

Investigating the Impact of the COVID-19 Pandemic on Computing Students' Sense of Belonging

One of three SIGCSE 2021 Best Papers, Computing Education Research Track

CATHERINE MOONEY & BRETT A. BECKER

UNIVERSITY COLLEGE DUBLIN

{CATHERINE.MOONEY; BRETT.BECKER}@UCD.IE

SIGCSE 2021 paper & video available at: www.brettbecker.com/publications



Investigating the Impact of the COVID-19 Pandemic on Computing Students' Sense of Belonging



Introduction

- *Sense of belonging* (SoB): a personal belief that one is an accepted member of an academic community, and whose presence and contributions are valued
- However, sense of belonging can show variations according to factors such as race, ethnicity and gender
- It has also been shown to be associated with attributes such as motivation and persistence

Motivation





- We have been tracking our undergraduate students' SoB for three years
- 130 student responses from 2017-2019
- Questions adapted from the 'Maths Sense of Belonging Scale' (Good, Rattan & Dweck, 2012)
 - 18 positively framed questions (e.g. I feel accepted/I feel respected/etc.)
 - 12 negatively-framed questions (e.g. I feel excluded/I feel disregarded/etc.)
 - All items were preceded by "When I am in a computer science setting..."
 - 8-point Likert scale
 - $SoB = \sum \text{positively framed question scores} - \sum \text{negatively framed question scores}$

Motivation

- For more insight, we also asked
 - What extra-curricular activities students had taken part in
 - How much students interact with other CS students socially
 - How much students enjoy problem solving
 - How much students are confident in their mathematical abilities
 - How much experience with CS they had prior to university

Pre-COVID

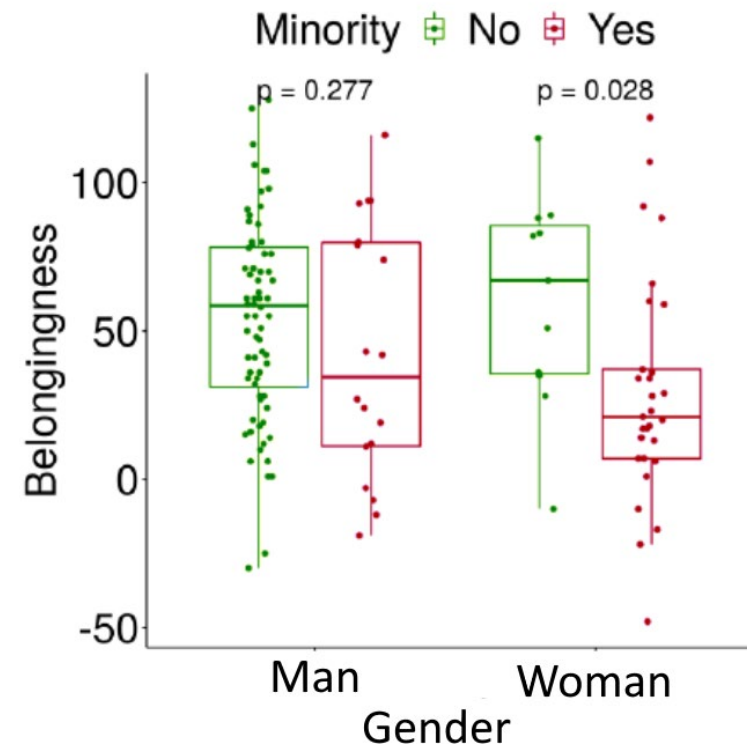
Motivation

- 130 students 2017-19 (pre-COVID)
- Generally, students self-identifying as:
 - Women* have  SoB
 - Minorities have  SoB
 - Men* have  SoB
 - Non-minorities have  SoB
- Intersectionality complicates this.

* Despite surveying several hundred students, even with a healthy response rate, we normally have very few students identifying as gender non-binary. To protect their identities, we have not included their data. Therefore numbers may be off by a few individuals.

Intersectionality

- We observed a lower sense of belonging in women who self-identified as being part of a minority group
- However, students identifying as women who did not identify as belonging to a minority had a sense of belonging comparable to students identifying as men



Approach

Post-COVID
onset

- In Summer 2020, we investigated:
 - **What is the impact of the COVID-19 pandemic and the ensuing shift to virtual delivery on the sense of belonging of our undergraduate computing students?**
- We surveyed students in August 2020 (post-COVID onset)
 - 68 responses
- Students had moved to studying remotely from March 12, 2020
 - and had been under various stages of lockdown for ~6 months.

Demographics

- 198 undergraduate students completed the survey in total: 130 pre-COVID and 68 post-COVID. Fairly evenly spread from years 1-4.
- → 62 identifying as women, 45 self-identifying as belonging to a minority.
- → 136 identifying as men, 33 self-identifying as belonging to a minority.
- How a student identified as a minority was completely open to them
 - Students could answer “no” or “yes” with no reason, or “yes” with any number of self-defined reasons
- We observed:
 - *Not all women identify as being part of a minority*
 - Some women identify as being part of a minority only because they are women
 - Some women identify as being part of a minority but not because they are women
 - Some women identify as being part of a minority because they are a woman in addition to other reasons including race, ethnicity, nationality, age, socio-economic factors, LGBTQIA+, and more

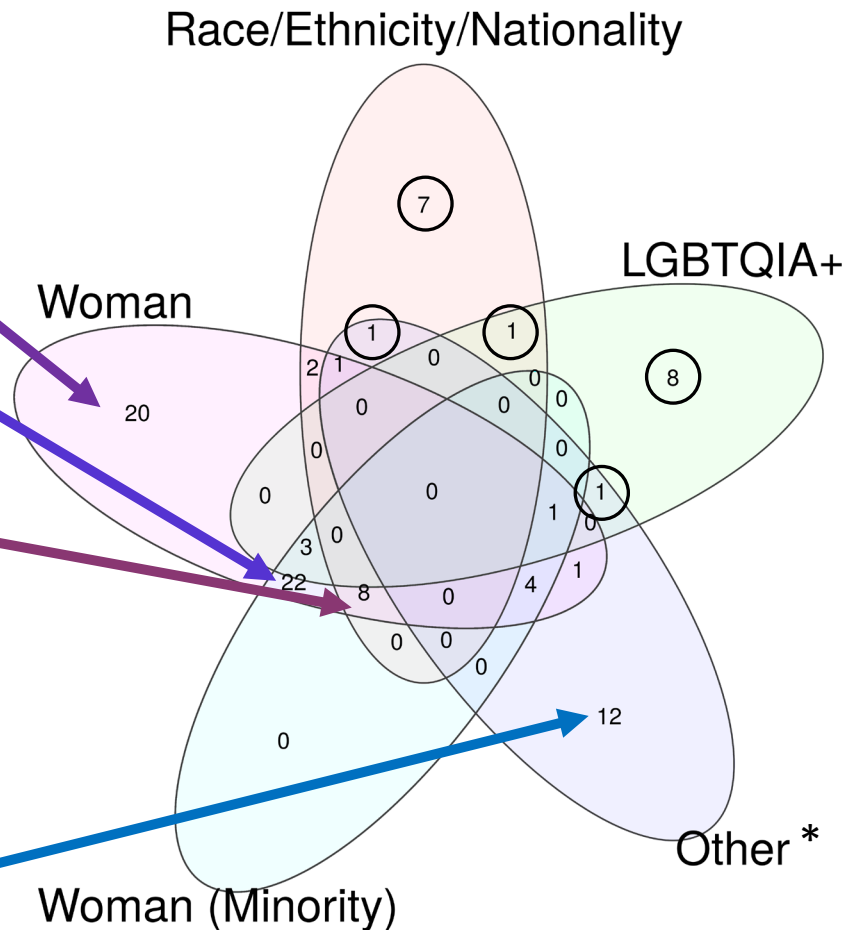
20 women did not identify as being part of a minority

22 women identified being a woman as their only reason for identifying as being part of a minority

8 women identified as being part of a minority because of being a woman and because of race/ethnicity/nationality

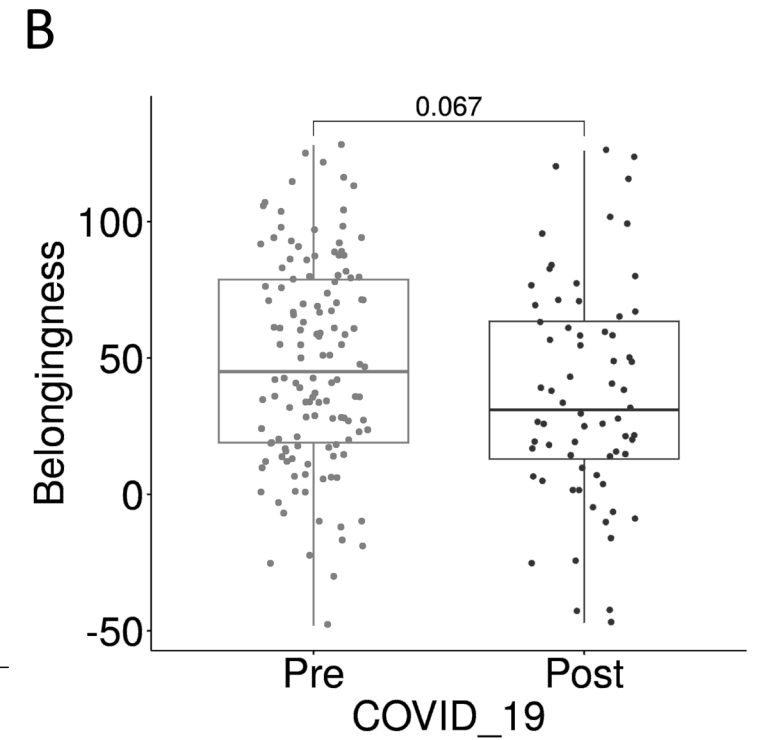
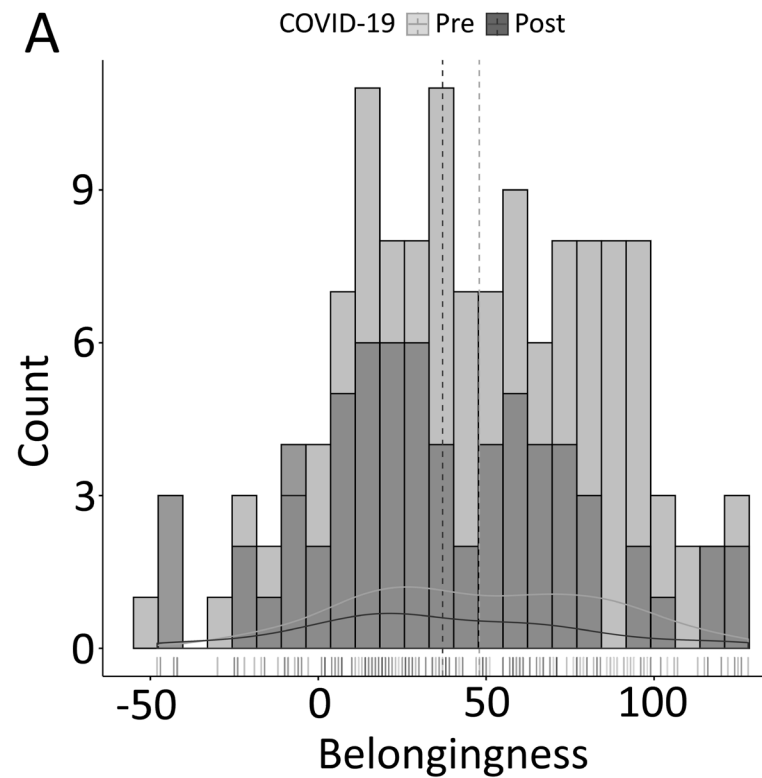
18 men identified as being part of a minority because of race/ethnicity/nationality and/or LGBTQIA+; 2 of them also gave additional reasons*

12 men identified as being part of a minority only for other reasons*



* Other reasons for being part of a minority included being a mature student, having a disability and socio-economic background

Histogram (A) and boxplot (B) showing the distributions of belongingness scores broken down by the time the survey was completed: pre-COVID-19 onset, and post-COVID-19 onset.

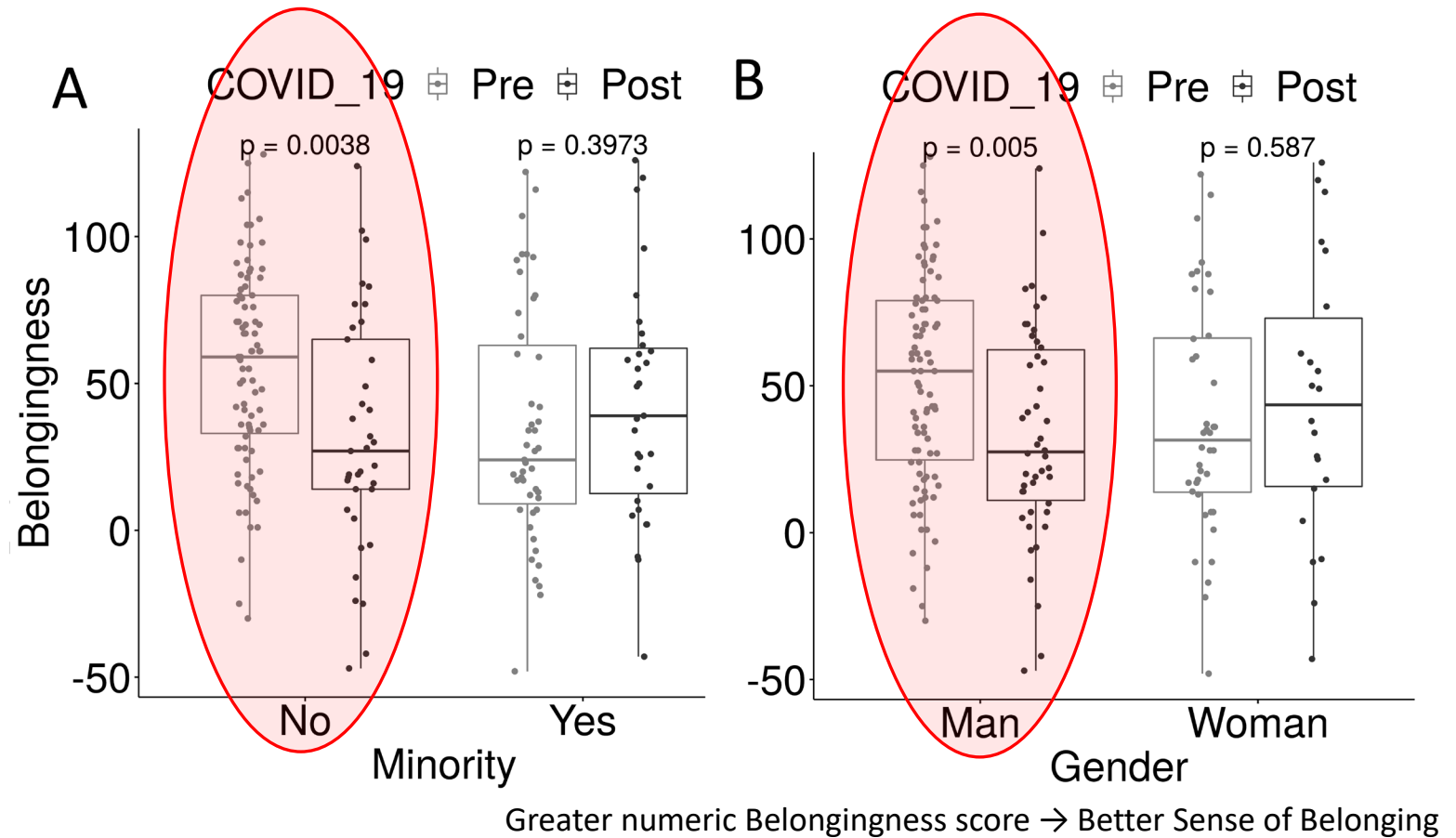


Greater numeric Belongingness score → Better Sense of Belonging

Boxplots showing belongingness from pre- and post-COVID-19 (onset) broken down by: (A) students that do and do not self-identify as being part of a minority; (B) students identifying as men or women.

Significant drop in sense of belonging of students not identifying as being part of a minority

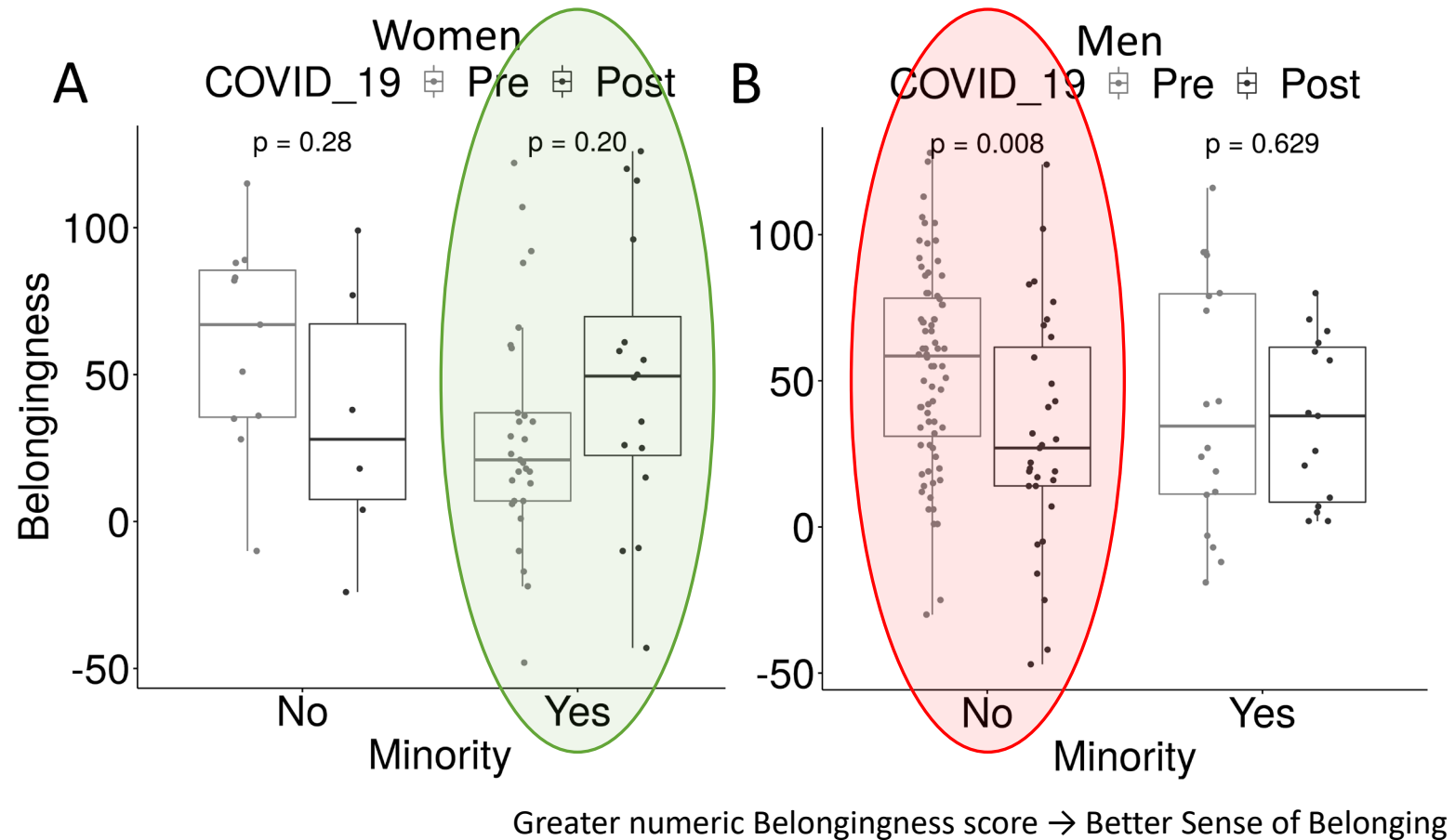
Significant drop in sense of belonging of students identifying as men



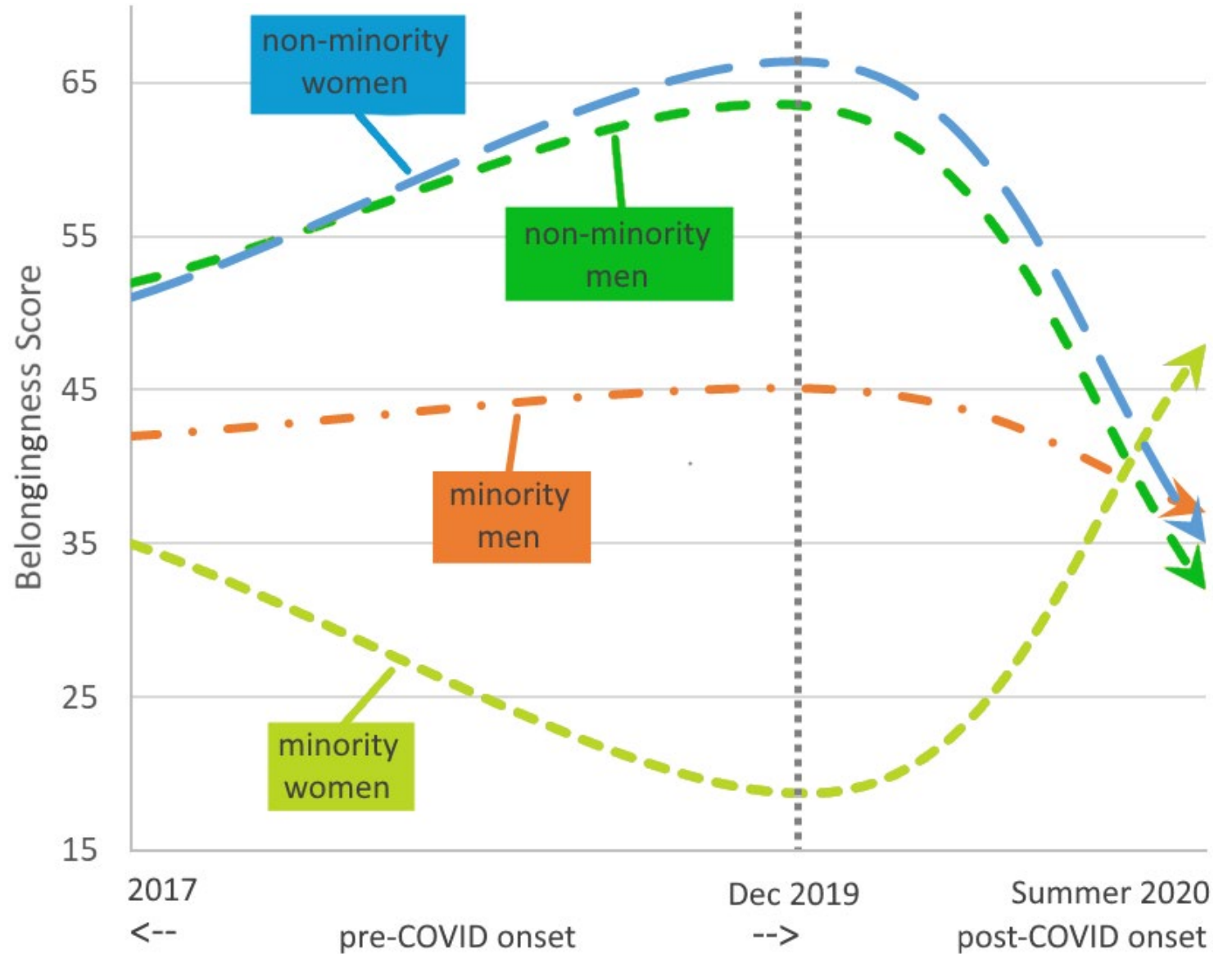
Boxplots showing belongingness from pre- and post-COVID-19 (onset), broken down by: women (A) and men (B), that do and do not self-identify as being part of a minority.

Non-significant, yet interesting increase in sense of belonging of students identifying as women and being part of a minority

Significant drop in sense of belonging of students identifying as men and not being part of a minority



Visualization of the mean belongingness scores of women and men who self-identified as belonging to a minority or not, from 2017-2020.



Greater numeric Belongingness score → Better Sense of Belonging

Conclusions

1. COVID-19 had a larger impact on the sense of belonging of all students in the space of a few months than we otherwise observed over the two prior years.
2. Men and women who do not identify as being part of any minority appear to have had similar downward shifts in their senses of belonging.
 - Although in our results only men showed a statistically significant decrease, the lack of a significant difference in women is likely due to sample size.
 - Women who do identify as being part of a minority had a large mean increase in sense of belonging post-COVID-19 although this was not statistically significant. Again, sample size may be a factor.
3. Men who do not identify as being part of any minority saw the largest statistically significant drop in belongingness post-COVID-19.

Moving Ahead

1. We ran an expanded survey at another Irish University in 2021. This corroborated many of our results but also yielded some new, potentially interesting insights.
2. We are rolling this survey out to the whole College of Science at UCD next week. Watch this space!

UCD College of Science

▶ UCD School of Biology and Environmental Science

▶ UCD School of Chemistry

▶ UCD School of Mathematics and Statistics

▶ UCD School of Biomolecular and Biomedical Science

▶ UCD School of Computer Science

▶ UCD School of Physics

▶ UCD School of Earth Sciences

Thank you!

Paper & video from SIGCSE 2021 available at www.brettbecker.com/publications