

# Patřicia Martinkov

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## Current Position

Institute of Computer Science, The Czech Academy of Sciences <b>Vice-chair of Department of Statistical Modelling</b> <b>Head of Computational Psychometrics Group</b>	PRAGUE, CZECH REPUBLIC
Faculty of Education, Charles University <b>Researcher</b>	PRAGUE, CZECH REPUBLIC
University of Washington, Department of Statistics, and Center for Statistics and the Social Sciences (CSSS) <b>Affiliate</b>	SEATTLE, U.S.A.

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## Education

Faculty of Mathematics and Physics, Charles University <b>PhD degree programme in Probability and Statistics,</b> <b>Econometry and Financial Mathematics</b> Dissertation: Reliability of composite dichotomous measurements	PRAGUE, CZECH REPUBLIC 2003 – 2007
<b>Master of Science in Probability, Mathematical Statistics and Econometry</b> Specialized in Statistics, Diploma thesis: Reliability of measurements	1998 – 2003

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## Research and Professional Experience

Institute of Computer Science, The Czech Academy of Sciences <b>Researcher</b> <b>Junior researcher, Research assistant</b>	PRAGUE, CZECH REPUBLIC <i>Since 2008</i> 2001 – 2008
University of Washington, Department of Statistics, and Center for Statistics and the Social Sciences (CSSS) <b>Visiting research scholar, Lecturer</b>	SEATTLE, U.S.A. 2013 – 2015

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## Grants

Theoretical Foundations of Computational Psychometrics <b>Principal investigator</b>	CZECH SCIENCE FOUNDATION (GAR) 21-03658S 2021 – 2023
Advances in Educational Assessment: Analytical Support for Test Development <b>Principal investigator</b>	TAR TL05000008 2021 – 2023
Center for Educational Measurement and Psychometrics <b>Principal investigator</b>	UK PRIMUS/17/HUM/11 2018 – 2021
The relationships between skills, schooling and labor market outcomes: A longitudinal study <b>Team member</b>	GAR P402/12/G130 2017 – 2018
Estimation of Psychometric Measures as Part of Admission Test <b>Principal investigator</b>	GAR 15-15856Y 2015 – 2017
Defining and Assessing Core Principles for Undergraduate Physiology <b>Consultant</b>	NSF DUE-1043443 2014 – 2015
Applicants at the Doorstep <b>Consultant</b>	IES R305H130030 2013 – 2015
Centre of Biomedical Informatics (CBI) <b>Team member</b>	MMT 1M06014 2006 – 2011

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## Awards (selection)

ICS Director's Award for outstanding publication record Institute of Computer Science of the Czech Academy of Sciences	2019
Outreach Lecturing Fund Award The Council for International Exchange of Scholars (CIES)	2014
Fulbright-Masaryk Fellowship J. W. Fulbright Commission	2013
Otto Wichterle Award Czech Academy of Sciences	2011
Academic scholarship (Prospěchové stipendium) Faculty of Mathematics and Physics, Charles University	2001

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## Teaching – Courses (selection)

Selected topics in psychometrics (NMST570) 1/1, 3 credits	MFF, CHARLES UNIVERSITY, PRAGUE, CZECH REPUBLIC Winter, each year since 2017/18
Seminar in Psychometrics (NMST571) 0/2, 2 credits	MFF, CHARLES UNIVERSITY, PRAGUE, CZECH REPUBLIC Summer, each year since 2017/18
Introduction to Biostatistics (B00364) Two 90min. lectures each year	1.LF, CHARLES UNIVERSITY, PRAGUE, CZECH REPUBLIC 2016/17, 2017/18
Item Response Theory Models of Testing (EDPSY 595) 2/1, 3 credits	UNIVERSITY OF WASHINGTON, SEATTLE, USA Winter 2015
Statistical Concepts and Methods for the Social Sciences (STAT/CSSS/SOC 221) 3/2, 5 credits, 180 students, leading 3 TAs and 1 grader	UW, SEATTLE, USA Spring 2015
Statistics in Medical Research TA, about 2-4 lab sessions each year, quiz sessions	EUROMISE CENTRE, 1.LF UK & ICS CAS, CZECH REPUBLIC 2002 - 2013
Statistics, Statistics for the Social Sciences	UNIVERSITY OF J. E. PURKYNE, CZECH REPUBLIC 2004
Biostatistics TA	TA, SCHOOL OF NATURAL SCIENCES, CHARLES UNIVERSITY 2004

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## Teaching – Workshops (selection)

Introduction to Differential Item Functioning (DIF) Analysis full-day workshop	AEA-EUROPE, LISBON, PORTUGAL November 13, 2019
Educational testing (CŽV) 6-hour workshop each year	RECTORATE OF THE CHARLES UNIVERSITY, PRAGUE, CZECH REPUBLIC 2018, 2019

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## Student Supervision

Adéla Hladká Doctoral. Defended thesis: Statistical models for detection of differential item functioning.	FACULTY OF MATHEMATICS AND PHYSICS, CHARLES UNIVERSITY 2016 – 2021
Lubomír Štěpánek Doctoral. Modern statistical approaches for analysis of psychometric properties of tests.	1ST FACULTY OF MEDICINE, CHARLES UNIVERSITY, PRAGUE Since 2018
Michaela Vařejková Master. Models for equating in cognitive tests.	FACULTY OF MATHEMATICS AND PHYSICS, CHARLES UNIVERSITY Since 2021
Dominik Tělupil Master. Defended thesis: Computerized adaptive tests.	FACULTY OF MATHEMATICS AND PHYSICS, CHARLES UNIVERSITY 2016 – 2018
Katarína Vlčková Master. Defended thesis: Fairness of educational tests and their items.	FACULTY OF MATHEMATICS AND PHYSICS, CHARLES UNIVERSITY 2012 – 2014
Supervision of research assistants Over 10 students (postdoc/doctoral/master/bachelor) led under different projects	INSTITUTE OF COMPUTER SCIENCE, CZECH ACADEMY OF SCIENCES Since 2012
Supervision of research assistants Over 10 students (postdoc/doctoral/master/bachelor) led under different project	FACULTY OF EDUCATION, CHARLES UNIVERSITY Since 2018

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## Committee member, reviewer of dissertation thesis

Martin Komarc

FACULTY OF PHYSICAL EDUCATION AND SPORT, CHARLES UNIVERSITY

Computerized adaptive testing in kinanthropology: Monte Carlo simulations using the physical self description questionnaire. 2017

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## Professional Activities

International Meeting of Psychometric Society 2022 <b>Program committee member</b>	BOLOGNA, ITALY 2022
Psychoco 2019 - International Workshop on Psychometric Computing <b>Local organizer, member of program committee</b> Over 90 participants from more than 15 countries, 35 talks	PRAGUE, CZECH REPUBLIC 2019
COST Action TD1306 <i>New Frontiers of Peer Review (PEERE)</i> <b>Management committee member</b>	2016 – 2018
CAS International Affairs Council <b>Member</b> , reviewer for over 60 mobility projects, Czech Academy of Sciences	2017 – 2021
Journal of the American Statistical Association <b>Reviews Associate Editor</b>	Since 2021
Reviewer of journal articles Science, Metrika, The R Journal, Journal of Educational and Behavioral Statistics, Statistika: Statistics and Economy Journal, Nutrients, Brain Sciences, Archives of Public Health, Psychological Medicine, Applied Psychological Measurement, The International Journal of Human Resource Management, CBE-Lifesciences, Asia Pacific Educational Review, Pedagogika, Orbis Scholae, Methods of Information in Medicine	
Book proposal reviewer Chapman Hall/CRC press	
Conference talk/poster reviewer ECER 2022, 2021, 2016, IMPS 2017	
Czech Statistical Society	MEMBER, SINCE 2001
International Society for Clinical Biostatistics	MEMBER, SINCE 2007
Union of Czech Mathematicians and Physicists	MEMBER, SINCE 2016
Psychometric Society	MEMBER, SINCE 2016
European/Czech Association of Educational Research	MEMBER, SINCE 2016
European Association of Methodology	MEMBER, SINCE 2018

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## Publications

WOS: 44 publications, 352 citations, h-index 11 (as of April 21, 2022, see E-5090-2014 on [researcherid.com](https://researcherid.com))

\* student or postdoc co-author

Recent articles in international impacted journals and proceedings – psychometrics contributions

Eroshva, E. A., & **Martinková, P.**, & Lee, C. J. (2021). When zero may not be zero: A cautionary note on the use of inter-rater reliability in evaluating grant peer review. *Journal of the Royal Statistical Society – Series A*.

Goldhaber, D., Grout, C., Wolff, M., **Martinková, P.** (2021). Evidence on the Dimensionality and Reliability of Professional References' Ratings of Teacher Applicants. *Economics of Education Review*, 83, 102130.

Kolek, L., Šisler, V., **Martinková, P.**, Brom, C. (2021). Can video games change attitudes towards history? Results from a laboratory experiment measuring short- and long-term effects. *Journal of Computer Assisted Learning*, 37(5), 1348–1369.

Hladká, A. \*, & **Martinková, P.** (2020). difNLR: Generalized logistic regression models for DIF and DDF detection. *The R Journal*, 12(1), 300-323.

**Martinková, P.**, Hladká, A. \*, & Potužníková, E. \* (2020). Is academic tracking related to gains in learning competence? Using propensity score matching and differential item change functioning analysis for better understanding of tracking implications. *Learning and Instruction*. 66(April 2020), 101286.

Štěpánek, L. \*, **Martinková, P.** (2020). Feasibility of computerized adaptive testing evaluated by Monte-Carlo and post-hoc simulations. In *Proceedings of the 2020 Federated Conference on Computer Science and Information Systems (FedCSIS)*, pp. 359-367.

Bartoš, F., **Martinková, P.**, & Brabec, M. (2020). Testing heterogeneity in inter-rater reliability. In Wiberg, M., et al. (Eds.) *Quantitative Psychology: The 84th Annual Meeting of the Psychometric Society*, Santiago, Chile, 2019. New York: Springer.

**Martinková, P.** & Drabinová, A.\* (2018). ShinyItemAnalysis for teaching psychometrics and to enforce routine analysis of educational tests. *The R Journal*, 10(2), 503-515.

**Martinková, P.**, Goldhaber, D., & Erosheva, E. (2018). Disparities in ratings of internal and external applicants: A case for model-based inter-rater reliability. *PLoS ONE* 13(10): e0203002.

**Martinková, P.**, Drabinová, A.\*, Liaw, Y. L.\*, Sanders E. A., McFarland, J. L., & Price, R. M. (2017). Checking equity: Why differential item functioning analysis should be a routine part of developing conceptual assessments. *CBE-Life Sciences Education*, 16(2), rm2.

McFarland, J.L., Price, R.M., Wenderoth, M.P., **Martinková, P.**, Cliff, W., Michael, J., Modell, H., & Wright, A. (2017). Development and Validation of the Homeostasis Concept Inventory. *CBE-Life Sciences Education*, 16(2), ar35.

Michael, J., **Martinková, P.**, McFarland, J.L., Wright, A., Cliff, W., Modell, H., Wenderoth, M.P. (2017). Validating a conceptual framework for the core concept of "cell-cell communications". *Advances in Physiology Education*, Vol. 41 no. 2, 260-265.

Drabinová, A.\* & **Martinková, P.** (2017). Detection of differential item functioning with non-linear regression: Non-IRT approach accounting for guessing. *Journal of Educational Measurement*, 54(4), 498-517.

**Martinková, P.**, Štěpánek, L.\* , Drabinová, A.\* , Houdek, J.\* , Vejražka, M., & Štuka, Č. (2017). Semi-real-time analyses of item characteristics for medical school admission tests. *FedCSIS conference proceedings*.

Řasová, K., **Martinková, P.**, Vyskotová, J., Šedová, M. (2012). Assessment set for evaluation of clinical outcomes in multiple sclerosis - psychometric properties. *Patient Related Outcome Measures*, 3, 59-70.

#### Articles in international impacted journals – Other (selection)

Řasová, K., **Martinková, P.**, Soler, B., et al. (2020). Real-world goal setting and use of outcome measures according to the international classification of functioning, disability and health: A European survey of physical therapy practice in multiple sclerosis. *International Journal of Environmental Research and Public Health*, 17(13), 4774.

Řasová, K., Freeman, J., Cattaneo, D., ..., **Martinková, P.** (2020). Content and Delivery of Physical Therapy in Multiple Sclerosis across Europe: A Survey. *International journal of environmental research and public health*, 17(3), 886.

**Martinková, P.**, Freeman, J., Drabinová, A.\*, Erosheva, E., ..., Řasová, K. (2018). Physiotherapeutic interventions in multiple sclerosis across Europe: Regions and other factors that matter. *Multiple Sclerosis and Related Disorders*, 22, 59–67.

Řasová, K., Freeman, J., **Martinková, P.** et al. (2016). The Organisation of Physical Therapy for People with Multiple Sclerosis across Europe: A Multicentre Questionnaire Survey. *BMC Health Serv Res*, 16, 552.

Štuka, Č., **Martinková, P.**, Zvára, K., Zvárová, J. (2012). The prediction and probability for successful completion in medical study based on admission test and pre-admission grades. *The New Educational Review*, 28(2), 138-152.

Ibrahim, I., Tintěra, J., Škoch, A., Jírů, F., Hlušík, P., **Martinková, P.**, Zvára, K., Řasová, K. (2011). Fractional anisotropy and mean diffusivity in the corpus callosum of patients with multiple sclerosis: the effect of physiotherapy. *Neuroradiology*, 53(11), 917-26.

**Martinková, P.**, Zvára, K. (2007). Reliability in the Rasch Model. *Kybernetika*, 43(3), 315-26.

**Martinková, P.**, Zvára jr., K., Zvárová, J., Zvára, K. (2006). The New Features of the Exam Evaluation System and Reliability of Its Fixed Tests. *Methods of Information in Medicine*, 45(2), 310-315.

Řasová, K., Havrdová, E., Brandejský, P., Zálišová, M., Foubíková, B., **Martinková, P.** (2006). Comparison of the Influence of Different Rehabilitation Programmes on Clinical, Spirometric and Spiroergometric Parameters in Patients with Multiple Sclerosis. *Multiple Sclerosis Journal*, 12(2), 227-234.

Řasová, K., Krásenský, J., Havrdová, E., Obenberger, J., Seidel, Z., Doležal, O., **Rexová, P.**, Zálišová, M. (2005). Is it Possible to Actively and Purposely make use of Plasticity and Adaptability in the Neurorehabilitation Treatment of Multiple Sclerosis Patients? A Pilot Project. *Clinical Rehabilitation*, 19(2), 170-181.

Řasová, K., Brandejský, P., Havrdová, E., Zálišová, M., **Rexová, P.** (2005). Spiroergometric and spirometric parameters in patients with multiple sclerosis: are there any links between these parameters and fatigue, depression, neurological impairment. *Multiple Sclerosis Journal* 11 (2), 213-221.

Vášková, M., Mejstříková, E., Kalina, T., **Martinková, P.**, Omelka, M., Trka, J., Starý, J., Hrušák, O. (2005). Transfer of Genomics Information to Flow Cytometry: Expression of CD27 and CD44 Discriminates Subtypes of Acute Lymphoblastic Leukemia. *Leukemia*, 19(5), 876-878.

#### Peer-reviewed articles in Czech journals (selection)

**Martinková, P.**, Drabinová, A.\*, & Houdek, J.\* (2017). ShinyItemAnalysis: Analýza přijímacích a jiných znalostních či psychologických testů. *TESTFÓRUM*, 6(9), 16-35.

**Martinková, P.**, Vlčková, K.\* (2014). Hodnocení reliability znalostních a psychologických testů. *Bulletin České statistické společnosti*, 25(4), 1-15.

#### Chapters in monographs

Greger, D., Straková, J., **Martinková, P.** (2022). Extending the ILSA Study Design to a Longitudinal Design. TIMSS & PIRLS Extension in the Czech Republic: CLoSE Study. In *International Handbook of Comparative Large-Scale Studies in Education: Perspectives, Methods and Findings*, Nilsen T., Stancel-Piątak, A., Gustafsson, J.-E. (Eds.). Springer, ISBN 978-3-030-38298-8.

#### Monographs

Štuka, Č., **Martinková, P.**, Vejražka, M., Trnka, J., Komenda, M. (2013). Testování znalostí při výuce medicíny. Konstrukce a analýza testů na lékařských fakultách. 156 pp. Praha: Karolinum. ISBN 9788024623696.

#### Software

**Martinková, P.**, Hladká, A.\*, Netík, J.\* (2022) ShinyItemAnalysis: Test and item analysis via shiny. R package version 1.4.1, over 49.000 downloads from CRAN, more than 32.000 online visits from more than 100 countries, over 900 monthly average downloads from GitHub.

Hladká, A.\*, **Martinková, P.** (2022) difNLR: DIF and DDF detection by non-linear regression models. R package version 1.4.0., over 55.000 downloads from CRAN, over 700 monthly average downloads from GitHub.

#### Invited talks and seminars (selection)

Deeper analysis of group disparities in ratings motivated by simulated and real data examples. CSSS 20th Anniversary Conference, University of Washington, Seattle. May 24, 2019.

Assessing disparities in student and applicant ratings. Seminar in Applied Mathematics. Masaryk University, Brno, May 14, 2019.

Advanced analysis of educational measurement. Seminar of Department of Didactics of Mathematics. Faculty of Mathematics and Physics, Charles University, May 2, 2019.

ShinyItemAnalysis for psychometric training and to enforce routine analysis of educational tests. R meetup Warsaw, May 24, 2018.

Towards effective and equitable assessment with ShinyItemAnalysis. 4EU Flagship workshop, Charles University, Prague, September 2018.

Statistika pro interdisciplinární výzkum. General membership meeting of the Czech statistical society, Prague, January, 2016

Assessment of clinical outcomes in multiple sclerosis: Challenges for international comparative studies. Workshop "Different Approaches in Neurorehabilitation and Their Impact on Clinical Improvements of Neurological Patients", Prague, Česká republika, 2016.

Researching reliability estimates in the context of Czech admission tests. OLF travel award, presented at UC Merced, UC Berkeley, and UCLA, 2014.

#### Conference talks and poster presentations (selection)

**Martinková, P.** Does a zero inter-rater reliability mean grant peer review is arbitrary? *Metascience* 2021. September 16-18 and 23-25, 2021. Virtual.

**Martinková, P.** Computational aspects of psychometrics taught with R and Shiny. *UseR* 2021. 5-9 July, 2021, Virtual.

**Martinková, P.**, Bartoš, F.\*, Brabec, M. Inter-rater reliability in complex situations: Model selection. *International meeting of psychometric society*, 19-23 July, 2021, Virtual.

Hladká, A.\*, **Martinková, P.** Estimation in generalized logistic regression models for DIF detection, *International meeting of psychometric society*, 19-23 July, 2021, Virtual.

**Martinková, P.**, Drabinová A.\* Simulated and Real Data Examples for Teaching Psychometrics. *Psychoco* 2019. International workshop on psychometric computing, 21-22 February, Prague.

**Martinková, P.**, Goldhaber D, Eroshva E. Model-Based Reliability to Check for Disparities in Ratings of Internal and External Applicants. EAM 2018, 25-27 July, Jena.

**Martinková, P.**, Drabinová A.\* ShinyItemAnalysis for psychometric training and research. IMPS 2018, July, New York.

**Martinková, P.**, Goldhaber D, Eroshva E, Lee C. Improving the Peer-Review Process with Model-Based Estimates of Inter-Rater Reliability and Detection of Rating Bias: From Teacher Selection to Journal Submissions and Grant Applications. PEERE International Conference on Peer Review, March 2018, Rome.

**Martinková, P.**, Drabinová A\*, Houdek J\*, Leder O\*, Štěpánek L.\* Teaching Psychometrics and Analyzing Educational Tests with ShinyItemAnalysis. useR!2017, Brussels.

**Martinková, P.**, Drabinová A.\* Detection of DIF Based on Non-IRT Generalized Regression Approaches. IMPS 2017, Zurich.

**Martinková, P.**, Drabinová A\*, Houdek J\*. Interactive and Step by Step Analyses of Test and Item Properties with "difNLR" and "ShinyItemAnalysis". Psychoco – International Workshop on Psychometric Computing 2017, Vienna.

**Martinková, P.**, Drabinová A\*, Leder O\*. Detection of Differential Item Functioning with difNLR Function. useR! 2016, Stanford University.

**Martinková, P.**, Goldhaber D. Mixed-Effect Models for Assessing Interrater Reliability and Its Moderators. IMPS 2016, Asheville.

Drabinová A\*, Martinková P. Detection of Differential Item Functioning Based on Non-Linear Regression. IMPS 2016, Asheville. **Student travel award for A. Drabinová.**

**Martinková, P.**, Goldhaber D. Hierarchical Models for Assessing Reliability in Teacher Hiring. JSM, Seattle, Aug 2015.

**Martinková, P.**, Goldhaber D. Improving Teacher Selection: Effect of Inter-rater and Intra-rater Reliability in Screening Process. AAFP, Washington D.C., Feb 2015.

**Martinková, P.**, Turčičová M\*. Generalized Reliability Used for the Comparison of Reliability Estimates in Tests with Binary Items. IMPS 2013, Arnhem, Netherlands. **Best poster award.**

Řasová K, **Martinková, P.**, Henze, T. Towards an Inventory of the Content of Physical Rehabilitation in Europe. Lifelong Perspective: Rehabilitation for MS Patients with Complex Needs, University of Turku, 24, 2011. RIMS 2011, Turku, Finland.

**Martinková, P.**, Šedová M, Řasová K. Reliability of clinical functioning measures in patients with multiple sclerosis. 30th Annual Conference of the International Society for Clinical Biostatistics, 147, 2009. ISCB 2009, Prague, Czech Republic.

**Martinková, P.**, Zvára K. Reliability of Composite Dichotomous Measurements. 29th Annual Conference of the International Society for Clinical Biostatistics, 93, 2008. ISCB 2008, Copenhagen, Denmark.