

## **Case Study: Civil Engineering Student Mental Health and Watching Football?**

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**Summary:** This paper reviews the mental health crisis among college students, describes a mental health unit in a first-year civil engineering seminar course, and shares student views. An unexpected finding was that students discussed the role of watching football in boosting their well-being. Faculty should be aware that student mental health is a significant concern and encourage students to develop a healthy balance of activities beyond school and work. Moving engineering away from its stress culture may help improve student well-being and success.

### **Background**

College student mental health has been characterized as a crisis [1]. Even before the pandemic only 40% of college students had positive mental health while almost 40% reported experiencing a significant mental health problem, including major and moderate depression (18% and 18%), severe and moderate anxiety (14% and 17%), suicidal ideation during the past year (14%), and inflicting non-suicidal self-injury (24%) [1]. Results differ by gender, with higher percentages of female compared to male first-year students frequently feeling anxious (52.8% F, 26.9% M) and depressed (21.2% F, 11.6% M) during the past year [2]. More specifically, engineering has been characterized as having a “stress culture” [3]. A large study in fall 2017 found high anxiety, stress, and depression levels among female engineering students (26.5%, 18.3%, 19.6%) and somewhat lower incidence among male engineering students (15.2%, 12.0%, 15.0%) [3]. A fall 2022 survey among engineering students found that 40% of the females, 18% of the males, and 71% of the transgender and others had a diagnosed mental health condition [4]. The study also explored elements of social stigma related to mental health and its detrimental effects on help seeking. These are just a few examples of the growing body of literature documenting concerns related to the mental health of engineering college students.

Student stress, anxiety, and depression have been found to relate to a number of factors including academic workload pressures [5] and the extent to which students have a healthy balance between work (school work, jobs, co-curricular activities) and life (leisure activities, personal needs) [6]. Work-life balance (WLB) considerations were found to be very important to current U.S. civil engineering students (e.g., “I don’t want to spend an excessive number of hours at my job”) [7]. Concerns about WLB impact STEM students’ planned career trajectories, including thoughts about leaving STEM [8]. Thus, engineering’s common reputation for being “all work and no rest” [9] should be of concern to faculty.

### **Mental Health Module**

During the COVID pandemic in fall 2020 the University of Colorado Boulder (CU) required that all incoming first-year students learn about mental health issues in a course setting. Within civil engineering (CE), my 1-credit CE seminar course was identified as the site for this content. The university specified four student learning objectives: (1) Gain an understanding of mental health and wellbeing; (2) Learn about strategies to increase resilience; (3) Recognize signs of distress and how to support others; (4) Identify available resources on campus. The campus provided a facilitation guide and slide deck. Faculty were not expected to be mental health experts and I communicated my lack of expertise to my students.

After the university mandate expired, I retained mental health as a topic in the course but made modifications to better align with civil engineering. At the beginning of the lecture a parallel is drawn between personal resilience and infrastructure resilience. The lecture focuses on learning objectives 1, 2, and 4. For the first objective, the prevalence of health issues reported by students are presented (e.g., stress 42%, anxiety 34%, depression 26%, sleep difficulties 24%, loneliness 54% [10]). Reporting the high percentages of college students facing mental health challenges is intended to reduce the stigma that often accompanies mental health. Student resilience data from our campus based on the Connor-Davidson Resilience Scale [11] is also discussed (i.e., able to adapt when changes occur, bounce back after hardships). Toward the second learning objective, students are introduced to the idea of self-care and the eight dimensions of wellness [12]. These dimensions are: physical, intellectual, mental/emotional, social, environmental, occupational, spiritual, and financial. Students are encouraged to think about activities that will help them maintain their physical, psychological, and emotional wellbeing. For the final objective, the list of available resources on campus is shared in lecture, and links are embedded in the course Canvas site. The health and wellness resources on campus include: counseling and psychiatric services (individual and group), disability services (including accommodations), medical services, health promotion programs and workshops, peer wellness coaches, and others. I believe that including the mental health unit communicates that I care about student wellbeing.

The module is timed to coincide with the first set of exams in calculus and chemistry, as students are typically experiencing heightened stress. There is a weekly assignment associated with the module (Figure 1). The assignment is not time consuming, to allow students to focus more attention on their high stakes exams in required courses. Given the sensitivity of the topic of mental health, students are given the power to select which questions they are comfortable answering, resources they would like to consult, and how to document that they completed the assignment. This aligns with Universal Design for Learning (UDL) principles [13]. Students receive full credit (10 points) for completing the assignment.

#### **Homework Assignment: Mental Health / wellness / resiliency**

*For the assignment this week, take some time to reflect on your experiences in college so far. You may choose to read some of the resources provided (or not). Discuss elements among the following that are of interest to you – you do not need to discuss all of these elements.*

- What has been your mental health / wellness status this semester? Describe times you have felt happy, excited, confident, successful, stressed, anxious, disappointed, and/or tired. Discuss sources of these feelings: physical health / illness, homework, exams, family issues, financial issues, etc.
- Describe a situation where you reached out for help and received support – from friends, family, on-campus resources.
- Describe positive actions you are taking to support mental wellness. Focus on what brings you joy and actions such as exercise, socializing, relaxing. Think about improving your time management, getting ahead.
- If you consulted any online resources, videos, etc. summarize what you learned, key messages. {include a reference}

Select 1 of 3 documentation options: (a) write 250-500 words total; (b) 3-5-min video / vlog; (c) visit Prof to discuss (Zoom or in-person)

Figure 1. Assignment associated with mental health, wellness, and resiliency

## Results

In-class clicker questions (for attendance) associated with the mental health lecture asked students to report their current mental health and main type of self-care (given clicker limitations only 5 of the 8 dimensions of wellness were provided as choices). Results are shown in Table 1. Interestingly, among the female students twice as many were stressed compared to happy, while for male students a higher percentage were happy vs. stressed. This generally poorer mental health among female college students has also been found in other studies.

Table 1. Percentage of male and female students selecting different clicker options

	Year: 2023		2022			Year: 2023		2022	
	M - F	n=32-19	M - F	n=31-15		My main self-care is:	M - F	n=28-19	M - F
I currently feel:					Social	43 - 53		29 - 43	
Happy, things are going well overall ☺	28 - 16		35 - 13		Physical	25 - 21		36 - 29	
OK, I have a good balance ☺	53 - 53		55 - 60		Spiritual	7 - 0		10 - 14	
Generally stressed ☹	19 - 32		10 - 27		Mental	18 - 16		23 - 14	
					Intellectual	7 - 11		3 - 0	

Student assignments in 2023 were coded to characterize the overall valence of student mental health as mostly positive, fairly balanced (mixed), or mostly negative. When female students (n=20) reflected on the semester thus far (5 weeks) 35% were positive, 45% mixed, and 20% negative; these results were more positive than the ‘current’ result from the in-class clicker. The essay results from the male students (n=30) were 63% positive, 30% mixed, 7% negative, which was more positive than their clicker responses and more positive than the female students. No students were fully positive or negative. While students might not reveal their actual feelings or challenges in the homework assignment, many shared their struggles with stress (n=35), anxiety (n=17), homesickness (n=4), chronic illness (n=4), and disappointment with exam scores (n=8).

The assignments were coded to reflect which of the 8 dimensions of wellness were evident (Table 2). The total is shown because there were not significant differences between male and female students. For self-care, students commonly discussed time with friends, talking with family, exercise, and time outside. Many students connected with academic support, but few reported utilizing the university counseling and psychiatric programs. The assignment revealed students’ desire for a healthy balance between school work and other life activities. Balance is critical, and this word was directly used by 16 students. Those without a good balance among wellness dimensions generally described more negative experiences (students reporting mostly negative feelings averaged 3.3 different wellness dimensions described versus 4.4 for students reporting mostly positive feelings). For example, a female student wrote: “I have no energy anymore for life, all I do is homework and sleep, and frankly I am very unhappy. This past month is the loneliest I have felt ... While I do enjoy the work I am doing and am excited for where it will take me, it has been a hard mental struggle to remind myself of that.”

On the fall 2023 mental health assignment something that caught my attention was that students mentioned the positive role of attending football games: 6 males and 1 female. Cheering for the home team in the outdoor stadium fulfills 4 dimensions of self-care: it takes their mind off their studies (mental), it is a social time and shared experience (social) while providing fresh air (environment) and exercise (physical). When the team was doing poorly in fall 2022 and fall 2021 only 1 student each year mentioned football. Example quotes:

2023 male: “I’m going to be straight up honest, I am not enjoying college at all. .... I know this major is a grind, and I have no problem with the grind, it just makes it hard when I do not see the results that I like to see. .... There have been a couple times that I’ve had fun, like at the football games, and hanging out with friends.”

2022 female: “Mostly this semester, I have been very stressed and very homesick. The transition from high school to college has been very difficult .... I have had some really fun moments here at CU like at the football games ....”

2021 male: “For the first two weeks of the semester, I had difficulty adjusting to college life and being away from home. I was stressed and anxious with balancing the workload and performing well in my classes.... Now four weeks in, I have found a good group of friends with people from the dorms and my roommates. .... I bought the sports pass and plan on going to every football game as a way to show school spirit and have fun.”

Table 2. Self-care dimensions discussed by students [and stressors] in 2023

Dimension	Examples / Quotes [stressors]	% of 51
Social	Hanging out with friends, calling family; “For my mental wellness I have now separated time to socialize and go out with friends” [but some also lonely, homesick]	100
Mental / Emotional	Self-aware, positive outlook, manage feelings, coping skills. “I’ve experienced both moments of prosperity and times of struggle, and I’m grateful for both.”	98
Intellectual	"I enjoy the feeling of learning and being productive"; "what brings me the most joy during the semester is watching my own grades progress little by little... my hard work reflected on the grade it brings me lots of joy"	78
Physical	Exercise (n=29) including gym, weight lifting, martial arts, yoga, running, biking, intramural sports, etc; Sleep (n=10); Eating well (n=5); Not excessive alcohol (n=1)	65
Environmental	Getting outside, understanding that natural and built environment impacts well-being	59
Occupational / Vocational	“getting a job has definitely benefited my mental health. Just going to work and getting in that routine is enough to divert my brain from stressing over school and other problems in life.”	8
Financial	“getting a job... I get paid quite well which helps ease the financial burden of college on both me and my family” [“financial aid situation”, “insane amount of debt”]	6
Spiritual	"I am going to continue to trust God..."	2

### Literature: Collegiate Sports

Collegiate sports can be viewed from both negative and positive perspectives. Critiques include the exploitation of the players, their risks for injury, and challenges being student athletes, which also have racial considerations [14]. A correlation has been found between collegiate sports and excessive alcohol consumption [15]. Observationally, at ‘big football’ schools, game day shuts down the campus, including libraries, and students are distracted from their studies. On the other hand, studies have identified many positive effects of being a sports spectator. The team identification – social psychological health model links “fandom” and well-being in college students [16-18]. Positive mental health effects may derive from social interaction (camaraderie), supportive cultural environments, identity, sense of belonging, stress relief, and catharsis [19-22]. For example, a female teen noted being ‘obsessed with’ Australian Football because it brings people together and allows her to escape from her own troubles (“I sort of forget about everything”) [21]. Aligned with the physical elements in the wellness model, increased heart rate has been measured while watching sports (e.g., [23]). Being outdoors to watch sporting events may convey additional benefits due to the relationship with the natural world [24]. Overall, the literature includes a lot of evidence to support why students can derive a variety of benefits from

attending and/or watching college sports. A summary of positive and negative elements of watching football is mapped to the self-care framework in Table 3.

Table 3. Examples of how being a spectator for college football maps to areas of self-care

Dimension	Impacts (+ positive, - negative)
Social	+ Being connected, being an active member of the community, time with friends
Physical	+ Being active yelling and cheering for team raises heart rate - If consume too much alcohol, eat junk food
Environmental	+ Watching the game from the outdoor stadium gives fresh air
Mental / Emotional	+ Having a positive outlook, coping skills (escape from stress)
Financial	- Cost of tickets (often low for students); time away from a job that earns money

### Football as an Analogy for College

There are parallels between a student’s college experience and football, such as:

    Lows and highs – The lows might be season(s) long or might last only part of the game.

    Team work – Many of the CE students received coursework help from other students and general support from friends and family.

Pervasive sports analogies may be annoying, but perhaps students absorb these models [25]. I aspire to having my students view me as a coach rather than a ref (enforcing rules) or the opposing team (putting up roadblocks to prevent students from reaching their goal of success in the course or earning their degree). Faculty should remember that our students may be facing an array of challenges (personal health challenges, helping friends or family who are struggling) – and they may not feel comfortable sharing the specifics of those situations. When our students ask for accommodations, our actions can help them reach their goals.

### Summary and Conclusion

The mental health crisis among college students is a serious problem. Reading the student reflections connected me with the values of the current generation – a healthy balance and appreciating social ties. A number of the first-year students, and particularly the female students, shared mostly negative feelings and experiences; non-normative groups may have particular struggles with belonging [3]. Cheering for the home team can take their mind off their studies, is a social time and shared experience, and is even exercise. Collegiate sports also provide an example of resilience and fighting back from adversity. I believe that it was worth the time in the introductory civil engineering course to introduce students to the self-care model, ask them to reflect on their well-being, and encourage them to schedule activities that will bolster their wellness. Many traditional first-year students are away from home for the first time and starting to develop habits that will last a lifetime. Students are facing an array of challenges and should be aware that support is available. Faculty should recognize the mental health crisis among college students. We can proactively design our courses to avoid unnecessary features that contribute to student stress and anxiety (e.g., cold-calling, group structure, high stakes tests) [26-28], instead offering opportunities to recover from poor grades (e.g., submit test corrections for partial credit, drop their lowest score) and build a growth mindset [e.g., 29]. Instructors should also consider hidden curriculum related to overwork [30-32]. If we imply that engineering students should always be studying, this might contribute to poor mental health. It might also discourage students from persisting in engineering to earn their degree or enter the engineering workforce. Alternatively, we can encourage students to develop a healthy balance which includes attending to the eight dimensions of well-being via an array of activities.

## References

- [1] National Academies of Sciences, Engineering, and Medicine, *Mental Health, Substance Use, and Wellbeing in Higher Education: Supporting the Whole Student*. Washington, DC: The National Academies Press, 2021. <https://doi.org/10.17226/26015>.
- [2] Higher Education Research Institute (HERI) at UCLA, *2022 CIRP Freshman Survey*. Data Tables. 57 pp. 2022.
- [3] K.J. Jensen and K.J. Cross, “Engineering stress culture: relationships among mental health, engineering identity, and sense of inclusion,” *Journal of Engineering Education*, vol. 110, pp. 371-392, DOI: 10.1002/jee.20391
- [4] M.L. Sanchez-Pena, A.M. McAlister, N. Ramirez, D.B. Samuel, S.A. Kamal, and X. Xu, “Stigma of mental health conditions within engineering culture and its relation to help-seeking attitudes: Insights from the first year of a longitudinal study,” *Proceedings of the American Society for Engineering Education (ASEE) Annual Conference & Exposition*, 22 pp., 2023
- [5] M. Mofatteh, “Risk factors associated with stress, anxiety, and depression among university undergraduate students,” *AIMS Public Health*. 2020 Dec 25; 8(1):36-65. doi: 10.3934/publichealth.2021004. PMID: 33575406; PMCID: PMC7870388.
- [6] J.M. Sprung and A. Rogers, “Work-life balance as a predictor of college student anxiety and depression,” *Journal of American College Health*, vol. 69, no. 7, pp. 775-782, 2021. DOI: 10.1080/07448481.2019.1706540
- [7] K. Koc, A.P. Gurgun, M.E. Ozbek, D. Kalan, C. Clevenger, and P. Omur-Ozbek, “Comparative analysis of work–life balance perceptions of civil engineering students,” *Journal of Civil Engineering Education*, volume 148, issue 2, 2021. [https://doi.org/10.1061/\(ASCE\)EI.2643-9115.0000057](https://doi.org/10.1061/(ASCE)EI.2643-9115.0000057)
- [8] A. Tan-Wilson and N. Stamp, “College students’ views of work-life balance in STEM research careers: Addressing negative preconceptions,” *CBE – Life Sciences Education*, vol. 14, pp. 1-13, 2015. DOI:10.1187/cbe.14-11-0210
- [9] K.L. Prince, “Experiences of undergraduate robotics engineering students with rest and work-life balance in academics,” Doctoral dissertation, Worcester Polytechnic Institute, 2023.
- [10] American College Health Association (ACHA), *National College Health Assessment NCHA III, Undergraduate student reference group Executive Summary Fall 2022*. Silver Spring, MD: ACHA, 2023.
- [11] S. Vaishnavi, K. Connor, and J.R. Davidson, “An abbreviated version of the Connor-Davidson Resilience Scale (CD-RISC), the CD-RISC2: psychometric properties and applications in psychopharmacological trials,” *Psychiatry Research*, vol. 152, no. 2-3, pp. 293–297, 2007..
- [12] D.L. Stoewen, “Dimensions of wellness: Change your habits, change your life,” *Can Vet J*, vol. 58, no. 8, pp. 861-862, 2017. PMID: 28761196; PMCID: PMC5508938.
- [13] F. Fovet, “Using Universal Design for Learning to optimize flexibility in assessment and class activities while maximizing alignment with course objectives,” in *Optimizing Higher Education Learning through Activities and Assessments*, 2020. DOI: 10.4018/978-1-7998-4036-7.ch007
- [14] G.R. Gems, L.J. Borish, and G. Pfister, *Sports in American History: From Colonization to Globalization*. 3<sup>rd</sup> Edition. Champaign, Illinois: Human Kinetics, 2023.
- [15] L.J. Merlo, J. Hong, and L.B. Cottler, “The association between alcohol-related arrests and college football game days,” *Drug and Alcohol Dependence*, vol. 106, pp. 69-71, 2010.

doi:10.1016/j.drugalcdep.2009.07.012

- [16] D.L. Wann, J. Hachathron, and M.R. Sherman, "Testing the team identification – social psychological health model: mediational relationships among team identification, sport fandom, sense of belonging, and meaning in life," *Group Dynamics: Theory, Research, and Practice*, vol. 21, no. 2, pp. 94-107, 2017. Available: <http://dx.doi.org/10.1037/gdn0000066>
- [17] D.L. Wann, P.J. Waddill, J. Polk, and S. Weaver, "The team identification – social psychological health model: Sport fans gaining connections to others via sport team identification," *Group Dynamics: Theory, Research, and Practice*, vol. 15, no. 1, pp. 75-89, 2011. DOI: 10.1037/a0020780
- [18] D.L. Wann, E. Brame, M. Clarkson, D. Broks, and P.J. Waddill, "College student attendance at sporting events and the relationship between sport team identification and social psychological health," *Journal of Intercollegiate Sports*, vol. 1, pp. 242-254, 2008.
- [19] J. Drenten, C.O. Peters, T. Leigh, and C.R. Hollenbeck, "Not just a party in the parking lot: An exploratory investigation of the motives underlying the ritual commitment of football tailgaters," *Sport Marketing Quarterly*, vol. 18, no. 2, pp. 92-106, 2009.
- [20] A. Pringle, "Can watching football be a component of developing a state of mental health for men?" *The Journal of the Royal Society for the Promotion of Health*, vol. 124, no. 3, pp. 122-128, 2004.
- [21] S. Hall C. McKinstry, and N. Hyett, "Youth perceptions of positive mental health," *British Journal of Occupational Therapy*, vol. 79, no. 8, pp. 475-483, 2016. DOI: 10.1177/0308022616632775
- [22] R.W. Jensen, Y.B. Limbu, and J. Choi, "How does the stadium atmosphere at a college football game affect behavioral intentions across gender lines? The mediating role of spectator satisfaction," *International Journal of Management and Marketing Research*, vol. 9, no. 2, pp. 41-58, 2016.
- [23] L.T. Khairy, R. Barin, F. Dmoniere, C. Villmaire, M-J Billo, J-C. Tardif, L. Macle, and P. Khairy, "Heart rate response in spectators of the Montreal Canadiens hockey team," *Canadian Journal of Cardiology*, vol. 33, pp. 1633-1638, 2017. <http://dx.doi.org/10.1016/j.cjca.2017.08.002>
- [24] A.A. Dosumu, "The environmental impacts and wellbeing benefits of sport: Assessing spectator and participant dominated sports in England," PhD thesis, University of Essex, 2016.
- [25] J.L. Shulman and W.G. Bowen, *The Game of Life: College Sports and Educational Values*, Princeton University Press, 2000. <https://doi.org/10.1515/9781400840694>
- [26] J.L. Hsu and G.R. Goldsmith, "Instructor strategies to alleviate stress and anxiety among college and university STEM students," *CBE – Life Sciences Education*, vol. 20, es1, pp. 1-13, 2021. DOI:10.1187/cbe.20-08-0189
- [27] V.R. Downing, K.M. Cooper, J.M. Cala, L.E. Gin, and S.E. Brownell, "Fear of negative evaluation and student anxiety in community college active-learning courses," *CBE – Life Sciences Education*, vol. 19, ar 20, pp 1-16, 2020. DOI:10.1187/cbe.19-09-0186
- [28] T.F. Mohammed, E.M. Nadile, C.A. Busch, D. Brister, S.E. Brownell, C.T. Claiborne, B.A. Edwards, J.G. Wolf, C. Lunt, M. Tran, C. Vargas, K.M. Walker, T.D. Warkina, M.L. Witt, Y. Zheng, and K.M. Cooper, "Aspects of large-enrollment online college science courses that exacerbate and alleviate student anxiety," *CBE – Life Sciences Education*, vol. 20, ar 69, pp. 1-23, 2021. DOI:10.1187/cbe.21-05-0132
- [29] T.S. Samuel, S. Buttet, and Jared Warner, "‘I Can Math, Too!’: Reducing math anxiety in



STEM-related courses using a combined mindfulness and growth mindset approach (MAGMA) in the classroom,” *Community College Journal of Research and Practice*, vol. 47, no. 10, pp. 613-626, 2023. DOI: 10.1080/10668926.2022.2050843

- [30] I. Villanueva, L. Gelles, M. Di Stefano, B. Smith, R. Tull, S. Lord, L. Benson, A. Hunt, D. Riley, and G. Ryan, “What does hidden curriculum look like and how can it be explored?” *Proceedings of the American Society of Engineering Education (ASEE) Annual Conference & Exposition*, paper 21884, 16 pp, 2018. DOI 10.18260/1-2—31234, <https://peer.asee.org/31234>
- [31] S.B. Kurki, L. Herriot, and M. French-Smith, "Provoking the (not so?) hidden curriculum of busy with a feminist ethic of joy," in *Canadian Curriculum Studies: A Métissage of Inspiration/Imagination/Interconnection*, Toronto ON: Canadian Scholars Press, pp. 292-300, 2018.
- [32] S. Arslan and N. Akbulut, “Hidden curriculum and educational stress,” *Kastamonu Education Journal*, vol. 26, no. 4, pp. 1111-1119, 2018. <https://doi.org/10.24106/kefdergi.398650>