

Validity of empirical research in psychology

1. Full title

Validity of empirical research in psychology

2. Research group

Psychological Methods

Program director: Han van der Maas

3. Members

Senior staff

Denny Borsboom, Conor Dolan, Pieter Koele, Han van der Maas, Gunter Maris, Eric-Jan Wagenmakers, Lourens Waldorp, Jelte Wicherts

Postdoctoral fellows

Raoul Grasman

PhD's

Angélique Cramer, Gilles Dutilh, Kees Jan Kan, Rogier Kievit, Sharon Klinkenberg, Mariska Knol, Dylan Molenaar, Don van Ravenzwaaij, Marthe Straatemeier, Ruud Wetzels, Annemarie Zand Scholten, Daan Zult

4. Membership Research Schools and other Research Institutes

The program is embedded in the Interuniversity Graduate School for Psychometrics and Sociometrics (IOPS). Within IOPS, the program collaborates closely with the National Institute for Educational Measurement (CITO).

5. Research topics

The research program of the Psychological Methods group is concerned with the conceptual analysis, technical development, practical implementation, and dissemination of methodological and statistical techniques in psychology. The central objective of the research program is to improve methodological practice in psychology by developing new methods for psychological research, communicating methodological advances to the general psychological audience, and assisting applied researchers in the correct application of optimal methodological techniques.

With this general objective, the group focuses on a number of more specific conceptual and empirical challenges in psychological research. First, much of

the research concerns matters that involve the *conceptual foundations of psychology and psychometrics*. This involves the analysis of psychometric concepts such as validity, reliability, and measurement levels, but also of psychological concepts like general intelligence, psychopathology, and personality. Second, a theme that runs through the program is the *analysis of data that involve the factor time*. This covers, for instance, online adaptive testing procedures, the analysis of learning curves, regime-switching models, and the modeling of speed accuracy trade-offs. Third, a general theme concerns the *analysis of individual differences*, especially in relation to differences between groups. This theme includes research on measurement invariance, selection, behavior genetics, and latent variable modeling. Finally, a recent addition to this spectrum is the *analysis of neuroscientific data*, involving models for fMRI and EEG/MEG data, but also covering the question of how we should jointly model neurological and behavioral measures.

6. Program development

In the past years, the Psychological Methods group has grown spectacularly, mainly as a result of the many research grants that were awarded in 2007. During 2008, these developments crystallized into the following structure.

The Psychological Methods group is chaired by professor Han van der Maas. As group leader, he is involved in nearly every research topic pursued in the department. He is also the primary driving force behind the following projects: 1) research into novel methods of *adaptive testing* in the context of the Math Garden ('Rekentuin') project, which involves the work of Marte Straatemeijer, Sharon Klinkenberg, Daan Zult, and Gunter Maris, and 2) research into the *structure of intelligence*, which involves the work of Kees-Jan Kan, Conor Dolan, and Jelte Wicherts.

Further, two prominent research programs, each supported by a VIDI-grant from NWO, are driven by Eric-Jan Wagenmakers and Denny Borsboom. Wagenmakers is the program leader of a research program on the analysis of psychonomic data that concern response times and accuracy measures by means of *diffusion modeling*. This research involves the work of Don van Ravenzwaaij, Gilles Dutilh, and Ruud Wetzels. In 2009, the group will be extended by another AiO project, supervised by Eric-Jan Wagenmakers and Conor Dolan, which will relate the research to individual differences in intelligence. Borsboom leads a research program into the relation between *causal networks and psychometric theory*, with special applications to psychopathology. This research involves the work of Angélique Cramer and Lourens Waldorp. In 2009 Verena Schmittmann will join this group as a postdoc. This research program has also initiated collaborations with members of the Clinical Psychology group (Jan-Henk Kamphuis, Arnold van Emmerik), and since 2008 features a joint PhD project on behavior genetics with Conor

Dolan, and with Dorret Boomsma of the Department of Biological Psychology at the Free University of Amsterdam.

In addition, three research programs are pursued in various collaborative constellations. First, the group has a research program on the analysis of *neuroscientific data* and its relation to psychological or behavioral measures. This work involves contributions by Raoul Grasman, sponsored by an NWO-VENI grant, Lourens Waldorp, Denny Borsboom, and Rogier Kievit. The program involves collaboration with members of the Developmental Psychology group (Hilde Huizenga), the Psychonomics Group (Romke Rouw, Steven Scholte), and the Philosophy of Science Department of Groningen University (Jan-Willem Romeijn). Second, a line of research revolves around *invariance relations in psychometrics*. Two important relations of this kind are measurement invariance and representational invariance (scale levels). Research on measurement invariance involves the work of Jelte Wicherts, sponsored by an NWO-VENI grant, Conor Dolan, and Dylan Molenaar (sponsored by an NWO-Toptalent grant). Research on scale levels is carried out by Annemarie Zand Scholten (sponsored by an NWO-Open competition grant), Denny Borsboom, and Gunter Maris. Third, several researchers of the group are involved in research on *educational measurement*. This involves the Math Garden project, but also the work of Mariska Knol on structured teacher feedback, and the research of Gunter Maris, Denny Borsboom, and Jelte Wicherts on fairness in educational testing.

The prominence of the group's research in the international fields of psychological methods, psychometrics, and mathematical psychology is evident from the many grants awarded and the high-impact publications of the group members. This prominence will be increased when the department hosts the 2009 edition of the meeting of the Society for Mathematical Psychology (Wagenmakers and co-workers) and organizes a high profile KNAW workshop on causal modeling (Borsboom & Waldorp). Furthermore, in 2009 the distinguished psychometrician Paul de Boeck, past president of the *Psychometric Society* and editor of the applications section of *Psychometrika*, will join our group as full professor on a newly created chair on the foundations of psychometrics and psychology, thereby further enhancing our profile in the psychometric world.

As noted above, the group has grown spectacularly in the past few years. This growth will continue in 2009, by the appointment of Verena Schmittmann as postdoc in Borsboom's program, the effectuation of an NWO-Open competition grant awarded to Jelte Wicherts, by filling a currently vacant position for Assistant Professor, and by the arrival of Prof. Paul de Boeck with an additional postdoc. This rapid growth of the program creates new challenges for the group. For instance, one of the main objectives for the next years will be to maintain thematic cohesion and constant communication between the group's

members. In 2008, we have therefore initiated small conferences, in which the entire research group comes together to share their results and developments. Another challenge will be to ensure that the group members retain sufficient career opportunities. This is important because the Psychological Methods group currently includes of a number of highly visible, internationally prominent young researchers, who either already qualify for a full professorship, or will do so within a short period of time. Therefore, an important task for the coming period is to create sufficient possibilities for further growth of the group’s members.

In conclusion, the program has been very successful in the past few years, and currently has no real weaknesses. The challenge for the coming years is to maintain and extend the present successes, by maintaining an excellent research environment, and by fostering the further development of methodological talent.

7. Composition of research input of academic staff in 2008

FTE	wp1	wp2	wp3	Total
Full professors (HL)	0.53			0.53
Associate professors (UHD)	1.80	0.49		2.29
Assistant professors (UD)	0.83	1.21		2.04
Other tenured research staff	0.22	0.80		1.02
<i>Total tenured research staff</i>	<i>3.38</i>	<i>2.50</i>	<i>0.00</i>	5.88
Non-tenured research staff				0.00
Ph.D. students	2.27	6.83		9.10
Research assistants	0.14	0.60		0.74
<i>Total non-tenured research staff</i>	<i>2.41</i>	<i>7.43</i>	<i>0.00</i>	9.84
Total	5.79	9.93	0.00	15.72

RESEARCH OUTPUT

1. Academic publications

1.a.1 In refereed journals issued in English

- Ahn, W. -Y., Busemeyer, J. R., Wagenmakers, E. -J., & Stout, J. C. (2008). Comparison of decision learning models using the generalization criterion method. *Cognitive Science*, *32*, 1376-1402.
- Borsboom, D. (2008). Latent variable theory. *Measurement*, *6*, 25-53.
- Borsboom, D. (2008). A tour guide to the latent realm. *Measurement*, *6*, 134-146.
- Borsboom, D. (2008). Psychometric perspectives on diagnostic systems. *Journal of Clinical Psychology*, *64*, 1089-1108.
- Borsboom, D., Romeijn, J. W., & Wicherts, J. M. (2008). Measurement invariance versus selection invariance: Is fair selection possible? *Psychological Methods*, *13*, 75-98.
- Borsboom, D., & Visser, I. (2008). Semantic cognition or data mining? *Behavioral and Brain Sciences*, *31*, 714-715.
- Borsboom, D., & Zand Scholten, A. (2008). The Rasch model and conjoint measurement theory from the perspective of psychometrics. *Theory & Psychology*, *18*, 111-117.
- Bosmans, J. E., Bruijne, M. C. de, Hout, H. P. van, Hermens, M. L., Adèr, H. J., & Tulder, M. W. van (2008). Practical guidelines for economic evaluations alongside equivalence trials. *Value in Health*, *11*, 251-258.
- Carpenter, D., Janssen, E., Graham, C., Vorst, H., & Wicherts, J. (2008). Women's scores on the Sexual Inhibition/Sexual Excitation Scales (SIS/SES): Gender similarities and differences. *Journal of Sex Research*, *45*, 36-48.
- Derks, E. M., Hudziak, J. J., Dolan, C. V., Beijsterveldt, T. C. E. M. van, Verhulst, F. C., & Boomsma, D. I. (2008). Genetic and environmental influences on the relation between attention problems and Attention Deficit Hyperactivity Disorder. *Behavior Genetics*, *38*, 11-23.
- Feltz-Cornelis, C. M. van der, Aldenkamp, A. P., Adèr, H. J., Boenink, M., Linszen, D., & Dyck, R. van (2008). Psychosis in epilepsy patients and other chronic medically ill patients and the role of cerebral pathology in the onset of psychosis: A clinical epidemiological study. *Seizure*, *17*, 446-456.
- Forstmann, B. U., Dutilh, G., Brown, S., Neumann, J., Cramon, D. Y. von, Ridderinkhof, K. R., & Wagenmakers, E. -J. (2008). Striatum and pre-SMA

- facilitate decision-making under time pressure. *Proceedings of the National Academy of Sciences of the USA*, *105*, 17538-17542.
- Geurts, H. M., Grasman, R. P. P. P., Verté, S., Oosterlaan, J., Roeyers, H., Kammen, S. M. van, & Sergeant, J. A. (2008). Intra-individual variability in ADHD, autism spectrum disorders, and Tourette's syndrome. *Neuropsychologia*, *46*, 3030-3041.
- Haig, B. D., & Borsboom, D. (2008). On the conceptual foundations of psychological measurement. *Measurement*, *6*, 1-6.
- Hol, A. M., Vorst, H. C. M., & Mellenbergh, G. J. (2008). Computerized adaptive testing of personality traits. *Zeitschrift für Psychologie*, *216*, 12-21.
- Maas, H. L. J. van der, & Straatemeier, M. (2008). How to detect cognitive strategies: Commentary on 'Differentiation and integration: Guiding principles for analyzing cognitive change.' *Developmental Science*, *11*, 449-453.
- Marwijk, H. W. J. van, Adèr, H. J., Haan, M. de, & Beekman, A. (2008). Primary care management of major depression in patients aged > or = 55 years: Outcome of a randomised clinical trial. *British Journal of General Practice*, *58*, 680-687.
- Ploeger, A., Maas, H. L. J. van der, & Raijmakers, M. E. J. (2008). Is evolutionary psychology a metatheory for psychology? A discussion of four major issues in psychology from an evolutionary developmental perspective. *Psychological Inquiry*, *19*, 1-18.
- Ploeger, A., Maas, H. L. J. van der, & Raijmakers, M. E. J. (2008). Is evolutionary developmental biology a viable approach to the study of the human mind? Reply. *Psychological Inquiry*, *19*, 41-48.
- Shiffrin, R. M., Lee, M. D., Kim, W., & Wagenmakers, E. -J. (2008). A survey of model evaluation approaches with a tutorial on hierarchical Bayesian methods. *Cognitive Science*, *32*, 1248-1284.
- Sluis, S. van der, Derom, C., Thiery, E., Bartels, M., Polderman, T. J. C., Verhulst, F. C., Jacobs, N., Gestel, S. van, Geus, E. J. C. de, Dolan, C. V., Boomsma, D. I., & Posthuma, D. (2008). Sex differences on the WISC-R in Belgium and The Netherlands. *Intelligence*, *36*, 48-67.
- Sluis, S. van der, Dolan, C. V., Neale, M. C., & Posthuma, D. (2008). Power calculations using exact data simulation: A useful tool for genetic study designs. *Behavior Genetics*, *38*, 202-211.
- Sluis, S. van der, Dolan, C. V., Neale, M. C., & Posthuma, D. (2008). A general test for gene-environment interaction in sib pair-based association analysis of quantitative traits. *Behavior Genetics*, *38*, 372-389.

- Straatemeier, M., Maas, H. L. J. van der, & Jansen, B. R. J. (2008). Children's knowledge of the earth: A new methodological and statistical approach. *Journal of Experimental Child Psychology*, *100*, 276-296.
- Verheul, R., Andrea, H., Berghout, C. C., Dolan, C. V., Busschbach, J. J. V., Kroft, P. J. A., Batemen, A. W., & Fonagy, P. (2008). Severity indices of Personality Problems (SIPP-118): Development, factor structure, reliability, and validity. *Psychological Assessment*, *20*, 23-34.
- Wagenmakers, E. -J., Maas, H. L. J. van der, Dolan, C. V., & Grasman, R. P. P. P. (2008). EZ does it! Extensions of the EZ-diffusion model. *Psychonomic Bulletin & Review*, *15*, 1229-1235.
- Wagenmakers, E. -J., Ratcliff, R., Gomez, P., & McKoon, G. (2008). A diffusion model account of criterion shifts in the lexical decision task. *Journal of Memory and Language*, *58*, 140-159.
- Wicherts, J. M. (2008). [Review of the book *What is intelligence? Beyond the Flynn effect*]. *Netherlands Journal of Psychology*, *64*, 41-43.
- Wicherts, J. M. (2008). Interesting volume on emotional intelligence, whatever it is [Review of the book *The science of emotional intelligence: Knowns and unknowns*]. *PsycCritiques*, *53*, 17.

1.a.2 In refereed journals issued in other languages

- Boo, G. de, & Wicherts, J. (2008). Copingstrategieën bij kinderen: Instrument, sekseverschillen en samenhang met sociaal gedrag. *Kind en adolescent*, *29*, 94-104.
- Hulstijn, E. M., Boomsma, A., Cohen-Kettenis, P. T., & Mellenbergh, G. J. (2008). De vragenlijst sociale vaardigheden van jongeren. *Tijdschrift voor Orthopedagogiek*, *47*, 460-470.

1.b In other journals

-

1.c Book chapters

- Dolan, C. V., & Berg, S. van den (2008). Statistical power. In B. M. Neale, M. A. R. Ferreira, S. E. Medland & D. Posthuma (Eds.), *Statistical genetics: Gene mapping through linkage and association* (pp. 61-81). London: Taylor and Francis.
- Moormann, P. P., Bermond, B., Vorst, H. C. M., Bloemendaal, A. F. T., Teijn, S. M., & Rood, L. (2008). New avenues in alexithymia research: The creation of alexithymia types. In A. J. J. M. Vingerhoets, I. Nyklicek & A. Vingerhoets (Eds.), *Emotion regulation. Conceptual and clinical issues* (pp. 27-42). New York: Springer.

Vries, A. L. M. de, Mellenbergh, G. J., Heerden, J. van, & Vorst, H. C. M. (2008). The multidimensional forced-choice item fails to control for social desirability due to the additive scoring method. In K. Shigemasu, A. Okada, T. Imaizumi & T. Hoshino (Eds.), *New trends in psychometrics* (pp. 51-60). Tokyo: Universal Academy Press.

Wagenmakers, E. -J., Lee, M. D., Lodewyckx, T., & Iverson, G. (2008). Bayesian versus frequentist inference. In H. Hoijtink, I. Klugkist & P. A. Boelen (Eds.), *Bayesian evaluation of informative hypotheses* (pp. 181-207). New York: Springer.

1.d Edited books

-

2. Monographs

-

3. Ph.D. Theses

3.a Internally prepared

Rijn, P. W. van (April 2008). *Categorical time series in psychological measurement* (pp. 127). Universiteit van Amsterdam. Promotors: P. C. M. Molenaar & H. L. J. van der Maas; co-promotor: C. V. Dolan.

3.b Externally prepare

-

3.c Doctorates at other faculties/universities, co-supervised by program members

-

4. Professional publications

Adèr, H. J. (2008). Temporal considerations and strategies. In H. J. Adèr & G. J. Mellenbergh (Eds.), *Advising on research methods: Proceedings of the 2007 KNAW colloquium* (pp. 125-147). Huizen, the Netherlands: Johannes van Kessel.

Adèr, H. J., & Mellenbergh, G. J. (Eds.). (2008). *Advising on research methods: Proceedings of the 2007 KNAW colloquium*. Huizen, the Netherlands: Van Kessel.

Adèr, H. J., Mellenbergh, G. J., & Hand, D. J. (2008). *Advising on research methods: A consultant's companion*. Huizen, the Netherlands: Van Kessel.

Regt, H. de, & Dooremalen, H. (2008). *Wat een onzin! Wetenschap en het paranormale*. Amsterdam: Boom.

Teune, P., Knol, M. H., & Ros, A. (2008). *Stimuleren van leren*. Utrecht: ThiemeMeulenhoff.

Wagenmakers, E. -J., & Maas, H. L. J. van der (2008). [Review of the book *Clocking the mind: Mental chronometry and individual differences*]. *Intelligence*, 36, 493-494.

Waldorp, L. (2008). [Review of the book *Applied asymptotics: Case studies in small sample statistics*]. *Biometrics*, 64, 660-660.

5. Popular publications

-

OTHER PROOFS OF PRODUCTIVITY

6. Editorships

Borsboom, D.

Netherlands Journal of Psychology (Associate Editor)

Dolan, C. V.

Intelligence

Multivariate Behavioral Research

Psychological Methods

Wagenmakers, E.-J.

Journal of Mathematical Psychology

7. Organisation of conferences and symposia

Straatemeier, M., Hickendorff, M., Maas, H. L. J. van der, & van Putten, C. M. (2008). Organisation of an expertmeeting for arithmetic researchers in The Netherlands and Belgium: Amsterdam, The Netherlands, April.

8. Research grants

Wagenmakers, E.-J. Co-applicant on the 'ALW open competition' PhD grant proposal '*The anatomical and neurochemical foundations of decision-making under time pressure*', funded by the Netherlands Organisation for Scientific Research (NWO). Fellow applicant and PI is Birte Forstmann.

9. Keynote speeches at conferences

Wagenmakers, E.-J. (December 2008). Doing what Id wants: The Savage-Dickey approach to Bayesian hypothesis testing. Invited keynote

presentation for the 18th IOPS winter conference, Oegstgeest, the Netherlands.

10. Collaborations

- Borsboom, D. (2004 - present). Collaboration with Haig, B.; Department of Psychology, University of Canterbury, New Zealand. *Foundations of psychological measurement*.
- Borsboom, D. (2005 - present). Collaboration with Markus, K. A.; John Jay College of Criminal Justice, City University of New York. *Frontiers of validity theory: Measurement, causation, and meaning*.
- Borsboom, D. (2003 - present). Collaboration with Cervone, D.; Department of Psychology, University of Illinois at Chicago. *Intra-individual processes and inter-individual differences in psychology*.
- Borsboom, D. (2007 - present). Collaboration with Hood, S. B.; Department of Philosophy, Bucknell University. *Realism and validity in psychometrics*.
- Wagenmakers, E.-J. (2005 - present). Collaboration with Brown, S. & Heathcote, A.; University of Newcastle, Australia. *Modeling response times and accuracy*.
- Wagenmakers, E.-J. (2007 - present). Collaboration with Lee, M.; University of California at Irvine, USA. *Bayesian graphical modeling*.
- Wagenmakers, E.-J. (2006 - present). Collaboration with Tuerlinckx, F.; University of Leuven, Belgium. *Statistical modeling in psychology*.
- Wicherts, J. M. (2006 - present). Collaboration with Carlson, J.; University of California, Riverside, USA. *IQ testing in Africa*.
- Wicherts, J. M. (2007 - present). Collaboration with Johnson, W.; University of Edinburgh, UK. *Heritability of item scores*.
- Wicherts, J. M. (2007 - present). Collaboration with Millsap, R.; University of Arizona, USA. *Measurement vs. predictive invariance*.