Social Context in College Student Personal Data: Designing New Mental Health Technology

Dong Whi Yoo*
Georgia Institute of Technology
Atlanta, Georgia
dongwhi.yoo@gatech.edu

Gregory D. Abowd
Georgia Institute of Technology
Atlanta, Georgia
abowd@gatech.edu

Munmun De Choudhury
Georgia Institute of Technology
Atlanta, Georgia
munmund@gatech.edu

ABSTRACT

Previous research has proved that college students' personal data, such as self-tracking and social media data, can be used to assess and predict students' mental health status. In addition to this, there are continuing academic and industrial efforts to support campus mental health by providing a way for other stakeholders, such as campus administrators, family members, peers, and clinicians, to review the students' personal data. Based on the preliminary findings from our on-going project, which includes interviews with campus administrators and on-campus clinicians, we suggest three implications which should be considered in future research: understanding the dynamics between different stakeholders, a need for a transparent visual presentation, and ethical challenges.

1 INTRODUCTION

Student mental health problems are pervasive and serious. In a recent nationwide survey, 32.9% of college students reported having been diagnosed with or treated by a professional for a number of mental health related issues, such as anxiety and depression [1]. In the same survey, 57% of students answered that the overall stress they experienced was higher than that experienced by non-student peers. Mental health concerns can negatively impact their academic success, as well as hamper their social and vocational foundations. As the college environment becomes more competitive than before, student mental health experts have asserted a need for a campus-wide response and strategy to improve student mental health[16].

Fortunately, the college student demographic happens to be a group in which many personal technologies, such as *self-tracking technologies* (smartphones, wearable devices) and *social media* are widely adopted [7]. One potential of these technologies is that they allow students to share and record their daily lives into digital forms. Sensors in smartphones and wearable devices can detect physical activities, location, or physical proximity [8]. Complementarily, content shared on social media can serve as a "lens" to what students do, how they engage socially, and what they are feeling [2, 19, 20].

Although not specifically focused on the college context, leveraging the potential of these data, especially self-tracking data, many tools and applications have been proposed and developed [5, 6, 10, 12]. These tools largely aim to enable self-reflection, promote self-awareness and behavior change, or surface interventions.

We note that a college campus encompasses a socially and geographically cohesive situated community, where poor mental health of an individual student not only impacts the students themselves, but also can have spillover effects on others, for instance, exacerbating the risk of copycat suicides [21]. Maintaining a healthy mental health climate on campus, alongside connecting students

in need with timely clinical care and counseling is, therefore, of paramount importance from a public health perspective [11]. For this purpose, per the Social Ecological Model of mental health [4], involvement of multiple stakeholders within college campuses has been advocated in literature. These stakeholders could include the students' family members, peers and friends, educators and instructors, on-campus clinicians, and campus administrators. However, despite acknowledgement of this need, currently, a lack of sufficient information about student well-being and behaviors in situ inhibits the efficacy, timeliness, and appropriateness of the actions of many campus stakeholders.

Therefore, we are highly interested in developing new technologies for stakeholders which can bridge current gaps in understanding students' mental health. To explore the potential of students' personal data in this context, we are conducting research which involves qualitative research with campus administrators and on-campus clinicians. We discuss preliminary findings from the on-going project as well as directions for future research.

2 DESIGNING FOR STAKEHOLDERS

2.1 Understanding Stakeholders

Understanding user groups, their needs, expectations, existing practices, and beliefs and values constitute a primary task in the user-centered design approach developing mental health technologies [15]. In the absence of adequate stakeholder involvement and feedback, interactive mental health technologies, when deployed in the real world, can lead to mistrust and poor perceptions of accountability, ill-informed folk theories behind how they work, violated expectations, and reinforced biases. In the college campus context, potential user groups of such technologies can include not only the students themselves who are suffering from a mental illness, but also their friends, family members, faculty, campus administrators, and on-campus clinicians. Previous research explored some of those stakeholder groups, such as family members, although not in a campus context, [17] and clinicians in a college campus [9]. However, there is still a need to investigate how other stakeholder groups, such as friends, peers, bystanders, and campus administrators, would review and appropriate students' personal data, if the data is voluntarily shared with them.

In addition to understanding each stakeholder group, we would also like to highlight that identifying the dynamics between stakeholder groups can reveal gaps which should be considered in designing the new mental health technology. For example, a nation-wide survey [18] has revealed that counseling centers and on-campus psychiatry often share their student patients, however, in more than 70% of universities, they use different electronic health record (EHR) systems. We might want to consider a system which could work

---

in different work environments, which would ultimately enhance collaboration between stakeholder groups in improving the overall college campus mental health.

2.2 Transparent Visual Presentation

In our on-going project, both groups of participants — campus administrators and on-campus clinicians — expressed interest in having a simple and easy to understand design because they felt they did not have enough time to wade through a morass of information. At the same time, they wanted the dashboard to reveal relationships between data types or the underlying factors of students' emotional and behavioral changes.

These two types of feedback from our participants—desire for a comprehensively detailed dashboard that is also streamlined to better suit users' need—indicate an *apparent tension* in the design of the new technology. They would need to provide a minimal amount of *simple*, highly accurate, relevant, and trustworthy information that can be consumed and interpreted easily, as well as pose reduced information load and burden to the stakeholders. At the same time, the new technology will need to provide *revealing* information—e.g., underlying causes relating to the precipitants and factors driving, exacerbating or improving students' mental health.

We recognize that navigating this tension would require trading off between abstraction (for simplicity) and transparency (for revealing information discovery)—a challenge in data-powered health technology design [3]. This challenge is especially salient in our case, because some of the data types our stakeholders identified to be valuable for the dashboard would need to be derived via machine learning from raw data (e.g., sleep or depression).

These approaches challenge the norm of transparency due to the opacity in their automated analytic capabilities [13]. Essentially, they prevent end users from understanding their inner workings while allowing abstraction of their technical intricacies. They also hinder legible interpretation of their outcomes and mutual interconnections amongst outcomes, in ways that challenge the end users' mental models, beliefs, and values, as well as trust in and expectations from the dashboards [14].

2.3 Ethical Challenges

The new technology we propose should be built on the informed consent of students who will provide personal data and have the data shared with stakeholders. However, even if they agreed to share the data, due to the highly sensitive nature of personal data, there can be ethical issues regarding privacy, confidentiality, and liability to consider. These issues can be challenging in two ways: firstly, students may decide not to share their personal data, in the first place, due to privacy concerns; secondly, even if they agree to share their personal data, they may inadvertently provide certain information, which they would not choose to intentionally share with the stakeholders otherwise. Further, since students' personal data is often not generated with the goal of inferring and measuring health status, any use of these datasets in the new technology, even with consent, constitutes secondary use, and therefore needs to be handled and used responsibly and cautiously.

To address issues surrounding **privacy**, we need to consider transparency features for the new technology. These features can let students stay informed about what kinds of data will be shared with whom, when, and in what ways. During the informed consent process as well as by adopting continued consent procedures, we can also provide an example screenshot of stakeholders' views, which will enable them to know that the data is abstracted and de-identified properly for the stakeholder who will view the interface. Additionally, the designs could be augmented with complementary student views, which can provide a regular review of the sharing process. In the case of a potential mismatch of expectations, students would have the ability to opt out of the sharing process altogether, or just eliminate specific data that they do not want to be considered from the new technology. In other words, regular reviews that show how their data will be processed and shared with others can assuage privacy related concerns.

Confidentiality concerns are related to situations wherein agreed upon personal data is exposed to people who do not have authorized access to that data. It can be caused by malicious attempts to access sensitive data or malfunctions in the security features of platforms. To address these concerns, the dashboard designs need to thoughtfully consider various aspects of data collection, storage, and presentation, in ways that prevent the need to access the raw data of students as much as possible.

Lastly, **liability** issues may occur if stakeholders are not able to take proper actions, even if they are notified of obvious trends in student mental health status that might need just-in-time interventions. Data related to suicidal risk or ideation would best illustrate these issues. Given the fact that student personal data would be leveraged in near real-time by the dashboards, the stakeholders may not be equipped to focus on such risk markers on the dashboard all the time and take proper actions toward preventing such tragic events. Further, there might be other situations where stakeholders are not able to deploy adequate resources, even if they are informed of adverse mental health crises, due to logistical or access limitations. To address this issue, we need to investigate what kinds of interventions might actually be practical and possible via future iterations of the dashboards.

Despite these ethical challenges, visual presentations of students' personal data can bring benefits to not only the stakeholders, but also to the student body itself. Hence, future research could involve collaborations of HCI designers and researchers with multi-disciplinary scientists, like clinicians and ethicists, to explore ways to alleviate these ethical concerns in the new technology.

3 CONCLUSION

In this position paper, we point out three implications for future research in designing new technology for campus stakeholders to support students' mental health. Firstly, as HCI researchers and designers, we need to consider the social context of students' personal data: which stakeholders play which roles to support students' mental health and how new technology can be incorporated in their current work practices. Secondly, we need to develop new technology which can provide simple to understand, and transparent visual presentation of students' personal data. Finally, we need to be proactive in overcoming ethical challenges, such as privacy, confidentiality, and liability. We believe multi-disciplinary collaboration between health informatics researchers, designers, clinicians, and ethicists can pave the way forward in tackling the college students mental health crisis.

REFERENCES

[1] American College Health Association. 2018. *National College Health Assessment II: Reference Group/Executive Summary Fall 2017*. American College Health Association, Hanover, MD.

[2] Shrey Bagroy, Ponnurangam Kumaraguru, and Munmun De Choudhury. 2017. A Social Media Based Index of Mental Well-Being in College Campuses. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems - CHI '17*. ACM, 1634–1646. https://doi.org/10.1145/3025453.3025909

[3] Eric P S Baumer. 2017. Toward human-centered algorithm design. *Big Data & Society* 4, 2 (7 2017), 2053951717718854. https://doi.org/10.1177/2053951717718854

[4] Centers for Disease Control and Prevention and others. 2015. The social-ecological model: A framework for prevention. https://www.cdc.gov/violenceprevention/overview/social-ecologicalmodel.html

[5] Eun Kyoung Choe, Bongshin Lee, Haining Zhu, Nathalie Henry Riche, and Dominikus Baur. 2017. Understanding Self - Reflection : How People Reflect on Personal Data Through Visual Data Exploration. In *Proceedings of the 11th EAI International Conference on Pervasive Computing Technologies for Healthcare (PervasiveHealth '17)*. ACM, New York, NY, USA, 173–182. https://doi.org/10.1145/3154862.3154881

[6] S Consolvo, McDonald DW, T Toscos, Chen MY, J Froehlich, and B Harrison. 2008. Activity sensing in the wild: a field trial of UbiFit Garden. (2008), 1797–1806.

[7] Eden Dahlstrom and Jacqueline Bichsel. 2014. *Study of Undergraduate Students and Information Technology*. http://www.educause.edu/ecar

[8] Seyed Amir Hoseini-Tabatabaei, Alexander Gluhak, and Rahim Tafazolli. 2013. A survey on smartphone-based systems for opportunistic user context recognition. *Comput. Surveys* 45, 3 (2013), 1–51. https://doi.org/10.1145/2480741.2480744

[9] Christina Kelley, Bongshin Lee, and Lauren Wilcox. 2017. Self-tracking for Mental Wellness: Understanding Expert Perspectives and Student Experiences. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems (CHI '17)*. ACM, New York, NY, USA, 629–641. https://doi.org/10.1145/3025453.3025750

[10] Young-Ho Kim, Jae Ho Jeon, Bongshin Lee, Eun Kyoung Choe, and Jinwook Seo. 2017. OmniTrack: A Flexible Self-Tracking Approach Leveraging Semi-Automated Tracking. *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies* 1, 3 (2017), 1–28. https://doi.org/10.1145/3130930

[11] Martha Anne Kitzrow. 2003. The Mental Health Needs of Today ' s College Students: Challenges and Recommendations. *Journal of Student Affairs Research and Practice* 41, 1 (2003), 165–180. https://doi.org/10.2202/1949-6605.1310

[12] Min Kyung Lee, Junsung Kim, Jodi Forlizzi, and Sara Kiesler. 2015. Personalization Revisited: A Reflective Approach Helps People Better Personalize Health Services and Motivates Them to Increase Physical Activity. In *Proceedings of the 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing (UbiComp '15)*. ACM, New York, NY, USA, 743–754. https://doi.org/10.1145/2750858.2807552

[13] Zachary C. Lipton. 2016. The Mythos of Model Interpretability. Whi (2016). https://doi.org/10.1145/3236386.3241340

[14] Eva Mayr, GÃijnther Schreder, Michael Smuc, and Florian Windhager. 2016. Looking at the Representations in Our Mind: Measuring Mental Models of Information Visualizations. In *Proceedings of the Sixth Workshop on Beyond Time and Errors on Novel Evaluation Methods for Visualization (BELIV '16)*. ACM, New York, NY, USA, 96–103. https://doi.org/10.1145/2993901.2993914

[15] David C. Mohr, Ken R. Weingardt, Madhu Reddy, and Stephen M. Schueller. 2017. Three Problems With Current Digital Mental Health Research . . . and Three Things We Can Do About Them. *Psychiatric Services* 68, 5 (2017), 427–429. https://doi.org/10.1176/appi.ps.201600541

[16] Carol T. Mowbray, Deborah Megivern, James M. Mandiberg, Shari Strauss, Catherine H. Stein, Kim Collins, Sandra Kopels, Caroline Curlin, and Robin Lett. 2006. Campus mental health services: Recommendations for change. *American Journal of Orthopsychiatry* 76, 2 (2006), 226–237. https://doi.org/10.1037/0002-9432.76.2.226

[17] Laura R Pina, Sang-Wha Sien, Teresa Ward, Jason C Yip, Sean A Munson, James Fogarty, and Julie A Kientz. 2017. From Personal Informatics to Family Informatics: Understanding Family Practices Around Health Monitoring. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing (CSCW '17)*. ACM, New York, NY, USA, 2300–2315. https://doi.org/10.1145/2998181.2998362

[18] David R Reetz, Carlyn Bershad, Peter LeVines, and Monica Whitlock. 2014. *The Association for University and College Counseling Center Directors Annual Survey*. The Association for University and College Counseling Center Directors (AUCCCD).

[19] Koustuv Saha, Larry Chan, Kaya De Barbaro, Gregory D. Abowd, and Munmun De Choudhury. 2017. Inferring Mood Instability on Social Media by Leveraging Ecological Momentary Assessments. *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies* 1, 3 (2017), 1–27. https://doi.org/10.1145/3130960

[20] Koustuv Saha and Munmun De Choudhury. 2017. Modeling Stress with Social Media Around Incidents of Gun Violence on College Campuses. *Proceedings of the ACM on Human-Computer Interaction* 1, CSCW, Article 92 (2017), 27 pages. https://doi.org/10.1145/3134727

[21] John S Westefeld, Christopher Button, James T Haley, Julie Jenks Kettmann, Jennifer Macconnell, Riddhi Sandil, and Benjamin Tallman. 2006. College Student Suicide: A Call To Action. *Death Studies* 30, 10 (12 2006), 931–956. https://doi.org/10.1080/07481180600887130