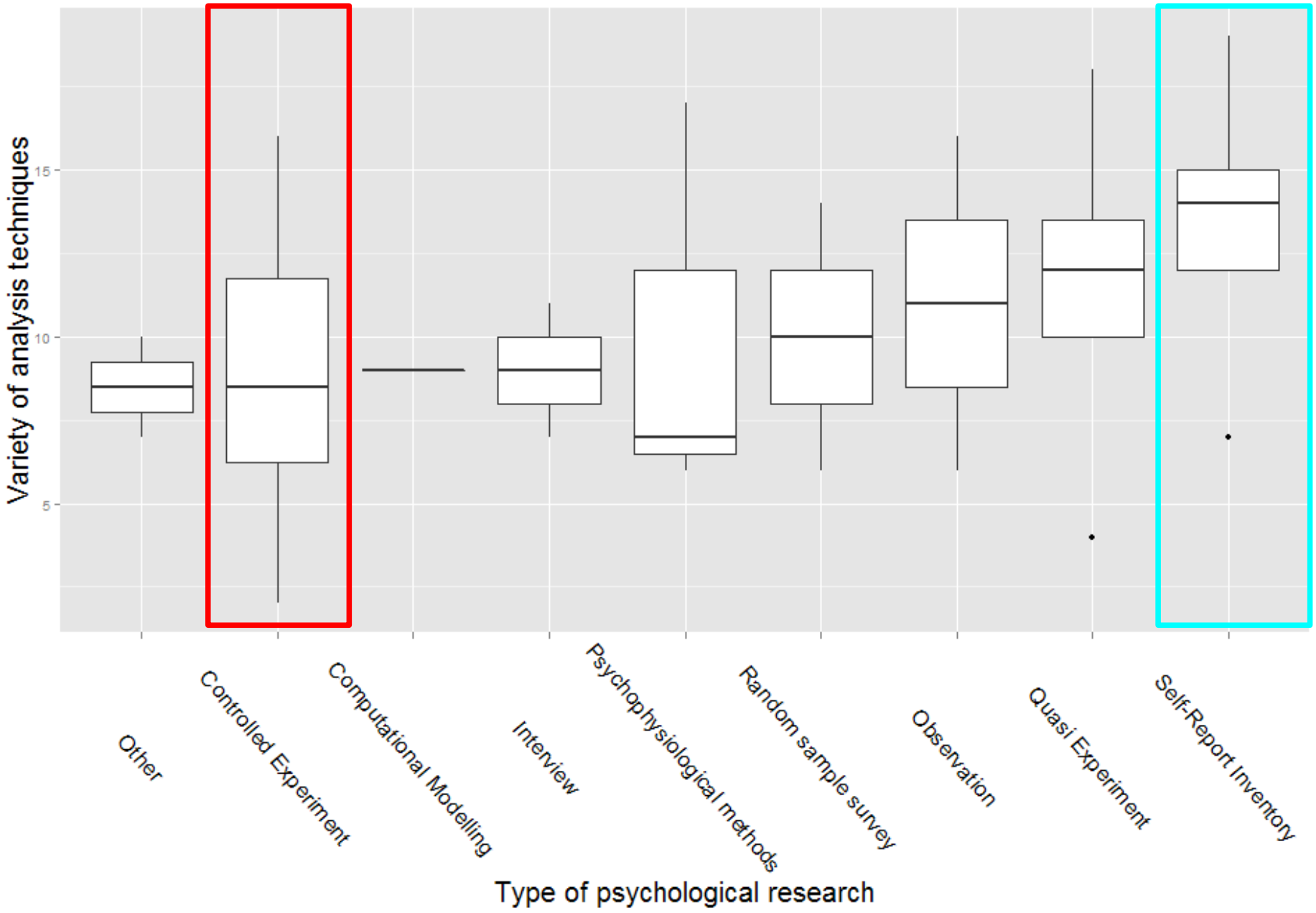
Types of research used by the current sample

The association between types of research experience and variety



Types of research used by the current sample

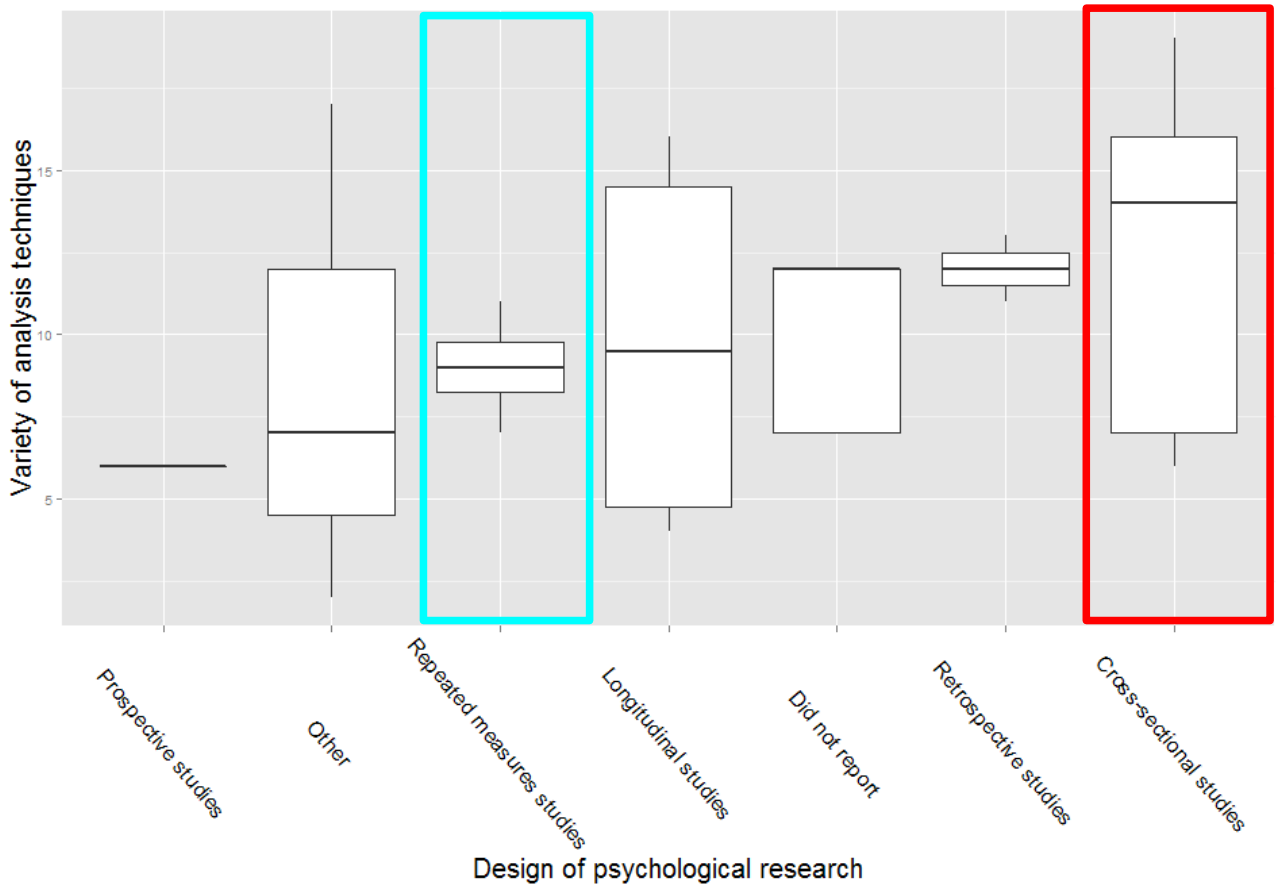
The association between types of research experience and variety



Design of research used by the current sample

Most used

Prospective studies	2	4%
Longitudinal studies	5	11%
Retrospective studies	5	11%
Other	6	13%
Repeated measures studies	11	24%
Cross-sectional studies	16	36%



Opportunities to expand knowledge

Have you ever felt your choice of research method, design, and data analysis was dictated by concerns other than the purely theoretical?

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73% answered YES 27% answered NO

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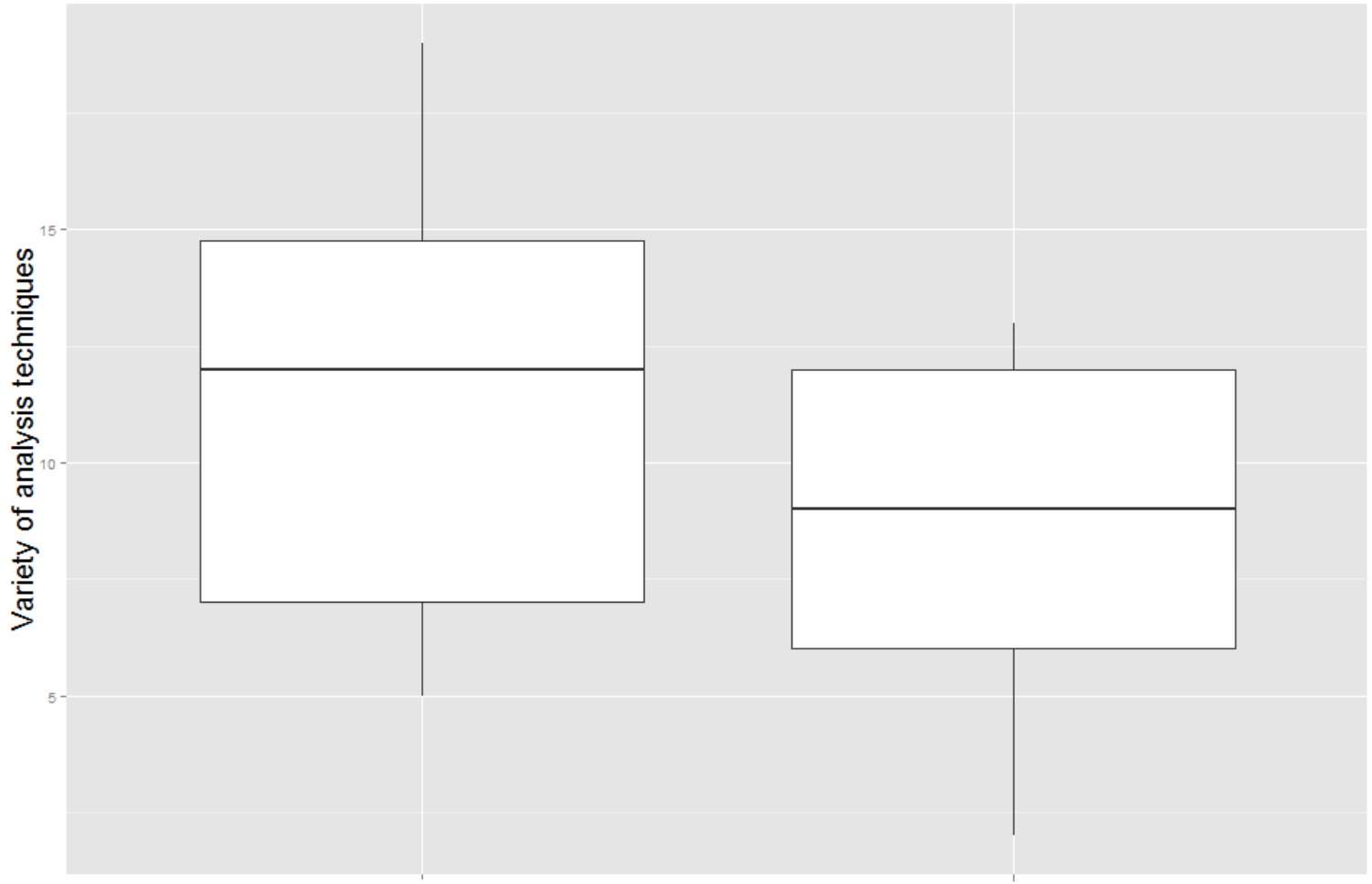
73% answered YES 27% answered NO



Why this result is worrying

Understand the question that needs to be answered before deciding which method and statistical analysis to use. The question should drive those choices, not the reverse.

- PhD from the United States, 42 years research experience

The importance of getting in early

Once misconceptions about statistics are established, they are hard to change

- (Garfield, 1995;Macdonald, 1997)

The importance of getting in early

Once misconceptions about statistics are established, they are hard to change

- (Garfield, 1995;Macdonald, 1997)

Having a good working knowledge of various types of data collection methods and analytic tools (statistical analyses, qualitative analyses) will mean you are free to ask a wider range of research questions and then know how to pursue the answer to those questions.

- PhD from the United States, 2 years research experience

In conclusion

Pre-existing approaches to guiding young academics through the statistical decision making process are limited by:

- Their supervisor's knowledge
- The scope of published works
- The scope of decision making aides

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You can help – complete the questionnaire at

http://tinyurl.com/academicdms

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MicroOsiris Decision Tree For Statistics (http://www.microsiris.com/Statistical%20Decision%20Tree/)

Selecting Statistics (http://www.socialresearchmethods.net/selstat/ssstart.htm)

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