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## Research statement

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I study problems at the intersections of human genetics, statistical inference, quantitative psychology, and numerical mathematics. My primary research foci include:

1. Efficient algorithms for the analysis and simulation of genome-wide data.
2. Performance of genomic variance component estimators in structured populations.
3. Metascience, falsifiability, and the identification of spurious findings.

## Education

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- 2019      Doctor of Philosophy  
            *Behavioral, Psychiatric, and Statistical Genetics*  
            *Advised by Matthew C. Keller*  
            *Department of Psychology and Neuroscience, University of Colorado Boulder*
- 2018      Master of Science  
            *Applied Mathematics*  
            *Advised by Stephen Becker*  
            *Department of Applied Mathematics, University of Colorado Boulder*
- Master of Arts  
            *Behavioral, Psychiatric, and Statistical Genetics*  
            *Advised by Soo Hyun Rhee*  
            *Department of Psychology and Neuroscience, University of Colorado Boulder*
- 2011      Bachelor of Arts  
            *Japanese Language and Literature*  
            *Advised by Terry Kawashima*  
            *Department of East Asian Studies, Wesleyan University*

## Peer-reviewed publications

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- 2019      **Border, R.** and Becker, S.. Stochastic Lanczos estimation of genomic variance components for linear mixed-effects models. *BMC Bioinformatics*. [doi.org/10.1186/s12859-019-2978-z](https://doi.org/10.1186/s12859-019-2978-z)
- Border, R.**, Johnson, E.C., Evans, L.M., Berley, N., Sullivan, P.F., Keller, M.C.. No support for historic candidate gene or candidate gene-by-interaction hypotheses for major depression across multiple large samples. *American Journal of Psychiatry*. [doi.org/10.1176/appi.ajp.2018.18070881](https://doi.org/10.1176/appi.ajp.2018.18070881)
- Border, R.**, Johnson, E.C., Evans, L.M., Keller, M.C.. Measurement error cannot account for failed replications of historic candidate gene-by-environment hypotheses: response to Vrshek-Schallhorn et al.. *American Journal of Psychiatry*. [doi.org/10.1176/appi.ajp.2019.19040374r](https://doi.org/10.1176/appi.ajp.2019.19040374r)

**Border, R.**, Smolen, A., Corley, R., Stallings, M., Brown, S., Conger, R., Derringer, J., Donnellan, B., Haberstick, B., Hewitt, J., Hopfer, C., Krauter, K., McQueen, M., Wall, T., Keller, M., Evans, L.. Imputation of behavioral candidate gene repeat polymorphisms in 486,551 publicly-available UK Biobank individuals. *European Journal of Human Genetics*. [doi.org/10.1038/s41431-019-0349-x](https://doi.org/10.1038/s41431-019-0349-x)

2018 **Border, R.**, Corley, R.C., Brown, S.A., Hewitt, J.K., Hopfer, C.J., Williams, S.K., Rhea, S., Shriver, C.L., Stallings, M.C., Wall, T.L., Woodward, K.E., Rhee, S.H.. “Independent predictors of mortality in adolescents ascertained for conduct disorder and substance use problems, their siblings, and community controls.” *Addiction*. [doi.org/10.1111/add.14366](https://doi.org/10.1111/add.14366)

**Border, R.**, Corley, R.C., Brown, S.A., Hewitt, J.K., Hopfer, C.J., Stallings, M.C., Wall, T.L., Young, S.E., Rhee, S.H.. “Predictors of adult outcomes in clinically- and legally-referred youth with antisocial behavior.” *PLOS ONE*. [doi.org/10.1371/journal.pone.0206442](https://doi.org/10.1371/journal.pone.0206442)

2017 Johnson, E.C., **Border, R.**, Melroy-Greif, W.E., de Leeuw, C., Ehringer, M.A., Keller, M.C.. “No evidence that schizophrenia candidate genes are more associated with schizophrenia than non-candidate genes.” *Biological Psychiatry*. [doi.org/10.1016/j.biopsych.2017.06.033](https://doi.org/10.1016/j.biopsych.2017.06.033)

**Border, R.** and Keller, M.C.. “Fundamental problems with candidate gene-by-environment interaction studies.” *Journal of Child Psychology and Psychiatry*. [doi.org/10.1111/jcpp.12669](https://doi.org/10.1111/jcpp.12669)

## Manuscripts under review

- Ip, H.F., van der Laan, C.M., Brikell, I., ..., **Border, R.**, ..., Bartels, M., Nivard, M.G., Boomsma, D.. “Genetic association study of childhood aggression across raters, instruments and age.” Preprint available at [doi.org/10.1101/854927](https://doi.org/10.1101/854927)

## Dissertation and master’s thesis

- **Border, R.**. "Topics in the quantitative analysis of complex trait genetic architectures". Psychology and Neuroscience Graduate Theses & Dissertations. *In press*.
- **Border, R.**. "Stochastic Lanczos likelihood estimation of genomic variance components". Applied Mathematics Graduate Theses & Dissertations. 120. [scholar.colorado.edu/appm\\_gradetds/120](https://scholar.colorado.edu/appm_gradetds/120)

## Presentations

2019 **Border, R.**, Becker, S.. (Poster). “Randomized algorithms for genomic variance components estimation in mixed models”. Presented at the 2019 *International Workshop on Statistical Genetic Methods for Human Complex Traits*, Boulder, CO.

2018 **Border, R.**, Johnson, E.C., Evans, L.M., Berley, N., Sullivan, P.F., Keller, M.C. (Paper presentation). “Quantitative reconciliation of GWAS and candidate gene findings: measurement error, nonlinearity, and artifactual results”. *Accepted* for the 48<sup>th</sup> meeting of the Behavior Genetics Association in Boston, MA. (Talk delivered by M.C. Keller due to illness)

**Border, R.**, Johnson, E.C., Berley, N., Medland, S.E., Sullivan, P.F., Keller, M.C. (Poster). “Examining the relevance of canonical candidate genes for major depression”. *Accepted* for the 48<sup>th</sup> meeting of the Behavior Genetics Association in Boston, MA.

- Evans, L.M., **Border, R.**, du Pont, A., Friedman, N.P., Johnson, E., Yang, J., Visscher, P., Keller, M.C. (Symposium talk). “Exploring the genetic architecture of psychiatric disorders using partitioned heritability approaches”. Presented by Luke Evans at the *World Congress of Psychiatric Genetics*, October 2018, Glasgow, Scotland.
- 2017 **Border, R.**, Johnson, E.C., Berley, N., Sullivan, P.F., Keller, M.C. (Poster). “Discrepancies between candidate gene and genome-wide studies of complex traits and endophenotypes.” Presented at the 25<sup>th</sup> annual meeting of the World Congress of Psychiatric Genetics, Orlando, Florida, October 13-17, 2017
- Park, A. L., Tsai, K. H., Guan, K., **Border, R.**, and Chorpita, B. F. (Talk). “Unintended consequences of evidence-based treatment policy reform.” In *Use of Evidence in Mental Health Treatment and Clinical Decision-Making*. Symposium held at the 4<sup>th</sup> Biennial Society for Implementation Research Collaboration Conference, Seattle, WA.
- 2016 Johnson, E.C., Melroy-Greif, W.E., **Border, R.**, Keller, M.C., Ehringer, M.A. (Poster). “Examining 25 classic schizophrenia candidate genes in the context of GWAS data: evidence for relevance?”. Presented at the 2016 meeting of the American Society of Human Genetics in Vancouver, British Columbia.
- 2015 **Border, R.**, Sawaya, S., Huggett, S., Brown, S.A., Wall, T.L., and Stallings, M.C. (Poster). “Sensitivity of random forests algorithm to population stratification in GWAS data”. Presented at the 45<sup>th</sup> annual meeting of the Behavior Genetics Association in San Diego, CA.

## Honors and awards

- 2016–2019 National Institute of Mental Health Trainee *T32 MH016880*  
*Selected by faculty training committee thrice consecutively (maximum number of times awarded to any graduate student), Institute for Behavioral Genetics, University of Colorado Boulder*
- 2018 Behavior Genetics Association Travel Award  
*Behavior Genetics Association*
- Departmental Travel Grant  
*Department of Psychology and Neuroscience, University of Colorado Boulder*
- 2017 United Government of Graduate Students Individual Travel Award  
*University of Colorado Boulder Graduate School*
- 2015–2019 Predoctoral Fellowship  
*Institute for Behavioral Genetics, University of Colorado Boulder*

## Peer review

I have refereed for the following journals:

- *Alcoholism: Clinical and Experimental Research*
- *American Journal of Medical Genetics Part B: Neuropsychiatric Genetics*
- *American Journal of Psychiatry*
- *BMC Psychiatry*
- *Genes, Brain and Behavior*

- *Journal of Psychiatric Research*
- *Molecular Psychiatry*
- *Psychological Bulletin*
- *Psychoneuroendocrinology*

## Teaching positions

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- 2019 Statistical Methods and Applications II (Combined Undergraduate and Graduate Sections)  
*Course Assistant, Department of Applied Mathematics.*
- 2018 Mathematical Statistics (Combined Undergraduate and Graduate Sections)  
*Course Assistant, Department of Applied Mathematics.*
- Statistical Methods (Combined Undergraduate and Graduate Sections)  
*Course Assistant, Department of Applied Mathematics.*
- 2016 Statistical Programming with R (Graduate)  
*Teaching Assistant, Department of Psychology and Neuroscience.*
- Statistics II (Graduate)  
*Teaching Assistant, Department of Psychology and Neuroscience.*
- 2015 Introduction to Statistics (Undergraduate)  
*Teaching Assistant, Department of Psychology and Neuroscience.*
- Statistical Programming with R (Graduate)  
*Teaching Assistant, Department of Psychology and Neuroscience.*

## Guest lectures

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- Mapping genes for complex traits. *Physiological Genetics and Genomics, Department of Integrative Physiology.*
- Randomized algorithms for genomic variance components analyses. *Randomized Algorithms, Department of Applied Mathematics.*
- Statistical power. *Introduction to Statistics, Department of Psychology and Neuroscience.*
- Functional programming concepts in R. *Statistical Programming with R, Department of Psychology and Neuroscience.*
- Methods for reproducible research in R. *Statistical Programming with R. Department of Psychology and Neuroscience.*