Universiteit Utrecht

Research mission statement and projects 2013 - 2016 of the department of Methodology and Statistics

The mission of the department of Methodology and Statistics of the faculty of Social and Behavioral Sciences of Utrecht University is to devise and extend methodological and statistical techniques in the behavioral and social sciences. We disseminate knowledge about these techniques through publications, teaching and consultation, and by organizing courses and conferences.

We will discuss the general research goals and discuss the four research areas in which we will concentrate our activities in the years 2013 – 2016, namely Data Collection and Data Quality, Methods for Information Synthesis, Longitudinal Research and Latent Variable Models. For each of these areas we give a description of projects.

Research goals
Our department aims at two types of research.

At the core we carry out research in methodological and statistical areas relevant to social and behavioral scientists. This includes fundamental research in methodology and statistics and development of new methodological and statistical techniques, recognized at the national and international level as excellent and contributing to the knowledge in the discipline.

In addition, we carry out more applied methodological and statistical research based on interaction with social and behavioral researchers within and outside the Faculty of Social and Behavioral Sciences. To maintain this interaction, we carry out a methodological and statistical consultation service for researchers in the faculty.

There are four key research areas that we describe below.

Research area: Data Collection and Data Quality
Empirical research in the behavioral and social sciences uses a variety of data collection tools. One important tool is large scale quantitative data collection using surveys and registers. In this area, developments are clearly going in the direction of cross-cultural comparative surveys and longitudinal surveys, and new methodological challenges posed by the increased use of mixed mode surveys, Internet panels and the use of register data as replacements of or in combination with surveys. These developments are both cost driven (exclusively face-to-face based surveys are becoming prohibitively expensive) and technology driven as technological developments enable the use of new survey methodologies.
M&S researchers in this area have a wide expertise in topics related to (survey) data collection and data quality, among others, questionnaire design, pretesting methods and design and analysis of complex surveys. This includes topics where survey methodology and survey statistics meet, such as designs that exploit missing data techniques and propensity score methods.

Research Topics for 2013 - 2016
In the coming years the department will focus on the following topics:
(i) Mixed mode surveys and Internet Panels. The department has a long history of research on nonresponse in surveys. Recently, the interest in this topic has shifted to the related problems of representativeness (R-indicators) and estimating and controlling bias in mixed mode surveys. On several of these topics, M&S has a formal collaboration with Statistics Netherlands (CBS).

(ii) Survey data quality in panel surveys. In the VENI-Project 'Getting the Right Answers: An Unconventional Approach to Building a Web Panel' new methods for recruiting panel members are investigated as well as causes that threat quality in online panel research: panel conditioning, attrition, visual design issues, non-response, and the inferential value of non-probability samples. Second, the project Survey data quality in panel surveys: trade-offs between nonresponse and measurement error awarded with a Future Leaders Grant by the ESRC in the United Kingdom focuses on modeling and estimating of common causes of the two largest sources of survey error in panel surveys: nonresponse bias due to drop out, and measurement error. This project aims to identify causes of survey error, and describe the consequences of these in a trade-off between survey data quality and survey costs. This project is joint with the Institute for Social & Economic Research at the University of Essex. This topic falls both under this research area as well as under the area Longitudinal Research.

(iii) Register data, including statistical models for population size estimation. The topic Population size estimation aims to develop methodology for estimating the size of hidden populations such as victims of domestic violence, the homeless and undocumented aliens.

(iv) Missing data analysis. The project Missing data focuses on multiple imputation, both for data missing at random as well as data missing not at random.

(v) Optimal design. An important topic in data quality is optimal design. In the coming years the focus is on optimal design in time-to-event studies and therefore this topic is elaborated under the Research Area Longitudinal Research.

(vi) Mixed methods research. This topic combines the use of qualitative research alongside the use of quantitative data collection methods. Qualitative research in the survey context contributes to a. the exploration of a research area to develop questionnaires, b. understanding of the question-answer process (cognitive interviewing) to improve questionnaires, and c. the comparison of research outcomes of surveys and other methods to examine strengths and weaknesses of surveys in a specific context.

Valorization, grants and output

Research area: Data Collection and Data Quality

(i) Mixed mode surveys and Internet Panels

(ii) Survey data quality in panel surveys

(iii) Register data: including statistical models for population size estimation

(iv) Missing data analysis

(v) Optimal design: is elaborated on in Area Longitudinal Research

(vi) Mixed methods research

(i) Internet and Mixed mode surveys

Team of researchers: Joop Hox, Edith de Leeuw, Peter Lugtig, Vera Toepoel, Frank Bais, Thomas Klausch, Jorre Vannieuwenhuyze

Grants

- **Toepoel, V.** (2010) Veni Grant Project (Dutch Organisation of Scientific Research); Getting the RIGHT answers: an unconventional approach to building a web panel Period: November 2010 – August 2014 Budget: € 364.000.
- **Klausch, T.** (2014) Post-doc financing by Statistics Netherlands (95k).

Publications

- **Toepoel V. & Lugtig, P.** (in press) What happens if you offer a mobile option to your web panel? Evidence from a probability- based panel of Internet users. *Social Science Computer Review,* advance access, 2 april 2014. doi:10.1177/0894439313510482
- **Klausch, L.T., Hox, J.J.** & Schouten, B. (2013). Measurement effects of survey mode on the equivalence of attitudinal rating scale questions. *Sociological Methods & Research*, *42*, 227-263.
- **Lugtig, P.,** Lensvelt-Mulders, G.J.L.M., Frerichs, R. & Greven, A. (2011), Estimating nonresponse bias and mode effects in a mixed-mode survey, *International Journal of Market Research*, 53(5), p. 669-686
- **Toepoel, V.** & Couper, M. (2011). Can verbal instructions counteract visual context effects in web surveys? *Public Opinion Quarterly,* 1-18.
- **Toepoel, V.** & Dillman, D.A. (2011). Words, numbers, and visual heuristics in web surveys. *Social Science Computer Review*, 29 (2), 193-207.(2), 193-207.
- **De Leeuw, E.D. & Hox, J.J** (2011). Internet surveys as part of a mixed-mode design. Pp. 45-76 in M. Das, P. Ester & L. Kaczmirek (Eds.). *Social and Behavioral Research and the Internet*. New York: Routledge.
- **Hox, J.J., De Leeuw, E.D.** & Dillman, D.A. (2008). The cornerstones of survey research. In Edith D. de Leeuw, Joop J. Hox, & Don A. Dillman (2008). International Handbook Of Survey Methodology. New York: Taylor & Francis, Psychology Press, EAM series, pp.1-17.
- **De Leeuw, E.D.** (2008). Choosing the method of data collection. In Edith D. de Leeuw, Joop J. Hox, & Don A. Dillman (2008). International Handbook Of Survey Methodology. New York: Taylor & Francis, Psychology Press, EAM series, pp.113-135.

P.h.D.-Projects
- **Klausch, T.** (2009-2014). Non-response and response bias in mixed mode surveys.
- **Bais, F.** (2014-present) Response Styles, Respondent Profiles, and Questionnaire Profiles in mixed-mode surveys, jointly funded by UU and Statistics Netherlands.

Valorization
Cooperation partners:
- Dutch Platform for Survey Research (Nederlandstalig Platform voor Survey Onderzoek, www.npso.net)
- Statistics NetherlandsStatistics Netherlands

Applied research publications:
- **De Leeuw, E.D.** (2011). Representativiteit versus datakwaliteit. [Representative samples or reliable answers?]. *CLOU, marketing informatie en research*, 53, July 2011, p. 39
- Roberts, A., **de Leeuw E., Hox, J., Klausch, T**., de Jongh, A. (2013). Leuker kunnen wij het wel maken. Online vragenlijst design:design: standaard matrix of scrollmatrix (We can actually make it nicer. Online questionnaire design: standard matrix or scrollmatrix). In MOA (ed.), Jaarboek MarktOnderzoekAssociatie 2013 (pp. 133-148). Amsterdam: MOA.
- **Toepoel, V.** (2009). Ik zie, ik zie, wat jij niet ziet. Het belang van visueel design in online onderzoek. In A.E. Bronner, P. Dekker, E. de Leeuw, L.J. Paas, K. de Ruyter, A. Smidts, & J.E. Wierenga (Eds.), Ontwikkelingen in het Marktonderzoek Jaarboek 2009 MarktOnderzoekAssociatie (pp. 43-60). Haarlem: Spaar en Hout.

ii) Survey data quality in panel surveys

Team of researchers: Joop Hox, Edith de Leeuw, Peter Lugtig, Vera Toepoel

Grant
- **Lugtig,** P. (2012), Utrecht University Grant: ESRC Future Leaders Grant, Subsidy for three year research project. Project: Trade-offs between non-response and measurement error in a panel survey. Period: 1

January 2013 - 31 December 2015
Budget: € 163.000

Publications
- **Lugtig, P.** (2014) Panel attrition: separating stayers, fast attriters, gradual attriters and lurkers. *Sociological Methods and Research.* Advance access, 7 February 2014. DOI:10.1177/0049124113520305
- **Lugtig, P.** and Jäckle, A. (2014) Can I just check...? Effects of edit check questions on measurement error and survey estimates. *Journal of Official Statistics* 30(1), p. 1-19. http://dx.doi.org/10.2478/jos-2014-0003
- Scherpenzeel, A. & **Toepoel, V.** (2012). Recruiting a Probability Sample for an Online Panel: Effects of contact mode, incentives, and information. *Public Opinion Quarterly.*
- Sikkel, D., Sikkel, D., **Hox, J., & De Leeuw E.** (2009). Using auxiliary data for adjustment in longitudinal research. In P. Lynn (Ed) Methodology of Longitudinal surveys. Wiley series in survey methodology. New York: Wiley, pp 141-155.
- **Toepoel, V.,** Das, J.W.M., & Soest, A.H.O. van (2008). Effects of design in web surveys: Comparing trained and fresh respondents. Public Opinion Quarterly, 72(5), 985-1007.

Valorization
Cooperation partners:
- ISER, University of Essex
- Dutch Platform for Survey Research (Nederlandstalig Platform voor Survey Onderzoek, www.npso.net)

Applied research publications:
- **Lugtig, P.J.** (2012). Luiaards en trouwe deelnemers. Classificatie van respondenten in een panelstudie. In Bronner, F. (Ed.), *Ontwikkelingen in het Jaarboek van de Markt Onderzoeks Associatie*. Haarlem: Spaar en Hout.
- Matthijsse, S., **De Leeuw, E.D.** & **Hox, J.J.** (2012). Professionele respondenten in online panels: Een bedreiging voor de data kwaliteit? De NOPVO-data nader geanalyseerd. In A.E. Bronner, P. Dekker, E. De Leeuw, L.J. Paas, K. De Ruyter, A. Smidts & J.E. Wieringa (Eds.), *Ontwikkelingen in het Marktonderzoek 2012. 37eJaarboek van de MOA [In Dutch: Developments in Market Research] Jaarboek 2012* (pp. 89-106). Haarlem: SpaarenHout.
- **De Leeuw, E.D.** (2004). Nonresponse en panelonderzoek: Voorkomen is beter dan genezen. [Nonresponse and drop out in panel studies: Prevention is the better cure]. *Facta*, December 2004, 28-30.

(iii) Register data, including statistical models for population size estimation

Team of researchers: Peter van der Heijden, Maarten Cruyff, Susanna Gerritse

Grants
- Dutch ministries: Estimation of the size of hidden and illusive populations, for example people from Middle and Eastern Europe 2012: 21k; ; victims and perpetrators of domestic violence(2012: 25k); illegal immigrants (2010: 43k; 2011: 21k)
- Statistics Netherlands: Preparation of the Census 2011 (82k)Statistics Netherlands: Preparation of the Census 2011 (82k)

Publications
- Alberto Oteo Perez, **M. Cruyff**, A. Benschop and D. J. Korf (2013). Estimating the Prevalence of Crack Dependence Using Capture-Recapture With Institutional and Field Data: A Three-City Study in the Netherlands, *Substance Use & Misuse* 48, 173-180

- **P.G.M. van der Heijden**, G. Cruts, **M. Cruyff,** (2013) Methods for population size estimation of problem drug users using a single registration, International *Journal of drug policy* 24, 614-618
- **Van der Heijden, P.G.M.,Van der Heijden, P.G.M.,** J. Whittaker, **M. Cruyff**, B. Bakker and R. van der Vliet (2012). People born in the Middle East but residing in the Netherlands: Invariant population size estimates and the role of active and passive covariates. *Annals of Applied Statistics*, 6, 831-852.
- Boehning, D. & **P.G.M. van der Heijden** (2009). A Covariate Adjustment for Zero-truncated Approaches to Estimating the Size of Hidden and Elusive Populations. *Annals of Applied Statistics*, 3, 595-610.
- **M. Cruyff** and **P.G. M. van der Heijden** (2008) Point and Interval Estimation of the Population Size Using a Zero-Truncated Negative Binomial Regression Model, Biometrical Journal 50, 1035-1050.
- Zwane, E., & **P.G.M. van der Heijden** (2007). Analyzing capture-recapture data when some variables of heterogeneous catchability are not collected or asked in all registrations. *Statistics in Medicine,* 26, 1069-1089.

Ph.D.-projects
- **S. GerritseS. Gerritse**, The estimation of population size and population characteristics using incomplete registries. With prof. dr. Bart Bakker, Statistics Netherlands, jointly funded by UU and Statistics Netherlands.

Valorisation
Cooperation partners:
- Statistics Netherlands,
- University of Southampton (where van der Heijden also has a chair)
- the city of Utrecht

Applied research publications:
- **Cruyff, M.,** G. van Gils en **P.G.M. van der Heijden** (2013). Simulatie recurrent event model. (In opdracht van het ministerie van Veiligheid en Justitie). Utrecht: Universiteit Utrecht, Departement Methoden en Technieken.
- **Van der Heijden, P.G.M., M. CruyffVan der Heijden, P.G.M., M. Cruyff** en G. van Gils (2013). Aantallen geregistreerde en niet-geregistreerde burgers uit MOE-landen die in Nederland verblijven. Rapportage schattingen 2009 en 2010. (In opdracht van Ministerie van Binnenlandse Zaken). Utrecht: Universiteit Utrecht, Departement Methoden en Technieken.

(iv) Missing data analysis

Team of researchers : Stef van Buuren, Peter van der Heijden, Maarten Cruyff, Shahab Jolani, Gerko Vink

Publications
- **Jolani, S.,** Frank, L.E. & van **Buuren, S. van** (2014). Dual imputation model for incomplete longitudinal data. *British Journal of Mathematical and Statistical Psychology, 67(2),* 197-212.
- **Vink, G**., Frank, L. E., Pannekoek, J., & **Van Buuren, S.** (2014). Predictive mean matching imputation of semicontinuous variables. *Statistica Neerlandica*, *68*(1), 61-90.
- **Vink, G., & van Buuren, S**. (2013). Multiple Imputation of Squared Terms. *Sociological Methods & Research*, *42*(4), 598-607.
- **Jolani, S., van Buuren, S.** & Frank, L.E. (2013). Combining the nonresponse and complete-data models for drawing imputation under MAR. *Journal of Statistical Computation and Simulation, 83(5)*, 866–877
- **Van der Heijden, P.G.M.,** J. Whittaker, **M. Cruyff**, B. Bakker and R. van der Vliet (2012). People born in the Middle East but residing in the Netherlands: Invariant population size estimates and the role of active and passive covariates. *Annals of Applied Statistics*, 6, 831-852.

- Zwane, E., and **P.G.M. van der Heijden** (2007). Analyzing capture-recapture data when some variables of heterogeneous
  catchability are not collected or asked in all registrations. *Statistics in Medicine*, 26, 1069-1089.

Ph.D.-projects
- **Gerko Vink** (2009 – 2014). Restrictive imputation of incomplete survey data.
- **Shahab Jolani** (2013). Dual imputation strategies for analyzing incomplete data.

Valorisation
Cooperation partners
- Statistics Netherlands
- Australian Curriculum, Assessment and Reporting Authority (ACARA)

Applied research publications
- **Vink, G., & Van Buuren, S.** (2013, September). Multiple Imputation of Longitudinal NAPLAN Data (Tech. Rep.). Australian
  Curriculum, Assessment and Reporting Authority.

(vi) Mixed methods research

Team of researchers: Hennie Boeije, Peter Lugtig, Vanessa Torres van Grinsven

Publications
- **Torres van Grinsven, V.** (2014). A pragmatic mixed-methods analysis: Identifying perspectives and sentiments with social
  media data. Sage Research Methods Cases, DOI: http://dx.doi.org/10.4135/978144627305014533915
- Willis, G. & **Boeije, H.R.** (2013). The survey field needs a framework for the systematic reporting of questionnaire development
  and pretesting. Editorial. Methodology, 9(3):85-86.
- **Boeije, H.R.** & Willis, G. (2013). The Cognitive Interviewing Reporting Framework (CIRF): towards the harmonization
  of cognitive interviewing reports. Methodology, 9(3):87-95.
- **Lugtig, P. & Boeije, H.R.** & Lensvelt-Mulders, G. (2012). Change? What change? An exploration of the use of mixed-methods
  research to understand longitudinal measurement variance. Methodology; 8(3): 115-123.
- **Torres van Grinsven, V.**, Bolko, I. & Bavdaz, M. (2012*).* Sources of Motivation in Business Surveys. Proceedings of the Fourth
  International Conference on Establishment Surveys (ICES IV), June 11-14, Montréal, Québec, Canada. International Conference
  on Establishment Surveys (ICES IV), June 11-14, Montréal, Québec, Canada.

Ph.D.-projects
- **Vanessa Torres van Grinsven** (2010 – 2015). Motivation of respondents in business survey.

Valorisation
Cooperation partners
- National Cancer Institute, National Institutes of Health (NIH), USA
- Statistics Netherlands
- Partners in Blue-Ets project
- University of Ljubljana, Slovenia
- University of Economics, Bratislava, Slovakia

Applied research publications
- **Torres van Grinsven, V.** & Snijkers, G.J.M.E. (2013). Sentiments of Business Respondents on Social Media. Proceedings of the
  NTTS, March 5-7 Brussels, Belgium.

RESEARCH AREA: METHODS FOR INFORMATION SYNTHESIS
The amount of information available from scientific research has exploded over the last decades

and is still increasing every day. Consequently, there is a need to integrate results from multiple sources in order to arrive at the current state of knowledge in a particular field. The objective of information synthesis is to build theory or to inform evidence-based interventions. In some cases, systematic reviews, meta-analyses or qualitative evidence synthesis methods can be used to achieve this, but in other cases novel and more advanced techniques are needed.

The expertise of M&S researchers covers a wide range of such techniques, ranging from methods for the synthesis of qualitative and mixed methods research, to Bayesian methods to incorporate prior research results in a current study analysis.

Research Topics for 2013 - 2016
In the coming years the department will focus on the following topics:
(i) Quantitative methods

· The incorporation of information from previous research in the quantitative analysis of new data as a way to build on earlier work. Such information can come from different sources, like expert knowledge, pre-specified theories, or historical data sets. Innovative Bayesian methods offer the opportunity to include prior information in the analysis of new data.

· Learning more from empirical data using prior knowledge. This topic follows the title of a VICI project and is concerned with the evaluation of hypotheses that are more informative than the traditional null and alternative hypothesis and in such represent the theoretical expectations of the researcher. In this project, Bayesian model selection techniques are developed for a large class of statistical models.

· Development of Bayesian methods for the analysis of circular data. This topic follows the title of a VIDI project concerned with developing Bayesian tools for data measured in angles/degrees (0º -360º). Two general topics of the research area are applied in the context of circular data: the evaluation of informative hypotheses using Bayesian model selection and the inclusion of results from previous research in current data analyses through the use of informative priors. One subprojects deals with data from longitudinal designs and, therefore, also falls under the key area Longitudinal analysis.

· Development of latent growth mixture modeling (LGMM). This project falls both under the research area Methods for Information Synthesis as well as under Longitudinal Analysis, and it is discussed in the latter area.

· Improving epidemiological research by Bayesian analysis. Within the UU Focal Area Epidemiology, a PhD grant for this project enables collaborations between our department and researchers from the Julius Centre for epidemiological research. The main focus of this project is the development of methods and guidelines for the incorporation of historical data in current data analyses.

(ii) Qualitative methods: Synthesis of qualitative research and mixed methods research. This topic contributes to the development and improvement of systematic review methods that can incorporate qualitative and quantitative studies. In an increasing number of social science domains both types of studies exist side by side and processing them requires a combined review method. In cooperation with professionals and policy makers new methods are applied that allow for a broader evidence base for interventions.

Valorization, grants and output

A. Systematic reviews of quantitative and qualitative evidence

B. Informative hypotheses and replication, Bayes and Frequentistic

C. Bayesian methods for circular data

A. Systematic reviews of quantitative and qualitative evidence

Team of researchers: Hennie Boeije, Irene Klugkist, Leonie van Grootel, Suzanne Jak, Haifang Ni-Dufour, Charlotte Rietbergen, Marieke Saan

Grants
-Jak, S. (2015). Rubicon Grant from the Netherlands Organisation for Scientific Research (NWO). Project: 'Stacking up the evidence: new methods for meta-analysis'. Executed at National University of Singapore, January 2015 to December 2015. **€**69.835.
-**Boeije, H.R.** and Leferink, S. (2012), Project: 'Developing decision-support review methods in victomology.' Jointly funded by Fonds Slachtofferhulp and Utrecht University. Period: 2012 August tot 2017 June Budget: € 240.000.
-**Klugkist, I.** and Jansen, K. (2009). Project: 'Improving epidemiological research by Bayesian analysis'. Funded by Focus Area Epidemiology, Utrecht University (joint project with UMCU). Period: 2009-2014. Budget: € 180.000.

Publications
-**Boeije, H.R.,** Van Wesel, F. & Slagt, M. (2014). Guidance for deciding upon use of primary mixed methods studies in research synthesis: lessons learned in childhood trauma. Quality & Quantity: 48(2): 1075-1088.
-**Jak, S.**, Oort, F.J., Roorda, D.L. & Koomen, H.M.I. (2013). Meta-analytic structural equation modelling with missing correlations. Netherlands Journal of Psychology, 67(4), 132-139.
-**Boeije, H.R.,** Slagt, M. & Van Wesel, F. (2013) The contribution of mixed methods research to the field of childhood trauma: a narrative review focused on data integration. Journal of Mixed Methods Research, 7(4): 347-369.
-**Boeije, H.,** Wesel, F. van & Alisic, E. (2011). Making a difference: towards a method for weighing the evidence in a qualitative synthesis. Journal of Evaluation in Clinical Practice, 17: 657-663.
-**Rietbergen, C**., **Klugkist, I.**, Janssen, K.J.M., Moons, K.G.M., **Hoijtink, H.** (2011). Incorporation of historical data in the analysis of randomized therapeutic trials. Contemporary Clinical Trials, 32, 848-855.

Ph.D.-projects
-**Grootel, L. van** (2010-2016) Developing and evaluating synthesis methods that incorporate quantitative and qualitative methods.
-**Rietbergen, C.** (2009 - present). Improving epidemiological research by Bayesian analysis.
-**Ni-Dufour, H.** (2013 - present). Bayesian techniques to update evidence in veterinary medicine.
-**Saan, M.** (2014 - 2017) Developing decision-support review methods in victomology.

Valorisation
Cooperation partners:
- Victim Support Netherlands
- Rehabiliation Centre De Hoogstraat
- Australian Centre for Posttraumatic Mental Health, Melbourne, Australia
- University Medical Centre Utrecht (UMCU)
- Faculty of Veterinary Medicine

Applied research publications:
- Swennen, M.H.J., Heijden, G. van der, **Boeije, H.R**., Rheenen, N. van, Verheul, F.J.M., Graaf, Y. van der & Kalkman, C. (2013)
  Doctors' perceptions and use of evidence-based medicine: a systematic review and thematic synthesis of qualitative studies.
  Academic Medicine, 88(9): 1384-1396.

B. Informative hypotheses and replication: Bayes and Frequentistic

Team of researchers: Herbert Hoijtink, Irene Klugkist, Rebecca Kuiper, Maria Bolsinova, Xin Gu, Yasin Altinisik

Grants
- **Hoijtink, H**. (NWO VICI grant (453-05-002, € 1.250.000). Learning more from empirical data using prior knowledge (2005).

Publications
-Gu, X., Mulder, J., Deković, M., & **Hoijtink, H.** (2014, July 21). Bayesian evaluation of inequality constrained hypotheses. *Psychological Methods*. Advance online publication. http://dx.doi.org/10.1037/met0000017

-**Kuiper, R. M.**, Raub, W., Buskens, V., and **Hoijtink, H** (2013). Combining Statistical Evidence from Several Studies: Positive Past Effects on Trust. Sociological Methods and Research, 42 (1), pp. 60–81.
-**Kuiper, R. M., and Hoijtink, H.** (2013). A Fortran 90 Program for the Generalized Order-Restricted Information Criterion. Journal of Statistical Software, 54(8), 1-19.
-**Hoijtink, H.J.A.** (2012). Informative Hypotheses. Theory and Practice for Behavioral and Social Scientists. Boca Raton: Chapman & Hall/CRC.
-**Van de Schoot, R., Hoijtink, H**., Hallquist, M. N., & Boelen, P.A. (2012). Bayesian evaluation of inequality-constrained hypotheses in SEM models using Mplus. Structural Equation Modeling, 19, 593-609.
-**Kuiper, R. M., Hoijtink, H.** & Silvapulle, M. J. (2011). An Akaike-type information criterion for model selection under inequality constraints. Biometrika, 98(2), pp. 495–501.
-**Klugkist, I.**, Laudy, O., **Hoijtink, H.** (2010). Bayesian evaluation of equality and inequality constrained hypotheses for contingency tables. Psychological Methods, 15, 281-299.
-**Kuiper, R. M., and Hoijtink, H** (2010). Comparisons of means using exploratory and confirmatory approaches. Psychological Methods, Vol 15(1), Mar 2010, 69-86.
-**Klugkist, I.,** Van Wesel, F., Bullens, J. (2011). Do we know what we test and do we test what we want to know? International Journal of Behavioral Development, 35, 550-560.
-**Van de Schoot, R., Hoijtink, H.** & Dekovic, M. (2010). Testing Inequality Constrained Hypotheses in SEM Models. Structural Equation Modeling, 17, 443–463.
-Mulder, J., **Klugkist, I., Van de Schoot, R.,** Meeus, Selfhout & **Hoijtink, H.** (2009). Bayesian model selection of informative hypotheses for repeated measurements. Journal of Mathematical Psychology, 53, 530-546.
-**Hoijtink, H., Klugkist, I**., & Boelen, P. A. (Eds.). (2008). Bayesian evaluation of informative hypotheses. New York: Springer.
-**Klugkist, I**., Laudy, O. & **Hoijtink, H.** (2005). Inequality Constrained Analysis Of Variance: A Bayesian Approach. Psychological Methods, *10 (4),* 477-493.

Ph.D.-projects
- **Altinisik, Y.** (2014 - present). Generalized order restricted information criteria (GORIC).
- **Gu, X.** (2011 - present). Bayesian evaluation of informative hypotheses in general statistical models.

Valorisation

Cooperation Partners:
- Statistics Netherlands
- Institute for Biostatistics, Leibniz University Hannover, Germany

Applied Research publications:
- ***Van de Schoot, R.**, Kaplan, D., Denissen, J., Asendorpf, J. B., Neyer, F. J. & van Aken, M. A. G. (2013). A gentle introduction to Bayesian analysis: applications to research in child development. Child Development, 85(3), 842-860. doi:0.1111/cdev.12169*
- *Kluytmans, A., **Van de Schoot, R.,** Mulder, J. and **Hoijtink, H.** (2012). Illustrating Bayesian Evaluation of Informative Hypotheses for Regression Models.* Frontiers in Quantitative Psychology and Measurement, *doi: 10.3389/fpsyg.2012.00002*

Bayesian methods for circular data

Team of researchers: Irene Klugkist, Jolien Cremers, Kees Mulder

Grants

- **Klugkist, I.G.** (2013). VIDI-grant (452-12-010) from the Netherlands Organization for Scientific Research (NWO). Project title:
A Different Angle: New Tools for Circular Data. Period: November 2013 – November 2018 Budget: € 800.000.

Publications

- Baayen, C., **Klugkist, I.** (in press). Evaluating order-constrained hypotheses for circular data from a between-within subjects
  design. Psychological Methods.
- Baayen, C., **Klugkist, I.**, Mechsner, F. (2012). A test of order constrained hypotheses for circular data with applications to
  human movement science. Journal of Motor Behavior, 44, 351-363.human movement science. Journal of Motor Behavior, 44,
  351-363.
- **Klugkist, I.**, Bullens, J. & Postma, A. (2012). Evaluating Order Constrained Hypotheses for Circular Data using Permutation
  Tests. Tests. British Journal of Mathematical and Statistical Psychology, 65*,* 222-236.

Ph.D.-Projects
- **Mulder, K.** (2014 - present). Circular data in experimental and cross-sectional designs.
- **Cremers, J.** (2014 - present). Circular data in longitudinal designs.

RESEARCH AREA: LONGITUDINAL RESEARCH
Many research questions in the social sciences pertain to change phenomena, for instance, developmental processes, learning, interventions, and regulatory mechanisms. To study such phenomena, longitudinal research designs in which the same units (e.g., individuals, families, organizations) are measured multiple times are essential. To analyze such data, longitudinal techniques are required, and this is one of the areas M&S specializes in.

The expertise of M&S researchers cover a wide range of longitudinal techniques, ranging from techniques which are appropriate for studying developmental processes that take place over the course of years or even decades, to techniques that can be used to study processes taking place at a micro-level and that fluctuate from hour to hour or even from second to second.

Research Topics for 2013 - 2016
In the coming years the department will focus on the following topics:

(i) Studying individual differences in dynamics. This topic stems from the VIDI-project Time for change: Studying individual differences in dynamics . The VIDI project is concerned with developing new multilevel models based on time series models to handle intensive longitudinal data. These data consist of a much larger number of repeated measures than more traditional longitudinal data, and therefore require a new statistical approach. Due to recent technological developments such as diary studies employing smart phones, such intensive longitudinal data are becoming more common. The models developed in this project allow for a more detailed investigation of processes that take place at the intra-individual or within-person level.

(ii) Power in studies on event occurrence. This topic stems from the VIDI-project Improving statistical power in studies on event occurrence by using an optimal design. The VIDI project aims to develop optimal study designs for longitudinal studies where the occurrence and timing of an event is measured in discrete time intervals. The main focus is on experimental settings where an intervention is compared to a control. The findings of this project will enable substantive researchers in the social and biomedical sciences to select the required number of time intervals and number of subjects such that an effect of treatment is detected with sufficient probability.

(iii) The Latent growth mixture model. In the VENI-project Integrating background knowledge about traumatic stress experienced after trauma into statistical models assessing individual change over time, Bayesian statistics is used to improve Latent Growth Mixture Modeling (LGMM). LGMM is an exploratory approach to distinguish between diverse subpopulations that are characterized by distinct developmental trajectories. The aim of this project is to develop ways in which to incorporate inequality constraints for the parameters, representing prior knowledge and expectations of the researcher, thus turning LGMM into a confirmatory approach. This model also falls under the research area Methods for Information Synthesis.

(iv) Survey data quality in panel surveys. The ESRC project Survey data quality in panel surveys: trade-offs between nonresponse and measurement error and the VENI project Getting the Right Answers: An Unconventional Approach to Building a Web Panel’ are part of this topic. These

projects also fall under the Research Area Data Collection and Data Quality and are discussed there.

(v) Development of Bayesian methods for the analysis of circular data in longitudinal designs. This project also falls under the research area Methods for Information Synthesis and is discussed there.

Valorization, grants and output
Research Area: Longitudinal Research

(i) Analyzing intensive longitudinal data

(ii) Improving statistical power and optimal design

(iii) Integrating background knowledge into SEM

(i) Analyzing intensive longitudinal data

Team of researchers: Ellen L. Hamaker, Rebecca M. Kuiper, Joran Jongerling, Noémi K. Schuurman, Silvia de Haan - Rietdijk

Grants
- **Hamaker, E.** (2011-2016) NWO-VIDI Grant (Dutch Organisation of Scientific Research). Project: Time for change: Studying individual differences in dynamics. Budget: € 400.000.
- **Hamaker, E.** (2006-2009) NWO-VENI Grant (Dutch Organisation of Scientific Research). Project: Time series models to study nonstationary psychological processes. Budget: € 200.000.

Publications
-□□□□□□□□□□□□□**Hamaker, E.L**., **Kuiper, R. M.** & Grasman, R.P.P.P. (2014). A critique of the cross-lagged panel model. *Psychological methods*.
- **De Haan-Rietdijk, S.,** Gottman, J.M., Bergeman, C.S., & **Hamaker, E.L.** (2014). Get over it! A Multilevel Treshold Autoregressive Model for State-Depent Affect Regulation. Psychometrika.
- Wang, L., Wang, L., **Hamaker, E.L.** & Bergman, C. (2013). Investigating inter-individual differences in short-term intra-individual variability. Psychological Methods.
- **Hamaker, E.L.** (2012). Why researchers should think "within-person": A paradigmatic rationale. In M.R. Mehl & T.S. Conner (Eds.), *Handbook of Methods for Studying Daily Life* (pp. 43-61). New York, NY: Guilford Publications.
- **JongerlingJongerling**, J. & **Hamaker**, E.L. (2011). On the trajectories of the predetermined ALT model: What are we really modeling? *Structural Equation Modeling: A Multidisciplinary Journal, 18, 3*, 370-382.
- Chow, S.-M., Ho, R.M., Chow, S.-M., Ho, R.M., **Hamaker, E.L.** & Dolan, C.V. (2010). Equivalence and differences between structural equation modeling and state-space modeling techniques. *Structural Equation Modeling*, 17, 303-332.

Ph.D.-projects:
- **Jongerling, J.** (2009 – present). Modeling interindividual differences in intraindividual change and variability(2009 – present). Modeling interindividual differences in intraindividual change and variability
- **Schuurman, N**. (2011 – present). Properties of hierarchical state-space models (2011 – present). Properties of hierarchical state-space modelsstate-space models
- **Haan-Rietdijk, S.**(2012 – present). Modeling individual differences in intraindividual change and variability

Valorisation:
Cooperation partners:
- Department of Psychiatry and Psychology, Maastricht UniversityDepartment
- Department of Psychology, Department of Psychology, University of Leuven, Belgium

(ii) Improving statistical power and optimal design

Team of researchers: Mirjam Moerbeek, Maryam Safarkhani

Grants
- **Moerbeek, M.** (2008) NWO-VIDI Grant (Dutch Organisation of Scientific Research). Project: Improving statistical power in studies on event occurrence by using an optimal design. Period: 2009 – 2014. Budget: € 600.000.
- **Moerbeek, M.** (2009) Aspasia Grant (Dutch Organisation of Scientific Research - NWO). Budget: € 100.000.

Publications
- **Safarkhani M. & Moerbeek, M.** (2014). The influence of a covariate on optimal designs in longitudinal studies with discrete-time survival endpoints. Computational Statistics and Data Analysis, 75, 217–226.
- **Safarkhani M. & Moerbeek, M.** (2013). Covariate Adjustment Strategy Increases Power in the Randomized Controlled Trial With Discrete-Time Survival Endpoints. Journal of Educational and Behavioral Statistics, 38, 355-380.
- **Jóźwiak, K. & Moerbeek, M.** (2013). Optimal Treatment Allocation and Study Duration for Trials with Discrete-Time Survival Endpoints. *Journal of Statistical Planning and Inference, 143*: 971-982.
- **Moerbeek, M.** (2008). Powerful and cost-efficient designs for longitudinal intervention studies with two treatment groups. *Journal of Educational and Behavioral Statistics*, 33(1): 41-61.

Ph.D.-projects:
- **Jozwiak, K.** (2009-2012). Project title: Improving statistical power in studies on event occurrence by using an optimal design. Date of Defence: April 12, 2013
- **Safarkhani, M.** (2011 – present). Project title: Heterogeneity in studies with discrete-time survival endpoints: implications for optimal designs and statistical power analysis.

Valorisation:
Collaboration partners:
- University of California at Los Angelos. Department of Biostatistics.

Applied research publicaytions:
- Thusch, C., Wierds, R., Thusch, C., Wierds, R., **Moerbeek, M.,** Ames, S.L., Grenard, J.L., Sussman, S., Stacy, A.W. (2009). Influence of Motivational Interviewing on explicit and implicit alcohol-related cognition and alcohol use in at-risk adolescents. Psychology of Addictive Behaviors, 23(1): 146-151.

(iii) Integrating background knowledge into SEM

Team of researchers: Rens (A.) G. J. van de Schoot, Mariëlle Zondervan-Zwijnenburg

Grants
- **Van de Schoot, R.** (2011-2016) NWO-VENI Grant (Dutch Organisation of Scientific Research). Project: Integrating background knowledge about traumatic stress experienced after trauma into statistical models assessing individual change over time. Period: January 2011 – January 2016. Budget: € 250.000.

- **Van de Schoot, R.** Co-applicant (2013-2016) Dutch Burns Foundation Grant. Project: The social impact of living with burn
  scars. Budget: € 160.000.
- **Van de Schoot, R.** Co-applicant (2012-2016) KWF/ Alpe D'Huzes Grant. Project: The efficacy and working mechanisms of two
  different home-based interventions for people suffering from chronic fatigue after cancer. Budget: € 546.900.

Publications

Ph.D.-projects
- **Zondervan-Zwijnenburg, M. A. J.** (2014 - present). Formalization and evaluation of prior knowledge based on prior/posterior
  predictive inference and informative hypotheses.predictive inference and informative hypotheses.

Valorisation
Collaboration partners:
- Dutch Burns Centre
- South African North West University
- University of Leuven

Applied research publications:
- **Van de Schoot, R.**, Kluytmans, A., Tummers, L., **Lugtig, P., Hox, J.** and Muthén, B. (in press) Facing off with
  choosing between Scylla and Charybdis: A comparison of scalar, partial, and the novel possibility of approximate measurement
  invariance. Frontiers in Quantitative Psychology and Measurement.

Latent Variable Modeling
Latent variables are variables that are not directly observed but are theoretically postulated or empirically inferred from observed variables. Recent insights make that latent variable models include, among others, structural equation models, multilevel models, and item-response models. Recent insights also allow to bring logistic regression and ordinal logistic regression under the umbrella of latent variable modeling. Thus the focus is here on models that are very general, and are very useful in applied research. For instance, structural equation modeling is useful for the analysis of mediation effects, multilevel models can be applied to the analysis of cluster randomized trials, where interventions are applied at the group level, and both structural equation models and item-response models are applied in the analysis of comparative and longitudinal surveys where measurement equivalence across countries-cultures and over time is an issue.

A relatively recent development is that these models are viewed as specific instances of a general latent variable model, and both statistical models and software has developed that allows specification of complex models. The expertise of M&S researchers in this area covers a wide range of techniques, allowing consultation of substantive researchers on a wide range of topics.

Research Topics for 2013 - 2016
In the coming years the department will focus on the following topics:

(i) Linking item response theory models with loglinear models. Recent research in our department led to the insight that a specific form of the one parameter item response model is a loglinear model. We will investigate how this key result can be generalized to other parts of the IRT machinery such as multi-dimensionality, DIF, and so on.

(ii) Multilevel Modelling. In this topic the focus will be in bridging the gap between what the general technology makes possible and the end user. The aim is to help end users making use of more sophisticated models so that his/her data can be analysed in a better way.

(iii) Latent variable models for longitudinal data. Topics are discussed under the Research Area Longitudinal Research and include multilevel modeling for individual change and the latent growth mixture model.

(iv) Logistic Prediction models. In these models the focus is on prediction of outcome categories and the area of application is student achievement and learning analytics.

Valorization, grants and output
Research Area: Latent Variable Modeling

(i) Item response theory

(ii) Structural equation modeling

(iii) Multilevel modeling

(iv) Logistic prediction models

(i) Item response theory

Team of researchers: David J. Hessen, Peter G. M. van der Heijden, Maria Bolsinova

Grants
-

Publications
- **Tijmstra, J., Hessen, D.J., Van der Heijden**, P.G.M., & Sijtsma, K. (2013). Testing manifest monotonicity using order-constrained statistical inference. statistical inference. *Psychometrika, 78,* 83-97.
- **Hessen, D.J.** (2012). Fitting and testing conditional multinormal partial credit models. *Psychometrika, 77,* 693-709.
- **Tijmstra, J., Hessen, D.J., Van der Heijden, P.G.M**., & Sijtsma, K. (2011). Invariant ordering of item-total regressions. *Psychometrika, 76, 217-227.*
- **Hessen, D.J**.(2011). Loglinear representations of multivariate Bernoulli Rasch models. *British Journal of Mathematical and Statistical Psychology, 64,* 337-354*.*
- **Hessen, D.J.** (2010). Likelihood ratio tests for special Rasch models. *Journal of Educational and Behavioral Statistics, 35,* 611-628.
- **Bolsinova, M., Hoijtink, H**., & Maris, G. (under review) Unmixing Rasch Scales.
- **Bolsinova M.**, & Maris., G. (submitted) A test for conditional independence between response time and accuracy.
- **Bolsinova M.**, & Maris., G. (submitted) Can IRT solve the missing data problem?

P.h.D.-Projects
- **Bolsinova M.,** New applications of Rasch models in educational measurement

Valorization
Cooperation partners:
- CITO

Applied research publications:
- Beek, Y. van, **Hessen, D.J**., Hutteman, R., Verhulp, E.E., & Leuven, M. van. (2012). Age and gender differences in depression across adolescence: real or 'bias?' *Journal of Child Psychology and Psychiatry*, 53, 973-985.

(ii) Structural equation modeling

Team of researchers: David J. Hessen, Suzanne Jak, Peter Lugtig, Rens van der Schoot, Noémi Schuurman

Grants
- 'Future Leaders Grant' on the topic , awarded by the Economic and Social Research Council in the United Kingdom, € 163.000

Publications
- Smeden, M. van, & **Hessen, D.J.** (2013). Testing for two-way interactions in the multi-group common factor model. *Structural Equation Modeling: A Multidisciplinary Journal, 20:1,* 98-107.
- **Hessen, D.J**., & Dolan, C.V. (2009). Heteroscedastic one-factor models and marginal maximum likelihood estimation. *British Journal of Mathematical and Statistical Psychology, 62, 57-77.*
- **Hessen, D.J**., Dolan, C.V., & Wicherts, J.M. (2006). The multi-group common factor model with minimal uniqueness constraints and the power to detect uniform bias. *Applied Psychological Measurement, 30, 233-246.*
- Adolf, J., **Schuurman, N.K**., Borkenau, P., Borsboom, D., & Dolan, C.V. (2014). Linking levels of analysis in psychometric data: The role of measurement invariance in testing the equivalence of intra- and inter-individual model structures. *Frontiers in psychology, 5.*
- **Jak, S**., Oort, F.J. & Dolan, C.V. (in press). Using two-level factor analysis to test for cluster bias in ordinal data. *Multivariate Behavioral Research, 49*, 544-553.
- **Jak, S.** (2014). Testing strong factorial invariance using three-level structural equation modeling. *Frontiers in Psychology, 5*, 745. DOI: 10.3389/fpsyg.2014.00745.
- **Jak, S**., Oort, F.J. & Dolan, C.V. (2014). Measurement bias in multilevel data. *Structural Equation Modeling, 21,*31 - 39*.*
- **Jak, S**., Oort, F.J. & Dolan, C.V. (2013). A test for cluster bias: Detecting violations of measurement invariance across clusters in multilevel data. *Structural Equation Modeling, 20*, 265-282*.*
- Barendse, M.T., Oort, F.J., **Jak, S**. & Timmerman, M.E. (2013). Multilevel exploratory factor analysis of discrete data. *Netherlands Journal of Psychology, 67,* 114 - 121*.*
- **Jak, S**., Oort, F.J. & Dolan, C.V. (2010)*.* Measurement bias and multidimensionality; an illustration of bias detection in multidimensional measurement models. *Advances in Statistical Analysis, 94,* 129 - 137.
- **Lugtig, P**. (2014) Panel attrition: separating stayers, fast attriters, gradual attriters and lurkers. Sociological Methods and Research 43: 699-723. DOI:10.1177/0049124113520305
- Cernat, A., **Lugtig, P**., Uhrig, S.C.N. and Watson, N. (2014) Assessing and relaxing assumptions in quasi-simplex models. *ISER working paper*, 2014-09
- **Lugtig, P.** and Lensvelt-Mulders, G.J.L.M. (2014) Evaluating the effect of Dependent Interviewing on the quality of measures of change. *Field Methods* 26, p. 172-189. DOI: 10.1177/1525822X13491860
- **Schoot, A.G.J., van de, Lugtig, P. and Hox, J.** (2012) A checklist for testing measurement invariance. *European Journal of Developmental Psychology* 9(4) DOI:10.1080/17405629.2012.686740
- **Lugtig, P., Boeije, H.R**. and Lensvelt-Mulders, G.J.L.M. (2012) Change, what change? Understanding longitudinal measurement invariance using mixed-methods. *Methodology* 7(3), p.115-123. DOI:10.1027/1614-2241/a/000043

Ph.D. projects
-

Valorisation
Cooperation partners:
-
Applied research publications:

- Delforterie, M.J., Creemers, H.E., Agrawal, A., Lynskey, M.T., **Jak, S**., van der Ende, J., Verhulst, F.C., & Huizink, A.C. (in press).
  Functioning of cannabis abuse and dependence criteria across two different countries: the United States and the
  Netherlands. *Substance use and misuse*.
- Merz, E.M. & **Jak, S**. (2013). The long reach of childhood: Social relationships across the life course.*Advances in Life Course*
  Research, 18, 212-222.
- Koomen , H.M.Y, Verschueren, K., van Schooten, E., **Jak, S**. & Pianta, R. C. (2012). Validating the Student-Teacher Relationship
  Scale: Testing Factor Structure and Measurement Invariance across Child Gender and Age in a Dutch Sample. *Journal of School*
  Psychology, 50, Psychology, 50, 215 - 234.
- Griffioen, D., de Jong, U. & **Jak, S**. (2012). Research self-efficacy of lecturers in non-university higher education. *Innovation in*
  Education and Teaching International, 50, 25-37.
- **Lugtig, P.** (2012) Luiaards en trouwe deelnemers. Classificatie van respondenten in een panelstudie, in Bronner, F. et al (red.)
  Ontwikkelingen in het Jaarboek van de Markt Onderzoeks Associatie, Haarlem: Spaar en Hout.

(iii) Multilevel modeling

Team of researchers: Suzanne Jak, Noémi Schuurman

Grants
-

Publications
- Adolf, J., **Schuurman, N**.K., Borkenau, P., Borsboom, D., & Dolan, C.V. (2014). Linking levels of analysis in psychometric data: The
  role of measurement invariance in testing the equivalence of intra- and inter-individual model structures. *Frontiers in psychology,*
  5.
- **Jak, S**., Oort, F.J. & Dolan, C.V. (in press). Using two-level factor analysis to test for cluster bias in ordinal data. *Multivariate*
  Behavioral Research, 49, 544-553.
- **Jak, S.** (2014). Testing strong factorial invariance using three-level structural equation modeling. *Frontiers in Psychology, 5*, 745.
  DOI: 10.3389/fpsyg.2014.00745.
- **Jak, S**., Oort, F.J. & Dolan, C.V. (2014). Measurement bias in multilevel data. *Structural Equation Modeling, 21,*31 - 39.
- Barendse, M.T., Oort, F.J., **Jak, S.** & Timmerman, M.E. (2013). Multilevel exploratory factor analysis of discrete data. *Netherlands*
  Journal of Psychology, 67, 114 - 121.
- **Jak, S**., Oort, F.J. & Dolan, C.V. (2013). A test for cluster bias: Detecting violations of measurement invariance across clusters in
  multilevel data. *Structural Equation Modeling, 20*, 265-282.

Ph.D. projects
-

Valorisation
Cooperation partners:
-
Applied research publications:
- Spilt, J., Koomen, H.M.Y & **Jak, S.** (2012). Are boys better off with male and girls with female teachers? A multilevel investigation
  of measurement invariance and gender match in teacher-student relationship quality.*Journal of School Psychology, 50,* 363 - 378.

(iv) Logistic prediction models

Team of researchers: Peter van der Heijden, Maarten Cruyff, David J. Hessen

Grants

- SURF Stimuleringsregeling Learning Analytics 2013 grant, 10k euro, Het voorspellen van studiesucces met statische en dynamische data; wat werkt?

Publications

- **Van der Heijden, P.G.M.,** Wubbels, T. en **Hessen, D.J.** (2012). Studiesucces of –falen van eerstejaars studenten voorspellen: een nieuwe aanpak. Tijdschrift voor Hoger Onderwijs, 30, 233-244.nieuwe aanpak. Tijdschrift voor Hoger Onderwijs, 30, 233-244.
- **Van der Heijden, P.G.M**., O. Buma, **D. Hessen** en G. Van Kampen. (2014). Het voorspellen van studiesucces met statische en dynamische data; wat werkt? Eindrapportage bij SURF Stimuleringsregeling Learning Analytics 2013. Utrecht: Departement Methoden en Statistiek.

Ph.D. projects

-

Valorisation

Cooperation partners:

-

Applied research publications:

-