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

My research is supervised by Noah Zaitlen at the UCLA David Geffen School of Medicine Neurology Department and Sriram Sankararaman in the UCLA Computer Science Department.

## Education

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

## Preprints

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- Adjangba, C., **Border, R.**, Romero Villela P.N., Ehringer, M.A., Evans, L.M.. “Little evidence of modified genetic effect of rs16969968 on heavy smoking based on age of onset of smoking.” [doi.org/10.1101/2020.04.22.20071407](https://doi.org/10.1101/2020.04.22.20071407)
- **Border, R.**, O’Rourke, S., ..., Keller, M.C.. “Assortative mating biases marker-based heritability estimates.” [doi.org/10.1101/2021.03.18.436091](https://doi.org/10.1101/2021.03.18.436091)
- Jami, J.S., ..., **Border, R.**, ..., Middeldorp, C.M.. “Genome-wide meta-analysis of internalising symptoms in 64,641 children and adolescents repeatedly measured between age 3 and age 18.” [doi.org/10.1101/2020.09.11.20175026](https://doi.org/10.1101/2020.09.11.20175026)

- Ip, H.F., ..., **Border, R.**, ..., Boomsma, D.. “Genetic association study of childhood aggression across raters, instruments and age.” [doi.org/10.1101/854927](https://doi.org/10.1101/854927)

## 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)

## Dissertation and master’s thesis

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- **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

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- 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 Colombia.
- 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

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- 2020 Dosier Muenzinger Award for Outstanding Contribution to Basic Research  
*Department of Psychology and Neuroscience, University of Colorado Boulder*
- 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

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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*
- *Bioscience Reports*
- *BMC Bioinformatics*
- *BMC Psychiatry*
- *Genes, Brain and Behavior*
- *JAMA Psychiatry*
- *Journal of Psychiatric Research*
- *Molecular Psychiatry*
- *Psychiatry Research*
- *Psychological Bulletin*
- *Psychoneuroendocrinology*

## Teaching positions

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

## Lectures

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- Mapping genes for complex traits. *Physiological Genetics and Genomics, Department of Integrative Physiology.*
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- 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.*