

Study tracks shifts in student mental health during college

March 13 2024



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A four-year study by Dartmouth researchers captures the most in-depth data yet on how college students' self-esteem and mental health fluctuates during their four years in academia, identifying key

populations and stressors that the researchers say administrators could target to improve student well-being.

The study also provides among the first real-time accounts of how the coronavirus [pandemic](#) affected students' behavior and mental health. The stress and uncertainty of COVID-19 resulted in long-lasting behavioral changes that persisted as a "new normal" even as the pandemic diminished, including feeling more stressed, less socially engaged, and sleeping more.

The researchers tracked more than 200 Dartmouth undergraduates in the classes of 2021 and 2022 for all four years of college. Students volunteered to let a specially developed app called [StudentLife](#) tap into the sensors that are built into smartphones. The app cataloged their daily physical and [social activity](#), how long they slept, their location and travel, the time they spent on their phone, and how often they listened to music or videos. Students also filled out weekly behavioral surveys, and selected students gave post-study interviews.

The study—which is the longest mobile-sensing study ever conducted—is [published](#) in *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies*.

The researchers will present it at the Association of Computing Machinery's [UbiComp/ISWC 2024](#) conference in Melbourne, Australia, in October. The team made their anonymized [data set publicly available](#)—including self-reports, surveys, and phone-sensing and brain-imaging data—to help advance research into the mental health of students during their college years.

Andrew Campbell, the paper's senior author and Dartmouth's Albert Bradley 1915 Third Century Professor of Computer Science said that the study's extensive data reinforces the importance of college and

university administrators across the country being more attuned to how and when students' mental well-being changes during the school year.

"For the first time, we've produced granular data about the ebb and flow of student mental health. It's incredibly dynamic—there's nothing that's a steady state through the term, let alone through the year," he said. "These sorts of tools will have a tremendous impact on projecting forward and developing much more data-driven ways to intervene and respond exactly when students need it most."

First-year and female students are especially at risk for high anxiety and [low self-esteem](#), the study finds. Among first-year students, self-esteem dropped to its lowest point in the first weeks of their transition from [high school](#) to college but rose steadily every semester until it was about 10% higher by graduation.

"We can see that students came out of high school with a certain level of self-esteem that dropped off to the lowest point of the four years. Some said they started to experience 'imposter syndrome' from being around other high-performing students," Campbell said. "As the years progress, though, we can draw a straight line from low to high as their self-esteem improves. I think we would see a similar trend class over class. To me, that's a very positive thing."

Female students—who made up 60% of study participants—experienced, on average, 5% greater stress levels and 10% lower self-esteem than male students. More significantly, the data show that female students tended to be less active, with male students walking 37% more often.

Sophomores were 40% more socially active compared to their first year, the researchers report. However, these students also reported feeling 13% more stressed than during their first year as their workload

increased, they felt pressure to socialize, or as first-year social groups dispersed.

One student in a sorority recalled that having pre-arranged activities "kind of adds stress as I feel like I should be having fun because everyone tells me that it is fun." Another student noted that after the first year, "students have more access to the whole campus, and that is when you start feeling excluded from things."

In a novel finding, the researchers identify an "anticipatory stress spike" of 17% experienced in the last two weeks of summer break. While still lower than mid-academic year stress, the spike was consistent across different summers.

In post-study interviews, some students pointed to returning to campus early for team sports. Others specified reconnecting with family and high school friends during their first summer home, saying they felt "a sense of leaving behind the comfort and familiarity of these long-standing friendships" as the break ended, the researchers report.

"This is a foundational study," said Subigya Nepal, first author of the study and a Ph.D. candidate in Campbell's research group. "It has more real-time granular data than anything we or anyone else has provided before. We don't know yet how it will translate to campuses nationwide, but it can be a template for getting the conversation going."

The depth and accuracy of the study data suggest that mobile-sensing software could eventually give universities the ability to create proactive mental-health policies specific to certain student populations and times of year, Campbell said.

For example, a paper Campbell's research group [published in 2022](#) based on StudentLife data showed that first-generation students experienced

lower self-esteem and higher levels of depression than other students throughout their four years of college.

"We will be able to look at campus in much more nuanced ways than waiting for the results of an annual [mental health](#) study and then developing policy," Campbell said. "We know that Dartmouth is a small and very tight-knit campus community. But if we applied these same methods to a college with similar attributes, I believe we would find very similar trends."

Weathering the pandemic

When students returned home at the start of the coronavirus pandemic, the researchers found that self-esteem actually increased during the pandemic by 5% overall and by another 6% afterward when life returned closer to what it was before. One student suggested in their interview that getting older came with more confidence. Others indicated that being home led to them spending more time with friends, talking on the phone, on social media, or streaming movies together.

The data show that phone usage—measured by the duration a phone was unlocked—indeed increased by nearly 33 minutes, or 19%, during the pandemic, while time spent in physical activity dropped by 52 minutes, or 27%. By 2022, phone usage fell from its pandemic peak to just above pre-pandemic levels, while engagement in physical activity had recovered to exceed the pre-pandemic period by three minutes.

Despite reporting higher self-esteem, students' feelings of stress increased by more than 10% during the pandemic. Since the pandemic, stress fell by less than 2% of its pandemic peak, indicating that the experience had a lasting impact on student well-being, the researchers report.

In early 2021, as students returned to campus, the reunion with friends and community was tempered by an overwhelming concern of the still-rampant coronavirus. "There was the first outbreak in winter 2021 and that was terrifying," one student recalls. Another student adds, "You could be put into isolation for a long time even if you did not have COVID. Everyone was afraid to contact-trace anyone else in case they got mad at each other."

Female students were especially concerned about the coronavirus, on average 13% more than male students. "Even though the girls might have been hanging out with each other more, they are more aware of the impact," one female student reported. "I actually had COVID and exposed some friends of mine. All the girls that I told tested as they were worried. They were continually checking up to make sure that they did not have it and take it home to their family."

Students still learning remotely had social levels 16% higher than students on campus, who engaged in activity an average of 10% less often than when they were learning from home. However, on-campus students used their phones 47% more often. When interviewed after the study, these students reported spending extended periods of time video-calling or streaming movies with friends and family.

Social activity and engagement had not yet returned to pre-pandemic levels by the end of the study in June 2022, recovering by a little less than 3% after a nearly 10% drop during the pandemic. Similarly, the pandemic seems to have made students stick closer to home, with their distance traveled cut by nearly half during the pandemic and holding at that level in the time since.

Campbell and several of his fellow researchers are now developing a [smartphone app known as MoodCapture](#) that uses artificial intelligence paired with facial-image processing software to reliably detect the onset

of depression before the user even knows something is wrong.

More information: Subigya Nepal et al, Capturing the College Experience, *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies* (2024). [DOI: 10.1145/3643501](https://doi.org/10.1145/3643501)

Provided by Dartmouth College

Citation: Study tracks shifts in student mental health during college (2024, March 13) retrieved 29 April 2024 from <https://phys.org/news/2024-03-tracks-shifts-student-mental-health.html>

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